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Asian Journal of Organic & Medicinal Chemistry

Special Issue

On

**Current Trend on Research in Applied Science,
Management and Technology**

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Developing Android Based Printer Application

Narendra Bawane and Snehal S. Raghatate

Department of Electronics & Telecommunication Engineering, Jhulelal Institute of Technology, Nagpur, India

ABSTRACT

Now-a-days wireless technologies are being used more and more. Everyone wants to go for easy life and devices are developed just to achieve that. One of the devices that we can take into consideration is a Printer. But one of the problems in printing a document is the desired application program is not available on the computer that is connected to the desired printer. Sharing the printers via local area network also allows multiple users to access the printers, but the connected computer should be always on during the printing process. This device can handle several local traditional printers and allows several users to print documents wirelessly. Embedded module itself acts here as an interfacing unit replacing the use of a desktop computer which is connected to the printer.

Keywords: wireless communication, printers

I. INTRODUCTION

We can get a physical copy of a digital image using Printers. For these all we need is a specialized software or driver which are understandable by the Printers. The image or text is then recreated on to the page using a series of minuscule dots.

The input to the system is a data file to print and the output of the system is serial data in printing format. We can wirelessly print documents, bills and invoices (MS Office: Word, Excel, PowerPoint; PDF and text files) from device memory, SD card and even from Google Drive (Google Docs) by using the printing method. Instantly print emails from Gmail, print photos and images (JPG, PNG, GIF), also print contacts, agenda, sms/mms, call log, web pages (HTML) and other digital content directly from your device to a printer right next to you. In the time of Covid-19 one should maintain distance and should avoid touch to any of the equipment. This application will surely take care of that and will reduce the efforts.

II. LITERATURE SURVEY

With embedded systems fast expanding its reach, subject matter related to this field is available in abundance. While working on this project we have studied matter from various sources such as books, online articles and reference manuals. The knowledge gained from this activity has been of great help to us in understanding the basic concepts related to our project and has ignited further interest in this topic.

"Linux for Embedded and Real time Applications", by Doug Abbott has been of great help in providing an introduction to the process of building embedded systems in Linux. It has helped us understand the process of configuring and building the Linux kernel and installing tool chains. This should be the initial Step for any project.

We understood the preponderance of the ARM processors in the field of embedded systems and the features of ARM processors from the document "The ARM Architecture" by Leonid Ryzhyk. The ARM architecture is a confluence of many useful features that makes it better than other peer processors. Being small in size and requiring less power, they prove useful in providing an efficient performance in embedded applications.

III. METHODOLOGY

Existing System:

The common data printing procedure has to use a notebook or desktop computer as a relay medium, first receiving the data from mobile and then sending it to printer using an appropriate printing Method. This is a tedious job.

This project proposed a design of a device which directly prints the data stored inside the Mobile without the assistance of a notebook or desktop computer.

Proposed System

The design comprises a microcontroller having a wifi module. The configured Wifi accepts file from Mobile and gives to controller and then controller will send to printer

IV. BLOCK DIAGRAM

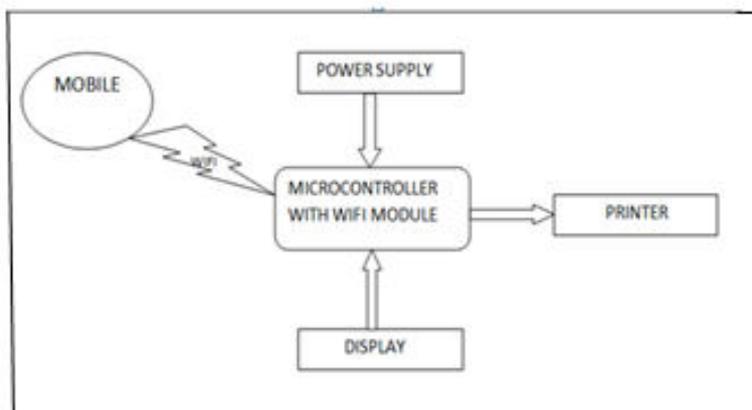


Fig. 1: Block Diagram

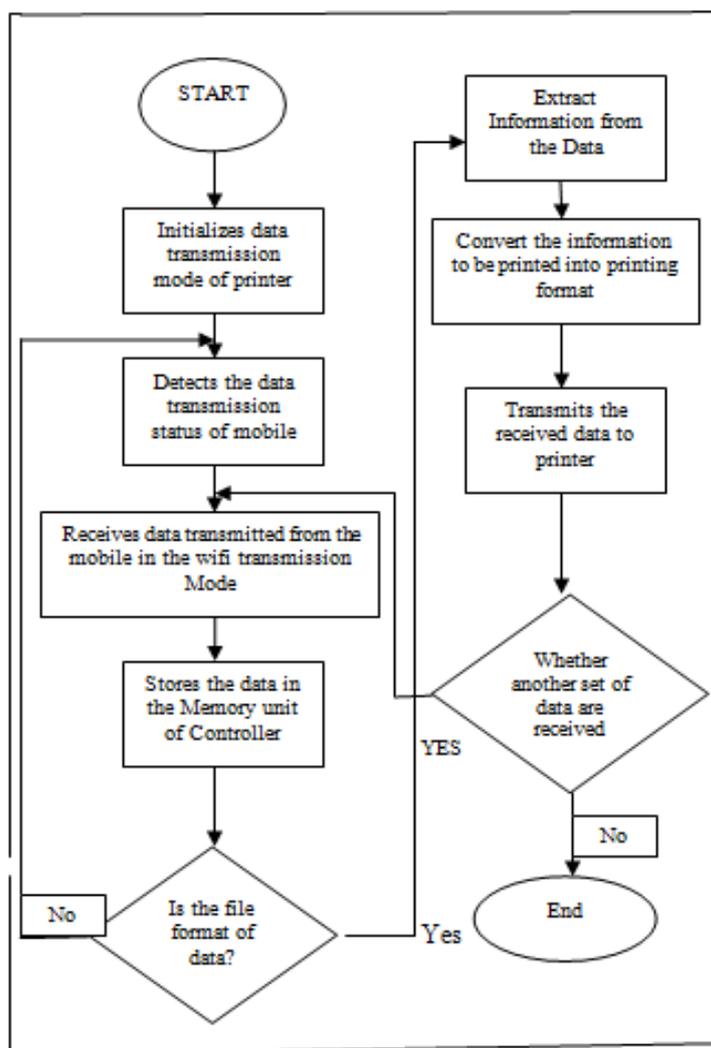


Fig. 2: Algorithm to be designed

The Algorithm shown in Fig. 2. consist of following steps –

- 1) Initialize the data transmission mode of printer.
- 2) Detect the data transmission mode of mobile.
- 3) Receives data transmitted from mobile.
- 4) Store the data in Memory unit.
- 5) Check the file format in the memory unit.

- 6) If the file format is correct then extract the information from the data, if file format is not correct then again detect the data transmission mode of Mobile phone.
- 7) Converts the information to be printed into printing data.
- 8) Transmits the received printing data to printer.
- 9) Stop

V. HARDWARE MODULES

A. Arduino

Arduino is an open-source electronics platform, it is based on easy-to-use hardware and software. Arduino boards are able to read inputs(from input pin) - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output(from the output pin) - activating a motor, turning on an LED, publishing something online.

Its main advantages are:

1. Inexpensive
2. Cross-platform
3. Easy to use
4. Open source

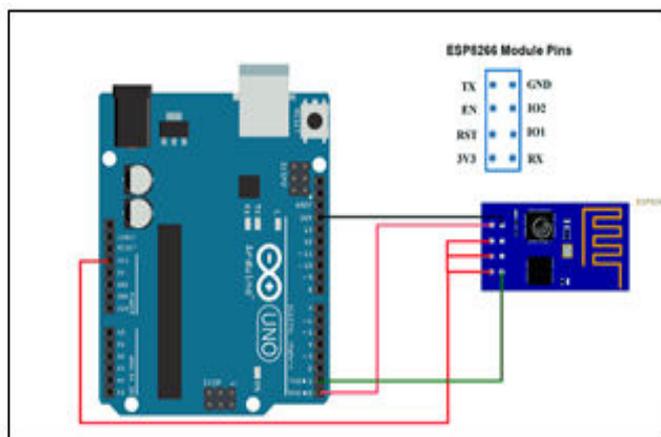


Fig.3: ESP8266 WiFi Module Interfacing with Arduino

A. Printer:

An external hardware device responsible for taking computer data and generating a hard copy of that data. Printers are one of the most commonly used peripherals and they print text and still images on the paper

B. USB:

USB transmission module-It is connected to the microprocessor and in electrical communications It is the medium between Arduino and printer.It is the connection between microprocessor and printer

C. Wi-Fi

Wi-Fi is **the wireless technology used to connect computers, tablets, smartphones and other devices to the internet**. It uses radio signals to transfer data from one end to another.

VI.SOFTWARE MODULES

A. Android Studio

Android Studio is Integrated Development Environment (IDE) for Android app development, It is official and based on IntelliJ IDEA . It enhance your productivity when building Android apps, such as:

- A flexible Gradle-based build system
- A fast and feature-rich emulator
- A unified environment where you can develop for all Android devices
- Apply Changes to push code and resource changes to your running app without restarting your app

-Extensive testing tools and frameworks -Lint tools to catch performance, usability, version compatibility, and other problems-C++ and NDK support

B. Arduino IDE 1.8.19 .Any Arduino board can use this software. It is a open source, Arduino Software(IDE) makes the things easy, as it is easy to code and upload.

VII.OUTPUTS

Interesting part for me was the UI generation. It is an amazing experience to generate an UI of an Android Application



Fig 3: Command printer icon

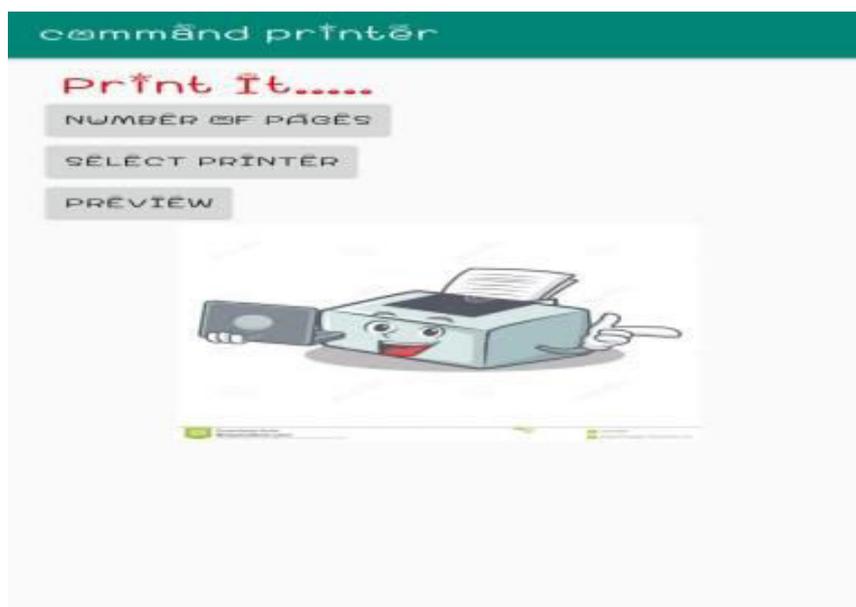


Fig 4: Command printer UI

VIII.CONCLUSION

The design comprises microcontroller having wifi module. The configured Wifi accept file from Mobile and gives to controller and then controller will send to printer.

Main aim of saving time of the user is achieved, as user is no more need to go to printer for a prints

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Substation Parameter Monitoring and Controlling Through IOT

Nitin Choudhary, Omprakash Upadhyay, Rahul Kannalwar, Pratiksha Sakhare, Kritesh Gaikawad, Sachin Barve, Himanshu Nakhale and Mohit Ranshoo

Department of Electrical Engineering, Jhulelal Institute of Technology, Nagpur, Maharashtra, India

ABSTRACT

Power is generated at power plant and is used to be carried out by transmission line to the distribution substation. The substation steps down the voltage through the transformer and distributes it to the different area. We need to monitor the parameters of distribution line like current, voltage, frequency, power, power factor and temperature of the substation.

Nowadays there are Smart Energy Meters available in the market whose readings can be monitored from anywhere using the internet and not only energy consumption but we can monitor multiple parameters such as voltage, current, power, power factor, energy and frequency, etc. on laptop or mobile using IOT. So today we are building IOT based substation parameters monitoring system using Node MCU. We are measuring the electrical parameters like current, voltage, frequency, energy power and power factor by using the

PZEM-004t sensor and for measurement of humidity and temperature in the transformer oil we are using DHT11 sensor. This will further connected through Wi-Fi to the node MCU from which the all the parameters will be display on the computer screen or on the mobile application (Blynk App)

The digital temperature control module is used for the measurement of transformer winding temperature. This module consists of temperature sensor and fan. Suppose if there is a temperature rise in the transformer winding the fan will be automatically operated for the cooling purpose. This comes under the controlling part. This project is based embedded system used for monitoring the voltage, current, and temperature and oil level of a transformer. Furthermore it is capable of recognizing the break downs caused due to overload, high temperature, over voltage and oil level intimation of transformer. The design generally consists of units, one in the substation unit, called as display unit, display units in the substation is where the voltage, current and temperature are monitored continuously by AVR microcontroller and is displayed through the display unit. The ultimate objective is to monitor the electrical parameters continuously and hence to guard the burning of transformer or power transformer due to the constraints such as overload, over temperature, input high voltage and double protection of CB operation by using the Internet of Things (IOT). Keywords: Transformer, transient voltages, circuit breaker, IOT

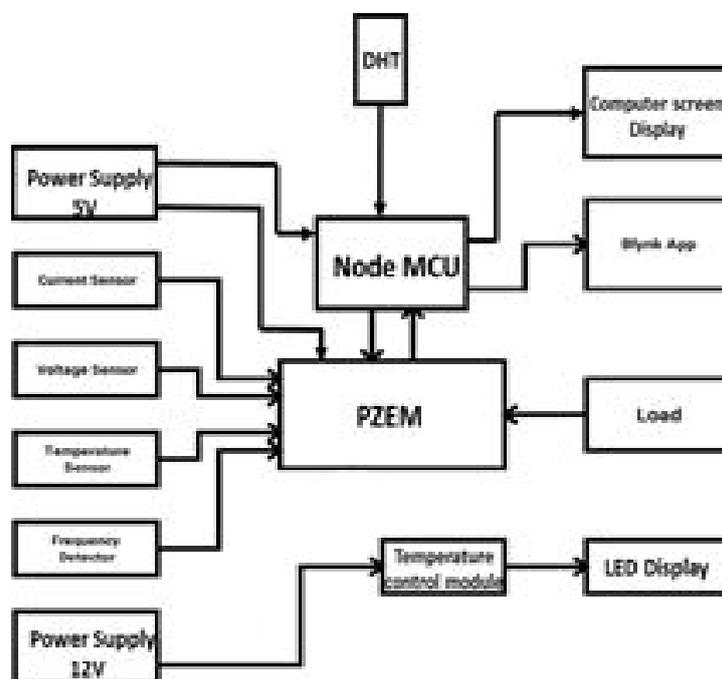
INTRODUCTION

The main aim of this project is to acquire remote electrical parameters in substation. The fundamental objective of this project is to improve reliability and compatibility, to maintain continuity of supply, real time monitoring of parameters and to reduce the labour cost. The overall academic goal of this project is to study and prototype a substation monitoring system in which the various parameters in the substation is to be monitored.

As complexity of distribution network has grown, automation of substation has become a need of every utility company to increase its efficiency and to improve quality of power being delivered. Today electricity still suffers from power outages and blackouts due to the lack of automated analysis and poor visibility of the utility over the grid. The distance between the generators and load may be in terms of hundreds of miles hence the amount of huge power exchange over long distances has turned out as a result of the lack of quality of the electric power. During the earlier development stages the issues on quality of power were not frequently reported. Demanding the quality of power being delivered at the user side has raised the alarm due to the increase in demand of electricity in the customer side. A huge amount of power is lost during the transportation of the general power which leads to the reduction in the quality of power received at substation. To Improve the quality of power with suffer solution it is necessary to be familiar with what sort of constraint has occurred. Additionally, if there is any inadequacy in the protection, monitoring and control of a power system. The system might become unstable. Therefore, it necessary a monitoringsystem that is able to automatically detect, monitor, and classify the existing constraintson electrical lines. Thus, monitoring of substation becomes the essential task forsupplying healthy power to the consumers in this automated era. Conventional energy meter which we use in our households to measure Energy consumption is an offline device, so it has to be monitored manually. But nowadays there are Smart Energy Meters available in the market whose readings can be monitored from anywhere using the internet and not only energy consumption but we can monitor multiple parameters such as

voltage, current, power factor, frequency, etc. on laptop or mobile using IOT. So today we are building IOT based substation parameters monitoring system using Node MCU. Here we will use PZEM AC multifunction Electric Energy Metering Power Monitor module to measure the various electrical parameters. PZEM AC Module is used for measuring AC voltage, current, power, energy, frequency and power factor. We are also using the DHT 11 module to measure the temperature and humidity in the transformer oil. And to post the data on computer screen or mobile we are using Node MCU. The module gives output, which can be read by various microcontrollers for further applications. We are going to connect the small rating of current transformer as a substation part in the circuit. The temperature control module is also used in the system to detect the temperature of transformer winding. In case of rise in temperature the fan will be automatically operated for cooling purpose. The purpose of this project is to acquire the remote electrical parameters like voltage, current, power, power factor, frequency, temperature, humidity and send these real time values over network using IOT module. This system also can automatically send the real time electrical parameters periodically (based on time settings). This system can be designed to send alerts whenever the voltage or current exceeds the predefined limits.

METHODOLOGY FOR PROPOSED WORK



1) BLOCK DIAGRAM

The block diagram for SMART MONITORING OF SUBSTATION is shown in fig. 4.1, it gives a short idea about the project. As shown in block diagram, the 5v supply is given to the Node MCU and PZEM. PZEM is AC power monitor. PZEM measures the electrical parameters like current, voltage, power, energy, frequency and power factor. The DHT sensor is used here for the measurement of temperature and humidity in the transformer oil. This two sensors are interfaced with the node MCU (Microcontroller). The output of PZEM and DHT sensors is sent to the node MCU which sends the real time values of all the parameters to display on the laptop screen in a serial way or on the mobile app. Another 12V supply is given to the Temperature control module. This is for the measurement of transformer winding temperature. This temperature control module consists of the LED display, inserting probe and fan. The temperature of transformer winding will be measured by inserting the probe in the Drawback of existing system:

- No automated over voltage protection
- No automated over current protection
- No automated over temperature protection
- No low oil level intimation system
- No remote monitoring and alerting system.

2) COMPONENTS

1) **Node MCU**:- NodeMCU is an open source platform based on ESP8266 which can connect objects and let data transfer using the Wi-Fi protocol, so that we can control it wirelessly. In addition, by providing some of the most important features of microcontrollers such as GPIO, PWM, ADC, and etc, it can solve many of the project's needs alone.

2) **PZEM-004t**:- PZEM-004T is an electronic module that functions to measure: Voltage, Current, Power, Frequency, Energy and Power Factors. With the completeness of these functions / features, the PZEM-004T

module is ideal for use as a project or experiment for measuring power on an electrical network. PZEM-004T module is very easy to use in programming using various types of microcontroller boards such as Arduino, ESP8266, STM32, WeMos, NodeMCU, Raspberry Pi etc. because it uses TTL serial communication.

3) **DHT11:-** DHT11 is a low-cost digital sensor for sensing temperature and humidity. This sensor can be easily interfaced with any micro-controller such as Arduino, Raspberry Pi, nodeMCU, etc., to measure humidity and temperature instantaneously. DHT11 humidity and temperature sensor is available as a sensor and as a module. The difference between this sensor and module is the pull-up resistor and a power-on LED. DHT11 is a relative humidity sensor. To measure the temperature, the sensor uses a thermistor and a capacitive humidity sensor.

4) **Temperature Control Module :-** W1209 Mini thermostat Temperature controller is low-cost 12V Temperature controller with LED display and 3 switch keypad for setting temperature and other parameters. The module features an NTC thermistor temperature sensing and has an accuracy of 0.1 C.

The W1209 digital temperature controller Module with Display and NTC Waterproof Temperature Sensor is an incredibly low cost yet highly functional thermostat controller.

With this module, you can intelligently control power to most types of electrical devices.

5) **Fan:** - Need for thermal control is necessary for the improved reliability and life extension of the components that are included in the system. Uncontrolled heat generated by electronic devices will not only decrease the performance of any system, but will ultimately lead to complete system failure. In order to prevent this catastrophe from occurring, it is imperative that your equipment be designed with an efficient cooling system. This system will not only be crucial to heat dissipation but will also contribute to the stability and long life of the equipment itself. DC fan with a well designed cooling path becomes one of the most important components of any equipment. DC fan is one of the best tools available to keep your electronic devices performing at top operational shape. DC fan functions best under a low pressure or low system impedance environment. With reduced fan speed the noise produced by an axial fan can be kept at a minimum.

3) COST

Structure of cost of elements PZEM-004t 1,250 NodeMCU 2000 Sensor 800 for excute coding (2500) Temperature sensor module with fan 1800 Power supply 1700 Total cost found 10,050.

4) WORKING

PZEM senses the substation supply (here 230 V) and measures the values continuously. To measure the parameters, it take supply of 230V. But for operation of the module it needs 5V supply. This supply of 5V is fed by power supply module which is also fed to NodeMCU. Likewise the DHT also measures the temperature and humidity. Now, this sensed and measured data is need to be display remotely in our laptop screen or on the mobile application. For that, NodeMCU is used. This microcontroller has inbuilt wifi module to transmit data to mobile continuously. So PZEM and DHT is interfaced with NodeMCU and an assembly code is uploaded to node MCU. After the complete process the data will be display on the laptop screen. The blynk application is used for monitoring this parameters on our smartphones. Blynk app is platform that allows you to quickly interface for controlling and monitoring your hardware projects from your android device. When load is connected, the output of PZEM and DHT sensor is sent to the node MCU which sends the real time values of all the parameters to display on the laptop screen in the serial way or on the mobile application (Blynk Application). This is how the project works. Firstly libraries are included to Arduino ide like ESP8266Wifi.h, PZEM004Tv30.h, DHT.h Software Serial.h, and Blynk Simple Now authentication key is set for blynk app and username and password is defined for the wifi connection. Then the pin and type of DHT is defined. For energy measurement timer is included, also for data transmission data pins and declared Data sampling task is begin and frequency is set (115200) Now loop begins for printing current, voltage, power, power factor, energy, frequency, humidity and temperature along with its defined units. Delay of 2 sec is set for real time monitoring of parameters.

RESULT

As it is known, most substation devices have high voltage and generate electromagnetic that can harm human health. We made a prototype for observing and adjusting the substation and transformer factors like voltage, current, power and temperature. All these considerations will be observed using Node MCU. We went for programming in such a way that it can monitor all parameters and display it on the computer screen or on the mobile. Monitors continuously the voltage value and gives intimate and shut down the transformer if voltage beyond or less than defined voltage. Monitors continuously the current value and gives intimate and shut down the transformer if voltage beyond or less than defined current. Monitors continuously the temperature and gives

intimate and shut down the transformer if temperature beyond or less than defined temperature. Continuously monitors the oil level and intimates if oil level is low. You can monitor CB by application by PC or mobile. Each and every parameter like voltage, current, temperature displays & oil level on LCD. Power supply is the main part of the circuit; the circuit needs the 12V DC supply. But in our home 230 AC supply is available. So it has converted it to 12V DC and 5V DC by Rectifier circuit by regulator IC 7812 and 7805 respectively. Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53- R0), a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-toDC adapter or battery to get started. You can tinker with your UNO without working too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again. LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over even segments and other multi segment LEDs. The reasons being: LCDs are Steps Followed in Designing the System.

APPLICATION

Electrical substation monitoring and diagnostics A substation intelligence system includes a substation computer which is operatively connected to a plurality of field devices through an input/output subsystem. Data indicative of the devices is stored in a substation database. Advanced monitoring and diagnostics use information from the database to perform various monitoring and diagnostic functions.

Remote monitoring and controlling physical parameters of a material under transportation An internet of Things (IOT) based system for remotely monitoring and controlling various physical parameters for chemical/biological material under transportation in a container is disclosed herein. Due to various circumstances, either hazardous or infectious, taking proper measures become necessary condition while transporting chemical or biological materials. The sensors attached to the container measure the associated physical parameters and send the data to a remote control system. The dynamic barcode responds to the change in any of the parameters and change in patterns accordingly. The remote server, based on the received data, instructs a controlling system to control the parameters, thus maintaining the health of materials Monitors continuously voltage and gives intimate and shut down the transformer if voltage beyond or less than defined voltage.

- Monitors continuously current and gives intimate and shut down the transformer if voltage beyond or less than defined current.
- Monitors continuously voltage and gives intimate and shut down the transformer if voltage beyond or less than defined temperature.
- You can know the present parameters of station you can get it whenever you by texting an SMS.
- Each and every parameter like voltage, current, temperature displays on LCD.
- Each and every parameter like voltage, current, temperature displays & oil level on LCD.

CONCLUSION

In this project, a proposed system for monitoring and controlling substations based on IoT in the electrical substations is designed and tested, to reduce disasters and economic losses in the important equipment in the stations. The parameters monitored included voltage, current, power, frequency, power factor, active power, temperature, and humidity. The PZEM-004T and DHT11 sensors are used to obtain the parameters. Data are transmitted continuously and displayed in real-time on the Blynk Application through the ESP8266 module. The implementation of the system reduces the severity of disasters in the stations and is considered as to step for transition from traditional substations to smart substations. The system has proven its feasibility, as the smart substation saves the time and effort that the engineers and technicians spend in obtaining the important readings in the stations and knowing the station's stability, where it can be recovered. In the future, the proposed system can be developed by linking more than one monitoring system for multiple substations together, so that the responsible authorities can monitor and control these systems remotely. This chapter concludes the project work along with the future scope of the project. We can install wireless cameras in the premises of substation switchyard, through which we shall be able to visually monitor the substation in a better way. This particular would be really helpful for monitoring of transformers as we know most of the time they are deployed in the

dispersed locations. Our project microcontroller based substation monitoring and control system with module will be able to protect the equipment substation automatically with the help of sensors and technology when ever fault occurs in the system. It will help in safe and consistent power supply. It will reduce the human contact for maintenance purpose and becomes self operating system. Also reduces the cost and maintenance.

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Transformer Health Monitoring System Using IOT

Piyush Bahad, Abhishek Meshram, Harshal Khobragade, Mahesh Gajbhiye, Chetan Bhaskar, Sangharakshit Meshram, Mahima Meshram and Niharika Nandgave

Department of Electrical Engineering, Jhulelal Institute of Technology, Nagpur, India

ABSTRACT

Electrical power plays a significant role in people's daily activities. Due to the advancement of technology IOT technique is used in most real-time applications. Various sensors are used to collect real data from the environment or objects. With the help of the IOT concept, people can create a machine-to-machine connection. This proposed system was designed to monitor and detect the faults of the transformer and immediately sent the message to the authenticated person. The important indicators used to measure the condition of the transformer are temperature, oil level, and vibration. This system can reduce manpower and increases the stability, accuracy, and efficiency of the transformer. The sensor data transfer to the controller and check the indicators limit values. If the indicator's value crosses the threshold values the message transfer to the concerned people. All the sensor values are sent to the android phone through IOT.

Keywords: Temperature Sensor, Ultrasonic Sensor, voltage Sensor, IoT, Relay, 16x2 LCD, Buzzer, ACS712 Current Sensor, ESP 32 Controller.

1. INTRODUCTION

Every second of human life electricity is an important component. Various components are used to regulate the energy distribution based upon the user's requirements [1]. The transformer is one of the major components used to distribute electrical energy. This component distributes the electrical power to the low-level voltage users. The condition of the transformer is the major criterion of the total network. Compare with the other components cost the transformer cost is high. So, continuous monitoring is necessary for all transformers. But transformers are situated in various places. In the olden days, the condition of the transformers is monitored with manual help. Continuous monitoring is a major issue in traditional systems. To overcome such kind of issue various new devices are used to monitor the condition of the transformer. Now IoT plays a major part in most of the real-time applications. Various sensors are used to measure the real-time data from electrical devices. overloading, temperature, and oil level are the major parameters used to monitor the condition of the transformer [2,3].

2. LITERATURE SURVEY

The transformer plays a significant role in the electricity domain. observing the condition of the transformer is a very critical task. Any small problems in the transformer also lead to major issues. Regular monitoring transformer health condition is important. Preventive devices are used to identify the fault and it will be helpful at the fault time. The main goal of the authors Amutha elakkiya et al., 2019 is to collect real-time data from the transformer with the help of the IoT (Internet of Things). This system can be used to monitor the important transformer features like temperature and the current level. The collected data sent through the TCP/IP internet protocol. using this system, the user will receive an alert signal when a power failure occurs. The LED display is used to display the phase defect message. The important parameter of the transformer is regularly sent to the android system. With the help of these parameters, the concerned people take necessary action and maintain the transformer in a better manner. This proposed embedded system is used to measure the current level, oil level, and temperature level of the transformer. The major goal of this system is to predict and prevent the fault of the transformer [4]. For the development of the Indian economy power system safety is very important. To provide the safety and reliability of the transformer monitoring system is used. A transformer is an important asset of the electrical network and it needs extra care and concentration. Sajidur Rahman ET AL., 2017 proposes THMS (Transformer Health Monitoring System) for monitoring the condition of the transformer in real-time. Huge numbers of transformers are available throughout the world; it is a very difficult task to observe the condition in a manual way of every transformer. So, an automatic monitoring system is needed to observe the condition of the transformer. This proposed system is embedded with the mobile to observe the load of the current, voltage level, oil temperature, and level of the oil. This system is integrated with the GSM (Global Service Mobile), microcontroller, and various sensors. The sensor data are collected and stored on the memory. The system checks the condition of the transformer using inbuilt instructions. If any abnormal conditions are occurring on the transformer the GSM component sent the message to the receivers' mobile phones contains the data about the abnormal condition. It is a wireless system to offer better monitor the condition of the transformer. The

developed system is embedded with the transformer and it sends the abnormal parameters to the cell phone using the GSM technique [5].

3. SYSTEM ARCHITECTURE

To monitored and detect the health condition of transformer as early as possible by measuring the level of transformer oil, humidity,voltage and temperature.

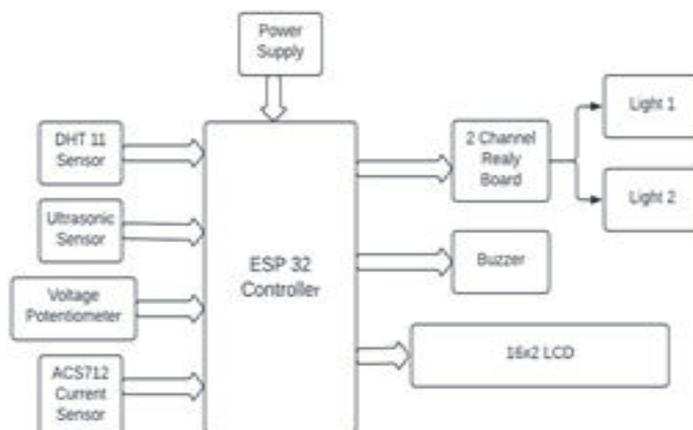


Fig.1: Block Diagram

3.1 Hardware

- ESP 32 Controller
- Ultrasonic Sensor
- Voltage Potentiometer
- DHT 11 Sensor
- Current Sensor
- Buzzer
- 16x2 LCD

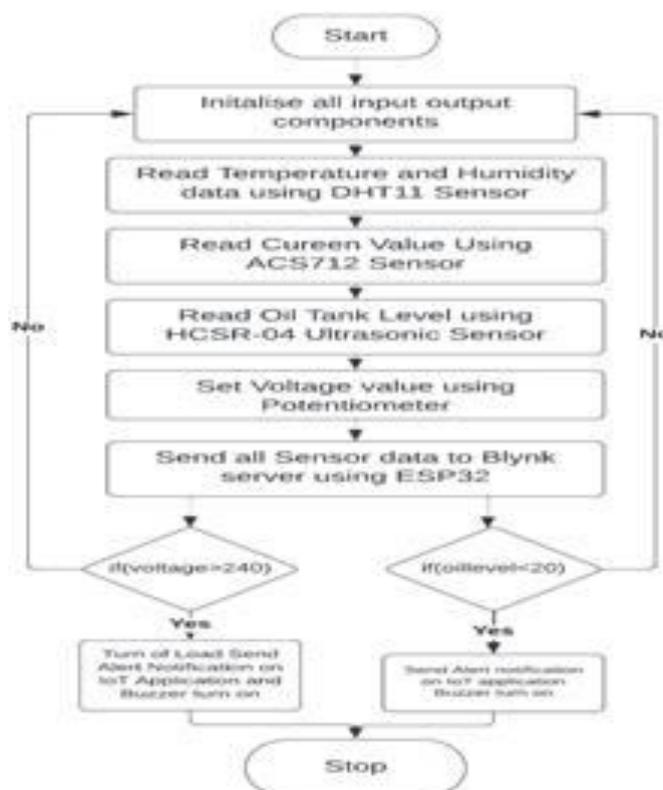


Fig.2: Flow Chart

This system design to send alert notification whenever any parameters detects but some time no person is available to extinguish problem so this system also capable to turnoff the load so this system helps to monitor and detect transformer health parameters in this system we used three different sensors for detecting voltage rating. first one is ultrasonic sensor for detecting level of transformer oil, second is DHT 11 sensor used to detect temperature of transformer.

Entire working of system depend upon input values of this three sensor we also used IoT(Internet of Things) for monitoring whole system from anywhere.

We used ESP32 controller for handling this because we need WiFi connectivity for IoT purpose and this controller have inbuilt Wi-Fi IC. Working of this project very simple first all sensor sense reading from environment and send this information to controller. All this sensor reading we send on Blynk cloud through ESP32 WiFi controller.

ESP 32 Controller

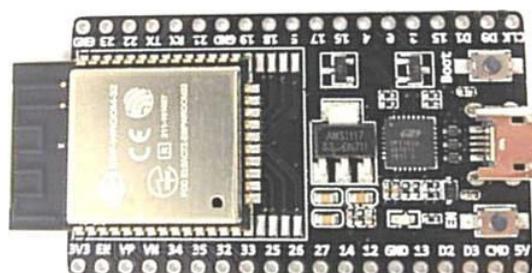


Fig.3: ESP32 Controller

There are totally three ways by which you can power your ESP32 board.

Micro USB Jack: Connect the mini-USB jack to a phone charger or computer through a cable and it will draw power required for the board to function

5V Pin: The 5V pin can be supplied with a Regulated 5V, this voltage will again be regulated to 3.3V through the on-board voltage regulator. Remember ESP32 operated with 3.3V only.

3.3 V Pin: If you have a regulated 3.3V supply then you can directly provide this to the 3.3V pin of the ESP32.

DHT 11 Sensor

DHT 11 sensor is a device which is used to detect the presence temperature and humidity of the transformer.

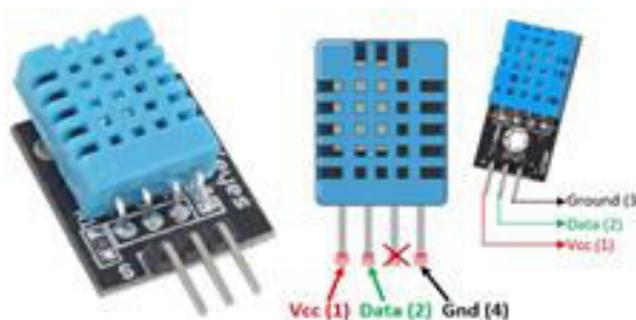


Fig.4: DHT 11 Sensor

The DHT11 is a commonly used Temperature and humidity sensor. The sensor comes with a dedicated NTC to measure temperature and an 8-bit microcontroller to output the values of temperature and humidity as serial data. The sensor is also factory calibrated and hence easy to interface with other microcontrollers.

The sensor can measure temperature from 0°C to 50°C and humidity from 20% to 90% with an accuracy of $\pm 1^\circ\text{C}$ and $\pm 1\%$. So, if you are looking to measure in this range then this sensor might be the right choice for you.

Relay

Relays are simple switches which are operated both electrically and mechanically. Relays consist of an electromagnet and also a set of contacts. The switching mechanism is carried out with the help of the electromagnet.

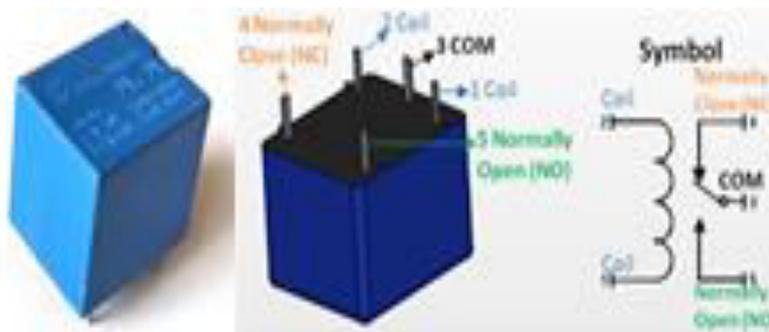


Fig.5: Relay Ultrasonic Sensor

As shown below the HC-SR04 Ultrasonic (US) sensor is a 4-pin module, whose pin names are Vcc, Trigger, Echo and Ground respectively. This sensor is a very popular sensor used in many applications where measuring distance or sensing objects are required. The module has two eyes like projects in the front which forms the Ultrasonic transmitter and Receiver. The sensor works with the simple high school formula that

$$\text{Distance} = \text{Speed} \times \text{Time}$$

The Ultrasonic transmitter transmits an ultrasonic wave, this wave travels in air and when it gets objected by any material it gets reflected back toward the sensor this reflected wave is observed by the Ultrasonic receiver module as shown in the picture below.



Fig.6: Ultrasonic Sensor

4. RESULT

We implement three different sensors in our system that are temperature sensor (DHT11), Ultrasonic sensor and voltage sensor all these three sensors send reading to ESP32 controller and ESP32 send all this information real-time on Blynk server we already set all sensor threshold value by studying and checking transformer parameter if any sensor reading exceeds threshold value it sends an alert message to concern person IoT Application and trigger buzzer also it terminates the system.

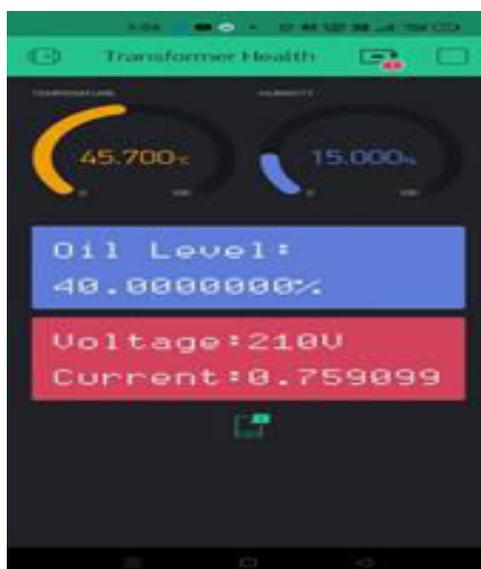


Fig.8: Output on IoT Application

Fig. 8 shows the user interface of IoT application have to separate gauge for shows real-time the sensor value another gauge for showing status of flame sensor. Other two are notification widgets one for sending an alert notification and other for sending email notification to the concerned person.

5. CONCLUSION

On our system, we read three different parameters for detecting these three parameters are rated voltage, temperature and humidity, and transformer oil level this will helps to improve the accuracy of transformer. It will help to detect above parameters on any condition with more accurately and fast.

So we try to overcome this issue by sensing different parameters for this reason we interface different parameters for sensing detection of various parameters.

Also, this system is based on IoT technologies so real-time sensor data and alert messages send to the concerned person so our system detects some parameters and accurately.

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Solar Inverter Using MPPT Technology

Piyush Bahad, Gaurav Watkar, Vivek Choudhary, Guru Bhojar, Sonali Chandekar, Pratima Mahajan, Priyanka Choudhari and Bhushan Atkar

Department of Electrical Engineering, Jhulelal Institute of Technology, Nagpur, India

ABSTRACT

In recent years, the interest in solar energy has risen due to deluge oil prices and environmental concern. In many remote or nascent areas, direct access to an electric grid is contrary to reason and a photovoltaic inverter system would make life much lucid and more adaptable. With this in mind, this project targets to design, build, and test a solar panel inverter. This inverter system could be used as a backup power during outages, battery charging, or for typical household applications. The chief features of the system are a true 250V sinusoidal voltage output, a wide input range, and maximum power-point tracking (MPPT). The big idea of this project is to design an inverter that will enable the inversion of a DC power source, supplied by Photovoltaic (PV) Cells, to an AC power source that will be used to supply a load. The benefit of this project is to give access to an everlasting and pollution free source of energy.

Keywords: PV array, Solar Panels

I. INTRODUCTION

Energy plays a vital role for development in all sectors. With depletion of fossil fuels used for power generation and increase in demand for power, the gap between supply and demand is becoming more. Renewable energy sources can only provide a solution to it. Sun radiates 180 billion MW of energy over Earth. Just one hour of this energy could meet power needs of entire planet for a year. India receives 5000 Trillion KWh of energy from Sun per annum. This energy is clean, pollution free and inexhaustible.

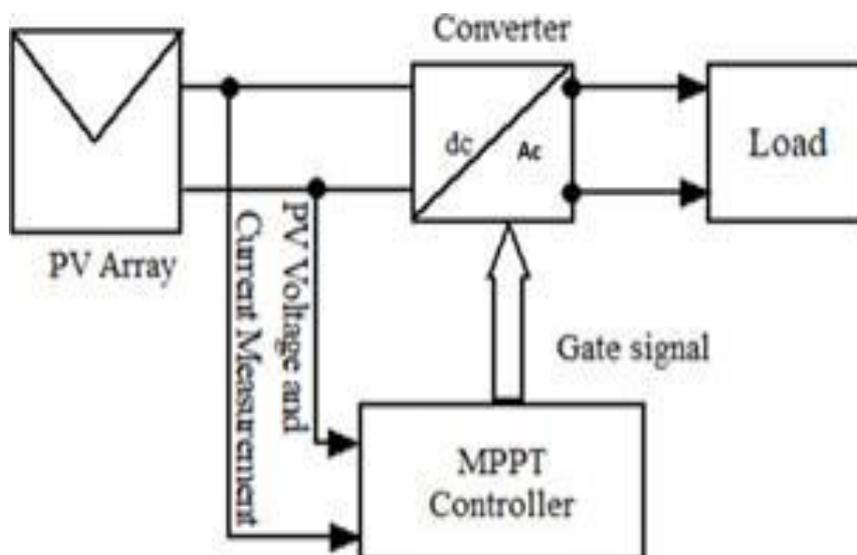
Photovoltaic (PV) is a method of generating electrical power by converting solar radiation into direct current electricity using semiconductors that exhibit the photovoltaic effect. PV panel is connected to the charging circuit. In a photovoltaic system the maximum power output changes with load, temperature and the solar intensity. In this paper we have designed an efficient MPPT solar inverter. Purpose of investment in solar power project is to enter in development of green energy technology, which is the only ultimate source of energy for future generations. This system is easy to fit and install in the existing systems. The higher performance of the proposed intelligent system has been verified. The solar tracking itself can be continuous or step tracking, depending on the application. Continuous tracking is needed for highly accurate systems. The controller aims at maximizing the solar PV cell's efficiency by forcing sunlight to be incident perpendicularly. The solar power system is also used in the solar powered vehicles. It can also be used in residential applications.

II. THE PROPOSED PV SYSTEM

Photovoltaic (PV) is a method of generating electrical power by converting solar radiation into direct current electricity using semiconductors that exhibit the photovoltaic effect. The intensity of sun's light is the reason for generation of electricity and not the heat. For example, compared to the month of January, April will provide less power as heat is more, that may affect the working of device. The generated voltage goes to the voltage regulator, passing through the control unit it goes to the inverter. From the inverter we get the AC output power.

A 20V, 100W solar panel gives around 7.59 ampere current in bright light. The solar panel with the inverter can produce a maximum power continuously. The batteries used are connected in parallel. The battery will store the energy produced by the panel. This battery is connected to the inverter. Battery used in our system is standard 12 V battery. Inverter is used to convert the input DC voltage from the battery into output AC voltage. The MPPT algorithm acts as the interface between the PV array and the energy storing device. For maximum power point tracking (MPPT) perturb and observe method (P&O) is used.

III. SYSTEM BLOCK DIAGRAM



IV. WORKING BLOCK DIGRAM

Photovoltaic array generates a form of renewable electricity particularly useful in situations where electrical power from the grid is not available such as in remote area power systems. A solar cell sometimes called a photovoltaic cell. It is a device that converts light energy into electrical energy. The PIC controller receives analog input from panel. The Panel output current and voltage is compared with the reference current and voltage accordingly controller gives signal to the DC geared motor. The output of ADC is same to the reference voltage then DC geared motor keeps the solar panel in same direction. The solar cell captures the sun's rays and gives the analog output to the ADC

V. OBJECTIVES

The main objective of our project is to design and construct a PV based system that produces electrical energy and supplying standalone AC loads, while minimizing its cost and size. The system's main properties are:

1. Production of quality electricity from a renewable source to reduce dependence on fossil fuels and the associated emissions of pollutants.
2. Reduce cost of energy consumption by being able to connect to the grid: sell energy and remove need for batteries which are the most expensive system components per watt.
3. To fight against global warming and any other problem related with fossil fuels, most countries are switching to renewable energy sources like sunlight.

VI. ACKNOWLEDGEMENT

We would like to thank all people who have helped us directly or indirectly for the completion of this paperwork. We express our true gratitude towards Prof. Piyush Bahadur sir for guiding us to understand the work conceptually. We are also expressing our thanks to Prof. Rohan Ingle sir, head of the department of Electrical Engineering for providing important information and required resources. With deep sense of gratitude we thank to our Principal Dr. Narendra Bawane Sir and Management of the SSCT for providing all necessary facilities and their constant encouragement and support.

VII. CONCLUSION

In this paper, we presented that a tracking system is more efficient than the existing stationary one. The output power is more in all the time domains in which the experiment was carried out. In the developed MPPT solar inverters, the power consumed by the tracking system is found to be more, which can be reduced in future works.

VIII. FUTURE SCOPE

1. This is the only energy that can meet the demand of the world's energy crisis, so a wide scope is waiting ahead to discover, improve, enhance the existing technology and be the change the world is waiting for.

IX. HARDWARE

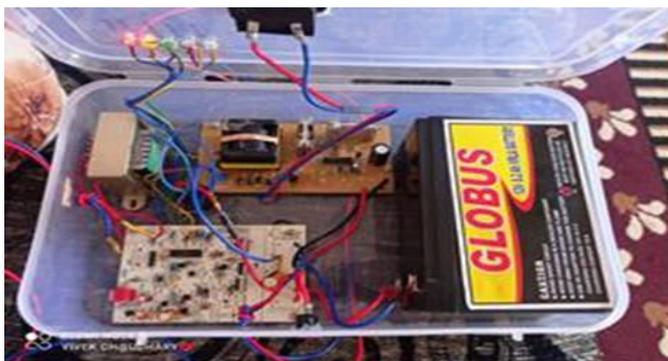


Figure 1: FINAL HARDWARE

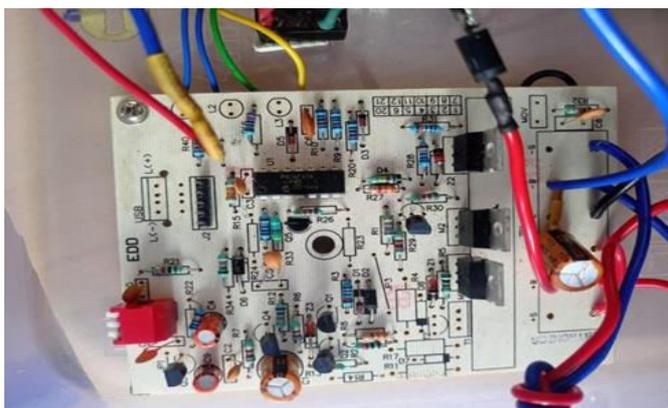


Figure 2: MPPT CIRCUIT



Figure. 3: INVERTER CIRCUIT

X. RESULT

Voltage measured varying the load.	3PM			
	Stationary I(Amp)	Stationary P(W)	Tracking I(Amp)	Tracking P(W)
20	00	00	00	00
18	1.44	25.92	1.52	27.36
16	2.47	39.52	3.1	57.6
14	2.89	40.46	4.7	65.8

Voltage Measured varying the load.	10AM			
	Stationary I(Amp)	Stationary P(W)	Tracking I(Amp)	Tracking P(W)
20	00	00	00	00
18	1.43	25.74	1.48	26.64
16	2.96	47.36	3.26	52.16
14	4.50	63	4.51	63.14

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Adsorptive Removal of Metformin HCL from Aqueous Solution Using Activated Biochar Prepared from Tea Waste Residue

Pradeep Kumar*, A. C Pandey and A. K Shukla

SMS Govt. Model Science College, Jiwaji University, Gwalior (MP), India

ABSTRACT

The presence of Pharmaceutically Activated compounds (PACs) as arising impurities in water is a significant concern. Ongoing reports have affirmed the presence of PACs in regular and wastewater frameworks, which have caused a few issues showing the pressing requirement for their evacuation, Metformin is also among the PACs which is highly consumed and released to the environment, this paper represents first-time adsorptive removal of Metformin with Activated Biochar prepared by waste tea residue of the household. Biochar was characterized and explored as a potential adsorbent for the removal of Metformin HCl from an aqueous solution. Adsorbent dose, contact time, the effect of pH, the surface area of biochar, and the functional group of pharmaceuticals influenced the adsorption efficiency. The adsorption phenomena were evaluated using experimental data fitted in both Langmuir and Freundlich isotherm models. The highest adsorption capacity of activated biochar residue was found to be 92.3% at 298 K pH 6.0, with $q_e = 13.48$ mg/g. The developed adsorption shows high reusability with a 5.6% reduction in removal efficiency. The result suggests that ATW can be used as promising low-cost adsorption for water remediation.

Keywords: Activated Carbon tea waste, Metformin hydrochloride, pharmaceutical pollutant, Water treatment, Adsorptive removal

INTRODUCTION

Diabetes is the most common non-communicable disease globally and has increased morbidity and mortality rates. It had affected 88 million in 2019 and is expected 115 million in 2030 of the Indian population. [1][2] India has become the second-largest number of diabetic patients. The changing lifestyle with less physical activity, increased fast food trends, sedentary lifestyle, and obesity are the etiological factors.[3][4] As the number of patients increased globally the consumption of anti-diabetic drugs increased globally. Metformin HCl is the highest prescribed drug for diabetic type-2 patients.[5], [6] It decreased down the blood sugar level by inhibiting hepatic glucose production and gluconeogenesis.[7][8] Metformin HCl is not metabolized in the body. hence, It is excreted as such in urine more than 90%.[6], [9], [10] due to which in so many countries sewage water and surface water are found contaminated with it.[11]

Recent studies of wastewater reveal that metformin is the most abundant pharmaceutical in the aquatic environment by mass and is detected in a concentration ranging from 1 to 248 ng.L^{-1} . That is dependent on population density and no. of patients in that area.[12][13] It was studied that when fish were exposed to concentrations observed in freshwater, caused intersex in the fish and retardation in growth.[14]

Because of its impact on the environment and human health. The removal of these pharmaceuticals is essential before being released into the environment, Conventional method like ozonation, osmosis, and advanced oxidation is suitable for purification but the elimination of the highly polar hydrophilic pharmaceutical is not possible.[15],[16] Among the all available technique, Adsorption is a more convenient and cheaper technique for the removal of the pharmaceutical compound from an aqueous medium.[17], [18]

Till date, so many adsorption materials have been developed and used for removal phenomena i.e. silica, soil, clays, agro-industrial waste, and household waste. from agro-Industrial waste and household waste for the removal of different contaminants from an aqueous medium. In this study, we have developed a Biochar derived from tea waste and activated through 1M orthophosphoric acid and Characterised through BET, SEM, XRD, and FTIR, suitability of adsorption evaluated through adsorption kinetics and isotherms, the applicability of adsorbent evaluated in a wastewater sample collected from sewage.

EXPERIMENTAL

Materials

Adsorbate Metformin HCl API with a potency of 100.% was gifted by Alkem laboratories Ltd, Navi-Mumbi for research purpose only, Ortho-phosphoric acid fo Analytical reagent grade purchased from Merck, Milli-Q-Water is from Laboratory Millipore Purifier. 0.45 μ Whatman filter paper, 0.22 μ Glass Nylon Millipore syringe filter.

Preparation of Biochar from the Waste Tea Residue

The wasted black tea used for activated biochar preparation was collected at home, Wasted black tea leaves that have been discarded after the process of making the tea were drunk in boiling water, and milk after that washed the sample with boiling water to remove dirt, milk, and sugar. rinsed with distilled water and dried in the oven at 105°C for 12 Hours. After that, churned the material in the oven at 650°C for 3Hour. Then for activation of biochar, first soaked the biochar for 48 Hours in 1Molar orthophosphoric acid solution. In the second step again kept in the oven at 105°C for 12 Hours. at last, Cool the activated biochar at room temperature and used it for the experiment. A similar type of method for the preparation of activated carbon from mung husk had been performed by Mondal et al. [19]

Characterization of Activated Biochar

FTIR analyzer has been used to find out the functional group present on the surface before and after of experiment. The surface texture of adsorbent has been investigated through scanning electron microscopy (SEM) analyzer at CSMCRI Bhavnagar, Gujrat (India), Morphology of biochar has been studied by X-ray diffraction pattern of adsorbent, and The surface area, Pore volume, and pore size of adsorbent were measured by the Brunauer-Emmet-Teller (BET) surface analyzer.

Preparation of Adsorbate Solutions

A stock solution of 200 mg Metformin HCl per liter was prepared by dissolving 100mg of metformin HCl in 500 ml distilled water, at the time of study different solutions had been prepared through this stock solution. 0.1N HCl and 0.1N NaOH solution were used for pH adjustment of the solution.

Adsorption Experiment

A Batch Mode Equilibrium method has been evaluated for the adsorption of MH on TWR from pH- regulated wastewater. At different parameters such as concentration, pH of media, contact time, the dosage of adsorbent and adsorbate, etc.

All experiments were evaluated in 50ml of the working volume of liquid sample with a concentration of 50mg/L in a 100ml volumetric flask and for the shaking temperature controlled magnetic mechanical shaker had been used for the study. After completion of the shaking process, the sample solution was filtered through a 100µ Whatman filter with a 0.45µ Nylon filter, and the filtrate was used for the study by using a UV-Visible spectrophotometer. A Triplicate sample has been used for each parameter and the mean value was used for data analysis. The concentration of adsorbate in the solution was measured by spectrophotometry at a wavelength ($\lambda_{max}=232$ nm). The equilibrium amount of adsorption (q_e) is calculated as-

$$q_e = \frac{C_0 - C_t}{m} \times V \quad (1)$$

Where,

C₀	-	Initial concentration of solution (mg/L)
C_i	-	Final equilibrium concentration of a solution in mg/L
V	-	Volume of the solution
m	-	Mass of the adsorbent added.

The %age removal of MH was calculated as-

$$\text{Sorption (\%)} = \frac{C_0 - C_i}{C_0} \times 100 \quad (2)$$

The controlled blank experiment was performed to nullify the impact of the flask wall with the adsorbent.

Equilibrium Kinetics and isotherm of adsorption model

The kinetics of adsorption was assessed by the following models,

1. pseudo-first-order
2. pseudo-second-order,

The equation of Pseudo- first order

$$q_t = q_e \times [1 - \exp(-k_f \times t)] \quad (3)$$

Pseudo- Second order

$$q_t = \frac{k_s \times q_e^2 \times t}{1 + k_s \times q_e \times t} \quad (4)$$

Intra particle diffusion

$$q_t = K_{id} \times \sqrt{t} + C \quad (5)$$

Where,

q_t	-	Adsorbate amount at any given time (mg.g^{-1})
q_e	-	Adsorbate amount absorbed at equilibrium (mg.g^{-1})
t	-	Time of contact (minutes)
k_f	-	Pseudo-first order rate constant (min^{-1})
k_s	-	Pseudo-second order rate constant ($\text{g.mg}^{-1} \text{ minute}^{-1}$)
k_{id}	-	intra-particle diffusion rate constant ($\text{mg.g}^{-1} \text{ h}^{-0.5}$)
C	-	Constant related with the thickness of boundary layer (mg.g^{-1})

Adsorption isotherms have been assessed through Langmuir and Freundlich isotherm models

RESULT AND DISCUSSION

Characterization of Activated Biochar

Characterization of adsorbent was performed to obtain remarkable consequences in the sorptive removal phenomena. The Surface Area was calculated $2.2902 \text{ m}^2/\text{g}$ and the single point total pore volume of adsorbent was calculated $1.48 \text{ cm}^3/\text{g}$ at $P/P_0=0.98$ through Micromeritics BET surface analyser N2 adsorption isotherm.

FT-IR spectra of ATW biochar were utilized to assess and recognised major functional groups attribute their role in adsorption phenomena. The activated biochar showed different adsorption bands before adsorption of MET at 297 cm^{-1} (-NH strong amine stretching), 1737 cm^{-1} (-C=O strong ketone stretching), 1590 cm^{-1} (-C=C-medium cyclic alkene stretching), 1367 cm^{-1} (Sulphonamide S=O strong stretching), 1230 cm^{-1} (Amine C-N stretching), 1088 cm^{-1} (Primary strong C – O stretching) and 514 cm^{-1} (Halo compound C-Br strong stretching). After adsorption of Met on activated biochar, a new band at 3589 cm^{-1} had been formed that indicate medium sharp stretching of alcohol, this new band form along with the shifting of the band from 1230 to 1217, 1088 to 1070, and 514 to 484. Regarding these data, it concludes that the aromatic group and ether group may be playing an important role in the adsorption of MET onto activated biochar.

The X-ray diffraction study reveals the mixture of amorphous and crystalline fingerprint of adsorbent, A small Hump between 20° and 30° indicate about amorphous nature of the adsorbent, and a sharp peak at 26.7° and 30.4° indicate the high crystallinity of the adsorbent.

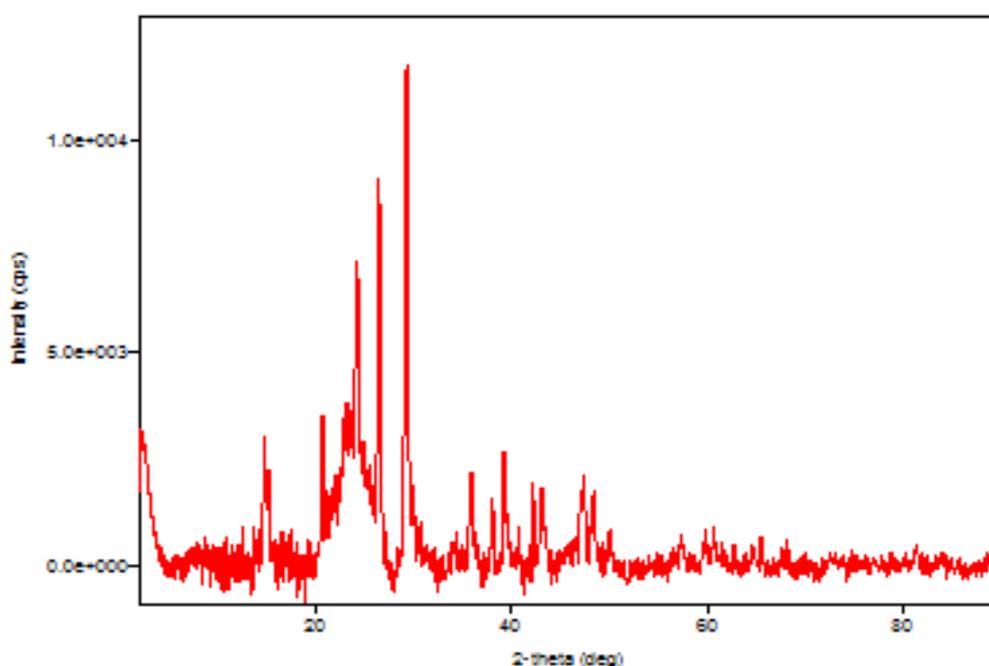


Fig 1: XRD spectra of Adsorbent.

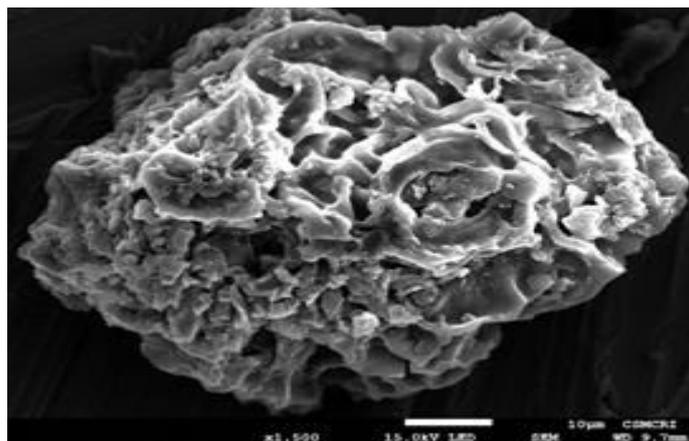


Fig 2: SEM image of of Adsorbent.

The disordered micrographic structure was confirmed by the peak present at 36.11° and 45.46° , which represent the mineral phase of carbon, a characteristic of activated biochar.

The Surface morphology of Activated biochar was investigated through a SEM+EDS analyser.

It was found that the structure of Activated biochar was porous, irregular in shape, and uneven in SEM micrograph as shown in Fig. 2. Based on the photo, there is a huge volume of voids on the surface which results in an extraordinary surface zone, a lot of adsorption sites, and so a huge sorption capacity. This allows the adsorbate to powerfully stick on the surface of the adsorbent.

Effect of Dosage

The adsorbent amount is an important parameter to calculate the adsorption capacity of the adsorbent at provided operating conditions. The adsorbent dosage increased from 0.2 to 2g per litre solution It was observed that MH removal rate increased with an increase in adsorbent amount. The adsorbent dosage is directly proportional to surface area and adsorption site so an increase in surface area and adsorption site increases adsorption capacity. (Fig. 3a)

Effect of Contact Time

Contact time for adsorption reveals the equilibrium. After, how much time at definite concentration and adsorbent dosage the process equilibrium. The contact time of MET adsorption on activated biochar has been varied from 0 to 120 minutes while studying the impact of contact time on Activated biochar. During the analysis, the amount of Activated biochar and the concentration of MET both were set to 100 mg and $50\text{mg}\cdot\text{L}^{-1}$, respectively. With MET in the solution, the adsorption efficiency of activated biochar was calculated over a range of durations (10, 20, 30, 40, 50, 60, 120, 180 and 240 minutes). We can see from Fig. 3b that the adsorption efficiency (q_e) is proportional to the adsorption time. We demonstrated that as the adsorption process time increases, so does the adsorption performance. The rate of MET adsorption was high in the first 10 minutes, then gradually decreased, with nearly complete MET removal occurring in 60 minutes. This period was found to be sufficient for reaching equilibrium. For further research, a 60-minute adsorption contact period was selected. Activated biochar would be one of the best adsorbent materials for removing pharmaceutical pollutants in a short amount of time, and it may be useful for industrial applications in the coming year as a result of its outstanding efficiency.

Effect of Agitation

Agitation speed is a crucial parameter for MET adsorption by activated biochar. The adsorption study was performed at different rpm ranging from 50 to 400 rpm. It was observed that as speed increased adsorption increased from 40.5% to 98.4% but after 200 rpm curve move down to 85.7% shown in fig.3c. This may be due to hydrodynamic condition at low rpm hence no interaction between adsorbent and adsorbate occur. But, as the rpm increased interaction between adsorbent and adsorbate increased because of turbulence and external film transfer coefficient. Further, above certain limit bending in the adsorption curve may be due to strong centrifugal force resulting in the desorption of adsorbate.

Effect of Temperature

In general, Temperature affects the adsorption process. The effect of Temperature was investigated at three temperatures 298, 308, and 313 as shown in Figure 100mg adsorbent was used to remove MH of 30 mg/g concentration of 50ml volume, The result shows that increase in temperature decrease the adsorption capacity of

adsorbent, it indicates the exothermic nature of the adsorbent. The adsorption process is a surface-related phenomenon and with increasing temperature, the thickness of the boundary layer decreases due to which the sorption process shifted towards desorption, which results in a decrease in adsorption capacity. A similar trend has been seen in previous research. [20]

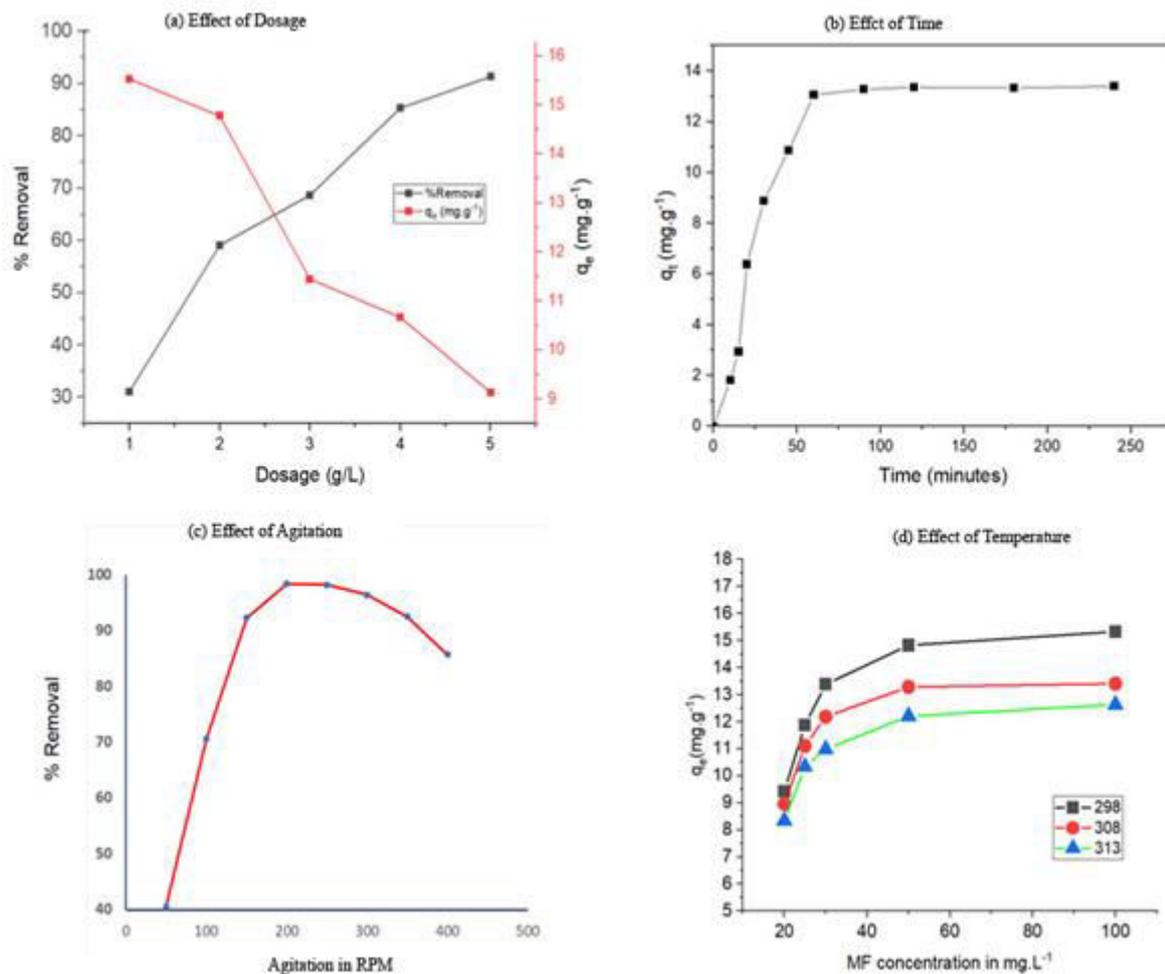


Fig 3: (a) Effect of Dosage (b) Effect of Time (c) Effect of Agitation and (d) Effect of temperature

Adsorption Kinetics

Adsorption kinetic study reveals information about the phenomena of the adsorption process in the remediation of aqueous effluent.[21] On comparing the data refer **Table-1** no. found that the Pseudo-second order model is more suitable than other two model first the Pseudo-first order and second interparticle diffusion adsorption kinetics.

The value of q_e experimental found 13.48 mg.g^{-1} and the value calculated from the Pseudo-first order model and Pseudo-second order model were 9.94 mg.g^{-1} and 15.8 mg.g^{-1} . According to this the Pseudo- second-order model follows for adsorption. The Pseudo-second order kinetic equation indicates the chemical sorption process from liquid solution and the process is adsorption capacity dependent, not on the concentration of solution[22].

Table1. 1- Adsorption kinetic model value for MH adsorption on ATW biochar.

Kinetic Model	Parameters	Results
Pseudo-first-order model	K_1	$1.58 \times 10^2 \text{ min}^{-1}$
	q_e	9.94 mg g^{-1}
	R^2	0.90
Pseudo-second-order model	K_2	$6.01 \times 10^3 \text{ min}^{-1}$
	q_e	15.81 mg g^{-1}
	R^2	0.92
Intra-Particle diffusion	K_{diff}	$9.79 \times 10^3 \text{ min}^{-1}$
	R^2	0.74

Adsorption Isotherm

The adsorption isotherm shows the relationship between the mass of adsorbate adsorbed per unit weight of adsorbent and the liquid-phase equilibrium concentration of the adsorbate. These isotherms provide important design data for adsorption systems.[23] The Freundlich and the Langmuir isotherm model were utilized to evaluate the experimental data.[24] first, these model equations changed to linear equation forms, to determine other variables of the model,

The linearized form of model are as follows-

The Langmuir Isotherm-

$$\frac{1}{q_e} = \frac{1}{q_{max}} + \left(\frac{1}{K_L}\right) \frac{1}{C_e} \quad (6)$$

The Freundlich Isotherm-

$$\log q_e = \log K_F + \frac{1}{n} \log C_e \quad (7)$$

Where,

- q_{max} - The maximum adsorption capacity of the adsorbent (mg.g^{-1})
- q_e - Amount adsorbate adsorbed at the equilibrium (mg.g^{-1})
- C_e - Equilibrium pharmaceutical concentration (mg.L^{-1})
- K_L - Langmuir equilibrium constant ($\text{dm}^3.\text{mg}^{-1}$)
- K_F - Freundlich equilibrium constant ($\text{mg.g}^{-1}(\text{mg.dm}^{-3})^{-1/nF}$)
- n - Dimensionless exponent of the Freundlich equation

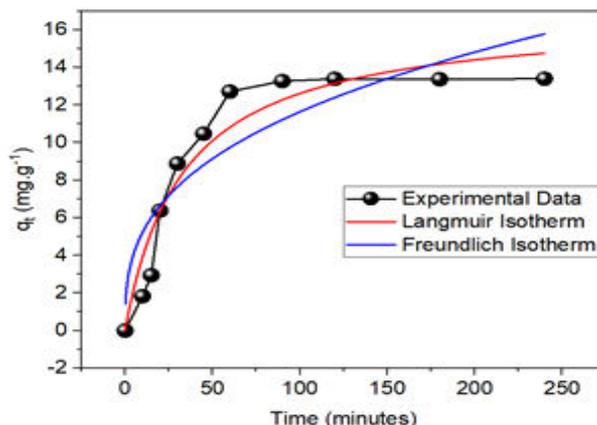


Fig 4. Equilibrium curve of Isotherm

The equilibrium curve of all the above isotherm models was shown in Figur 3 and Table no. 4 shows the result of the MH adsorption for different isotherms. The value of the correlation coefficient was found 0.98 and 0.87 for the Langmuir and the Freundlich isotherm respectively. Hence, The Langmuir Isotherm is fitted for the adsorption process, and it concludes that a monolayer formation of Metformin formed at the surface of Activated biochar. And which represents the equilibrium distribution of MH between solid and liquid phases.[25]

Table- 2; Comparison of the Langmuir and the Freundlich Isotherm.

Adsorption isotherms	Parameters		
	Units		Value
The Langmuir Isotherm	q_{max}	-	8.08
	K_L	-	23.89
	R^2	-	0.98
The Freundlich Isotherm	K_F	-	7.33
	n	-	2.74
	R^2	-	0.87

CONCLUSION

The Finding in this study concludes that ATW biochar is an effective adsorbent for the removal of Metformin HCl from wastewater because of its unique properties including the high porosity, High content of carbon, and reactive functional group. ATW biochar as a salvaged material has a very low economic value and is easily available. Its utilization for remediation of wastewater from Metformin HCl is convenient, cheaper, and Cost-effective. Maximum adsorption of Metformin HCl on ATW biochar was calculated at 13.48 mg.g⁻¹ through the pseudo-second-order reaction.

However, a feasibility study is suggested to take place when the ATW biochar is in a plan to be used for industrial effluent treatment. Such as the expenses of collection, transportation, and preparation of discarded black tea.

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An Implementation on Braille Text Analysis and Detection Based on Automatic Image Recognition

Narendra Bawne and Ankita Shende

Department of Electronics & Telecommunication Engineering Jhulelal Institute of Technology, Nagpur, India

ABSTRACT

This work deals with image analysis algorithms using Braille and the subsequent transfer of any letter. Also mentioned is the overall concept of the assignment of Braille and introduces alphabet for the blind. Another part deals with blindness, its investigations and identifying and possibilities of its acquisition. In the largest part of the work named program concept is introduced in the initial processing point MATLAB and explanation of basic concepts and definitions necessary for processing. In the second part of the concept is a step by step presented a working program for the translation of the letters. is to evaluate the performance of the program and an analysis of possible errors

I. INTRODUCTION

Automatic Image Recognition, Braille text Analysis and Detection, Matlab

Braille is a system of touch-reading and writing for the blind or those who are visually impaired. The system consists of raised dots that represent the letters of each of the alphabet. Even though most people are blessed with normal or good eyesight, people tend to take their ability to see for granted by ignoring the little details in life that truly make a difference. In reality, blind or visually impaired children need to learn how to read and write using the Braille alphabets from a very early age. However, for some children, the Braille text might not be an immediate choice because learning Braille takes a long time without the help of the experts. The practice of dot-touched communication was first introduced by Charles Barbier who served in Napoleon Bonaparte's French army in the early 1800s [1]. He was the creator of 'night writing' system or the sonography. The Braille system is a tactile language where each element is represented by a cell with six dot positions, arranged in three rows and two columns. Each dot position can be raised or otherwise allowing different configurations which can be felt by trained

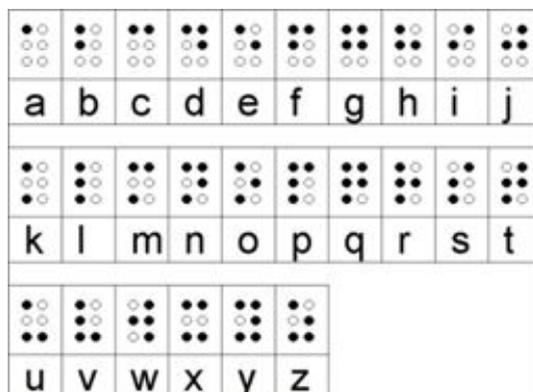


Fig. 1 shows the Braille dots coordination and the printed Braille's dots.

The Braille system had been used widely, and the mappings or sets of character designations vary from language to language. By using the Braille alphabet, blind people or those with visual-impaired as well as normal persons can review and study the written word. In English Braille there are three levels; (1) Grade 1 – a letter-by-letter transcription used for basic literacy, (2) Grade 2 – an addition of abbreviations and contractions, and (3) Grade 3 – various non-standardized personal shorthand

II. LITERATURE SURVEY

Shreekanth. T, V.Udayashankara in algorithmic approach for the recognition of double sided embossed Braille document, with simple Braille dot analysis, based on the variation in the gray level values of the Braille ima protrusions and depressions created on the original Braille document. The work in this paper has two main tasks, first is to recognize the printed Braille dots and second is to differentiate them as recto and verso dots. This involves few proc placement of designed mask on the centroid detected dots and differentiating recto dots from verso dots. Dots from the interpoint Braille document can be separated into recto and verso dots with single scan and with the average processing time of 5.6 seconds. The experiments carried out on the developed database and obtained an excellent recognition rate of 99%.

Abdul Malik Al-Salman, Yosef Al Ohali, Mohammed AlKanhall, and Abdullah AlRajihin 2014 [1] The proposed system has used some new techniques to recognize Braille cells using a standard scanner. The system has been tested with a wide variety of A4 scanned Braille documents, both single and double sided, written in the Arabic language and scanned on single-sided and double-sided documents 99% of the dots are correctly recognized.

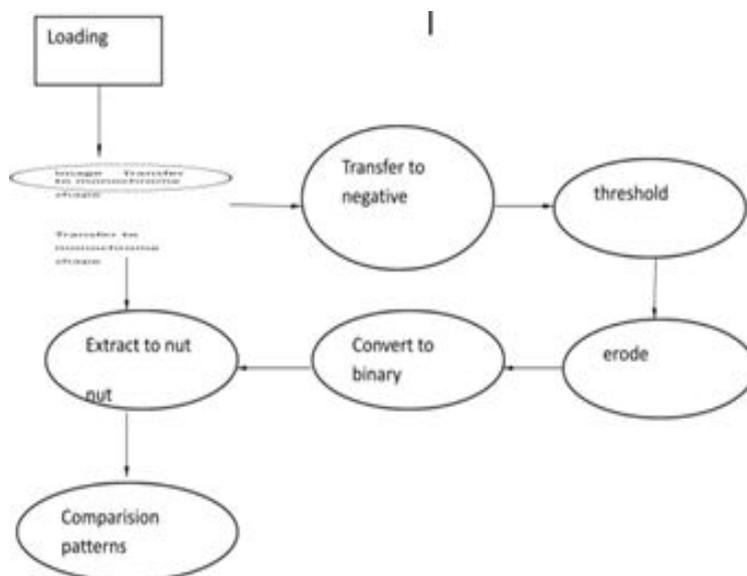
Mohammed Y. Hassan, Ahmed G. Mohammed artificial neural network was designed and tested to convert English characters into grade 1 literary Braille code, taking into account the nonlinearity of the conversion because of Braille rules. The network was designed with minimum structure including a number of layers, and a n neurons in each layer. Noisy input patterns were introduced to the network including the addition of a noise of std 0.2 to all characters, which resulted in one or two characters to be detected wrong for each time running the program. A pattern of designed N.N and the results were satisfying. Zainb.

Authman, Zamen F. Jebr in 2013 of an automatic system for recognizing printed Braille cells. for each part of the image processing. For achieving this system, local and adaptive thresholding has been used, and shrinking mechanism is added to the system for make Braille cells shape's more regular to relente the next task of (OBR) system. This process has an efficiency and it take only 17 sec. to recognize green Braille sheets and 21 sec. in recognize yellow Braille sheets is divided into two types grade 1 Braille and grade 2 Braille Braille is the most basic representations of letters, numbers and punctuation, [5, substitution of normal print letters for letters from the Braille alphabet which can be read by all Braille users, and it is the first stage of learning to read Braille. Grade 2 Braille, now because Braille ones, numerous contractions have been introduced to make them take up less space and faster to read. Contracted Braille is known as Grade 2, and is by far the most widely used. It makes use of approximately more than 300 contractions (in addition to the presentations mentioned above.) A contraction is used to shorten the length of a word. Contractions for example, the word for representing one character in Grade 2. The word question represent only two letters in grade 2 make it much faster and easier for everyone to enjoy a Braille book, While the Grade 1 of the number of letters in Braille word be equal to the number of letters of any language to the same word Here are some examples in Table (1). :

Example of Grade 1 and Grade 2 Simplification [5, 7, 4 and Grade 1 Grade 2 II. RELATED WORKS section provide a survey of the literature related to Braille character recognition Braille character recognition.

V.Udayashankara in 2014 [11] This paper presents an efficient and a new algorithmic approach for the recognition of double sided embossed Braille document, with simple Braille dot analysis, based on the variation in the gray level values of the Braille ima protrusions and depressions created on the original Braille document. The work in this paper has two main tasks, first is to recognize the printed Braille dots and second is to differentiate them as recto and verso dots. This involves few processes such as, thresholding, centroid detection, mask design, placement of designed mask on the centroid detected dots and differentiating recto dots from verso dots. Dots from the interpoint Braille document can be separated into recto

III. METHODOLOGY



Flowchart of the Proposed Model

Structure of Used Methods for Analysis

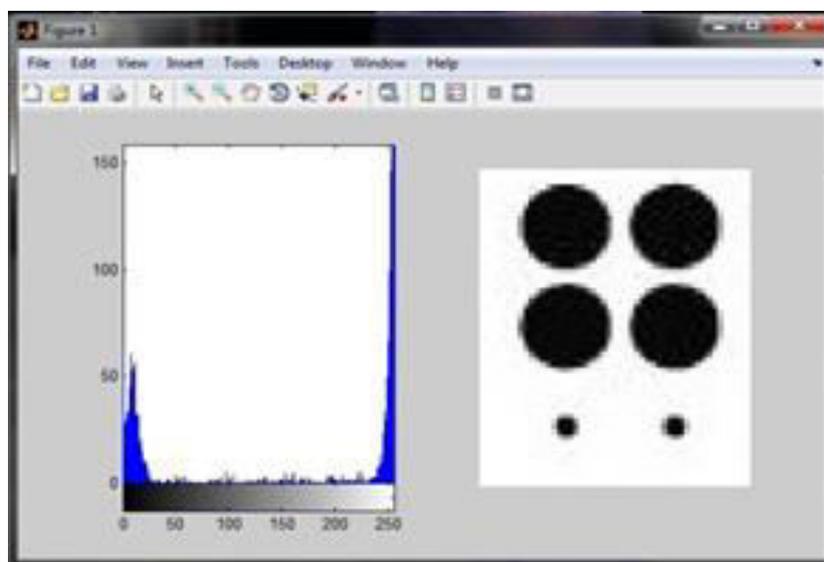
The loaded input image has 3 layers, but such an image cannot be further processed, so it is converted to monochrome shape. Threshold, which is set to a value, is used to refine the detection. All pixels above the threshold are assigned a value of 255, which corresponds to white. Below the threshold of 0, which corresponds to black.

Algorithm:

Verification of the developed system for Braille analysis and detection To determine the functionality of the program, various images of letters were analyzed in several possible ways views. Satisfactory results have been achieved, with translation proceeding without difficulty. Of course, a program error can occur due to incorrect detection of the comparison matrix, that mainly if the letter is not smooth and contains unknown objects in its vicinity that were not processed and smoothed by erosion.

To demonstrate the correct function of the program, I enclose the processing of the letter B step by step. Due to the possibility of incorrect translation or complete absence of letter processing, it was created analysis of 30 different images, some of which contain ideal parameters for processing, others are borderline, possibly unprocessable, due to its known low contrast between objects and background, or foreign objects interfering directly with the searched image.

IV. RESULTS AND DISCUSSION



Drawing a Histogram and the Original Image into One Graph

V. CONCLUSION AND FUTURE WORK

Teaching students with visual impairments.

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Literature Survey of Electric Solar Wheel Chair with Peltier Module Base Cooling Box

Nitin Choudhari, Dhiraj Kamble, Sayyed Farhan, Ritik Takit, Ankit Bhalerao and Pankaj Belsare
Department of Mechanical Engineering, Jhulelal Institute of Technology, Nagpur, Maharashtra, India

ABSTRACT

This proposed paper describes the hardware implementation of electric solar base wheelchair with peltier module base cooling Box, connection of different hardware components and their programming schematic diagram of components and block diagram of hardware model.

Nowadays, the number of elderly people has increased some live with their children. Some live with their children, some live in adult foster home and some even live by themselves. The problem arises when the elderly people lose their ability to move around not everyone can be present to help them at all time. Patient involved in physical injuries and disabilities with good mental strength struggle to get through place using the solar base wheelchair. A wheelchair is a chair with wheel, designed to be replacement for walking. This project is used for COVID patient also, because the sanitization facilities are available.

The cooling Box are fixed to the back side of the wheel chair These Box are using thermoelectric module is does not need any kind of refrigerant and mechanical device like compressor etc.

Keywords: Peltier plate, Temperature sensor, battery, microcontroller, solar panel, wheelchair, joystick.

INTRODUCTION

Wireless Android-Based Wheelchair Control and Systems a system where the DC motor is used to move the wheelchair. Nowadays, handicapped people face problem to control wheelchair by themselves. Sometimes they need other people to help them. This project will provide a new way to control the movement of wheelchair which are turn to the left, turn to the right, move forward and reverse. Electric appliances can also be switched on and off without using any wire. The overall wheelchair operation uses DC motor, motor driver module, joystick and ARDUINO board etc

Prevnar 13 is an active immunization for infants (6 weeks old) to adults (18 years of age and older). This is for the prevention of invasive pneumococcal disease including sepsis, meningitis, bacteraemic pneumonia, pleural empyema and bacteraemia caused by Streptococcus pneumoniae serotypes 1, 3, 4, 5, 6A, 6B, 7F, 9V, 14, 18C, 19A, 19F and 23F. Prevnar 13 vaccines are packed in sizes without needles. The storage temperature of Prevnar 13 is ranging from 8°C up to 25°C. To supply adequate storage temperature for Prevnar 13, a thermoelectric cooler module (TEC) is used. A thermoelectric cooler module consists of thermocouples connected in series while thermally operating in parallel. Two different electrical conductors such as copper and iron are commonly used for TEC. Thermoelectric cooling utilizes the Peltier effect in order to create a heat flux between the junctions of two different conductor materials. This is a process wherein heat transfer is present from one side of the thermoelectric module to the other depending on the current direction. It is commonly used in heating or cooling although the main application is for cooling. There are many people in the Philippines residing in the rural areas which are not able to reach medical facilities on time due to constraints in transportation and low number of health facilities. Philippine government and UNICEF only provide coolers or insulated boxes to transport medical supplies such as vaccines. Vaccines require optimal storage temperature and many vaccines lose its potency because of improper handling and inadequate storage temperature. The purpose of this study was to develop a portable refrigerator for Prevnar 13 vaccine using thermoelectric cooler and Arduino-based temperature controller that is capable of maintaining the optimal temperature of the vaccine. Prevnar 13 is stable for 4 days at 25°C and can last longer if stored lower than 25°C. These data can be used as a guideline in storing and shipping the vaccine. To provide optimal storage temperature, TEC modules are advantageous in fabricating a portable refrigerator since it is lightweight and compact. The design of the portable refrigerator in general, was based on the theoretical considerations

LITERATURE REVIEW

This chapter presents literature review on the development of the wheelchair control as well as android system. The development of the different control system of the wheelchair that aim to help disable people to move freely is discussed. The advantages and disadvantages of each wheel chair development are also presented and compared. This chapter also presents the development of the android system as android system will be utilized in this project.

Wheelchairs History To improve quality of life for the elderly and disabled people, electricpowered wheelchairs (EPWs) havebeen frequently deployed over the last 20 years. In response tothe demands of wheelchair users for equal access, hand- propelled wheelchairs, electrically controlled wheelchairs, and automated-guided wheelchairs have been developed. The development of wheelchair have begun over the past 1000 years and the designs of the wheelchair have been changed within recent decade.

Development of Autonomous Robotic Wheelchair Controller Using Embedded Systems Chung, Hung, Chin and Ko (2007) developed Autonomous Robotic Wheelchair Controller Using Embedded Systems. In general, an autonomous robotic wheelchair includes the techniques of obstacle sensing and avoidance, local path navigation, and friendly interactions withusers when compared to conventional powered wheelchairs. Most of researches on autonomous robotic wheelchairs used the personal computer as the supervisory controller since its powerful computing capacity and familiar coding environment. Nevertheless, the personal computer is not feasible to the wheelchair users due to inefficient size, lower reliability and larger power consumptions.

By using the embedded computing architecture, the proposed robotic wheelchair controller performs characteristics of compact size, better reliability and lower power consumptions while the benefits of powerful computing capacity and familiar coding environment are maintained. Theses fuzzy logic based navigation functions are fused together to solve practical situations of the robotic wheelchairs.

Smart Electronic Wheelchair Using Arduino and Bluetooth Module, Deepak Kumar Lodhi et al, International Journal of Computer Science and Mobile Computing, Vol.5 Issue.5, May-2016, pg. 433-438

This paper describes the design of a smart, motorized, voice controlled wheelchair using embedded system. Proposed design supports voice activation system for physically differently abled persons incorporating manual operation. Thispaper represents the “Voice-controlled Wheel chair” for the physically differently abled person where the voice command controls the movements of the wheelchair. The voice command is given through a cellular device having Bluetooth and the command is transferred and converted to string by the BT Voice Control for Arduino and is transferred to the Bluetooth Module SR-04connected to the Arduino board for the control of the Wheelchair. For example, when the user says „Go“ then chair will move in forward direction and when he says „Back“ then the chair will move in backward direction and similarly „Left“, „Right“ for rotating it in left and right directions respectively and „Stop“ for making it stop. This system was designed and developed to save cost, time and energy of the patient. Ultrasonic sensor is also made a part of the design and it helps to detect obstacles lying ahead in the way of the wheelchair that can hinder the passage of the wheelchair.

Android Controlled Wheel Chair, Imperial Journal of Interdisciplinary Research (IJIR) Vol-2, Issue-6, 2016 ISSN: 2454-1362, <http://www.onlinejournal.in> There are some peoples who cannot walk because of some problems such as accidents, health issues, age. So there should be some mechanism that can be used to remove these defects. The proposed Android Controlled Wheel Chair is used to remove these defects and people can survive in the environment easily. The android application is created and installed on the Smartphone and connection is done using Bluetooth. The wheelchair can move in two modes first is touch mode and second is voice mode. In the touch mode when user want to change the direction, by using the touch screen of the Smartphone the user has to choose the direction specified within the four quadrants on the screen. In the second mode user just have to give the voice input whether he wants to go such as left, right, up, down. The proposed wheel chair contains the 89C51 microcontroller which is used to execute all the commands. The device motor driver L293D is used and HC05 Bluetooth module is used. This wheelchair will help the people with lower extremities, older people to survive in the environment.

Smart Android Wheelchair Controller Design, INTERNATIONAL JOURNAL FOR ADVANCE RESEARCH IN ENGINEERING AND TECHNOLOGY,

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This project is related to the android-based wheelchair controller. The system is designed to control a wheelchair by using an android device. The objective of this project is to facilitate the movement of disable people or handicapped and also the senior people who are not able to move well. The result of this design will allow the special people to live a life with less dependence on others. Android technology is a key which may provide a new approach of human interaction with machines or tools. Thus their problem can be solved by using android technology to control the movement of a wheelchair. In this project, Basic4android interface is designed to program the android device that will be able to control the movement of wheelchair. This project integrated IOIO board and direct current motor to create the movement of wheelchair. The results of this project

showed that this project can be used for future research works and to design excellence innovation that meets market need and public interest.

Jonathan Michael Schoenfeld et al [1] in his thesis submitted on integration of a thermoelectric sub cooler in 2008. There are two general research areas focused on increasing TEC performance; materials Research on thermoelectric semiconductors and system level assembly and heat dissipation techniques. The former is focused on developing advanced thermoelectric materials with superior thermoelectric properties. The most important parameter of a thermoelectric semiconductor is the figure of merit, Z , which is given by $\alpha^2 / (\rho\kappa)$. Each of these properties is temperature dependent so often the figure of merit will be given at a particular temperature in the dimensionless form, ZT . Increasing the figure of merit directly results in an increase in the optimum COP of a TEC. The most common thermoelectric semiconductor in today's TECs is Bismuth Telluride (Bi_2Te_3), which has a ZT of ~ 0.9 at 300 K. (2) Bass et al. (2004) [2] investigated the use of multi-layer quantum well (MLQW) thermoelectrics in a cooling application. MLQW thermoelectric material is a composite of thin layers of alternating semiconductor material with differing electronic band gaps deposited on a substrate. In this way, the thermal and electrical conductivity of the material can be decoupled. The nondimensional figure of merit of such composite materials has been determined experimentally to be as high as 3 or 4. Theoretical analysis predicted COPs as high as 5 at a ΔT_m of 20 K. A TEC utilizing MLQW thermoelectric material is still under development. It can be expected that the additional manufacturing costs of such a module would be substantial. (3) Chain and Chen et al. (2005) [3] investigated the use of a micro channel heat sink on a TE module used to cool a water tank. The micro channels were etched into a silicon wafer with a glass cover plate. Four micro channel heat exchangers were fabricated with a differing number of ports and hydraulic diameters (D_h), from 89 ports at a D_h of 65 μm to 44 ports at a D_h of 150 μm . Water was pumped at flow rates ranging from 289 – 10,702 ml/h to remove the heat from the hot side of the module. The micro channel was placed on top of a 4 cm x 4 cm TE module. The lowest measured thermal resistance for the heat sink was 1.68 K/W. The authors suggested that the thermal resistance could be reduced to 0.5 K/W by increasing the aspect ratio of the micro channel ports and by using a more conductive material like copper. (4) Webb et al. (1998) [4] investigated the use of a thermosyphon as the heat sink of a TE module used for electronics cooling. A porous aluminum surface was employed to enhance the boiling heat transfer in the evaporator. The condenser was constructed with internal micro fins to enhance condensation. An experimental study was conducted with simulated heat loads typical of a thermoelectric module heat rejection. At 75 W a thermal resistance of 0.0505 K/W was calculated for a 45 mm square enhanced boiling surface. The authors also recognized that the thermal resistance decreased slightly with increasing heat flux. As the figure of merit continues to increase through a continued research effort, the use of thermoelectrics for air cooling has become more feasible. (5) Riffat and Qiu et al. (2005) [5] investigated TE air conditioning systems with an air and water cooled heat sink. A cylindrical heat sink was designed through the optimization of the interior fin length and pitch as well as fluid velocity. The cylindrical design was capable of reducing heat exchanger volume and thermal resistance. An evaporative water "condenser" was suggested as the outdoor unit, which would cool the circulated water down close to the wet bulb temperature through convective and evaporative cooling. It was shown that the thermal resistance of a water cooled heat sink was significantly lower than an air cooled heat sink, with values reported as low as 4.75×10^{-4} K/W for a cylinder with an outer surface area of 0.23 m². An ideal COP of 1.8 was reported at a ΔT_m of 20 K of merit of $Z = 3.0 \times 10^{-3}$ K⁻¹. Although possible, it would be difficult to fabricate a TE module on a curved surface as suggested. (6) Muhammad Khazratul development of small D.C. thermoelectric refrigerator et al [6] The refrigerator is one of the most innovative and important inventions of the twentieth century. The basic function of a domestic refrigerator is to preserve the quality of perishable food products. Several studies have shown that the quality of food products directly depends on temperature and air distribution inside the storage chambers. Hence, unsuitable temperatures and air velocities may cause food to undergo a premature deterioration. Even if the average temperature inside the refrigerator cabinet is adequate, uncontrolled rise or fall in local temperatures may affect the quality of food products. A device described as a "refrigerator" maintains a temperature a few degrees above the freezing point of water; a similar device which maintains a temperature below the freezing point of water is called a "freezer". The refrigerator is a relatively modern invention amongst kitchen appliances. It replaced the common icebox which had been placed outside for almost a century and a half prior, and is sometimes still called by the original name "icebox". A typical household refrigerator is actually a

combination refrigerator-freezer since it has a freezer compartment to make ice and to store frozen food. Today's refrigerators use much less energy as a result of using smaller and higher-efficiency motors and compressor, better insulation materials, larger coil surface areas, and better door seals.

WORKING

The joystick is switch based and gives 4 signals to the arduino. As per the 4 signals like left right forward and backward the arduino sends signal to the L298 motor driver IC. The L298 is connected to the DC motors and as per the signal motors will rotate. The relay is connected to the arduino via BC547 transistor and if the base of the transistor is 1 then relay will on and 0 relay will off. This relay is connected to the high pressure pump 12V dc operated and the fogger spray nozzles are connected on the top of the chair where the sanitizer will spray after the button is pressed. The chair operates on 12V DC batteries of 10AH. This battery is charged by the solar panel fixed on the top of the chair.

A 10w Solar panel are fix to the top of the wheel chair having rating of 12v , 800mA output from sunlight is used to store energy in the Battery. The power supply to the Arduino and peltier plate is given through 12v Battery .A12v ,1.2AH Battery which is rechargeable is used to fed the power supply to all the equipment which are connected to each other. Arduino nano is a microcontroller board .microcontroller used in arduino nano is AT mega 328 it has 12 digital pins starting from D2 to D13 and it also has 8 analog pins starting from A0 to A7. This digital and analog pins are assigned with multiple function but the main function is to act as a either input or output .Arduino nano can performs 3 types of communication protocols which are 1) serial protocol ,2)SPI protocol, 3)I2c protocol. Arduino is the central controller and (Digital Humidity Temperature) DHT11 sensor send signal to read the temperature and gives command from arduino nano .we set in program if the temperature is above 5 degree then relay will trigger and peltier plate turns ON. Single pole double throw (SPDT) 5v dc operated relay is used for switch ON and OFF power to the peltier plate. It has two poles and connected two loads. The voltage is applied across a joint conductors of peltier plate to create an electric current. When the current flows through the junction of two conductors heat is removed at one junction and cooling occurs at another junction (i.e cooling occurs inside the box). A 12v dc operated fan is used to extract the heat from heat sink and make air to pass from it to cool the heat sink. A 16 character , 2 line liquid crystal display (LCD) is used for measuring the temperature.

METHODOLOGY

In order to produce a good project, there are several procedures that must be followed. Initially, information about the wheelchair problem must be identified. Then, more information about the wheelchair problem is gathered from the journals, internet, books and also articles.

The design of the inside volume of the prototype is 7.5L which was based on a manufacturer's datasheet that mainly manufactures vaccine storage that uses cold packs to maintain the inside temperature using arduino uno controller. The cooling effect is done by the peltier plate. When we provide 12V dc supply to the peltier plate then one side goes to cold temperature and other goes heat up that use cooling fan with heatsink.

The aim is to maintain the temperature of the box and turn ON off the peltier plate to save power.

FUTURE SCOPE

We have designed this wheelchair for the physically disabled people those who cannot walk, so that they can easily handle it with their hands by using the Android application.

Different models were planned and created and each was able to reach and persistently give a capacity and perfect capacity temperature extending from 22°C to 27°C. When subjected to a conditioned range, it gotten a most reduced temperature of 20o C. We have been effective in planning a framework that satisfies the proposed objectives. In any case we do realize the confinements of this framework. The show plan can be utilized as it were for keeping up a specific temperature. The framework is incapable to handle variances in stack. Broad alterations have to be consolidated some time recently it can be discharged for productive field utilize. Thermoelectric refrigeration is one of the key zones where analysts have a sharp intrigued. A few of the later headways within the range outperform a few of the characteristic demerits like unfavorable COP. Cascaded module engineering has characterized modern limits for its application Additionally later breakthrough in natural particles as a thermoelectric fabric guarantees a shining future for TER.

HARDWARE USE:-

1) Arduino Nano :-

Specifications: - Microcontroller Atmel ATmega328 SMD Package

Operating Voltage (logic level) 5 V

Input Voltage (recommended) 7-12 V Input Voltage (limits) 6-20 V

Digital I/O Pins 14 (of which 6 provide PWM output) Analog Input Pins 8



2) Relay:-

SPDT 5V DC

230V / 7A – AC support switching

28V / 10A – DC support switchin



3) Pump:-

Rated Voltage: DC 6V to 12V (1 amps) Working current: 0.5A to 0.7A (Max)

Power: 4W-7W Max Lift: 3m

Max Suction: 2m Max Current: Up to 2 Amps while starting up The maximum flow rate of up to 1 – 3L/min.



4) Solar Panel :- Solar Panel 10W Nominal Voltage 12V Current 800 ma



5) DC Geared Motor:-

12V 240RPM

Length: 100mm Torque: 20 to 25 kg.cm Shaft Diameter: 8mm Weight: 250.00g



6) Battery:-

Rechargeable Battery 12V 7AH * 12 Volt 7AH Sealed Battery.



7) Joystick:-

This joystick can support the 8 way and 4-way models.



8) Peltier Module:-



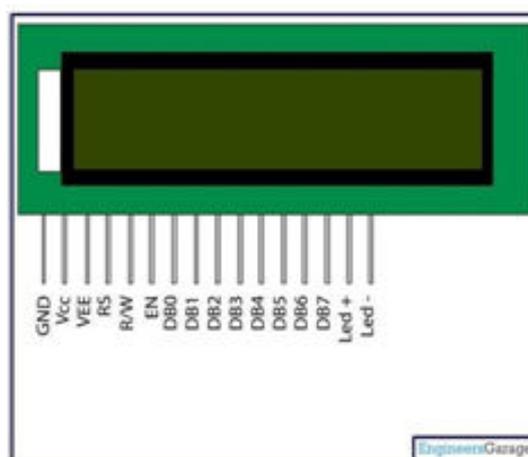
9) Arduino Nano



10 Fan:-

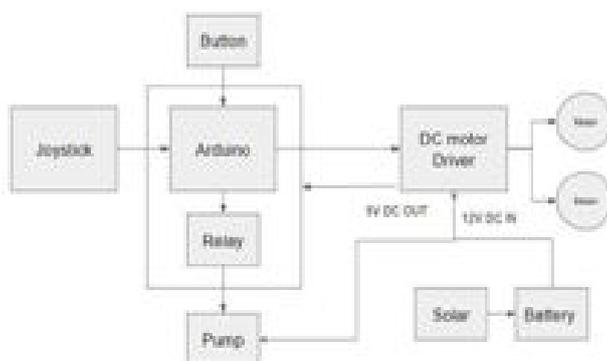


10) Led :-

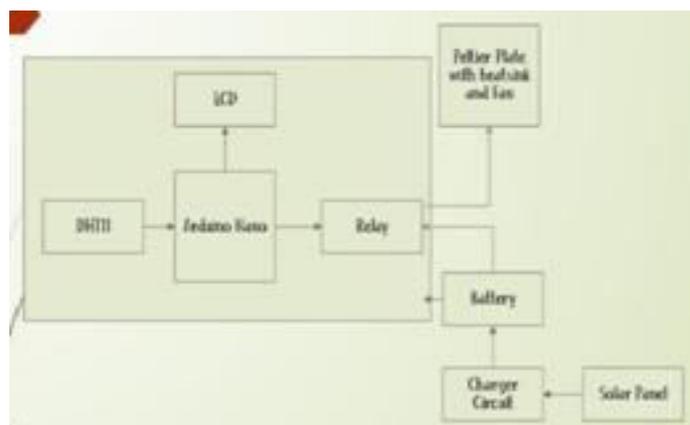


CIRCUIT DIAGRAM:-

1) Circuit Diagram of Wheelchair



2) Circuit Diagram of Cooling Box



APPLICATION:-

Use for Handicaps Persons & Specially Beneficial for Covid Patients.

Automatic Sanitization Facility.

Suitable For All

Make More Places Accessible

Effortless Transport

A Safe Option

Easy to Carry a Vaccine or Medicine to Does Not Work in Room Temperature.

Picture of Hardware Model



CONCLUSION

The movement of wheelchair is controlled by Joystick, the wheelchair can move to the right and to left as well as move forward and backward. All of this movement can be controlled by using Joystick.

Since Peltier cooling isn't effective comparatively and due to its little size applications, it isn't broadly utilized. It found its application as it were in hardware Cooling etc. but, we have seen that there is a tremendous scope of investigate in this field approximately thermoelectric materials, its fabrication, heatsink plan etc. researchers are working on lessening irreversibility's within the system, because peltier cooler has more potential which we will see from the tremendous distinction between esteem of to begin with low proficiency and moment low productivity.

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An Implementation on Analysis of Parkinson's Disease

Shubhangi Giripunje and Aafrin Ali Sayyed

Department of Electronics & Telecommunication Engineering, Jhulelal Institute of Technology, Nagpur, India

ABSTRACT

Parkinson's infection is a cerebrum issue that prompts shaking, solid - ness and trouble with strolling, parity, and coordination. Parkinson's side effects for the most part start step by step and deteriorate after some time. as the induction advances may experience issues strolling and talking. Parkinson's is a neurological issue, which is one of the most excruciating, risky, and nondurable issues, which happens at more established ages. the static spiral test (SST). dynamic spiral test (DST) and circular motion test on certain point records were utilized in the analytical modeling application which was created for the conclusion of this malady. The data set is collected from the online authorized into 70-30% of splitting into the training and testing information inside the original and control structures of ten-fold cross-validation approval method. Training set is utilized for train the ML-based analytical classification models such as logistic regression, neighbors classifier, decision tree, and support vector machine. The model is also trained by performing hyper-parameter tuning. Asr indicated by outcomes acquired, SVM with RBF kernel is more effective than other classifiers; furthermore, logistic regression calculations are in investigation of new information. This study contributes in the same direction by analyzing the behavior according to treatment classification.

Keywords: Circular motion test, Decision tree, Dynamic spiral test, KNN, Logistic Regression, Parkinson's disease, Statistic Spiral test, Support vector machine

INTRODUCTION

Parkinson's sickness is one of the most well -known development issues on the planet. Parkinson's influences roughly 1% of all grown-ups beyond 60 year old. This issue is the consequences of the degeneration of dopamine producing cells in the substantia nigra in the midbrain. Dopaminergic cells are presently being utilized as a treatment to improve a significant number of the manifestations that portray Parkinson's sickness. The reason for the ailment cannot be known. Be that as it may, there has been a bounty of research attempting to distinguish potential inception. This writing survey will feature a portion of the principle places that analysts have on the reason for parkinson's illness. Among these causes are natural poisons. hereditary variable, and oxidative pressure. parkinson's malady (PD) is thesecond most regular development ailment after basic tremor with a rate pace of around 1% among grown-ups beyond 60 years old. in spite of the fact that the specific reason for parkinson's ailment cannot known, it is considered to be potentiated by the cooperation of natural, furthermore, hereditary components.

At the point when a patient presents with tremor, it may very well be helpful to play out a couple of basic pen and paper tests. right now, disclose how to expand the benefit of penmanship and of drawing archimedes spirals and straight lines as clinical evaluations. These errands take merely seconds to finish however give an abundance of data that supplements the standard physical assessment. They help the determination of a tremor issue and can add to its longitudinal observing. viewing the patients upper appendage while they compose and draw may uncover variations from the norm, for example, bearing and balance of oscillatory pen developments and for in general size of handwriting. fundamental, dystonic, practical, and parkinsonian tremor every has a trademark example of variation from the norm on these pen and paper tests.

2. LITERATURE REVIEW

The earlier research work states that, huge possibilities for studies are available in PD recognition concentrated on discourse preparing [4-6] where the conclusion is finished utilizing continued vowels and characteristic discourse. moreover. engine side effects can additionally be distinguished and managed, displaying persistent developments and walk [7,8]. change in the kinematics of penmanship is one of the underlying signs seen in PD. McLennan et al [9] detailed that roughly 5% of patients with PD indicated micrographia and 30% of patients announce declining of penmanship before the beginning of the engine manifestations. Engine manifestations related with parkinson's infections cause three fundamental changes recorded as a hard copy [10]: the size of composing [11] (micrographia[12]), pen pressure [13], also, kinematics. A few devices have been created to dissect PD quite penmanship [14]. not just the static angles, yet in addition, the dynamic ones are intriguing. for example, speed, and pen pressure decrease during composing [13, 15]. A few survey papers

have been distributed as of late [16,17]. The penmanship of an individual relies upon the visual ability [12], composing style, or language aptitudes of the individual [18].

3. METHODOLOGY

In this, the comparative study is carried out for comparing the result of different classifiers with parameters tuning and discussing the result. The classifier models are implemented in python using the sklearn library.

These are different classifier is applied on the parkinsons dataset

A. Logistic Regression

Logistic regression (LR) is a machine learning calculation which is to calculate a probability of a certain event or class, i.e., yes/no, positive/negative. It causes the likelihood concept and is a prescient investigation calculation. consider a logistic regression, a linear regression model yet the logistic regression utilized an increasingly mind boggling cost work, this cost capacity can be characterized as the 'sigmoid capacity' or otherwise called the 'strategic capacity' rather than a direct capacity tends it to constrain.the cost work lies in the range of 0 and 1 this boundary restrictions are defined by the theory of strategic relapse. in this way, direct direct capacity neglect to speak to it as it can have a worth more prominent than 1 or under 0 which is beyond the realm of imagination according to the speculation of calculated relapse.

$$0 \leq h\theta(x) \leq 1$$

Logistic Regression Hypothesis Expectation

B. K-Nearest Neighbor (K-Nn)

k-nearest neighbors (k-NN) is a regulated AI model. Administered learning is the point at which a model gains from information that is as of now named. An administered learning model takes in a lot of articles and yields esteems. The model at that point prepares on that information to figure out how to make expectation on concealed information.k-NN models work by taking an information point and taking the gander at tha 'k' nearest marked information focuses. The information point is then allotted the name of the 'k' nearest focus. the information point is then allotted the name of most of the 'k' nearest focuses. The kNN undertaking can be separated into three essential capacities.

- Figure the separation between any two focuses
- Discover the Closet neighbors dependent on these pairwise separations.
- larger part value on a class mark dependent on the closest neighbor list

C. Decision Tree

DS is one of the tree based classifiers which generates the rule based tree by using major two criteria such as gini index or entropy. In this paper, both cases for DS are implemented.

$$\text{GiniIndex} = 1 - \sum_j p_j^2$$

if a random variable x can take n different value, the ith value xi with probability p(xi), we can associate the following entropy with x.

$$H(x) = -\sum_{i=1}^N p(x_i)\log_2 p(x_i)$$

D. Support Vector Machine (Svm)

Support vector machine (SVM) is a famous and amazing classifier technique.SVMs, much like strategic relapse, build an ideal isolating hyperplane in the component space between the two classes. The part stunt ventures the information into a higher measurement, where it turns out to be directly detachable. fitting a SVM includes hypertuning parameters x and y. y decides the impact of information focuses, higher qualities make the model increasing worldwide, and low qualities mean information focuses influence a littler neighborhood gathering.

The basic model representation of this work is represented in fig 1

The following stage are the stages of model implementation

- Data gathering 1 lakh plus instances are collected through the online authenticated data source.
- Data pre-processing [missing Value handling, feature extraction, data scaling, and encoding].
- Data splitting [using ten-fold cross- validation, the 70-30% data split among train-test dataset].
- Model implementation using different classifiers with parameter tuning using train set

- Assess models using test dataset.
- Discuss the results by considering the classifier model performance measures.

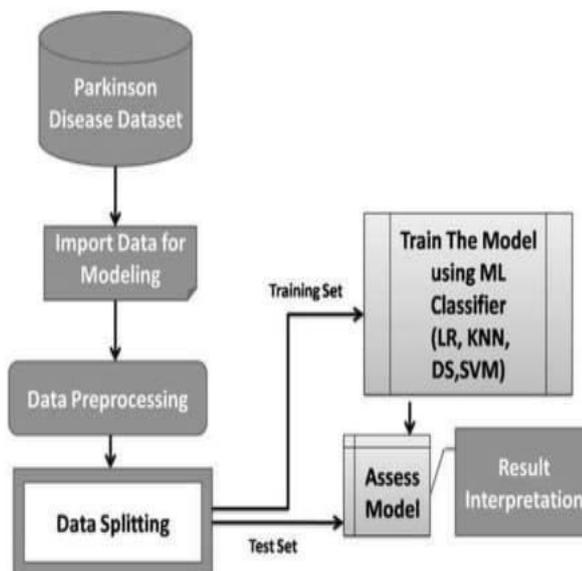


Fig 1: proposed methodology

4. CONCLUSION

The Parkinson's disease classification is carried out by applying automated architectures of machine learning classifiers. These results are promising because without manipulating the data and techniques, the results are incorporated. Now, in the view of the point classifier, the decision tree gives the best fitness model when we apply without altering the depth of the tree and selecting gini as a splitting criterion. The SVM model is compromised with accuracy when sigmoid as kernel is applied due to the non-binary classification problem. As per the comparison study, it may be possible to get a more optimized result by applying the machine learning's best classifier neural network. So for the future study of the result by applying NN.

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Smart Forest Fire Detection System Based on Optimized Solar Energy Using Arduino with Source of Safety Equipments

Rohan M. Ingle, Samiksha D. Maske, Shreya H. Kale, Nilima M. Dorle, Pranali D. Sakhare, Sakshi Thool, Samiksha Dhandole and Vishakha Godbole

Department of Electrical Engineering, Jhulelal Institute of Technology, Nagpur, India

ABSTRACT

Now a day's movement of animals from forest areas to residential areas is a big problem. The main reason for that problem is forest fires. The number of trees has reduced from the forest that creates the worst environment for animals to survive in forest. Arduino platform based IOT enabled early fire detector and monitoring systems are the solution to this problem. In our project, a fire detector using an Arduino which interfaces with some sensors and buzzer's is used to provide the final SMS to the users through the given number. The LCD is the output device. The sensor's values are displayed in the LCD display. Tank of water source is included to control the fire without waiting for fire service at the initial stage.

Keywords: Arduino, sensors, buzzers, GSM module, LCD display, Tank water

I. INTRODUCTION

Forest fires are the most prevalent type of disasters studied in the literature since they are relatively easy to prevent, and with the threat of global warming they are increasing the importance of preventing forest fires. In the present arena, wildlife and forest departments are facing the problem of movement of animals from forest area to residential area. The number of trees has reduced drastically from the forest that creates an unhealthy environment for animals to survive in the forest.

A forest fire is a disaster which consists of a fire that demolishes the large area covered mainly with trees and undergrowth, a big threat for the wildlife and people who live in forests. Every year, million acres of forests are burnt down. These forest fires have an important impact on the destruction of vegetation, on atmospheric pollution, and directly on human lives. Forest fire is a most common threat in forests which are as old as forests. Fire poses a big threat not only to the wealth of forest but also reigns, through the total region, consisting of animals and plants and causing serious effects on the biodiversity and environment. A wildland fire is an uncontrolled fire that occurs mainly in forest areas, although it can also invade urban or agricultural areas. Among the main causes of wildfires, human factors, either intentional or accidental, are the most usual ones. The number and impact of forest fires are expected to grow as a consequence of global warming. Early detection is the primary way for reducing the damages of forest fires hazards.

Wireless sensor networks can detect and monitor fires among forests in real time and immediately in comparison to the satellite based techniques. Satellite based detection is a more popular method for detection of fire but their long duration of scanning and low resolution limits the satellite based systems. In wireless sensor networks, sensors in large numbers are deployed in a forest.

This could have been avoided if the fire was detected in the early stages. Our project proposes a system for tracking and alarming the protection of trees against forest fires. Nowadays IOT (Internet of Things) devices and sensors allow the monitoring of different environmental variables, such as temperature, humidity, flame, ultrasonic, moisture etc. arduino platform based IOT enabled fire detector and monitoring system is the solution to this problem. In our project we have built a fire detector using Arduino mega which is interfaced with a temperature sensor, smoke sensor and a buzzer.

II. LITERATURE SURVEY

Numerous answers for identification of out-of-control fire have been displayed and executed in recent years. Fire detection system is utilized to recognize nearness of problem areas and identification of wildfire.

IOT devices and sensors allow the monitoring of different environmental variables, such as temperature, humidity, moisture etc. Arduino based IOT enabled fire detector and monitoring systems are the solution to this problem. Here we have built a fire detector using Arduino UNO which is interfaced with a temperature sensor, a smoke sensor and a buzzer.

We will be using GSM which is used to provide the final SMS to the user through the given number in the simulation program. Whenever a fire occurs, the system automatically senses and alerts the user by sending an alert to an app installed on the user's android mobile or web page accessible through the internet. It consists of

fire sensor which is used for fire detection. If any catastrophic event occurs the system will immediately send the alert message.

We will be using GSM which is used to provide the final SMS to the user through the given number in the simulation program, Flame sensor which is used to denote the flame ranges and if it is high the forest fire will be detected in the LCD display and if it is low forest fire won't be detected.

A temperature sensor is used to measure humidity which has two electrodes with moisture holding substrate between them. Due to change in the humidity there is a corresponding change in the conductivity of the substrate and also the resistance between these electrodes changes. On the other hand, for measuring temperature these sensors use a NTC temperature sensor or a thermistor. A thermistor is actually a variable resistor that changes its resistance with change of the temperature. These sensors are made by sintering of semi conductive materials such as ceramics or polymers in order to provide larger changes in the resistance with just small changes in temperature.

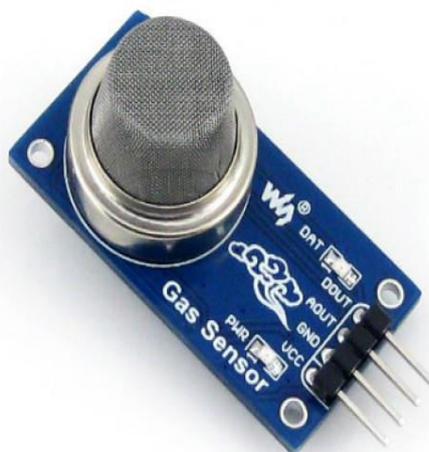
The two main modules present in the project are the Monitoring Area Module and the Forest Area Module. The outcome of the above implementations reveal that various sensors used in addition to the temperature sensor improves security level for areas located near the forests. It also shows that the Optimized Solar Energy Harvester increases the efficiency to about 85 %. Wireless sensor network is a network in which a large number of sensors are deployed and data is collected from them and send to a particular system for processing

The period of computation is too small for the fire to spread from one place to another. To increase the dynamics of the fire detection, a pre-alert for the nodes is generated which can be potentially captured during fire, in the next computation stage. A soft intermediate threshold value is measured between sensing threshold and proximity threshold and the value is used. It is called a warning threshold.

Localization has become very essential as assisting technology, the effectiveness of WSN is directly linked to the accuracy of localization as better localization is a basis of next measurement and decision. Localization algorithm is mainly divided into two main parts which are range based localization algorithm and range free localization algorithm. The advantage of a localization algorithm that is based on ranging is higher than compared to the algorithm that is not based on ranging. Range finding algorithm generally provides strength of received signal, the angle of arrival and time difference in arrival. It presents the prototype for early forest fire detection in which an alert is sent to base station via SMS (Short Message Service) and call using GSM module when the temperature exceeds the threshold value. Also data is sent continuously to the base station using the Bluetooth module. An increase in the temperature than normal temperature can give us indication of forest fire

III. Components Used

1. Smoke Sensor



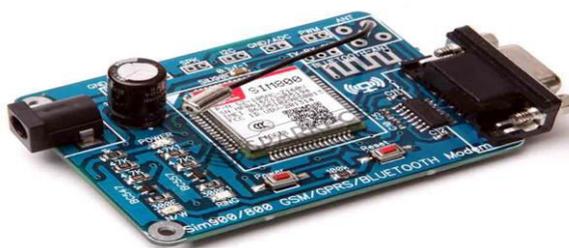
An optical smoke alarm contains a photoelectric sensor, which measures variations in a light signal emitted by an electroluminescent diode. Under normal conditions and if no smoke is present, the signal is continuous and normal.

2. Solar Panel



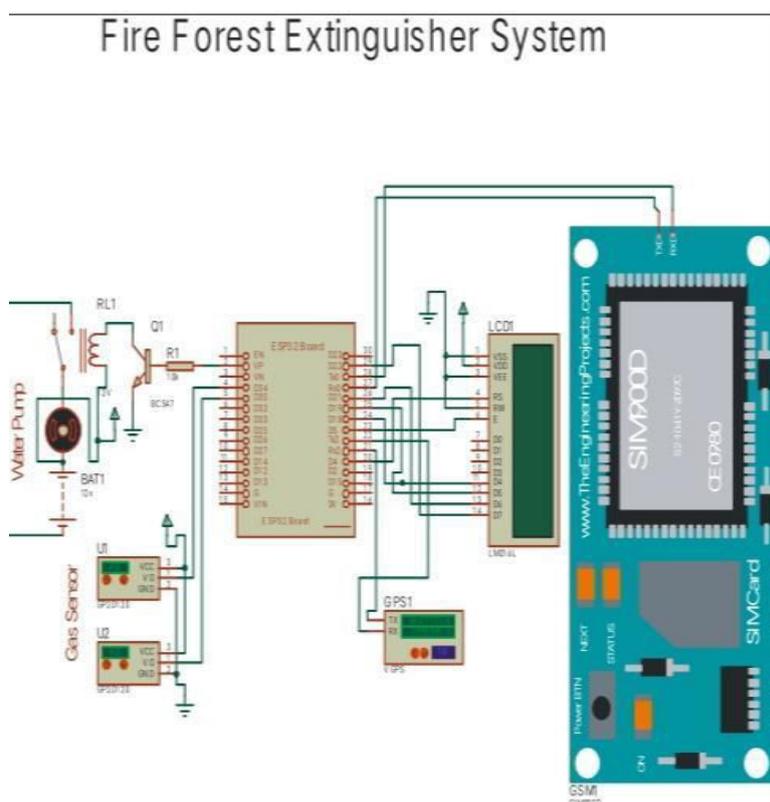
A solar cell panel, solar electric panel, photo-voltaic (PV) module or solar panel is an assembly of photo-voltaic cells mounted in a framework for installation.

3. GSM Modules



A **customized Global System for Mobile communication (GSM)** module is designed for wireless radiation monitoring through short messaging service (SMS). This module is able to receive serial data from radiation monitoring devices such as survey meter or area monitor and transmit data as a text SMS to a host server.

IV. Main Circuit Diagram



Actual Hardware



In this system, the ESP32 board is the heart of the system. All the processing of the system is done through the board. This microcontroller board has an inbuilt WIFI module as well as Bluetooth module this board have a digital pins as well as analog pins and the GSM Modem is connected to the USART pins of the board at RX0 pin and TX0 pins. The GPS Module is connected to the USART pins at RX2 and TX2 pins. The communication between the GSM modem and GPS Module is done through serial communication. Smoke Sensors are used and are connected to the analogue pins of the board. Smoke sensor is an analog sensor, whose output voltages are changed as according to the density of smoke coming from fire. A DC Water pump is connected to the digital pin of the board through a BC457 transistor. The current required for switching the relay is given through this transistor. ARDUINO IDE is used to program for this system. Initially the WIFI module gets connected to the cloud, through IP address. GSM modem is all initialized, by sending a SMS to the concerned mobile. GPS module also gets initialized by powering it. When the LED starts blinking on the GPS, the GPS data gets started. When the smoke gets detected by the sensor, the ESP board, read that value of smoke and accordingly start extinguish the smoke or fire by starting the water pump, as well as the system send the SMS to the concern department that the fire has occur at the specific location. The GPS location is send to the fire department.

V. OBSERVATIONS

Options:

Latitude	Longitude	Detection
21.1458° N	79.0882° E	Normal
21.1458° N	79.0882° E	Detected

Retrieve Data

Latitude	Longitude	E - Detection
21.1458	79.0882	Normal
21.1458	79.0882	Detected

VI. FUTURE SCOPE

In the future, we can develop this model to minimize the energy consumption of all sensors and complete networks considering the node distribution among clusters using distributed sensing. More Sensors can be implemented to the system for more efficiency. The availability of water in the area can be detected by some more sensors for detecting water.

VII. FUTURE WORK

The minor changes in this system can lead to more effective work for the future. We can use this SMART FOREST FIRE DETECTION for forest surveillance which can help to protect wildlife in forests from unusual events such as animal hunting, animal trafficking, wood trafficking and other things.

By installing Infrared /Night Vision cameras it possesses the ability to see through pitch black conditions using Infrared LEDs.

VIII. RESULT

The proposed SMART FOREST FIRE DETECTION Method uses smoke detection and temperature variation in the proposed area. By the use of these techniques, moderate security level is achieved in the results. The temporary safety equipment used gives the extra advantage to the proposed system according to the regions. This system is implemented with real time and power supply which helps the SMART FOREST FIRE DETECTION SYSTEM more suitable to work according to the weather, time, etc.

IX. CONCLUSION

The system is working, the smoke sensor senses the fire and accordingly sends the data to the web server. The water pump extinguishes the fire when the fire occurs and the location of the forest is sent to the website as well as sent to the fire department mobile. The location of the forest is sent in a longitude and longitude manner. The Battery of 12 volt of 1.2 mah is used. A Solar Panel of 50 watt is used to charge the battery. A PHP Language is used for developing a website. The XAMPP offline web server is used. The phpMyAdmin data is used for storing the events happening in the forest. GSM Modem 800L is used for sending the data. 5v is required for GSM module and GPS Module. The Water Pump works on 12 Volt.

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Solar Based Pesticides Spray Robot

R. M. Ingle, Vijay R. Usendi, Nandini M. Manwatkar, Pratik S. Bhadang, Sakshi S. Dhoke, Suraj R. Verma, Isha Dhote and Prathamesh Mangrulkar

Department of Electrical Engineering, Jhulelal Institute of Technology, Nagpur, India

ABSTRACT

One of the important occupations in a developing country like India is agriculture. This system deals with the expositions of robotics can be applied to various fields of agriculture. It is very important to improve the efficiency and productive capacity of agriculture by replacing laborers with intelgients solar machine like robots using the latest technology. As we know that pesticides and fertilizers contain harmful chemicals which affects human body. The main motive of our prototype is to help farmers in various agriculture operations like spraying of pesticides and fertilizers by using solar energy. Solar photo voltaic (PV) was used for operating the sprayer and for charging a battery. The motor was used to regulate spraying liquid form the sprayer tank and spray it through sparing disc nozzle. This prototype will be provide safety to farmers precision agriculture and increasing income, the cost of our prototype is effective as it works in the solar energy (Renewable energy) and it is based on the wireless technology (RF communications).

Keywords: Solar Panel, Battery, IOT, Sprayer.

I: INTRODUCTION

Spraying of pesticides is an important task in agriculture for protecting the crops from insects. Farmers mainly use hand operated or fuel operated spray pump for this task. This conventional sprayer causes user fatigue due to excessive bulky and heavy construction. This motivated us to design and fabricate a model that is basically trolley based solar sprayer In our design, here we can eliminate the back mounting of sprayer ergonomically it is not good for farmers health point of view during spraying in this way here we can reduce the users fatigue level. There will be elimination of engine of fuel operated spray pump by which there will be reduction in vibrations and noise. The elimination of fuel will make our spraying system eco-friendly. So with this background, we are trying to design and construct a solar powered spray pump system.

Contribution of agricultural growth to overall progress has been widespread. Increased productivity has helped to feed the poor, enhanced farm income and provided opportunities for both direct and indirect employment. The success of India's agriculture is attributed to a series of steps. The major sources of agricultural growth during this period were the spread of modern crop varieties, intensification of input use and investments leading to expansion in the irrigated area. In areas where 'Green Revolution' technologies had major impact, growth has now slowed. New technologies are needed to push out yield frontiers, utilize inputs more efficiently and diversify to more sustainable and higher value cropping patterns". At the same time there is urgency to better exploit potential of rain fed and other less endowed areas. Given the wide range of agro ecological setting and producers, Indian agriculture is faced with a great diversity of needs, opportunities and prospects. Future growth needs to be more rapid, more widely distributed and better targeted. These challenges have profound implications for the way farmers' problems are conceived, researched and transferred to the farmers. "On the one hand agricultural research will increasingly be required to address location specific problems facing the communities on the other the systems will have to position themselves in an increasingly competitive environment to generate and adopt cutting edge technologies to bear upon the solutions facing a vast majority of resource poor farmers". The robotic systems play an immense role in all sections of societies, organization and industrial units. The objective of the project is to develop a microcontroller based system at helps in on-farm operations like seeding and fertilizing at pre-designated distance and depths with all applicable Innovative idea of our project is to automate the process of sowing crops such as sunflower, baby corn, groundnut and vegetables like beans, lady's finger, pumpkin and pulses like black gram, green gram etc & to reduce the human effort and increase the yield. The plantation of seeds is automatically done by using DC motor. The distance between the two seeds are controlled and varied by using Microcontroller. It is also possible to cultivate different kinds of seeds with different distance. When the Robot reaches the end of the field we can change the direction with the help of remote switches. The whole process is controlled by Microcontroller. Seed plantation is our day to day life is done by tractor in farms. The conventional method for seeding is the manual one. But it requires more time & the man power shortage is faced continuously. India is agrarian economies and most of rural populations depend on agriculture to earn their livelihood. Agriculture is the largest livelihood provided in India mostly in the rural areas. The farmers are in need of seeds for ploughing & cultivation. The seeds are available in packets & many industries deal in manufacture of such seed packets.

II: LITERATURE SURVEY

Wireless Control of an Automated Guided Machine:-

Introduction the robotic system is an electromechanical (conveys a sense that it has agency of its own) and artificial agent which is steered by DC motor which has four wheels. The farm is cultivated by the machine, depending on the crop considering particular rows & specific columns. The infrared sensor detects the obstacles in the path and it also senses turning position of vehicle at end of land. The seed block can be detected and solved using water pressure. The machine can be controlled remotely and solar panel is used to charge DC battery. Assembly language is used in programming the microcontrollers. The microcontroller is used to control and monitor the process of system motion of vehicle with the help of DC motor.

Design and Implementation of Pesticide Spraying Robot using IOT :-

This paper designed a pesticides spraying robot using raspberry pi. Fossil Fuels operated Sprayers are eliminated by DC pump which results in the reduction of vibrations and noise. This makes spraying system ecofriendly. To implement the idea a vehicle is made which is electronically operated by a remote (mobile app). Sprayer is fitted the robot so that it can spray pesticides uniformly covering a large area in less time. The main advantage in this paper is sprayer Height is Adjusted According to the Plant Height.

Design and Operation of Agriculture Based Pesticide Spraying Robot:-

Robot is controlled with a PIC16F877A microcontroller. Designing of the latest inverted ROBOT which can be controlling using an APP for android mobile. We are developing the remote buttons in the android app by which we can control the robot motion with them. And in which we use Bluetooth communication to interface controller and android. Controller can be interfaced to the Bluetooth module through UART protocol. According to commands received from android the robot motion can be controlled

III.METHODOLOGY USED

The spraying mechanism, in particular, includes an Arduino Nano microcontroller. It additionally includes a tank of 500ml capability to which a water pump is hooked up. a splitter is connected to this water pump along with the two nozzles at the two opposite ends and through this nozzle spraying is practised. It also includes a motor driving force circuit to govern the pace of spraying. The spraying mechanism plays the following features. Pump ON/OFF manages: It is used to turn On/Off the water pump that is used to spray.

Also the unskilled farmer can be easily operated automatic the spray system. The design and fabrication of a manually operated single-row Seed planter that is cheap, easily affordable by the rural farmers.

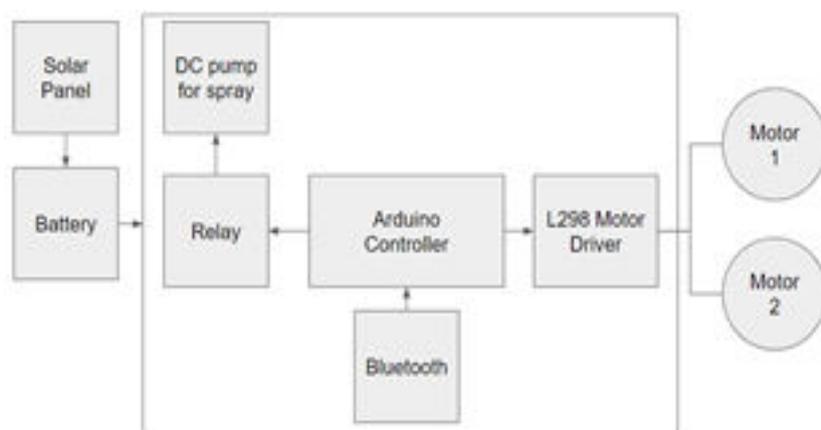


Fig. 1: System Block Diagram

THE SYSTEM HARDWARE

Hardware Use

Arduino Nano

Arduino Nano circuit board with Arduino IDE is capable of reading analog or digital input signals from different sensors, activating the motor, turning LED on/off and do many other such activities. All functionalities are performed by sending a set of instructions to the ATmega328 main microcontroller, on the board via Arduino IDE. The Arduino board also includes Power USB, Power (Barrel Jack), voltage regulator, crystal oscillator, voltage pins (3.3v,5v,gnd,vin), A0 to A5 analog pins, icsp pin, power led indicator, tx and rx leds, 14 digital input/output pins, Aref, and Arduino reset

The Arduino Uno is a microcontroller board, based on the ATmega328. The Uno board functioning is different from all other boards in that it does not use the FTDI USB to serial driver chip. Instead, the ATmega328 is programmed as a USB to serial converter. The ATmega328 is a low power CMOS 8 bit microcontroller based on the AVR enhanced RISC architecture structure

The Arduino project started in 2003 as a program for students at the Interaction Design Institute Ivrea in Ivrea, Italy,[2] aiming to provide a low-cost and easy way for novices and professionals to create devices that interact with their environment using sensors and actuators. Common examples of such devices intended for beginner hobbyists include simple robots, thermostats and motion detectors.

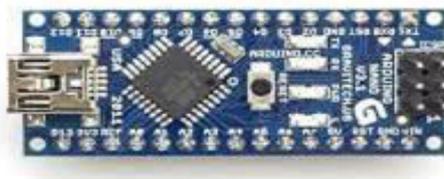


Fig. 2: Arduino Nano

DC MOTOR

An electric motor is an electrical machine that converts electrical energy into mechanical energy. Most electric motors operate through the interaction between the motor's magnetic field and electric current in a wire winding to generate force in the form of rotation of a shaft. Electric motors can be powered by direct current (DC) sources, such as from batteries, motor vehicles or rectifiers, or by alternating current (AC) sources, such as a power grid, inverters or electrical generators.

General-purpose motors with standard dimensions and characteristics provide convenient mechanical power for industrial use. The largest electric motors are used for ship propulsion, pipeline compression and pumped-storage applications with ratings reaching 100 megawatts. Electric motors are found in industrial fans, blowers and pumps, machine tools, household appliances, power tools and disk drives. Small motors may be found in electric watches.

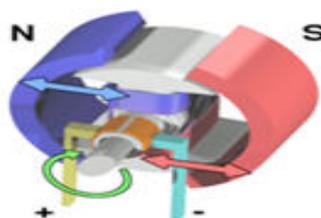


Fig. 3: DC MOTOR

Relay

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

A type of relay that can handle the high power required to directly control an electric motor or other loads is called a contactor. Solid-state relays control power circuits with no moving parts, instead using a semiconductor device to perform switching. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called "protective relays".



Fig. 4: Relay

HC-05 Bluetooth Module

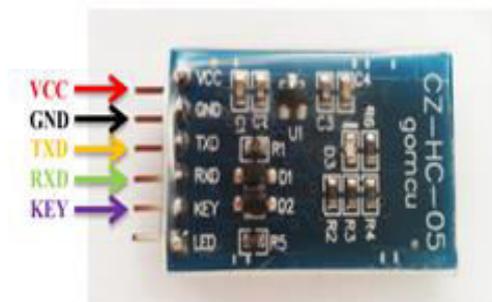
HC-05 Bluetooth Module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Its communication is via serial communication which makes an easy way to interface with controller or PC. HC-05 Bluetooth module provides switching mode between master and slave mode which means it able to use neither receiving nor transmitting data. Specification:

Model: HC-05

Input Voltage: DC 5V

CommunicationMethod: Serial Communication

Master and slave mode can be switched



Pin	Description	Function
VCC	+5V	Connect to +5V
GND	Ground	Connect to Ground
TXD	UART_TXD, Bluetooth serial signal sending PIN	Connect with the MCU's (Microcontroller and etc) RXD PIN.
RXD	UART_RXD, Bluetooth serial signal receiving PIN	Connect with the MCU's (Microcontroller and etc) TXD PIN.
KEY	Mode switch input	If it is input low level or connect to the air, the module is at paired or communication mode. If it's input high level, the module will enter to AT mode.

Fig. 5: HC-05 Bluetooth Module

Software Use

The Compilation Process

The arduino code is actually just plain old c without all the header part (the includes and all). when you press the 'compile' button, the IDE saves the current file as arduino.c in the 'lib/build' directory then it calls a makefile contained in the 'lib' directory.

This makefile copies arduino.c as prog.c into 'lib/tmp' adding 'wiringlite.inc' as the beginning of it. this operation makes the arduino/wiring code into a proper c file (called prog.c).

After this, it copies all the files in the 'core' directory into 'lib/tmp'. these files are the implementation of the various arduino/wiring commands adding to these files adds commands to the language

The core files are supported by pascal stang's procyon avr-lib that is contained in the 'lib/avr-lib' directory

At this point the code contained in lib/tmp is ready to be compiled with the c compiler contained in 'tools'. If the make operation is succesfull then you'll have prog.hex ready to be downloaded into the processor.

IV: ADVANTAGES

Because of pesticide is harmful for person who spray it in the farm the robot is used instead of person and farmer can operate easily the robot. The main advantage is to protect the farmer from the pesticide hazards, farmer will not dependable on the labours for the spray which is main issue face the farmer due to lack of labours Solar-powered pesticide Systems are practical in flat terrain where the sun shines. Solar-powered pesticide pumps can be placed in or next to the pond or other source of pesticide and the pesticide can be pumped where it is needed. Solar pesticide pumping is clean and efficient. Solar electric water pumping cuts down on waste because it's based on natural cycles. Your panels give the most pumping power on the sunniest days---when you need the most pesticide. Solar-powered pesticide systems take very little maintenance.

DISADVANTAGES

The disadvantages are as follows:

Relatively high initial cost.

Lower output in cloudy weather.

FUTURE SCOPE

Now we fabricating this model availability of components and economical and technology in future we will make according to that time technology if all the farmer use we can save the power



Fig. 5: Prototype assemble

OBSERVATION TABLE

Sr. No.	Parameter	Tractor	Manual	Robot
1	Time Taken	Less	More	Less
2	Work Done	Depend on fuel/more	Less	More
3	Man power	Moderate	More	Less
4	Area covering	High	Less	High
5	Pollution	Yes	No	No
6	Harmful leaving beings	No	Yes	No
7	Cost per square Hector	High	Moderate	Less

Time Duration Mainly

- 1) **Tractor:** - 10 Lt. – ½ Hours
- 2) **Robot:** - 1 time charging – 4 to 5 Hours
- 3) **Manually:** - More time

RESULTS AND ANALYSIS

After analysis of the result after completing the solar powered pesticide sprayer, the discharge rate of pesticides from the tank is high and by this farmers can save time for spraying pesticides and since it is having wheels is very much easy to move it. It use solar energy which is renewable source of energy so there will be no pollution and it saves energy for future generation. Since India is an agricultural country so we need a pesticide sprayer which works on solar energy which does not cause any pollution and gives high output that saves money, time for farming. When we compared with the existing system we got that the system that we are using provides the required operation in less time and in large quantity without failure.

CONCLUSIONS

As a conclusion, in order to design and develop an autonomous pesticide spraying for a fertigation farm has been successfully conducted. All the subsystems such as navigation systems and spraying systems are included. Although the navigation part has been tested, the autonomous pesticide sprayer robot can be wirelessly navigated by android app. For future works, the spraying pressure of the autonomous pesticide sprayer robot will be tested and the electronic circuits need a waterproof structure since the autonomous pesticide sprayer robot deals with a pesticide which is fluid. Therefore, the isolation of the electronic component should be done well by separating each electronic component in the container box to prevent it from being damaged if the flooding or leakage happened inside the robot. On the other hand, the pest monitoring system should be developed to be an auto monitoring device while spraying the pesticide

ACKNOWLEDGEMENTS

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Study of an Ayurvedic Tonic – Dasamoolarishtam Using Thermal Variation of Viscosity and Acoustic Parameters

Bindu R. G

NSS College, Nilamel, Kollam, Kerala, India

ABSTRACT

Thermal variation of acoustic parameters namely adiabatic compressibility and specific acoustic impedance and that of viscosity has been done for four brands of Dasamoolarishtams along with a standard one. The deviation in the physical characteristics of samples prepared commercially on a large scale as well as prepared traditionally on small scale has been compared and the results are analysed and interpreted.

Keywords: dasamoolarishtam, viscosity, adiabatic compressibility, specific acoustic impedance.

INTRODUCTION

Ayurveda is considered as the traditional medical system of India. Ayurvedic medicines are commonly prepared from the leaves, stem as well as roots of plants. Since ayurvedic medicines have no side effects, it is getting worldwide acceptance in a big way. This eventually leads to high demand for ayurvedic medicines and other concentrates. Hence the process of ayurvedic preparations has changed from the hands of traditional physicians to industrialized firms, who prepare them on a large scale using modern machinery to meet the demand [1]. In the present paper, an attempt has been done to study the thermal variation of viscosity and derived acoustic parameters- adiabatic compressibility and specific acoustic impedance to the most popular Ayurvedic medicine namely Dasamoolarishtam.

Dasamoolarishtam (commonly spelled as Dasamularista) is widely used as an ayurvedic health tonic and pain reliever. It is a combination of ten herb roots along with herb leaves and hence got its name as Dasamoola [2,3]. It is a fermented liquid prepared from various herbal ingredients and contains 3 to 7% self-generating alcohol, which is beneficial to health [4]. It is considered as a relief medicine for regaining overall health of women from post-delivery weakness and a rejuvenator for female reproductive system. It strengthens the muscles of uterus for uterine contraction and to have better menstrual discharge [5, 6]. In Ayurveda, many physicians suggest Dasamoolarishtams for the speedy recovery of postpartum problems in women and restoration of hormone in them because of its strength providing properties [7]. Again it is considered as a good appetizer and improves digestion and reduces symptoms of fatigue in individuals [8]. Because of its medical importance several companies are involved in the preparation of Dasamoolarishtams in a commercial scale which causes depreciation in its quality. Since it is a fermented liquid, many preservatives (some of them may be harmful) are used by manufacturers to improve its shelf life. Such preservatives can cause serious health issues to individuals especially to women after delivery who are weaker during delivery period. Hence an attempt has been made to study different brands of Dasamoolarishtams manufactured by different companies on large scale along with the one prepared in small scale by a traditional physician. The aim of the study is to find how the different brands of arishtams sold in the market differs from one another and from the sample prepared by a traditional physician and to find the presence of possible preservatives in them.

MATERIALS AND METHODS

Samples of Dasamoolarishtam sold by four popular ayurvedic firms which prepares it on a large scale were collected and classified as Samples A, B, C and D. The arishtam locally prepared by a traditional physician is considered as the standard Sample S. Each sample is centrifuged initially for 20 minutes in an automatic laboratory centrifuge rotating at 2100 rpm in order to remove the suspended particles in it. It is then diluted to 50% by volume by adding distilled water. The viscosity of the diluted sample is determined using an Oswald viscometer kept at different temperatures ranging from 298 K to 318 K at an interval of 5 K. The viscometer was kept in a thermostatically controlled water bath and the temperatures were maintained steady within an accuracy of ± 0.01 K. The time of flow was determined after equilibrating the viscometer with the bath temperature using a calibrated stopwatch having an accuracy of ± 0.01 s. The accuracy of the instrument is checked by determining the viscosities of benzene, nitrobenzene and toluene at various fixed temperatures and is found to be in good agreement with the literature values [9, 10]. The density measurements were performed using a 12cm³ double-stem pycnometer and the masses were determined using a single pan electronic balance (DHONA 200B) with an accuracy of ± 0.1 mg. The ultrasonic velocities were measured by a single crystal ultrasonic interferometer (Mittal Enterprises, Model No: F 81) at a frequency of 2 MHz with an accuracy of ± 0.1 ms⁻¹. All the measurements were repeated thrice and its average has been considered as the true value.

Theory

The viscosity of a liquid is given by

$$\mu = \mu_w \frac{\rho}{\rho_w} \frac{t}{t_w} \quad (1)$$

where μ and μ_w are the viscosities, ρ and ρ_w are the densities and t and t_w are the times of flow through the same capillary tube under the same conditions for the liquid and water respectively. The unit of viscosity is Pa-s.

The adiabatic compressibility of a liquid is given by

$$\beta_s = \frac{1}{U^2 \rho} \quad (2)$$

Another derived acoustic parameter, specific acoustic impedance of a liquid is given by

$$Z_A = U \rho \quad (3)$$

where U is the ultrasonic velocity and ρ , the density of the liquid under study.

RESULTS AND DISCUSSION

Ultrasonic velocities, densities and viscosities of the different samples of Dasamoolarishtams were determined at five different temperatures ranging from 298 to 318 K at an interval of 5K and are tabulated in Table 1. From the knowledge of ultrasonic velocity and density, acoustic parameters namely adiabatic compressibility (β_s) and specific acoustic impedance (Z_A) have been determined using equations (2) and (3) respectively. The thermal variation of viscosity (μ) as well as the thermal variations of β_s and Z_A of the samples under study are shown in Fig.1, Fig.2 and Fig.3 respectively.

Table.1 Variation of U, ρ, β_s, Z_A and μ at different temperatures for different samples of Dasamoolarishtams.

Parameters	298 K	303 K	308 K	313 K	318 K
Sample A					
U	1575.9	1583.2	1588.3	1593.5	1597.3
ρ	1053.74	1051.89	1050.47	1047.57	1045.57
$\beta_s \times 10^{10}$	3.821	3.793	3.774	3.759	3.749
$Z_A \times 10^{-6}$	1.661	1.665	1.668	1.669	1.670
$\mu \times 10^3$	1.577	1.336	1.173	1.068	0.9781
Sample B					
U	1585.3	1590.7	1596.6	1600.8	1603.8
ρ	1053.92	1051.52	1049.89	1047.00	1045.21
$\beta_s \times 10^{10}$	3.775	3.758	3.736	3.727	3.720
$Z_A \times 10^{-6}$	1.671	1.673	1.676	1.676	1.676
$\mu \times 10^3$	1.691	1.409	1.220	1.092	1.035
Sample C					
U	1584.7	1590.0	1595.2	1600.3	1604.3
ρ	1062.21	1059.45	1058.20	1054.96	1053.67
$\beta_s \times 10^{10}$	3.744	3.724	3.709	3.697	3.683
$Z_A \times 10^{-6}$	1.684	1.687	1.689	1.689	1.691
$\mu \times 10^3$	2.522	2.316	1.896	1.659	1.407
Sample D					
U	1567.3	1574.4	1580.1	1585.0	1589.8
ρ	1044.49	1041.80	1040.10	1037.57	1036.44
$\beta_s \times 10^{10}$	3.898	3.872	3.851	3.836	3.817
$Z_A \times 10^{-6}$	1.637	1.640	1.643	1.645	1.648
$\mu \times 10^3$	1.465	1.263	1.098	1.014	0.9253
Sample S					
U	1585.3	1592.3	1597.2	1602.2	1605.8
ρ	1058.56	1056.48	1054.72	1051.89	1050.11
$\beta_s \times 10^{10}$	3.759	3.733	3.717	3.703	3.693
$Z_A \times 10^{-6}$	1.678	1.682	1.685	1.685	1.686
$\mu \times 10^3$	2.320	2.078	1.742	1.585	1.345

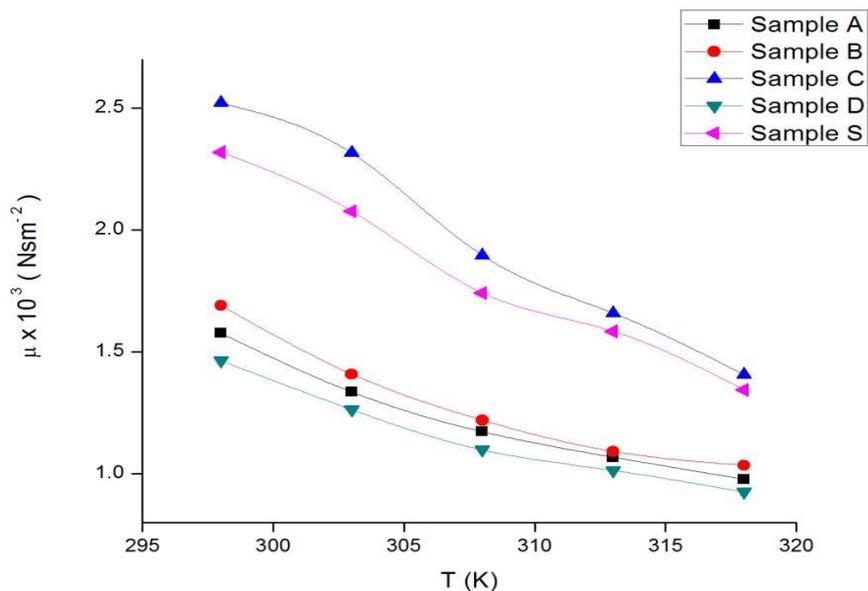


Fig.1 Variation of viscosity (μ) with temperature for different samples of dasamoolarishtams

From Fig.1, it can be seen that the general nature of variation of μ with temperature is same for all graphs. ie; viscosity decreases with increase in temperature. The shape of the curves of Sample C and the standard one - Sample S are similar except for a shift and is different from the curves of Samples A, B and D. Samples C and S have higher viscosity and the fall in viscosity with temperature is greater at low temperature range when compared to Samples A, B and D. The high value of viscosity for Samples C and S may be due to the presence of higher level of sugar content in them. The curves of Samples C and S are close and similar to one another. Curves of Samples A, B and D are close and have low viscosity values. The fall in viscosity with temperature in these samples is also low when compared to Samples C and S particularly at higher temperature range. The similarity in the nature of variation and closeness of the curves of Samples C and S shows that Sample C has the same quality and ingredients as that in the standard Sample S.

The study conducted by Domini et.al [11] shows that the addition of preservatives in a sample results in an upward deviation in μ vs T curve at higher temperature. A similar deviation is found in the case of μ vs T curves for the samples A, B and D which are produced commercially on a large scale. Hence these samples may contain preservatives. The Sample S, which is considered as the standard one, does not show any such upward deviation at higher temperature. Also, no such upward deviation can be found in Sample C. Hence Sample C, which is prepared by Government controlled unit, may be considered as the one free from preservatives.

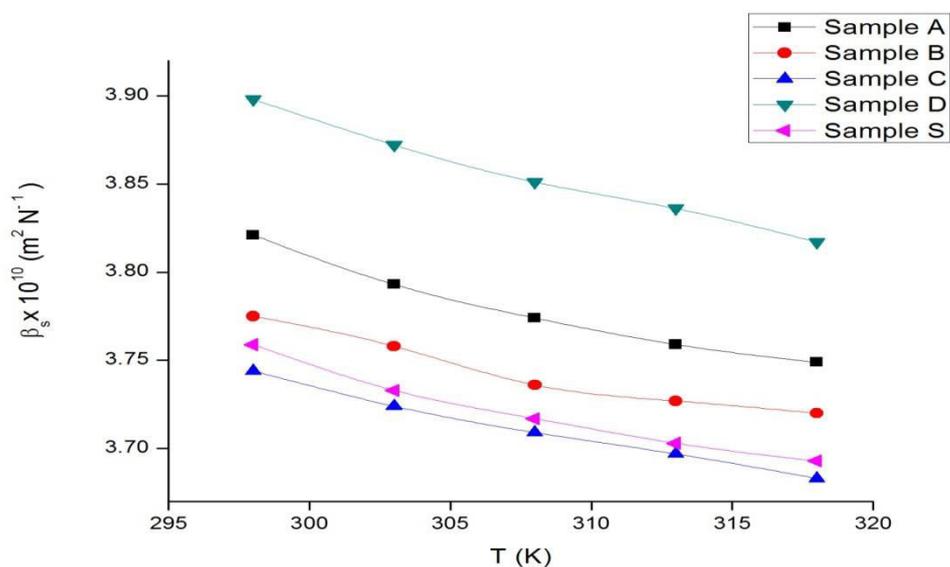


Fig.2 Variation of adiabatic compressibility (β_s) with temperature for different samples of dasamoolarishtams

Analysing Fig.2, it can be seen that the shape of curves for all the samples are more or less the same except for Sample B. There is a relative shift between the curves for different samples similar to μ vs T graphs. The shape of the curve is almost similar to that of sugars (glucose, fructose or sucrose). It has been shown by Mohanan et.al [12] that an increase in sugar content in a solution shifts the $\beta_s - T$ graph downwards. Since the curves for B, D and A shift upwards relative to standard one S and that of C shifts downwards, it can be assumed that the sugar content in the sample decreases in the order $D < A < B < S < C$. Also Sample C is close to the standard Sample S. The decrease in sugar content in the commercially prepared samples B, A and D may be due to the addition of preservatives in them. Sample S is prepared by a traditional physician on a small scale while Samples B, A and D are prepared by three companies on a large scale. Sample C is also prepared in a large scale, but not to the extent of B, A and D. The similarity in the curves for all samples except B is attributed to the common method of production based on the same text and same type of ingredients. The shape of Sample B is different from those of others which may be due to its production based on a different text.

Again Fig.3 shows the variation of specific acoustic impedance Z_A with temperature for different samples of dasamoolarishtams. Here also we can see that the nature of variation of all the samples is almost similar except Sample B. Moreover the shift in Sample C from the standard one is small when compared to that of other samples.

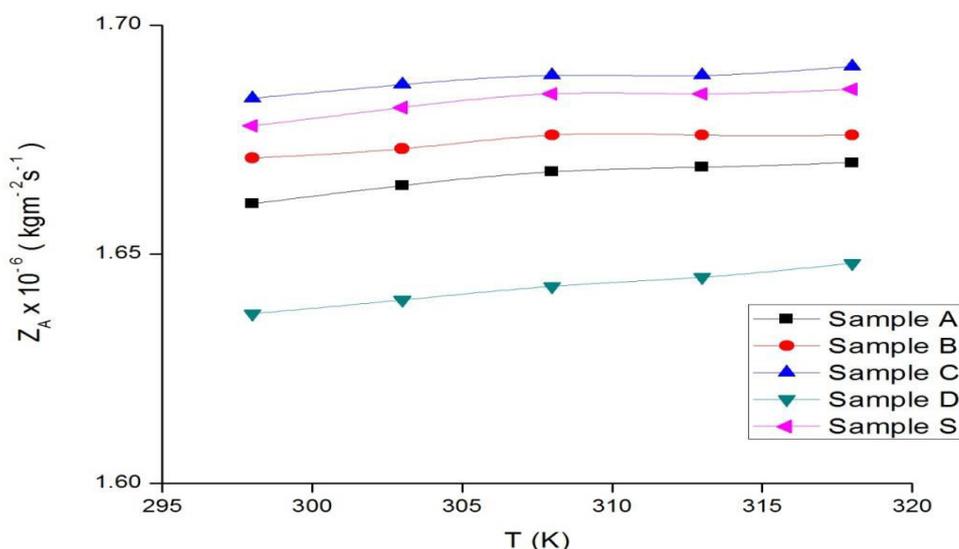


Fig.3 Variation of specific acoustic impedance (Z_A) with temperature for different samples of dasamoolarishtams

Here also the shape of the graphs of Z_A versus T is similar to those of sugars [12]. An increase in sugar content in a solution shifts Z_A versus T curves upwards [12]. From the figure it is clear that the curve for Sample C shifts upwards while that for Samples B, A and D shifts downwards relative to Sample S. Hence it can be assumed that the sugar content in the samples decreases in the order $D < A < B < S < C$. The decrease in the sugar content in Samples B, A and D may be due to the addition of preservatives in them for longer shelf life and the result confirms the findings using the acoustic parameter adiabatic compressibility.

The general similarity in the nature of variation of curves for all samples for the entire temperature range except B shows that those samples are made of same text and same ingredients and Sample B is prepared on a different text. The slight fluctuations may be due to the difference in the amount of ingredients used. Thus from the present study of thermal variations of viscosity, adiabatic compressibility and specific acoustic impedance, it can be seen that the shape of Sample C is similar to that of standard Sample X for the entire temperature range. Thus it can be concluded that Sample C prepared by Government controlled unit has a quality equal to that of standard Sample S prepared on a small scale and is free from preservatives.

CONCLUSIONS

Thermal analysis of viscosity, adiabatic compressibility and specific acoustic impedance done in five different samples of dasamoolarishtams reveals that the samples prepared commercially on a large scale differ in their physical characteristics from the sample prepared on a small scale by traditional method. The study of arishtams

helps us to find its sugar content as well as its rate of quality. The study also identifies the presence of preservatives in certain samples.

ACKNOWLEDGEMENT

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MPPT Based Solar Charge Controller with Monitoring System

Rupesh Wankar, Prashant Debre, Ashish Dyaneshwar Thombre, Roshan Haridas Kapte, Mayur Lahanu Nishane, Shikhar Verma and Rajendra Shende
Electrical Engineering, Jhulelal Institute of Technology, Nagpur, India

ABSTRACT

Solar or photovoltaic (PV) system is an alternative clean energy resource that has received much attention in the research and industries. Solar charge controller (CC) is the heart of a solar system. Three common types of charge controller are ON/OFF, pulse width modulation (PWM) and maximum power point tracking (MPPT). MPPT is getting very much popularity nowadays for its high capability of power extracting from solar panel. This paper is presenting here an improved design of MPPT solar charge controller using Arduino. The proposed technique significantly reduces system power loss and increase the efficiency. Additionally, some new features are added like data logging and protections from high voltage disconnect (HVD), low voltage disconnect (LVD), over current protection, short circuit protection and reverse polarity protection.

Keywords: charge controller, MPPT technique, PV system, Arduino, Microcontroller, Buck converter.

INTRODUCTION

With the advancement of semiconductor physics, its extraction process of energy has become more efficient these days. Particularly, perturb and observe (P&O), incremental conductance (INC), constant voltage (CV), short current pulse, fuzzy logic control (FLC), artificial neural network (ANN) and some other techniques have been reported to offer an efficient energy extraction process. However, the efficiency of an energy extraction process can further be improved considering the Current-Voltage (I-V) characteristic of a solar cell. The I-V characteristic of a solar cell is nonlinear and varies with irradiation and temperature. There is a unique point on the I-V or Power-Voltage (P-V) curve of the solar array called Maximum power point (MPP) at which the entire PV system operates with maximum efficiency and produces its maximum output power. When a PV array is directly connected to a load, the systems operating point will be at the intersection of the I-V curves of the PV array and load. However, under most conditions this operating point is not at the MPPT. Therefore, it is desirable to ensure that the load line passes through the MPP to continuously deliver the maximum power to the output. To achieve this maximum output power and thereby to improve the efficiency, maximum power point tracking (MPPT) technique can be employed in the PV system. Different MPPT techniques have been developed and implemented. It is also evident that none of those have employed a microcontroller based MPPT technique using Arduino.

It makes the system simpler, more efficient and highly flexible. This research therefore aims at designing and implementing a microcontroller based MPPT solar charge controller technique using Arduino. Solar panel is the source of nonlinear energy. 40W 12V Polycrystalline solar panel and 12V lead acid battery is used to experiment a PV system using this proposed charge controller. Electrical specifications of this panel are mentioned in the table below-

Name	Rating
Maximum power	40W
Maximum voltage	17.10V
Maximum current	1.76A
Open circuit voltage, V_{oc}	21.16V
Short circuit current, I_{sc}	1.94A
Operating temperature	-40°C to +85°C

Table I- Electrical Specifications of Solar Panel

Table II depicted the developed specification against the older version of charge controller and specific uses of the proposed features.

Table II – Developed specifications of the proposed system

Feature	Model/Rating	Specification
Panel	40W, 12V	Input source, Load
MPPT	12V 3A	Common Negative
Arduino Nano	ATmega 328P	Microcontroller board
Current sensor	ACS712-20A	Protection for over current or short current flow

Buck converter	—	Convert panel voltage to battery voltage
MOSFET driver	IR2109D (10V to 600V)	High speed power MOS-FET drivers
Wireless Fidelity (Wi-Fi) module	ESP8266	Data logging
USB connector	USB 2 (480 Mbit/s)	Direct charging of external devices
Display	DIS-00014 (20*4)	Monitoring system status

Proposed System Configuration

The conflict between MPPT and charge control engulfs the truth that the MPPT produces variable voltage and current depending on the weather conditions, whereas the charge control requires invariable current and/ or voltage to charge battery. When the DC-DC converter uses the MPPT control signal, the uncontrolled voltage can perhaps damage the battery. On the other hand, when the converter uses charger control, it may not land at the MPPT. It thus necessitates two different DC-DC converters to taste the expediency of both MPPT and charger control.

The PV panel produces power depending on the temperature as well as irradiation circumstances and engages the boost converter to follow the maximum power point. The MPPT control processes its inputs and tailors the duty ratio of the boost converter to move the converter input voltage to the operating point that corresponds to maximum power. The maximum power obtained from the PV panel supports the load as well as the battery as long as the PV power remains greater than the load power and the battery fully charged. The battery supports the load in case of PV power becomes reduced than the load power until the point of low voltage disconnect.

This system operates in four modes: - MPPT, CC, CV, IDLE. The operating modes of the system under study depend on the availability of PV energy, load requirement and the present charge level of the battery.

Arduino Nano is used to control the charge controller operation. Fig 1 shows the pin out configuration of the board.

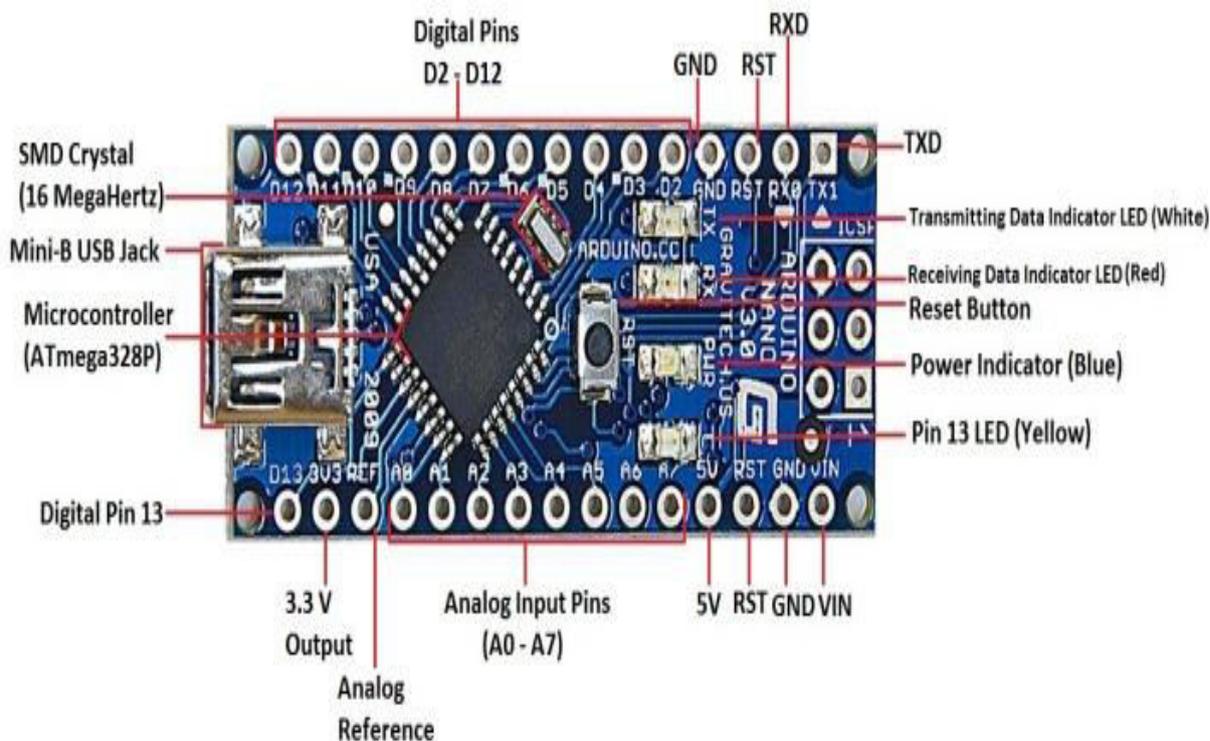


Fig 1: Arduino Nano Pin Out Configuration

Based on ATmega 328P, it is a 30 male I/O header board, configured in a DIP 30 style. Arduino Nano contains 14 digital pins, 8 Analog pins, 2 Reset Pins and 6 Power pins. It comes with a crystal oscillator of frequency 16Mhz. It is used to produce a clock of precise frequency using constant voltage.

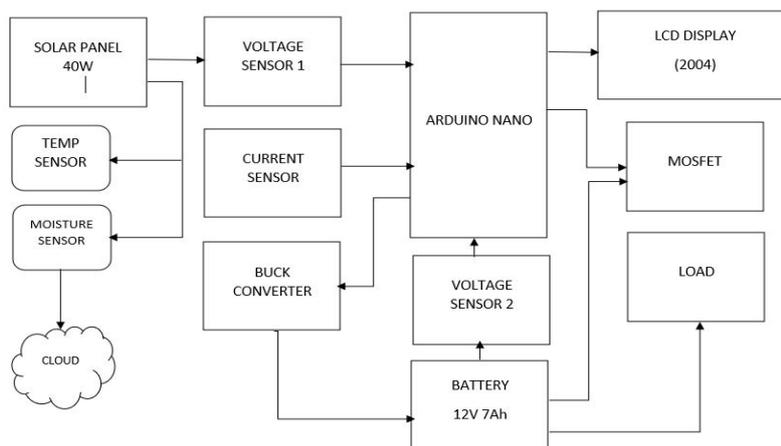


Fig 2: Block Diagram of proposed system

DESIGN OF CONTROLLERS

Modeling and Characteristics of Solar Photovoltaic (PV) Cell

The basic element of a solar PV system is PV cells. These cells are connected to form modules. It is further expanded in the form of arrays as per the power requirement. These PV cells exhibit nonlinear characteristic. The output of the PV cell varies with solar irradiation and the ambient temperature.

Conventional Perturb & Observe/Hill Climbing MPPT Scheme

The other name of the P&O method is hill climbing method. In fact, the hill climbing and P&O methods are different ways to achieve the MPP. Hill climbing MPPT is achieved by perturbing the duty cycle of the power converter. In the P&O method, the perturbation is applied either in the reference voltage or in the

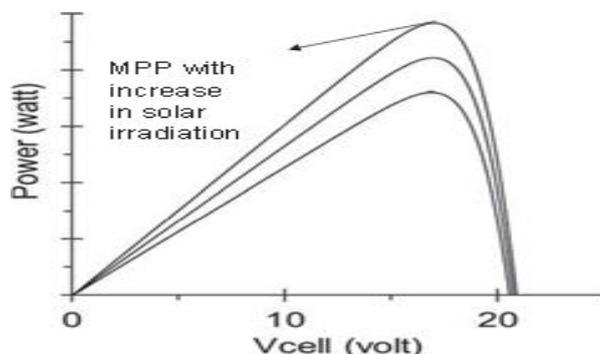


Fig 3: Solar PV power characteristics with different solar irradiation level.

Reference current signal of the solar PV. The flow chart of the conventional P&O method is shown in Fig 3. In this flow chart, Y is shown as the reference signal.

It could be either solar PV voltage or current. The main aim is to achieve the MPP. To achieve it, the system operating point is changed by applying a small perturbation (OY) in solar PV reference signal. After each perturbation, the power output is measured.

If the value of power measured is more than the previous value, then the perturbation in reference signal is continued in the same direction.

At any point, if the new value of solar PV power is measured less than the previous one, then the perturbation is applied in the opposite direction. This process is continued till MPP is achieved.

The converter interface bestowed for battery charging requires to be composed for achieving high SOC during charging and for preventing deep discharging to increase the lifetime of battery. The MPPT represents an optimal load to PV array by outputting the most favourable voltage to the load. The battery charging control aims to regulate the voltage and/or current in accordance with the mode of operation of the battery.

The MPPT processes the PV voltage and PV current at its input to give the optimum duty cycle required to move the converter input voltage to the point corresponding to maximum power on the guidelines of the flowchart shown in Fig.4.

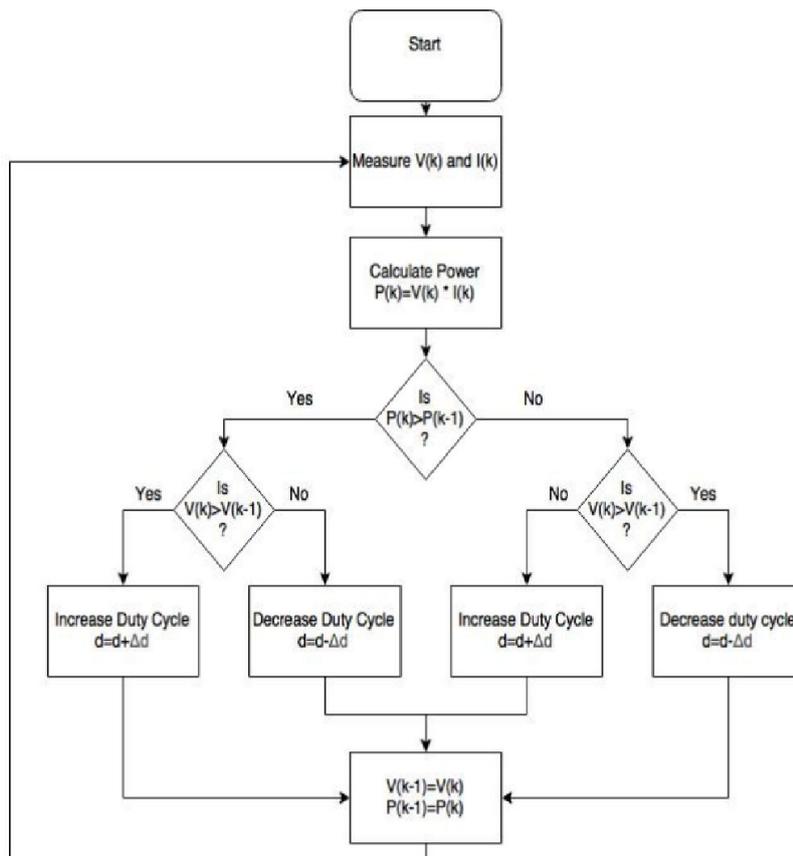


Fig 4: Flowchart of MPPT Algorithm

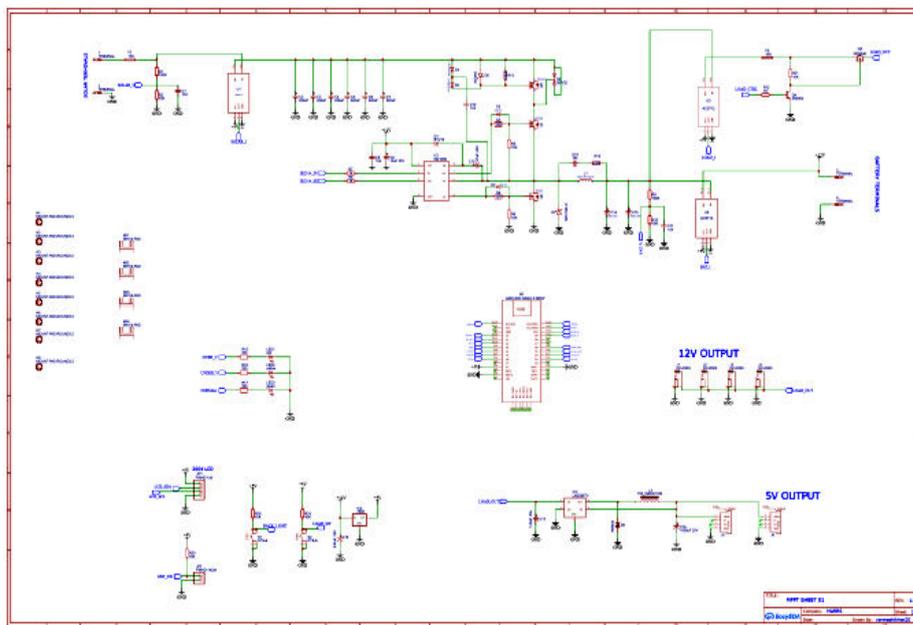


Fig 5: Schematic Diagram

The circuit has been designed on EasyEDA software. High current n channel Mosfet IRF 3205 is used for protection from back current from the battery to the panel. ACS-712 20A current sensors are used for sensing the input current from the panel, at the 12V output and battery input. This system has a working frequency of 31.6 KHz. Buck converter uses two toroidal inductors of 346µH and 466µH. IR 2109D is a half bridge gate converter 8 pin IC. For fast switching IN5822 Schottky Diode is used for the output.

This design comprises of four 12V and two 5V USB type outputs which can output a total of 3 Amps. Below is the PCB layout from EasyEDA.

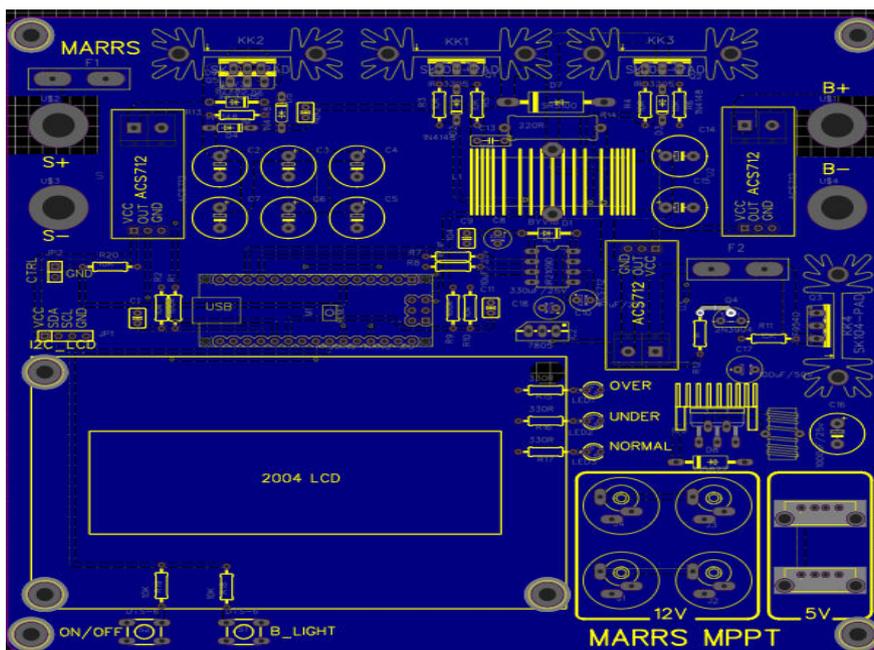


Fig 6: PCB Layout of MPPT

The schematic is converted into PCB as shown in Fig 6. This is a Common Negative type MPPT design whose negative terminals of solar and battery are grounded.

The design uses two n-channel Power Mosfets IR3205 for switching purpose. IC7805 is used to supply +5VDC to the VCC pins of Arduino, Current Sensors and LCD Display. Voltage divider circuit containing of 10K and 100K resistors on both sides of the microcontroller for the Solar and Battery inputs. IN 4148 along with 10K resistor and 0.1uf capacitors are used for bootstrapping the mosfets. IR 2109D half bridge driver IC is used to trigger the power mosfets. BYV32 is used for Anti-Back feed protection. An AC load is connected through a high frequency inverter circuit while 12VDC is directly obtained from charge controller as its output. For real time monitoring of the temperature and moisture of solar panel, DHT11 sensor, BMP 180 sensor are interfaced with Arduino UNO and the data is transferred to cloud using NODEMCU ESP8266 Wi-Fi Shield. The UNO is powered through the 5V DC output of MPPT.

The main function of the buck converter being stepping down the DC Voltage from the reference voltage (12V in this case), to the required necessary Voltage (3V in this case). The Yellow region in the indicates the maximum voltage of 3V obtained after Buck convertor comes into action with an input voltage of 12V.

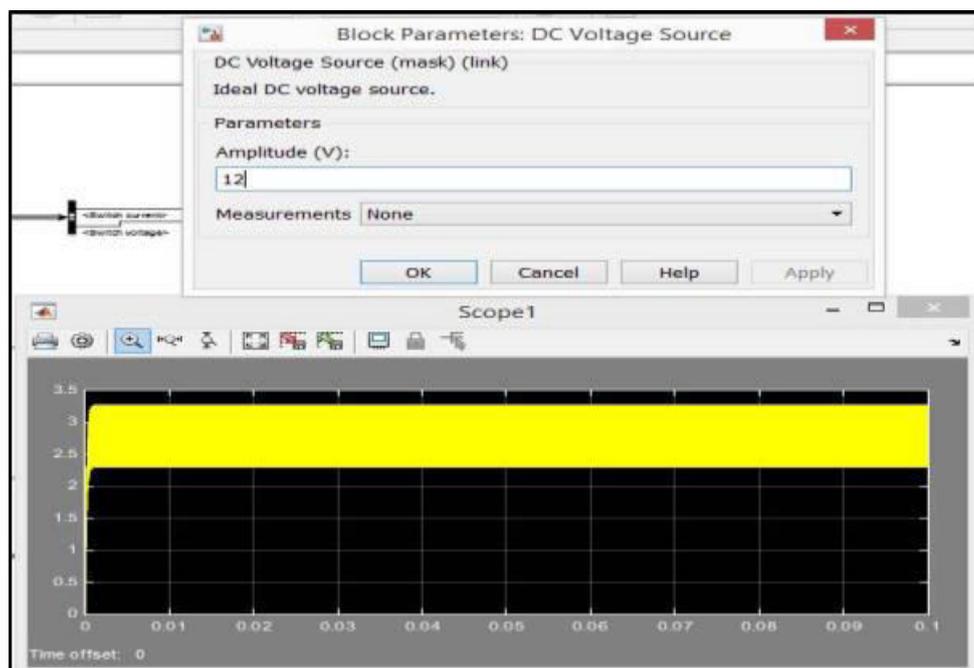


Fig 7: Output Voltage characteristics of Buck Converter

OBSERVATIONS

Charge Controller

Fig 8. shows the charge controller demonstration. The two columns talk about the process in which either a battery or a load come into action.

Sr No.	Conditions	Results Expected	Output Observed
1.	Battery volt >10v Solar power>1w	Load ON Battery Charging OFF	
2.	Battery volt <10v Solar power<1w	Load OFF Battery Charging ON	

Fig 8: Charge controller demonstration

The 1st Horizontal Row shows that when the Battery Voltage is greater than 10V and the Solar Power is greater than 1W, the entire supply reaches the load i.e., Load is turned ON and the battery charging remains OFF.

The 2nd Horizontal Row states that when the Battery voltage is less than 10V and the Solar Power is also less than 1W, the Load turns OFF and the Battery charging gets turned ON, is less than 10V and the Solar Power is also less than 1W, the Load turns OFF and the Battery charging gets turned ON.

Duty Cycle

Sr No	V _{in} (v)	I _{in} (A)	R _i (Ω)	R _L (Ω)	Duty cycle (Calculated) (%)	Duty cycle (Observed) (%)
1.	13.8	0.34	40.58	67	64	
2.	12.73	0.4	31.8	67	75	
3.	14.2	0.49	28.98	67	79	

Fig 9: Duty Cycle Observations

For maximum power point tracking, Input Impedance should be equal to the load impedance. But since the input voltage fluctuates continuously, it is not possible to keep the input resistance steady. That is why the Duty Cycle is worked upon.

The rating of solar PV used is 40W @ 1000 w/m² solar irradiation.. Since the PV is flooded with artificial lighting, therefore, power generated is not 40W—rather, it is around 6–7 Watts. But the purpose to test the effectiveness of MPPT scheme is achieved. The Power-Vcell curve of solar PV from the experimental setup with artificial light source, i.e., 1000 W/m², is shown in Fig 10.

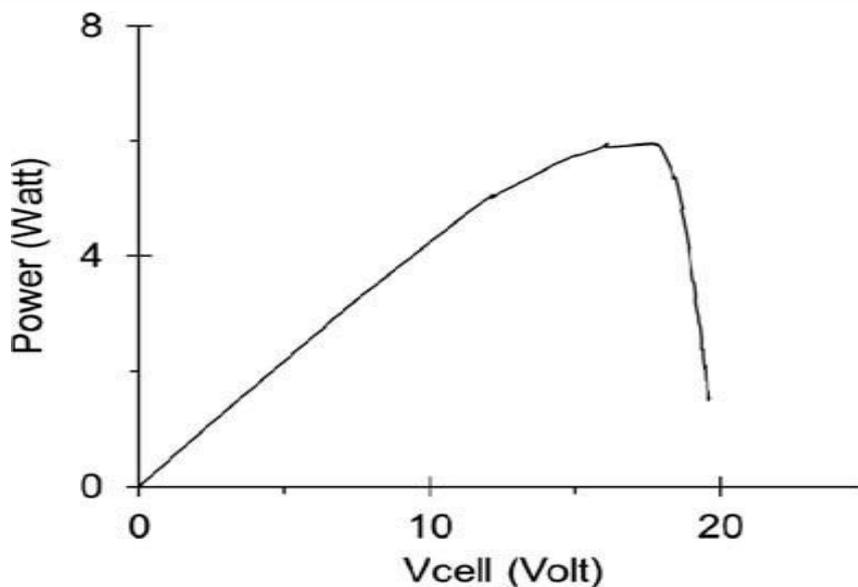


Fig 10: Experimental results with full artificial light.

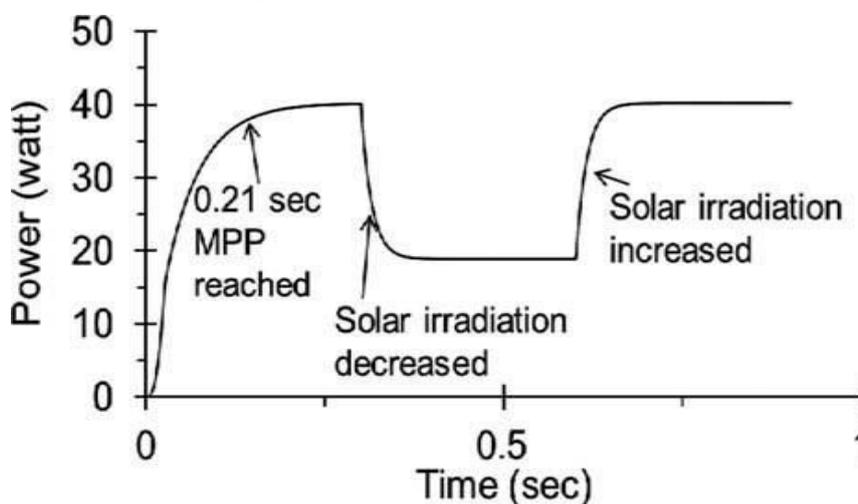


Fig 11: Simulation results: Power vs. time

Fig.11 shows the experimental results under changed solar irradiation levels.

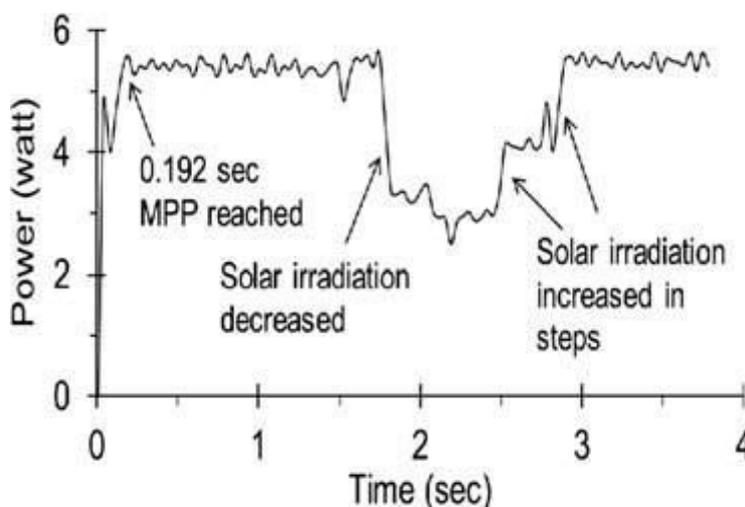


Fig 12: Experimental results: Power vs. time

Fig. 12 presents the experimental results obtained under similar conditions to that of simulation. It can be seen that the time taken to reach MPP is approximately 0.21 sec, and even if the solar irradiation is changed, the MPP scheme is not giving false results. Also, the experimental and simulation results are almost similar, except the steady state oscillation is invisible in simulation. It is due to the fact that dP/dV is much less.

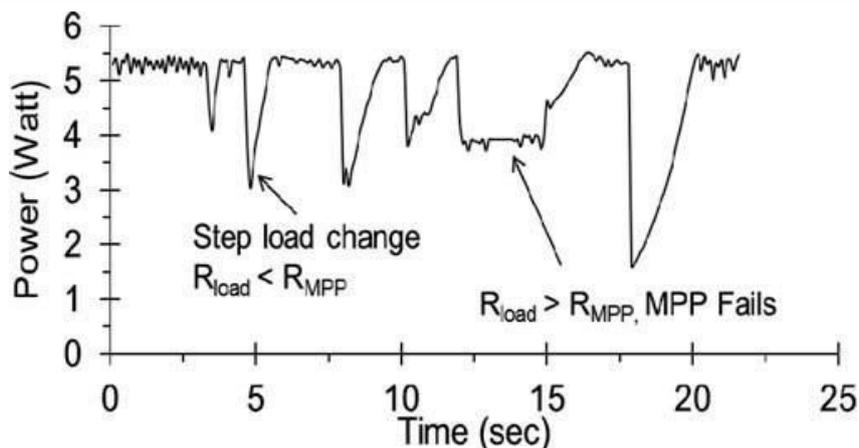


Fig13: Experimental results: Solar PV power vs. time at different load conditions.

Figure 13 shows the experimental results under different load conditions. It is evident that if R_{Load} is less than R_{MPP} , the MPP works and restores the power to MPP level. The moment R_{Load} is greater than R_{MPP} , the proposed MPP fails, which is obviously expected.

V.RESULT

The MPPT curve was successfully achieved at different times of a day. The PV curve was plot against the resistive load characteristics and the maximum power point was tracked. Operations of charge controller were successfully achieved as shown in the observations.

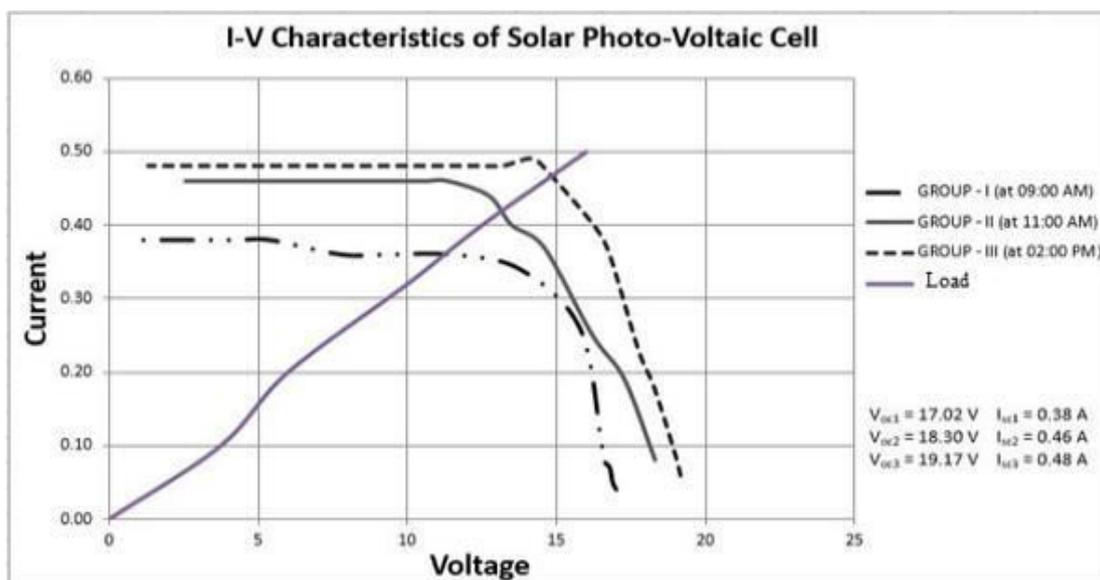


Fig 14: IV and Load Characteristics of Photo Voltaic Cell

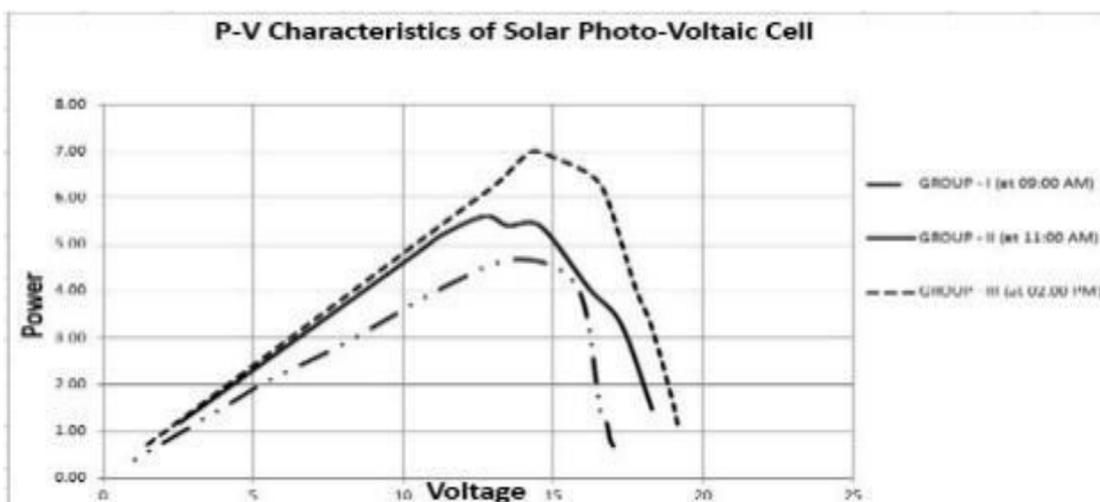


Fig 15: PV Characteristics

VI. CONCLUSION

In this paper a MPPT charge controller has been designed and tested. The proposed system demonstrates its low cost, low power consumption, microcontroller-based control unit and high-power efficiency. Arduino based alternative was chosen since it permits easy and customized system modifications. The proposed system also facilitates remote monitoring with data storage, external device charging and continuous system status displaying.

This work presented a prototype board based in a small microcontroller that controls the lead acid battery charging process and also the correct used of the lead-acid battery.

The control algorithm executes the P&O maximum power point tracking function allowing, according to solar irradiance, the transfer of maximum energy generated by photovoltaic panel to the battery.

This P&O algorithm increase the efficiency power transference in comparison to systems that have not a MPPT (direct connection), reducing the size and the cost of the PV panel. This board assures the fast, safe and complete battery (lead acid) charging process and also monitor its discharge.

For future work the complete charging process should be analyzed to compare with another system working without P&O MPPT algorithm.

From the preliminary results it is expect that the charging process using the MPPT algorithm will be faster.

Hall Effect base current sensors are very efficient, simple in connections and easy in use but it is little bit expensive in the India only. For MPPT circuit implementations always have to use complete development board kit for microcontroller otherwise its circuitry will complex and less efficient.

VII. ACKNOWLEDGEMENT

This project has been implemented in the hardware form under the guidance of Prof. Rupesh Wankar, Electrical Engineering Department, Jhulelal Institute of Technology, Nagpur as a final year term project.

VIII. INDUSTRIAL SCALING

This maximum power point tracking device serves as a proof of concept but has the potential to be scaled to industrial implementation. Research is being conducted into the concept of implementing a micro-inverter solution that would be installed at each PV panel before connecting them in series or parallel. As previously discussed, this project could act as a precursor to a type of charge controller that could be realized at individual PV panels. In order to do so, the competitive price point would need to be determined through a thorough study of the cost of implementation and market research. Once this number was identified, the features could be scaled down appropriately to reach this goal. Consequently, if a charge controller of this type was to be produced at an industrial scale, it would drive down the cost of the parts and manufacturing significantly and should be considered in the initial research into the feasibility of producing such a system. Another possible design change for an industry ready design might involve replacing the current Xbee wireless device with another, more expensive, module that enables the data to be transferred over much larger distances. Another alternative would be to incorporate a Wi-Fi transceiver which also has a larger range than the current design. This device was not used in the current project because although it transfers data at a high rate, it consumes more power. Finally, the photovoltaic charge controller design presented is meant to be an off the-grid system and uses a battery to store its power. In some industrial scenarios it would be beneficial to develop an MPPT charge controller to interface with a grid tied system.

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A Review on Data Transmission Using Encryption and Compression Techniques

Sagrika¹, Gursewak Singh Brar² and Sandeep Sharma³

¹PTU, Jalandhar, India

²BBSBEC, Fategarh Sahib, India

³GNDU, Amritsar, India

ABSTRACT

All kind of digitally information stored is known as data. The safeguarding of resources is what security is all about. Through use of protective digital privacy steps to prevent unauthorized access to systems, databases, and websites is defined as data protection. Cryptography protects users by allowing them to secure data and confirm the identity of many other customers. The method of decrease the quantity of bits or bytes needed to describe a collection of data is known as compression. It enables for further information to be saved. Our research goal is to use various cryptography techniques to secure data. The information will first be compressed, and then encryption schemes will be implemented, followed by a comparative analysis of all possible permutations of compression and data encryption. When encryption & compression are performed simultaneously, processing time & speed are reduced.

Keywords: Data Security, Cryptography, Compression, Huffman, Diffie Hellmen Key exchange.

I. INTRODUCTION

There is a demand for control is to protect that your data remains secure but only authorized users have entry to it, as well as take care of that unauthorized user has not been able to change it, providing correctness. Compression is used to secure data since it uses less disc space (saving some money) and allows for further data transfer over the web. It improves the speed with which information is received from drive to storage. Confidentiality, Authentication, Integrity, & Non-repudiation are the four security objectives for data security. Data security is afforded from across company by data protection. Data compression is well recognized for saving money on storage and transmission. It implies converting data in an appropriate format, known as the associations, into data in a tiny package, understood as the code word[1]. Data encryption is very well for ability to prevent eavesdropping. It uses an encryption key to convert information from one format, defined as plaintext, to another, defined as cipher text. Compression and encryption are presently conducted independently. Existing compression or encryption technologies have significant flaws in terms of speed and computer computation, which raises the cost. To eliminate this disadvantage, combine the best procedures into one.

The portion of this paper is structured as follows. Section II contains the cryptography. Section III consists of encryption algorithms. Section IV gives the introduction of compression and its various techniques. Section V explains the literature review. Section VI concludes with a conclusion.

II. CRYPTOGRAPHY

The two most common methods for hiding information are cryptographic algorithms and steganography. Cryptography is used in this study. Cryptography is a big data discipline that provides strategies for converting ordinary plain text into incomprehensible form so that Valid Users are able to access information at the destination [2]. The mathematical scientific research of encoding and decoding data is known as cryptography. Figure 1 depicts the cryptography process, with P denoting Plaintext, C denoting Ciphertext, E denoting Encryption, & D denoting Decryption.

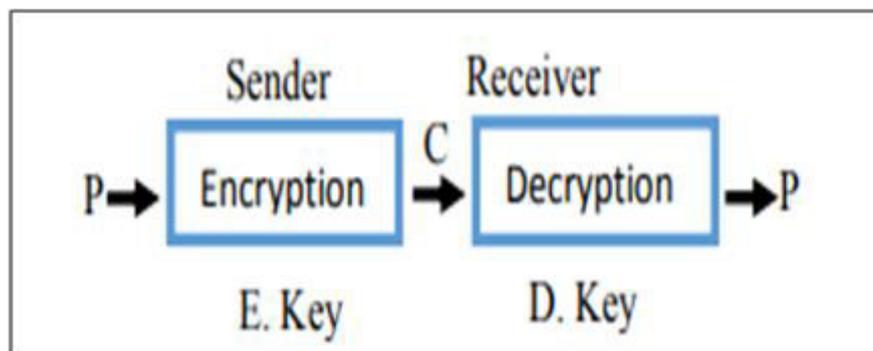


Fig 1: Cryptography Process [2]

III. ENCRYPTION ALGORITHMS

There were two types of encryption: symmetric cryptography & asymmetrical cryptography. Despite being far more effective and secure than secret encryption techniques, open key encryption wasn't used in IoTs due to slower processing and higher memory consumption. [3]. The two most common forms of symmetric cryptography simulations are square and bitstream encryption calculations. Square encryption algorithms encrypt data of a predetermined length square and generate jumbled up data inhibits of the same length. AES, DES, Skipjack, RC5, and more algorithms are used in these calculations. Bit stream encryption computations, treat data as a flowing organization of bits.

There are a variety of often used symmetric computations that are documented, briefly displayed, and analyzed as follows. In particular, [4] presents a comparison of encryption estimations:

Blowfish/Twofish

Blowfish is currently assumed to be safe because no compelling cryptanalysis has been identified. Furthermore, it ensures that genuine cryptography is used in programs. Moreover, Bruce Schneier personally recommended using Twofish, a more upgraded version. Counterpane Labs released a rectangular figure called Twofish in 1998. Twofish was one of the 5 contenders for the AES. Regardless, it was not chosen as AES by NIST since the AES champion (Rijndael) is regarded to have superior execution in both equipment and software above the other finalists in ordinary. It is also intended to run on a variety of platforms. Regardless of the fact that it was not picked as AES, because of the unique phase [5], it could be a good solution for our circumstance right now.

Rijndael Algorithm (AES)

Rijndael was picked by NIST as the winner of the AES competition in 2000. Rijndael's architectural argument relies on a substitution stage system. It is quick in terms of both software or hardware. Rijndael does not use a Feistel organise, unlike its precursor DES [6].

Skipjack Algorithm

This is one of the fastest and easiest square figure computations, but it is required for embedded structures. Skipjack, or a variation thereof, is often used in remote systems such as TinySec, SenSec, and Minocin. [7].

Table 1: Comparison of encryption algorithms [18]

Algorithm name	Size of Key (a bit)	Size of Block (a bit)	Round
DES algo	56	64	16
3DES algo	168,112,56	64	48
DES-X algo	184	64	16
Blowfish algo	32-448,8-128	64	16
Twofish algo	128,192,256	128	16
TEA, XTEA algo	128	64	64
XXTEA algo	128	64	It is influenced by the size of the block.
AES algo	128,192,256	128	It is influenced by the size of the key.
Skipjack algo	80	64	32
HIGHT algo	128	64	32

IV. COMPRESSION

The source code method that effectively reduces the total number of bits needed to describe a given piece of data. The compression rate is the amount of bits before and after reduction divided by the number of bits after compression. Problems with compression: Compression methods are divided into two categories. Lossless compression is one type of compression, whereas lossy compression is another. Researchers obtain exactly the same data after lossless compression as designers did previously. The only purpose lossless compressions are used on word documents is that any loss in the word documents is unacceptable[8]. Some examples include Lempel Ziv coding, Huffman coding and Run Length coding. Designers will not receive the very same documents as before compression when using lossy compression, and some information will be lost. These reduction algorithms are used on photos, audio files, & videos since some loss may be accepted in these formats. Block Truncation Coding, Transform Coding, as well as other techniques are instances.

Huffman Coding Method

In Huffman Coding method, variable length codes are allocated to input alphabets based on their frequency, development in the past codes are assigned to high-frequency letters & conversely. It is a method of data reduction that is lossless. This code does not always produce the best results. Users can't always get to the finish

of the code since it employs variable length codes [9]. To prevent confusion, the suffix of one character's code should not be the prefix of any character's code.

Assume user have 4 characters, w, x, y, and z, with probability of 2, 4, 1 and 3. As a result, the Huffman codes for the letters may be 11, 0, 10, or 1.

LZW Coding

It refers for Lempel Ziv Welch Coding method & compresses data using a table-based lookup technique. Characters are encoded using a constantly constructed dictionary in this manner. The letters that have already occurred in the incoming digital signal are stored in this dictionary.

Arithmetic Coding

Lossless and lossy compression techniques can both benefit from arithmetic coding. Words with a high frequency would be allocated smaller numbers, & conversely.

Run Length Encoding

The information or text documents are compressed using run length encoding. The original value is displayed here by providing the number of times a certain character has occurred, therefore the letter itself. When there is more information repeated in a row, it performed best. Image processing is one of its uses.

For Example:

Data: BBBBBAACCCCAAABBB

After applying Run length coding method, the output we get

Data: - 5B2A4C4A3B

V. LITERATURE REVIEW

Izhar et al.,(2017) utilized a combination of compression and encryption techniques to ensure data security, which results in less storage being taken up, lower communication overhead, as well as faster transfer times. While encryption methods exist, the more basic ones are readily brute-forced, while the more secure versions are significantly more difficult to construct. As a result, the authors attempted to develop three novel methods for data protection. We've incorporated the principles of confusion and dissemination to the point where a brute force attack algorithm is impossible to execute[9].

Wu et al., (2018) introduced a new partially parallel approach that mixes Huffman tree creation with traversal coding to speed up the construction of Huffman coding tables in Huffman encoders. Because to the largely parallel characteristic, theoretical model & post-layout numerical simulations reveal that the proposed method might boost Huffman encoding performance by roughly 75%, while also being suitable for FPGA Platform[10].

Bhattacharjee et al., (2018) presented a hybrid strategy for addressing any number of distinct or incessant transmissions faults that combines an inventive pattern creation with a novel error restraint mechanism. A freshly built pattern table is used to produce the pattern phrases in this technique. It also has a unique data compression mechanism for controlling data size & integrity. The projected hybrid method, when compared to other conventional techniques, is capable of reducing data loss and errors by providing a low Mutual Information percentage and a high SNR. The results show that it saves time and space by improving Compression Proportion and Throughput [11].

Liu et al.,(2018) introduced the first ETC approach to ECG data processing. In comparison to non - encrypted compressions, the suggested methodology not only protects private information but also ensures signal integrity without reducing compression ratio. The information is compacted using the SVD approach, which allows the developed scheme to offer quality-control stored information even when the information is encrypted. In experiments, the proposed methodology is shown to be an excellent method for ensuring information security and compression efficiency for ECG data[12].

Sivakumar et al.,(2019) launched Heroku is a cloud service, and the authors secure the data in the Heroku cloud using AES strong encryption. Information in a cloud service may be encrypted using AES security. A dual cloud could also be employed if one or both clouds are operational. When a cloud is operational, data must be more helpful when it comes to cloud uploading and storing. Moreover, the time it takes for data to be encrypted to be computed indicates a larger quantity of data and a longer time to encrypted form[13].

Nuradha et al.,(2019) I used the CW1173 board to get the traces when the AES program operated. Using CPA study with the Hamming distance S-box output approach, the researchers were able to identify all of the sub

keys used in the Advanced encryption algorithm. At the conclusion of this research, the researchers discovered the secret to AES assumptions with the findings of 100 percent security analysis attacks on crypto-processor implementations among software and hardware platforms. The test findings suggested that CPA could be implemented using notduino. To avoid power analysis assaults, the microcontroller requires protection[14].

Singh et al.,(2019) For secure data transmission over a system, an investigation of encryption & lossless compression algorithms with enhanced security is performed. Compression was contrasted to Encryption, which was likened to Encryption, which was compared to Joint Compression as well as Encryption, which was contrasted to Encryption, which was likened to Encryption, which was likened to Encryption, which was contrasted to Encryption, which was contrasted to Encryption, which was compared. The most effective compression and encryption criterion was obtained by combining the block scrambling method[16] for image encryption with the JPEG XR compression technique to achieve a final compression proportion of 60.77 percent. [15].

Pramod et al., (2017) recommended a new encryption mechanism based on the AES. The new technique computes a 400-bit block data encryption as well as a key dependent rotational S-Box that varies based on the user's 200-bit key. Hackers can examine fixed S-boxes to find weak spots, whereas key-dependent S-boxes create offline evaluation of an attack on a single set of S-boxes difficult. This aids in the safe storage of information in the cloud as well as the uninterrupted transfer of data in Cloud Computing and Big Data[17].

Chaudhry et al., (2018) looked into all of the limitations that present in the IoT in a very thorough manner. Different IoT requirements are discussed in this paper, all of which must be examined in order to fulfill the goal of security. The computation shown here is a first step into using basic salt-based encryption to address this security problem. The small piece structure aids in this endeavour while also speeding up the entire process. While the need for more security precautions has resulted in a slew of solutions to security challenges, some IoT are vulnerable to security attacks because no credible countermeasures have been developed to combat these threats[18].

VI.CONCLUSION

In this study, evaluated performance in terms of many factors. It demonstrates the fundamentals of cryptography & compression, as well as how these methods were applied to a text document. Data security is achieved through the employment of a mix of compression and cryptographic algorithms. To enhance security of suggested information, authors compressed the information and then encrypted it. It has a number of advantages, along with the ability to send a huge volumes of data through the internet. Combining would be less expensive, reduce time, and be more secure. Various cryptography approaches could be combined with compression methods in the future. Other conventional methods should be used as well. For the sake of applying approaches, a performance analysis must be carried out. Authors would be able to model a new approach for data security once user receive the results.

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Blood Culture [Blood Count Test, LFT, KFT, Lipid Profile (Cholesterol & Triglycerides), Blood Sugar Test, Cardiac Test & Thyroid Function Test] Using Arduino UNO

Anil Bawaskar and Karan K. Ramteke

Department of Electronics & Telecommunication, Jhulelal Institute of Technology, RTMNU (Nagpur University), Nagpur, Maharashtra, India

ABSTRACT

By blood culture test we find a bacteria or fungus in the blood, but to find that fungal we use traditional manual method, which take more time for result. To reduce that time and give as much as accurate result in less time with a automation this project is been developing. Using this project we can help doctors to diagnose patients as much as quick by giving result to them in less time.

Keywords: Blood, Fungus, Bacteria.

I. INTRODUCTION

Blood normally doesn't have any bacteria or fungi in it. Because as we know that the kidney play's a major role for blood purification but still we got bacteria in blood. There are many sources like Abscessed tooth, Germs on medical equipment (such as surgical tools and needles), Skin ulcers or other wounds, Urinary tract infection & many more. This can cause blood infection also it can develop by weak immune system. This infected blood can most often occurs with other serious infections, such as those affecting the lungs, kidneys, bowel, gallbladder, or heart valves. People who have prosthetic heart valves and prosthetic joints have a higher risk of a infection following their surgery, although these infections are not common.

A blood infection also can develop when the immune system is weak. This can occur in children and older adults. It can happen because of a disease such as cancer or AIDS also from medicines (such as corticosteroids or chemotherapy) that change how well your body can fight infections (immunity).

This test can be done in laboratories which take time to give result; also it's a lengthy process which can take 7-8 day for final result. To reduce this period this system can help.

II. BLOCK DIAGRAM

In this project the blood is provide to the Fiber Glass Enclosure. This enclose make sure that the outer light cannot effect on blood sample. The AS7265x sensor used which is a three sensor device which is using to collect digital data from blood. The controller sends command to the sensor to start normal light and with that sensor start collecting data by first sensor.

The collected data is transmit to the controller. Again the controller sends command to the sensor this time UV (Ultraviolet) sensor get activate and start collecting data from blood and transmit this data to the controller.

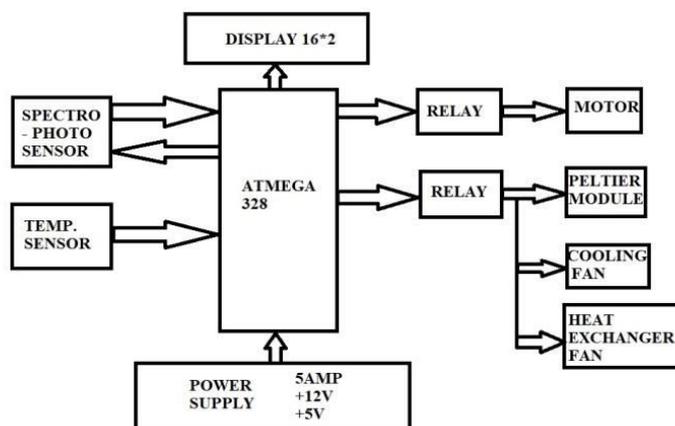


Fig.1

Again the controller send command to the sensor and this time IR sensor get activate and start collecting data from blood and transmit this data to the controller.

Through this three sensor it will give total eighteen signals, for this eighteen signals it will check variation in signals accordingly it will show result on display.

Also we are maintaining temperature of the device around 35°C by Peltier module we are controlling cooling & heat of the device, if it is hot then cooling fan will active, if it is too cool then heat exchanger fan will activate and maintain the temperature.

III. HARDWARE

A. AS7265x Series Device

Triad Spectroscopy Sensor is a powerful optical inspection sensor also known as a spectrophotometer. Three AS7265x spectral sensors are combined alongside a visible, UV, and IR LEDs to illuminate and test various surfaces for light spectroscopy.[6] The Triad is made up of three sensors AS72651, AS72652, and AS72653 and can detect the light from 410nm (UV) to 940nm (IR).[6] In addition, 18 individual light frequencies can be measured with precision down to 28.6 nW/cm² and accuracy of +/-12%.[6] Utilizing our handy Qwiic system, no soldering is required to connect it to the rest of your system.[6] However, we still have broken out 0.1 -spaced pins in case you prefer to use a breadboard.[6]



Fig.2

Spectroscopy Sensor communicates over I2C by default or over 115200bps serial.[6] We've written a fully formed Arduino library to access all the various features include taking readings and illuminating LEDs all over the I2C interface.[6] In addition, the Triad can setup to communicate over serial.[6] The serial interface uses an AT command set.[6] The I2C address of the AS7265x is 0x49 and is hardware defined.[6] A multiplexer/Mux is required to communicate to multiple AS7265x sensors on a single bus. If you need to use more than one AS7265x sensor consider using the Mux Breakout.[6]

B. Arduino Uno

The Arduino Uno is a microcontroller based on the ATmega328.[7] It have a 20 digital input/output pins in which 6 can be used as PWM outputs and 6 can be used as analog inputs, a 16 MHz resonator, a USB connection a power jack an in-circuit system programming (ICSP) header, and a reset button.[7] It contains everything needed to support microcontroller simply connect it to a computer (or appropriate wall power adapter) with a USB cable or power it with a AC-to-DC adapter or battery to get started.[7]

The Uno differs from all preceding boards in that which does not use the FTDI USB-to-serial driver chip.[7] Instead it features an ATmega16U2 programmed as USB-to-serial converter. This auxiliary microcontroller has its own USB boot loader, which allows advanced users to reprogram it. [7]

The Arduino has a large support community and an extensive set of support a libraries and hardware add-on “shields” (e.g. you can easily make your Arduino wireless with a Wixel shield), making it a great introductory platform for embedded electronics.[7] Note that we also offer an Spark Fun Inventor’s Kit, which includes an Arduino Uno along with an assortment of components (e.g. breadboard, sensors, jumper wires, and LEDs) that make it possible to create a number of fun introductory projects.[7]. This is the 3rd revision of the Uno (R3), which has number of changes:[7]

- The USB controller chip changed from ATmega8U2 (8Kb flash) to ATmega16U2 (16Kb flash). This does not increase the flash or RAM available to sketches.[7]
- Three new pins were added to all of which are duplicates of previous pins. The I2C pins (A4, A5) have been also been brought out on the side of the board near AREF. There is a IOREF pin next to the reset pin, which is a duplicate of the 5V pin.[7]
- The reset button is now next to the USB connector making it more accessible when a shield is used. [7]



Fig. 3

C. FT232R- USB UART IC

The FT232R is the latest device to be added to FTDI's range of USB UART interface Integrated Circuit Devices. The FT232R is a USB to serial UART interface with optional clock generator output, and the new FTDIChip-ID security dongle feature.[8] In addition, asynchronous and synchronous bit bang interface modes are available.[8] USB to serial designs using the FT232R have been further simplified by fully integrating the external EEPROM, clock circuit and USB resistors onto the device.[8]

The FT232R adds two new functions compared with its predecessors, effectively making it a "3-in-1" chip for some application areas.[8] The internally generated clock (6MHz, 12MHz, 24MHz, and 48MHz) can be brought out of the device and used to drive a microcontroller or external logic.[8] A unique number (the FTDIChip-ID™) is burnt into the device during manufacture and is readable over USB, thus forming the basis of a security dongle which can be used to protect customer application software from being copied.[8]

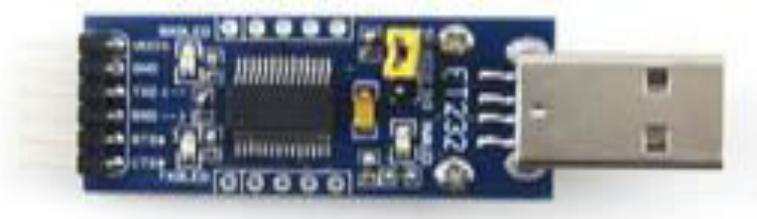


Fig. 4

D. Peltier Modules

The **Peltier elements**, which are also called **thermoelectric modules** or TEC, are an electrically operated heat pump [9]. Here, energy in the form of heat is transferred from one side of the module to the other side and has to be dissipated there [9]. The Peltier module is based on the so-called **Peltier effect** which describes the quasi-inverse of the Seebeck effect [9]. The Peltier effect states that energy can be transported in the form of heat by a current flow in a semiconductor, which creates a temperature difference [9]. The Seebeck effect means that a current flow is obtained when a temperature difference is applied to a semiconductor [9]. The Seebeck effect is used to measure temperature or to harvest electrical energy [9].

The Peltier element is the a heat pump, which is based on the transport of electric current in a semiconductor [9].

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Hybrid Charging System for Solar Street Light

S. A. Kale, Aashu Mandokar, Asmita W. Dongre, Jaya R. Sapkal, Nikita S. Dhande, Rupal S. Kapse, Snehal Nagrale and Aman Surode

Department of Electrical Engineering, Jhulelal Institute of Technology, Nagpur, India

ABSTRACT

In the past few years there is a global transformation on technology and researches which aims to energy savings through the usage of renewable sources in many applications. Solar as well as wind energy can be used for street lighting usually in cases of low consumption applications. The objective is to operate the lighting system with renewable energy and also to use the appropriate lamp for the lighting of low traffic roads. The proposed lighting system is an integrated unit with a photovoltaic panel, a wind generator, lamp, battery, inverter, charger etc. After extended calculation the appropriate parts of the system are selected in order to be autonomous. A result of system design is that an amount of the produced energy remains. The wind-solar hybrid system was designed in this thesis. This system uses an AC bus. It is permitted to enlarge the system and it can connect the other equipment conveniently. In the thesis it is also designed and analyzed the configuration of the wind-solar energy system, the controller, and inverter. The conclusion of this thesis is to show that the combination of wind and light energy can be effectively. It improves the use of natural resources. It is a good demonstration of the social sustainable development's design and implementation, as well as the experimental validation results.

Keywords: hybrid charging for solar street light, wind plus solar, power saver lamp.

INTRODUCTION

Global issues such as global warming, rising sea level, deprivation of fossil fuel and rising electricity cost have accelerated the research and development on alternative energy sources. In recent years, solar and wind source have become the prominent sources of alternative energy worldwide. Apart from power generation and transportation system, alternative energy has found their way into smaller scale applications such as remote villages, city lighting system, water pumping for irrigation and desalination.

Street lights are the raised source of light on the edge of a road or walkway, which are switched ON in the evenings near the sunset time to provide the lighting for the passer's by. Major advantages of street lighting includes: Prevention of accidents and increase in safety. Studies have shown that darkness results in a large number of crashes and fatalities, especially those involving pedestrians. Sometimes they are also used to provide security to keep the nefarious activities at bay. The working principle of solar powered street light is to get through solar panel to absorb sunlight, then converting into electric power to store into battery. The battery provides power for LED lamp in night.

1. Solar Energy

Solar energy is radiant light and heat from the sun that is harnessed using range of ever-evolving technologies such as solar heating, photovoltaics, solar thermal energy. Solar energy is present on the earth continuously and in ample manner. Solar energy is easily available. It is pollution free and also reasonable in cost. It also has low running cost. Only difficult part with solar system is it cannot harvest energy in bad weather condition. But it has greater productivity in all other energy sources with high initial investment. It has extensive life span and has zero emission.

2. Wind Energy

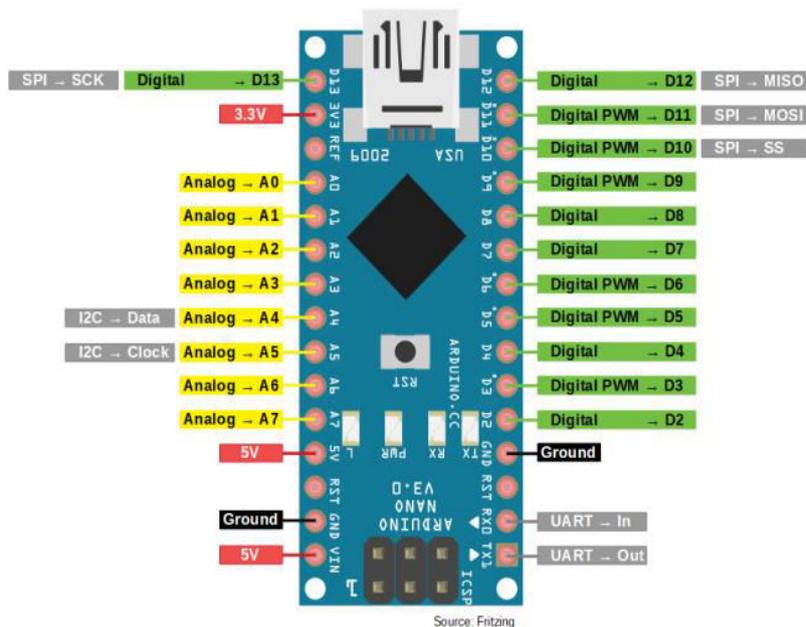
Wind energy is the energy which is extracted from wind. We have to design wind mill. It is renewable energy sources. Wind turbines convert the kinetic energy of the wind into mechanical power by rotating propeller-like blades around the rotor. The rotor turns the drive shaft, which turns on electric generator to convert mechanical power into electricity

SYSTEM DESCRIPTION

1. Arduino Nano

Although microcontroller type PIC is usually used in programming and software field, Arduino has become very popular in the world in recent times. It is based on Arduino's past wiring and processing projects. Processing is written for non-programming users. Arduino wiring is produced on the basis of the programming language. The common feature of both is that it provides an environment where even the basic knowledge of electronics and programming can easily design. Arduino is now becoming more and more common nowadays.

Even unmanned aerial vehicles made with Arduino, which is used almost every field, are visible. The causes of the spread of Arduino at such a rapid rate are;



- It can be used on all platforms due to the simplicity of the development environment with driver usage.
- With the help of the advanced library, even complex operations can be easily solved.
- Programs written in Arduino can run fast because they are not run on any other platform.
- There is a lot of hardware support that is compatible with Arduino and can work together.
- Communication with the environment is easy because it is open source.
- If there are any problems due to a large number of Arduino users, the solution can be easily reached.

2. Regulated Power Supply:-

The power supply selected for feeding the control circuit of the servomotors is capable of delivering the same current even if all the synchronous servomotors are operating. When all servo motors are operated at the same time, they draw 0.5A current. In addition, 5 V was needed for the Arduino used for robot movement in the project. This requirement is provided by a 5V power supply.

Component List:

1. Step down transformer
2. Voltage regulator
3. Capacitors
4. Diodes

Let's get into detail of rating of the devices :

Voltage Regulator

As we require a 5V we need LM7805 Voltage Regulator IC.

7805 IC Rating:

- Input voltage range 7V- 35V
- Current rating $I_c = 1A$
- Output voltage range $V_{Max}=5.2V, V_{Min}=4.8V$

LM7805 PINOUT DIAGRAM

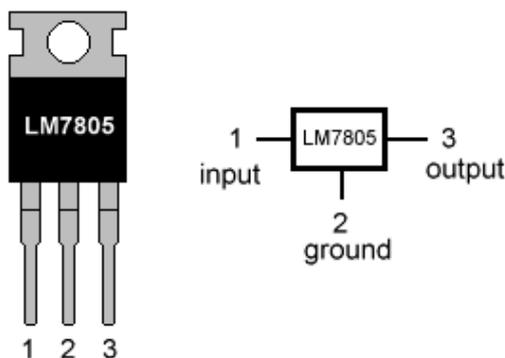


Fig 5: Regulator IC 7805

Transformer

Selecting a suitable transformer is of great importance. The current rating and the secondary voltage of the transformer is a crucial factor.

- The current rating of the transformer depends upon the current required for the load to be driven.
- The input voltage to the 7805 IC should be at least 2V greater than the required 2V output, therefore it requires an input voltage at least close to 7V.
- So I chose a 6-0-6 transformer with current rating 500mA (Since $6\sqrt{2} = 8.4V$).

Rectifying Circuit

The best is using a full wave rectifier

- Its advantage is DC saturation is less as in both cycle diodes conduct.
- Higher Transformer Utilization Factor (TUF).

1N4007 diodes are used as its is capable of withstanding a higher reverse voltage of 1000v whereas 1N4001 is 50V

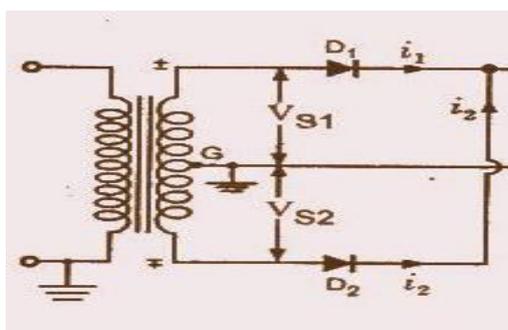


Fig 6: Rectifying Circuit

Capacitors

Knowledge of Ripple factor is essential while designing the values of capacitors

It is given by

- $Y = 1/(4\sqrt{3}fRC)$ (as the capacitor filter is used)

1. $f =$ frequency of AC (50 Hz)

2. $R =$ resistance calculated

$$R = V/I_c$$

$V =$ secondary voltage of transformer

1. $V = 6\sqrt{2} = 8.4$

2. $R = 8.45/500mA = 16.9\Omega$ standard 18Ω chosen

3. C= filtering capacitance

We have to determine this capacitance for filtering

$$Y = V_{ac-rms} / V_{dc}$$

$$V_{ac-rms} = V_r / 2\sqrt{3}$$

$$V_{dc} = V_{Max} - (V_r / 2)$$

$$V_r = V_{Max} - V_{Min}$$

- $V_r = 5.2 - 4.8 = 0.4V$
- $V_{ac-rms} = .3464V$
- $V_{dc} = 5V$
- $Y = 0.06928$

Hence the capacitor value is found out by substituting the ripple factor in $Y = 1 / (4\sqrt{3}fRC)$

Thus, C= 2314 μF and standard 2200 μF is chosen

Datasheet of 7805 prescribes to use a 0.01 μF capacitor at the output side to avoid transient changes in the voltages due to changes in load and a 0.33 μF at the input side of regulator to avoid ripples if the filtering is far away from regulator.

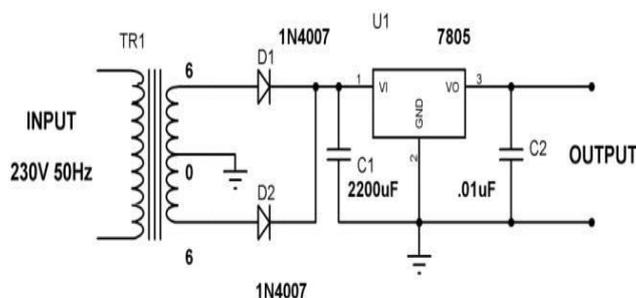


Fig 7: Full Step down Voltage Regulator Circuit

3. Mppt Charge Controller:-

An MPPT, or maximum power point tracker is an electronic DC to DC converter that optimizes the match between the solar array (PV panels), and the battery bank or utility grid. To put it simply, they convert a higher voltage DC output from solar panels (and a few wind generators) down to the lower voltage needed to charge batteries.

Solar cells are neat things. Unfortunately, they are not very smart. Neither are batteries - in fact, batteries are downright stupid. Most PV panels are built to put out a nominal 12 volts. The catch is "nominal". In actual fact, almost all "12-volt" solar panels are designed to put out from 16 to 18 volts. The problem is that a nominal 12-volt battery is pretty close to an actual 12 volts - 10.5 to 12.7 volts, depending on state of charge. Under charge, most batteries want from around 13.2 to 14.4 volts to fully charge - quite a bit different than what most panels are designed to put out.

Here is where the optimization or maximum power point tracking comes in. Assume your battery is low, at 12 volts. An MPPT takes that 17.6 volts at 7.4 amps and converts it down so that what the battery gets is now 10.8 amps at 12 volts. Now you still have almost 130 watts, and everyone is happy.

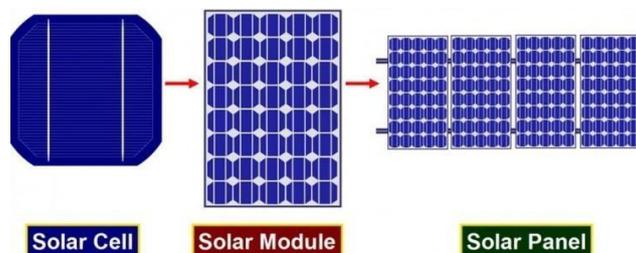
Ideally, for 100% power conversion you would get around 11.3 amps at 11.5 volts, but you have to feed the battery a higher voltage to force the amps in. And this is a simplified explanation - in actual fact, the output of the MPPT charge controller might vary continually to adjust for getting the maximum amps into the battery.

The Power Point Tracker is a high-frequency DC to DC converter. They take the DC input from the solar panels, change it to high-frequency AC, and convert it back down to a different DC voltage and current to exactly match the panels to the batteries. MPPT's operate at very high audio frequencies, usually in the 20-80 kHz range. The advantage of high-frequency circuits is that they can be designed with very high-efficiency transformers and small components. The design of high-frequency circuits can be very tricky because of the problems with portions of the circuit "broadcasting" just like a radio transmitter causing radio and TV interference. Noise isolation and suppression becomes very important.

4. Solar Pv Module:-

A single solar cell cannot provide required useful output. So to increase output power level of a PV system, it is required to connect number of such PV solar cells. A solar module is normally series connected sufficient number of solar cells to provide required standard output voltage and power.

In a solar module the solar cells are connected in same fashion as the battery cell units in a battery bank system. That means positive terminals of one cell connected to negative terminal voltage of solar module is simple sum of the voltage of individual cells connected in series in the module.

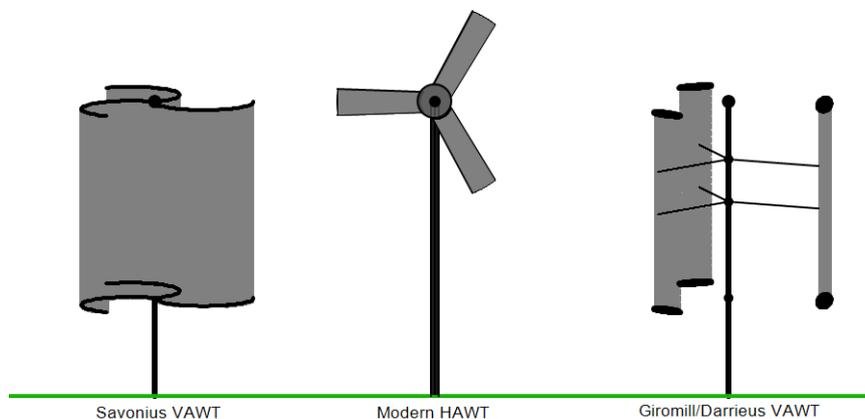


The normal output voltage of a solar cell is approximately 0.5 V hence if 6 such cells are connected in series then the output voltage of the cell would be $0.5 \times 6 = 3$ Volt.

5. Wind Power:-

Wind turbines can be used as stand-alone applications, or they can be connected to a utility power grid or even combined with a photovoltaic (solar cell) system. For utility-scale (megawatt-sized) sources of wind energy, a large number of wind turbines are usually built close together to form a wind plant, also referred to as a wind farm. Several electricity providers today use wind plants to supply power to their customers.

Stand-alone wind turbines are typically used for water pumping or communications. However, homeowners, farmers, and ranchers in windy areas can also use wind turbines as a way to cut their electric bills.



Small wind systems also have potential as distributed energy resources. Distributed energy resources refer to a variety of small, modular power-generating technologies that can be combined to improve the operation of the electricity delivery system.

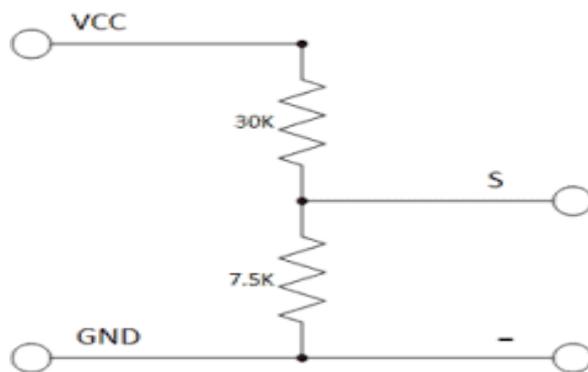
6. Current and Voltage Sensor

Voltage Sensor

A voltage sensor is a sensor used to calculate and monitor the amount of voltage in an object. Voltage sensors can determine the AC voltage or DC voltage level. The input of this sensor is the voltage, whereas the output is the switches, analog voltage signal, a current signal, or an audible signal.

Sensors are devices that can sense or identify and react to certain types of electrical or optical signals. The implementation of a **voltage sensor** and current sensor techniques has become an excellent choice for the conventional current and voltage measurement methods.

That is, some **voltage sensors** can provide sine or pulse trains as output, and others can produce amplitude modulation, pulse width modulation, or frequency modulation outputs.



In voltage sensors, the measurement is based on a voltage divider. Two main types of voltage sensors are available: **capacitive type voltage sensor** and **resistive type voltage sensor**.

Current Sensor

The ACS712 is a fully integrated, hall effect-based linear current sensor with 2.1kVRMS voltage isolation and an integrated low-resistance current conductor. Technical terms aside, it's simply put forth as a current sensor that uses its conductor to calculate and measure the amount of current applied.

For current sensors that work by direct sensing, ohm's law is being applied to measure the drop in voltage when flowing current is detected.



We've established a general idea of what current sensors are applicable for earlier. Well, with the ACS712 IC being able to detect both AC/DC current, it can be used in a wider range of applications apart from electrical appliances. Be it Arduino/other microcontroller usages, or industrial, commercial, and communication applications, it can be found applicable.

The ACS712 current sensor can be connected to your Arduino board through a series of jumper wires connections based on its pinout. However, here at Seeed, we understand the complications and complexity of doing so.

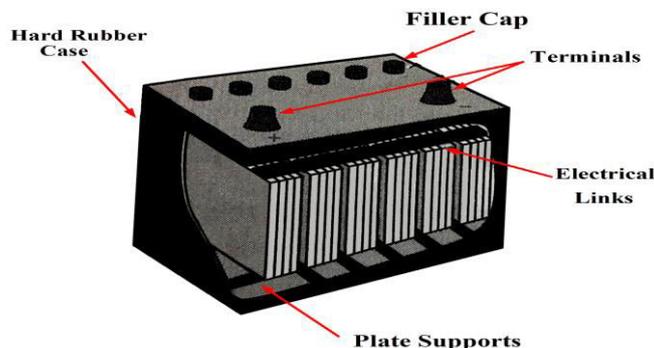
7. Solar Street light:-

Most solar LED street light systems choose the high-power white LED as the lighting source now. Compared to other lighting source, it has a remarkable energy saving, low maintenance cost and several advantages, Thus it's very suitable for the public lighting.



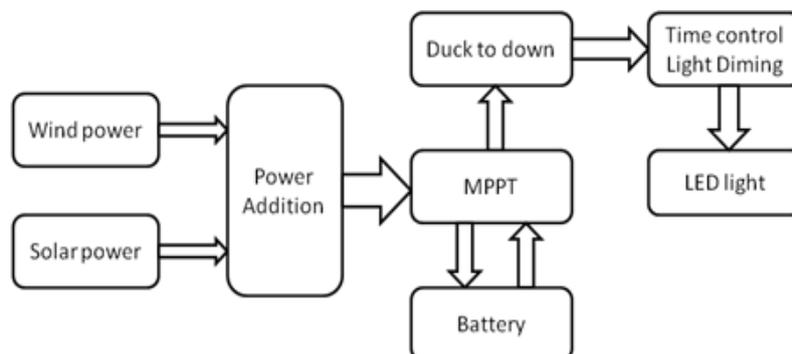
8. Lead Acid Battery:-

Lead acid batteries are the most commonly used type of battery in photovoltaic systems. Although lead acid batteries have a low energy density, only moderate efficiency and high maintenance requirements, they also have a long lifetime and low costs compared to other battery types. One of the singular advantages of lead acid batteries is that they are the most commonly used form of battery for most rechargeable battery applications (for example, in starting car engines), and therefore have a well-established, mature technology base.



A lead acid battery consists of a negative electrode made of spongy or porous lead. The lead is porous to facilitate the formation and dissolution of lead. The positive electrode consists of lead oxide. Both electrodes are immersed in an electrolytic solution of sulfuric acid and water. In case the electrodes come into contact with each other through physical movement of the battery or through changes in thickness of the electrodes, an electrically insulating, but chemically permeable membrane separates the two electrodes. This membrane also prevents electrical shorting through the electrolyte.

Block Diagram of Project



This is basic block diagram is show the basic structure of this project. In this project adding the power of solar and wind then provide the MPPT charge controller. The charge controller is converting the suitable voltage for batter to charging. After full charge power disconnects and moves the standby condition. Then battery provides the power for duck to down and time control light diming circuit. Street light ON automatically by using solar panel feedback signal.

Programing Softwares

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike.

Arduino was born at the Ivrea Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for IoT applications, wearable, 3D printing, and embedded environments.

CALCULATIONS AND RESULTS

The total power generated by this system may be given as the addition of the power generated by the solar PV panel and power generated by the wind turbine.

Mathematically, it can be represented as $P_{total} = N * P_{wind} + N_{solar} * P_{solar}$

Where,

P_{total} = Total Power Generated P_{wind} = Power Generated by wind N = No. of wind turbine

P_{solar} = Power Generated by Solar N_{solar} = No. of Solar Panel

▪ Calculations for Wind Energy

The power generated by wind energy is given by, $Power = (\text{density of air} * \text{swept area} * \text{velocity cubed}) / 2$

$$P = \frac{1}{2} \rho A V^3$$

Where,

P is power in watts (W)

ρ is the air density in kilograms per cubic meter (kg/m^3) A is the swept area by air in square meters (m^2)

V is the wind speed in meters per second (m/s).

Fig.4: Matlab Wind Results

The above figure shows the total power developed by inconsistent wind and its output in DC voltage and current.

▪ Calculations for Solar Energy

To determine the size of PV modules, the required energy consumption must be estimated. Therefore, the power is calculated as

$$P_{solar} = I_n(t) * A_{solar} * \text{Eff}(pv)$$

Where,

$I_n(t)$ = isolation at time t (kw/m^2) A_{solar} = area of single PV panel (m^2)

$\text{Eff}(pv)$ = Overall efficiency of the PV panels. Overall efficiency is given by,

$$\text{Eff}(pv) = H * PR$$

Where,

H = Annual average solar radiation on tilted panel. PR = Performance ratio

CONCLUSION

Wind energy and solar energy are renewable. They are non-polluting and zero emission new energies. They have gradually become the main energy source the future of the world is using. Wind-solar hybrid streetlights are a fairly typical comprehensive application. Their main components are solar photovoltaic panels, a lead-acid storage battery, a control system, an inverter, a wind power generator, a lamp-post and a light source. Wind-solar hybrid streetlight working principle is: The systems use natural wind and solar energy as power. Wind wheel absorbs the wind energy to make the wind generator rotating, making the wind energy into electrical energy. Electric current through the controller of the rectifier makes the alternating current into direct current by the voltage stabilizing effect. Then electric power will charge the battery pack, and the battery will store the electric energy. At the same time, the solar energy will transform into direct current by using the photovoltaic effect. The electric power will be used for the load, or stored in battery for standby.

From the sources of energy, solar energy and wind energy are highly complementary in time and geographically. Daytime sunlight is the strongest, but the wind is very small. In the evening after the sunset, the light is very weak, but because the surface temperature changes, the wind power are stronger. In summer, the sun light is strong but wind is small. In winter, the sun light is weak but there is enough wind. So the wind-solar hybrid streetlight system is an independent system based on of the best resource conditions.

RESULT

They will work at a time but wind turbine continuously working because it's depend on traffic on the road, more traffic create more wind power. This hybrid street light charge battery day and night. Hence, This system does not depend on sun light. This street light works on cloudy area and rainy session.

Time	PV Voltage	PV current	Wind voltage	Wind current	PV power	Wind power	Total power
4am	00.0	0.0	14.2	1.2	00.0	17.04	17.04
6am	10.0	0.1	14.3	1.3	1.0	18.59	19.59
8am	12.1	0.6	13.1	0.9	7.26	11.79	19.05
10am	13.6	1.1	5.0	0.1	14.96	0.5	15.01
12am	14.4	1.6	12.0	0.5	23.04	6.0	29.04
2pm	14.5	1.6	13.2	1.2	23.20	15.84	39.04

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Development of Virtual Assistant for Laptop

Mona Mulchandani, Farheena Tabassum and Parul Bhanarkar

Department of Computer Science and Engineering, Jhulelal Institute of Technology, Nagpur, Maharashtra, India

ABSTRACT

This is a system developed for the laptops to ease the workloads of users. Nowadays we require to do same tasks repeatedly in daily checking the services, inspecting, and so on. We regularly open our email, YouTube, Wikipedia, Google, Reminders according to our need. This purposed system will make you to do this task by giving voice instructions. It also does some automation tasks like WhatsApp automation, Google automation, and YouTube automation. Also provide some OS features like shutdown the system, capture screenshots by taking your instructions.

Keywords: Send-email, automation, OS features, virtual assistant

INTRODUCTION

A virtual assistant (VA) is a programme that recognises voice instructions and does tasks on the user's behalf. They use a combination of specialised computer chips, microphones, and software to listen for precise spoken commands from you and respond in the voice you choose. The popularity of speech-enabled smart assistants is growing, owing to the availability of a growing number of network services and an expanding number of new skills. However, their ability to extract real-time visual information from video data, whether about the person or the environment, limits their potential.

Speech recognition can be very useful if do not want to types commands or use keyboard. Simply put, you're conversing with the machine, and your words appear on the screen. It was created to provide a simple way to write on a computer and to assist people with a variety of disabilities. It is useful for users with hand disabilities, who often find typing impossible or painful. Voice-recognition apps can also help people with spelling issues, because well-recognized words are almost always pronounced correctly. Scientists trained voice assistants to listen to and reply to our queries in a more natural and understandable way using text written by people online. Most speech-enabled smart assistant do not provide the facility of automation like WhatsApp automation, Google chrome automation. Also, they do not provide to so OS features with just commands like capturing screenshot, shutdown the system, sending emails, telling IP address, etc. Current virtual assistants can open apps, set alarms or reminders, but do not read a book by translating it into another language.

To overcome the problems listed above and to make virtual assistant more powerful, this system provide an advanced featured virtual assistant that will do all these specified tasks.

Data Driven Service Workflow

General Data Anaysis Process

The Figure Below Shows The Process:

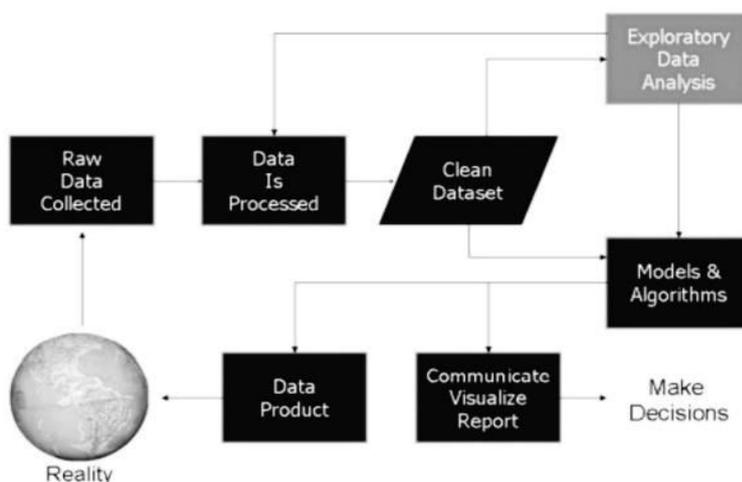


Fig. 1: Data Driven Analysis [8]

We begin by gathering raw data, cleaning it up, processing and exploring it, applying models and algorithms, and then communicating reports to the decision maker.

Speech Recognition Algorithm

Speech is the method for communication, and it is also essential for understanding and to communicate with others. Speech recognition is a technique used on computer programmes to assist them understand spoken words in Artificial Intelligence.

A general Speech Recognition system can simply be coupled with a conventional data analytics architecture and can accomplish the activities listed below:

- Provide input as speech.
- This is the phase of the data pre-processing procedure where we clean up the data so that the computer can process it.
- Conversion from stereo signal to monochrome signal takes place & passed to the frequency domain.
- Synthesis of recognised words to assist the machine in speaking in a dialect that is similar to that of the human.

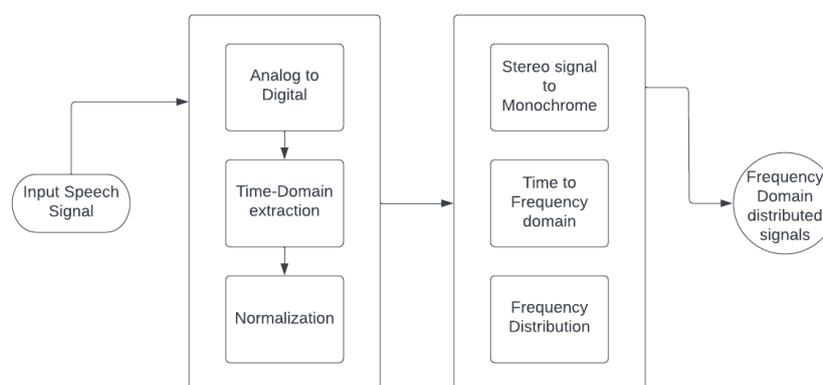


Fig. 2: Speech recognition process

The first stage in developing a voice recognition algorithm is to develop a system that can read audio files (.wav,.mp3, etc.) and comprehend the information contained inside them. We can use Python libraries to read these files and analyze them for analysis. This phase is used to represent audio signals as structured data points.

- **Recording:** It is a file that commands and act as an input to the algorithm. After that, the algorithm examines the contents of the file and builds a voice recognition model from it.
- **Sampling:** All signals from a recording are digitized and saved. Because machines only understand numeric input, these digital signatures are difficult for software to operate with. The method of converting these digital data into discrete numeric form is known as sampling.

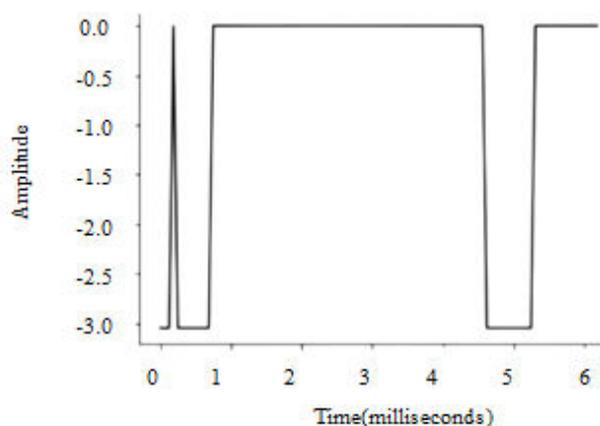


Fig. 3: Input Audio Signal

METHODOLOGY

General Structure

In light of the findings, the voice application will be used in the following three ways: First, to issue commands to the computer, next to input data into the computer, and ultimately, to communicate with other people. We'll talk about general components for voice applications in this part. The general structure of speech is divided as:

Front-End Interfaces

The user will have direct access to the interface and communication users by offering Input and Output with visual designs and an icon-based menu in the front-end-interface. It receives user speech prompts and responds by providing users with a voice recognition system that detects voice inputs and, in most cases, generates audio feedback to users after various other components of the system have completed their orders.

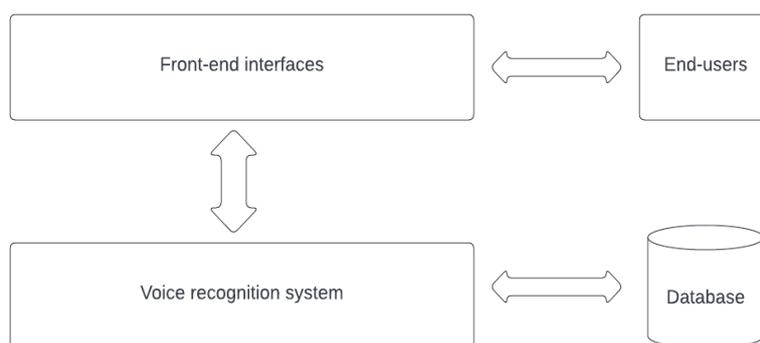


Fig. 4: General structure of voice application

End-Users

End users are those who use the applications on the devices like mobile and laptops. They will utilize this device for voice communication and feedback via the application.

Database

Here, some files or commands are already put to give desired output to the user. While the system application for language type can provide extra explanations to users or provide functions based on files in the database in extension, the system requires the installation of an additional text file database to add and update.

Voice Recognition System

This system has the ability to process the input and provide the desired output to the user according to the input received. It serves as a gateway for the user. In a nutshell, we should examine voice recognition system to clearly understand user voice commands and to receive feedback from the system. It contains all of the processes by which application systems direct for constructing speech signals to text data and a few forms of key meaning of speech.

Observations

From the last few years, the virtual assistants have competed with one another in many ways. We found many new features with upgraded versions as long as days passed. Having a virtual assistant can enable us to achieve the time, work, and lifestyle balance you desire. Just like any other profession, you'll need to put a lot of efforts and continuity. You will be able to manage your time and work from anywhere if you have a virtual assistant. You will have the power to choose what you want to deal with and what duties you want to perform.

A lot of virtual assistants are available in the market and daily they are updating with the newest technologies. We studied various assistants and observed markable differences. The following tables provide a comparison in their performances.

Table I: Comparison of different VA

Functions	My VA	Alexa	Cortana	Google
WhatsApp Automation	Yes	Yes	No	No
IP address detail	Yes	Yes	Yes	Yes
Wikipedia	Yes	Yes	Yes	Yes
Set Alarm	Yes	Yes	Yes	Yes
Pay Music	Yes	Yes	Yes	Yes

CONCLUSIONS

Natural Language Processing is used by virtual assistants to process the language spoken by the human, comprehend the question, process the query, and respond to the person with the result. Artificial Intelligence must be integrated with the device in order for it to perform smartly and control IoT applications and devices, as well as reply to queries that will search the web for results and process them. It is intended to reduce human effort by allowing the device to be controlled solely through human voice. This assistant can also be programmed to connect with other intelligent voice-controlled devices. Machine learning and categorizing questions in specific result sets and using them in subsequent searches might improve the accuracy of the devices.

ACKNOWLEDGMENT

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An IOT Based Solar Power Monitoring System

P. D. Debre, Swapnil Rahangdale, Anuj Yadav, Arpeet Sakhre, Abhay Motghare, Nikhil Sonekar and Shubham Gher

Department of Electrical Engineering, Jhulelal Institute of Technology, Nagpur, India

ABSTRACT

Renewable energy sources are proven to be reliable and accepted as the best alternative for fulfilling our increasing energy needs. Solar photovoltaic energy is the emerging and enticing clean technologies with zero carbon emission in today's world. To harness the solar power generation, it is indeed necessary to pay serious attention to its maintenance as well as application. The IoT based solar energy monitoring system is proposed to collect and analyzes the solar energy parameters to predict the performance for ensuring stable power generation. The main advantage of the system is to determine optimal performance for better maintenance of solar PV (photovoltaic). The prime target of PV monitoring system is to offer a cost-effective solution, which incessantly displays remote energy yields and its performance either on the computer or through smart phones. The proposed system is tested with a solar module of 15-20 watts to monitor string voltage, string current, temperature, and irradiance. This PV monitoring system is developed by a smart Wi-Fi enabled microcontroller with latest embedded ARM processor that communicates and uploads the data in cloud platform with the Blynk application. Also the Wireless monitoring system maximizes the operational reliability of a PV system with minimum system cost.

Keywords: Solar PV, Internet of Things, Mobile Application, Online Monitoring.

I. INTRODUCTION

Solar power plants need to be monitored for optimum power output. This helps retrieve efficient power output from power plants while monitoring for faulty solar panels, connections and dust accumulated on panels lowering output and other such issues affecting solar performance. So here we propose an automated IOT based solar power monitoring system that allows for automated solar power monitoring from anywhere over the internet. We use NodeMCU based system to monitor a solar panel parameters in the range of 15-20Watt. Our system constantly monitors the solar panel and transmits the power output to IOT system over the internet. Here we use IOT application called Blynk to transmit solar power parameters over the internet to IOT dashboard. It now displays these parameters to the user using an effective UI and also notify user when the output falls below specific limits. This makes remote monitoring of solar plants very easy and ensures best power output.

Internet of things (IoT) is playing a major and crucial role in the daily life of humans by enabling the connectivity of many and most of the physical devices through internet to exchange the data for monitoring and controlling the devices from a remote location, where the devices are becomes intelligent. This technology can connect a wide range and varieties of things such as animals, humans, smart transport, smart grids, virtual power grids, smart cities, vehicles, heart monitoring systems, environmental sensing, shopping systems, automated homes, energy management, assistance for disabled and elderly individuals, cochlear implants, tracking of things, equipment manufacturing, agriculture, emergency monitoring systems, electronics tool collection systems, vehicle control etc. according to the survey there is a increase of 31% i.e 8.4 billion internet connected devices from 2016-2017. The connected device may increase to 30 billion by 2020 and which makes the business market around 7.1 trillion dollars by 2020. By using the IoT we can enable the machine to machine communication M2M or device to device communication without human intervention.

In the modern life electricity became the important and essential part of the life. For any work now, a day we require electricity like lighting, heating, refrigeration, cooling, transportation systems what not all the home appliance works on electricity. In day to day life the consumption of electricity is increased but not decreased. To compete with the requirement of the public more and more electricity is to be generated and give to the end users. As the population increases the consumption also increases.

The power is generated in three methods generators, electro chemistry, and photo-voltaic effect.

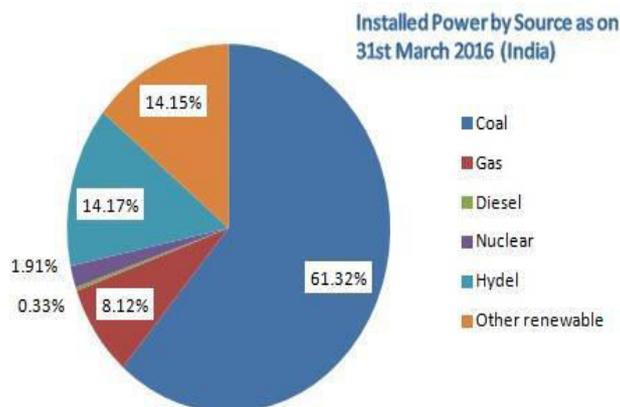


Fig. 1: The percentage of power sources installed

The electric generator is the most used form to generate the electricity which based on faraday's law of electromagnetic induction by transforming the mechanical energy into electrical energy. Storing the electricity in a battery is called electro chemistry which transforms the chemical energy to electrical energy. The other source to electricity is renewable energy which transforms the light energy into electrical energy which is known as photovoltaic effect we call this as solar energy. In this the electricity is generated from free, abundant sunlight.

The mechanically generated power is cheaper than compared with solar power to produce in large quantities due to of photovoltaic solar panels. In remote locations where there is no commercial power solar energy becomes the source for the home and other things. In the recent era the solar panels are deployed dramatically, and subsidies are given. Due the environmental conditions like global warming the all countries reduced production of electricity by burning the fossil fuels. A Typical solar module consists of 6x10 photovoltaic solar cells which can generate the power for residential applications. If requires the more power than more number of panels to installed. The panel produces DC output power in range of 100 to 365 Watts.



Fig. 2: Solar Panels

To produce huge electricity for the commercial and business purpose no of panels are placed in a array which are called as solar plants.

Always the output power of the solar panel depends on the radiation reached to the solar cell that converts into electric energy. If the dust is more on the panel then the less electricity is produced where the effectiveness of the solar panel decreases. To increase the efficiency of the solar panels some improvement must be done. In paper we propose a system that monitors the dust formed on the panels. Systems consist of a controller incorporated with Node MCU, LDR sensor. The controllers check the predefined conditions that are programmed and detects whether dust is from through the output voltage and give the alerts to the users or the maintenance in charge. It also uses the things speak cloud to show the received data from sensor and GUI to monitor.

II. LITERATURE ANALYSIS

K.G.Srinivasan, Dr.K.Vimaladevi and Dr.S.Chakravarthi has develop a "Solar Energy Monitoring System by IOT" (2020), in this paper the author proposed a system which refers to the online display of the power

usage of solar energy as a renewable energy. This monitoring is done through raspberry pi using flask framework. Smart Monitoring displays daily usage of renewable energy. This helps the user to analysis of energy usage. Analysis impacts on the renewable energy usage and electricity issues.

Many researchers had made many studies in this major problem and proved that 50% of the PV solar panels performance reduces by the dust accumulation on the cleaned panels. The studies made on the effects that causes to the solar panel due dirt the by well-known organization in the world google of 1.6 MW solar plant in there California headquarters [3]. 4.7% average loss is recorded in the pioneer's investigations by impact of dust in the solar systems that is made by the authors Hottel e.l. [4]. The authors Salim et al made an investigation on dust accumulation and stated that there is a 32% reduction of solar power in a span of eight months in a solar village near Riyadh [5]. The development of monitoring online and the control of system is based on android platform by Bluetooth interface of mobile phone As a communication link it creates data exchange with the hardware of power conditioning unit, with the help sensing circuits the value of Current and the voltage measurement of the renewable source is processed by the micro controller of the microchip [6].

Then the parameter are Sent to the personal computer over USB and the system is observed instantly. The system is monitored daily, weekly and monthly. Author Garg of Roorkee made an experiment and discovered that panel would reduce 8% average transmittance by the accumulation of dirt on 45-degree tilted glass plate after a 10-day period [7]. Due to accumulation of dust on the panels it is observed that useful energy is reduced by 30%. The common methods used to clean the dust are by spraying water on the panels with cleaning agent. Vibrating the panels with motors as the cell phone vibrates so that the dust goes off from the panels. The dust jumps off from the panels by creating a positive charge. By using a brush manual, we must clean the PV panels. Solar panel monitoring is important. It is vital that solar panels are monitored regularly in one way or another.

You need to make sure they are operating correctly, and the system is generating as much as predicted. If you have solar panels installed, you should at the very least check the generation meter once a week and take a note of the reading [8]. And should go to the place of the panels arranged and note the readings every time. It is a manual checking procedure, always should go to the place of solar panel system arrangement to note down the readings. So, it is not possible to take readings all the time, whenever required should go to the place of system arrangement. And optimum power cannot be obtained due to no proper alignment of solar power [9].

Goto, Yeshihiro, has explained that the integrated system that monitors and manages the has developed and it has started operation. The System can operate and maintain above 200,000 telecommunication power plants, which includes inverters, rectifiers and air conditioning Plants, is installed above 8000 buildings to improve the user interface which use the communication technologies and the information of Feature system and it integrate management and remote monitoring functions into single system [10].

III. PROPOSED SYSTEM

The most conspicuous part of a residential solar power system is the solar panels. Thin-film semiconductor or crystalline silicon is used make the P V solar cell for many of the residential applications. These photovoltaic (PV) devices contain semiconductors that generate electricity directly from sunlight. The electrical devices are powered, or it is send to the grid when electrons are made free by solar energy in these materials. One of the most important aspects of getting your solar panels to produce electrical energy at optimum efficiency is keeping them in full and direct sunlight. Solar monitoring systems will track the amount of electricity your solar panels have generated and contributed to the power grid.

For the sensing the light we have used a light dependent resistor is component varies the resistance with the light intensity that fall on it and can different a night and a day There are many potential ways of monitoring solar panels. There are high tech solutions which upload data continuously to a web portal which allows you to monitor your systems performance from anywhere in the world.

In this proposed system we have an open source IOT cloud platform application Blynk is used. To use this user has create an account which contains different channels for monitoring of different parameters in the system or in the monitoring the parameters in a remote device.

This cloud enables the administrator or the user to visualize the data in graphical representation. With internet-based monitoring, energy output data is transferred to a router, making it available through an online interface. The main advantage of systems like these is that your solar panel output information is readily available anywhere you can get an internet connection.

IV. Block Diagram

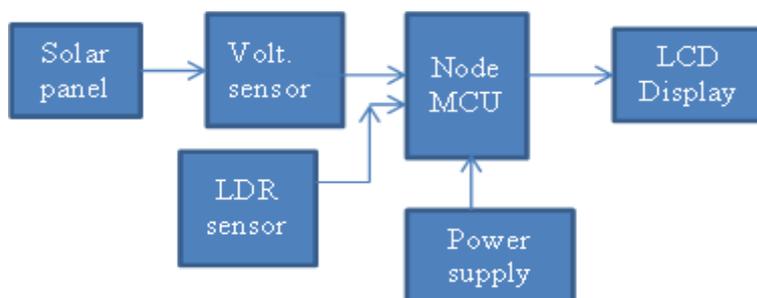


Fig.2: Block Diagram

We placed solar panel at the outside of project so that it could convert solar energy into electrical energy. This energy is then measure with the help of voltage sensor which a potential divider circuit which can measure voltage at the output. This measured voltage is then fed to the controller which is NodeMCU controller with inbuilt Wi-Fi. For detection of luminance we are using light sensor which is LDR (light dependent resistor). This sensor will give high resistance in the absence of light and gives low resistance when light intensity increases. Both sensors are connected to the controller so that values of sensor could be read and displayed. Value can be monitor on LCD and IOT device which could be Laptop or mobile. To interface LCD with Controller an I2C module is used to convert serial data from controller to parallel data for LCD.

V. Circuit Description:

The proposed system consist of NodeMCU controller, solar panel, potential divider circuit as voltage sensor, LDR sensor for light detection and LCD display with I2C module to interface with controller.

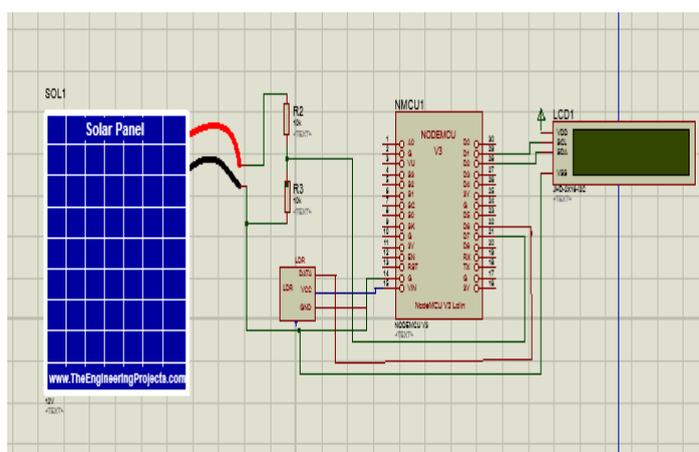


Fig.3: Circuit Diagram

Node MCU

The node MCU acts as a key processing element for the proposed system as shown in figure 1 which is developed by ESP8266 open source community of micro-controller on single board that can be programmed using the Arduino IDE having a RAM size of 128Kbytes and program storage capacity of 4 Mega Bytes. It can be powered by a USB cable, having a operating voltage of 3.3 to 5 volts and an in built Wi-Fi SoC Architecture. The figure 6 show that Node MCU

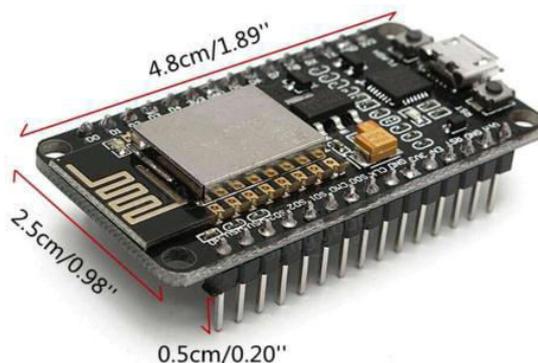


Fig.4: NodeMCU Controller

Solar Panel

The electricity generated by capturing the sun light is called as solar energy which is used for business and home purpose. The natural nuclear reactor is sun which releases the energy with tiny packets called photons. The atoms lose the electrons when the photons hit the solar cells. A solar panel is made of multiple panels that wired together, more electricity is generated by the more panels we deploy. Silicon like semiconductors is used to make the PV photovoltaic solar panels as shown in figure 7. Direct Current is generated by the solar panels. Most of the electrical appliance works on AC supply can AC can be less expensive for transmit to long distances.

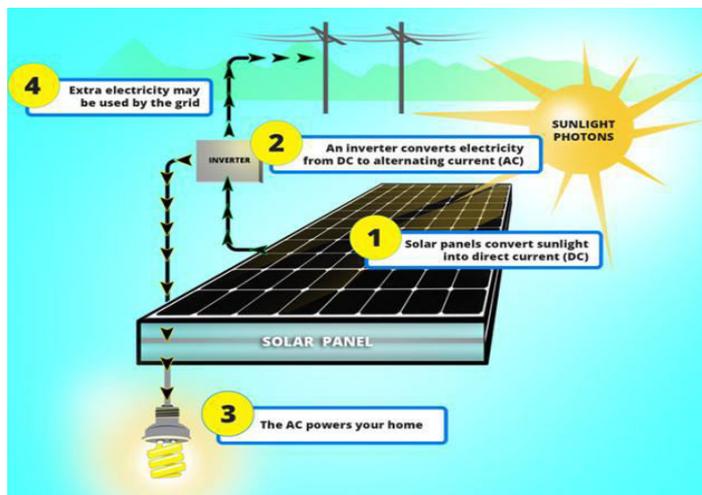


Fig.5: Solar Panel

LCD

All sensors value will be indicating on LCD display which is connected to the controller via I2C module which convert serial data from controller to parallel data for LCD display. I2C module has 4pins which are connected to the digital pins of controller. SCL and SDA pins of module are connected at D1 and D2 pins respectively. Rest 2 pins are ground and supply pins which are connected to ground and supply pins of controller.



Fig.6: LCD with I2C

LDR

Photo conductivity is the main working principle of a LDR or light dependent resistor. All the electrons in the semiconductor of the valance band excites when the light or photos fall on the resistor. When the light falls on the LDR resistance gets decreased and increase in the dark or called as dark resistance. Basing on the materials the LDR's are classified in to two types Intrinsic Photo Resistor and Extrinsic photo resistor.



Fig.7: LDR

CONCLUSION

An IoT based virtual solar energy monitoring system is developed using a low-cost smart microcontroller. The cloud-based Blynk application shows the measured solar parameter in real time through mobile. The monitored parameters show the optimized result that matches approximately with Electrical ratings of solar module tested under Standard Test Condition (STC). The proposed work helps to predict the performance of the Solar PV module through remote access. This can be extended for a large-scale solar plant to take preventive action by regularly monitoring the performance of the solar plant. It will be highly useful for the industrial and commercial application.

FUTURE SCOPE

This project can be further enhanced, by using the results of this current project, i.e. the monitored values obtained are helpful in predicting the future values of the parameters considered. Prediction of the amount of solar energy will be stored in the battery. The data stored in cloud can also be analyzed using the MatLab. The CSV file from the cloud is taken for analysis in R. The web application can be developed for interaction with the end user; the user can also predict values of the future events. In the same way we can go for android application also. During the prediction two or more models can be used for same dataset, to find the accuracy of each model. The motive of the paper is to enhance the sharing out of power in India where hitches like load shedding a common situation.

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Three Phase Fault Detection in Transmission Line Using IOT

S. A. Kale, Sagar Sarode, Sourabh Shahu, Shanu Shelki, Ritesh Shende, Swapnil Chawre, Amit Singh and Nitesh Lavhare

Department of Electrical Engineering, Jhulelal Institute of Technology, Nagpur, India

ABSTRACT

The fault occurred in transmission line is very much risky for the locality. In HV and EHV transmission line there are less fault occurrence but in locality the fault happening is more as compared to outside in transmission line. In our prototype we build a model which is to be detect the fault in transmission line by comparing the voltage signal between the transmission line and a reference value, the reference value is predecided and if the transmission line voltage is more than or less than reference value then fault is to be shown in display. The information regarding fault happening in particular phase is send to web page via IOT device which is NODE MCU(Esp32) and also shown in display. The optocoupler is used to sense the voltage and send output to microcontroller IC. Here microcontroller IC ESP32 is used in this IC programming is to be done which compare the voltage signal and send output to IOT module and display. The power supply is provided to supply 5-volt dc power to all component this supply is different from the supply which is used to check the fault occurrence.

INTRODUCTION

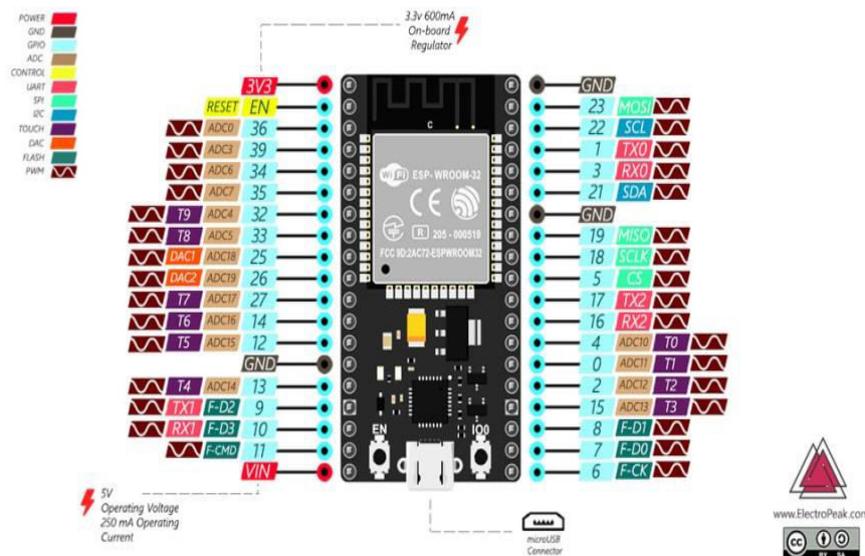
As we seen our surrounding the fault occurred in the transmission line is very common in rainy season and it is very dangerous for us. The electrical power system is growing in size and complexity in all sectors such as generation, transmission, distribution, distribution so in this complex network fault is happened which results in several economic losses and reduce reliability of electrical system. We take care to resolve this fault as soon as possible, if we failed to resolve this then it can cause complete black our or grid failure. Generally the 70% to 90% of faults on overhead lines, most of the faults occurred due to lighting smiles, storm, flashover these is very harmful for the society. In transmission line this type of faults line to line faults line to ground fault there are many types of faults. Due to faults power failure and also damage the electric equipment. In electricity journey the generation of transmission, distribution, utilization of electrical power is called electrical technology in power generation transmission and distribution many components are involved.

So there are many types of electrical faults or faults like in transmission lines occurs in transmission system like line to line faults and line to ground fault in power system etc. In the project will show you the prototype of three phase fault detection system. Mainly occurred in H.V transmission line our project accurately detect the distance of three phase fault from source system and display on control panel by using ESP32. In this project we use sensing device which is present on the line even though L-L ,L-Gnd and any unsymmetrical fault was occurred it will show on display. ESP32 is a heart of our project it will detects the fault, analyses and classifies these faults and then, determined the fault distance. Then, the fault information is transmitted to the cloud and the Mobile app in fraction of second.

SYSTEM DESCRIPTION

A. Arduino Nano

ESP32 is a series of low-cost, low-power system on chip microcontrollers with integrated WiFi and dual-mode Bluetooth. Its robust application is that it is capable of functioning reliably in industrial environments, and its operating temperature ranges from -40°C to $+125^{\circ}\text{C}$. Powered by advanced calibration circuitries, ESP32 can dynamically remove external circuit imperfections and adapt to changes in conditions.



- The ESP32 have reliable board, firmware, and peripherals. The processing power also creates secure socket layer connections and great essential requirements in the world of IoT.
- ESP32 devices have more GPIO to work with more useable and complicated projects. It is a better suited for every situation where an application needs a microcontroller.
- Programs written in Arduino IDE can run fast because they are not run on any other platform.
- There is a lot of hardware support that is compatible with ESP32 and can work together.
- Communication with the environment is easy because it is open source.
- If there are any problems due to a large number of Arduino users, the solution can be easily reached.

B. Regulated Power Supply

The developing three phase fault detection system prototype we used 3 transformer for step down 230v AC into 12v AC for safety purpose only. In addition, 5 V was needed for the ESP32 microcontroller is use to read or monitor 3 phase wire status via isolation circuit. This requirement is provided by a 5V power supply, we also need 9v battery for fault signal detection.

Component List

1. Step down transformer
2. Microcontroller ESP32
3. LCD Display (16*2)
4. Rectifier filter circuit (AC to DC)
5. Optocoupler
6. Relay module
7. Battery
8. Buzzer

Let's get into detail of rating of the devices :

TRANSFORMERS

diagram we used three phase fault detection system using phase R,B and Y we required 3 step down centre tapped transformer with same rating.

Transformer Rating

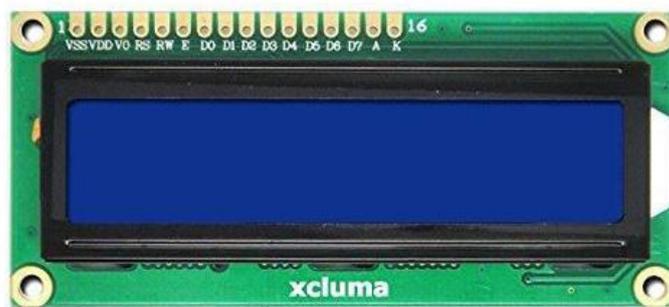
- For safety purpose we have to step down the voltage of the transformer.
- For this purpose we choose 230V/12 V, 500mA.

LCD Display (16*2)

- The term LCD stands for liquid crystal display
- These displays are mainly preferred for multi-segment light-emitting diodes and seven segments. The main benefits of using this module are inexpensive; simply programmable, animations, and there are no limitations for displaying custom characters, special and even animations
- The operating voltage of this LCD is 4.7V-5.3V
- The utilization of current is 1mA with no backlight

Every character can be built with a 5×8 pixel box

The alphanumeric LCDs alphabets & numbers.



Rectifying Circuit

For this purpose we using a full wave rectifier

- With this device you will have a source of low voltage , DC power suitable as a replacement of battery.
- As we already converted 230V AC to 12V AC without using other voltage regulation circuitry we chose this circuit.
- Hence with the use of this circuit we convert 12V AC to DC without any ripple.

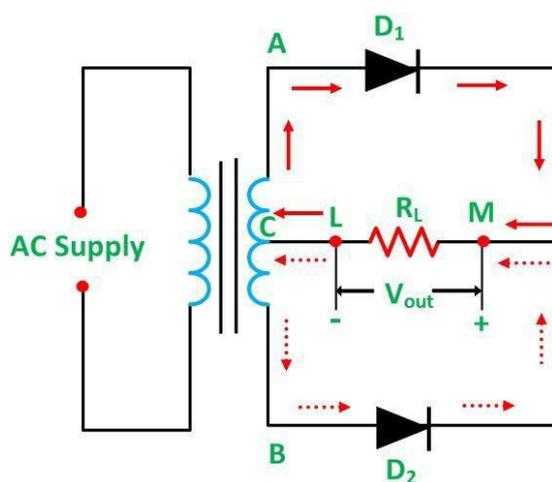


Fig 6: Rectifying Circuit

Optocoupler

We use protection like electric isolation, For this purpose we use PC 817 because it is reliable to use due to its functionality

- Rectifier is converting the HIGH AC to HIGH DC and resistance is lowering down the DC voltages. The DC voltages coming out from the resistance is lower in voltages but it has a noise that is not effective to use as the signal. To convert it to the proper signal we use the optocoupler.
- The optocoupler generates the same type of single pulse no matter how much the signal has noise. This single pulse is used to detect the events of change in frequency which is known as zero crosses.
- The protection is for both input and output. It can protect up to HIGH 5KV from electric isolation

- PC817 is much efficient in switching for microcontrollers. Simple transistors can be used but due to its neglecting the noise factor the optocoupler can be used as switching too.

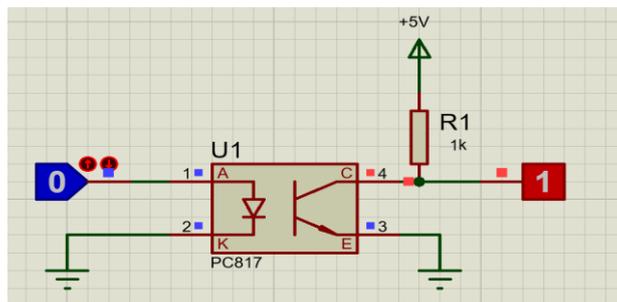
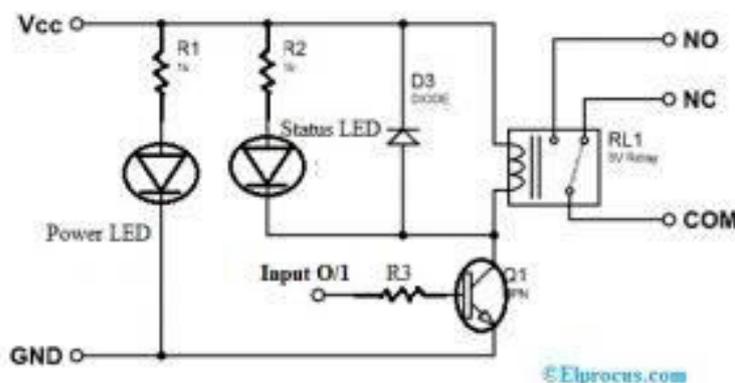


Fig 7: PC817 Optocoupler

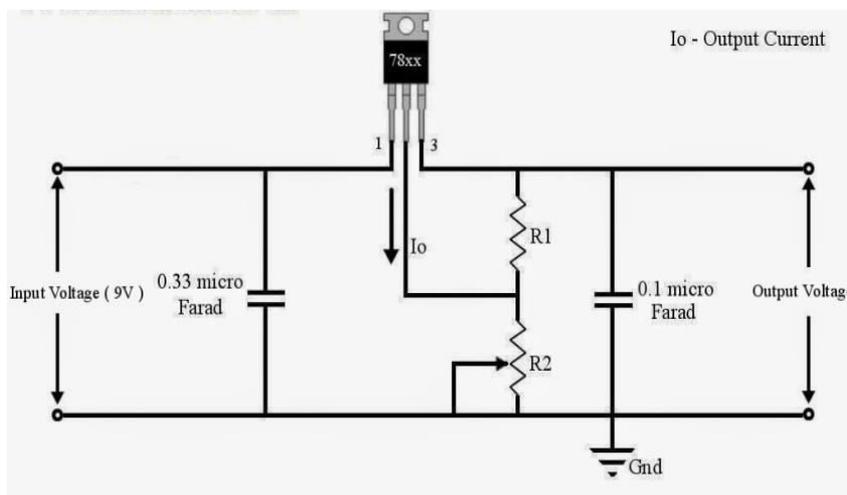
Relay Module

- We use 5v relay is an automatic switch that is commonly used in an automatic control circuit and to control a high-current using a low-current signal.
- The controlling of a 5v single channel relay module can be done by interfacing any kind of microcontroller.
- For that, we use a GPIO pin like a digital o/p pin which gives an active high & low signal toward the control pin. Once the relay activates, we can listen to an audible sound that comes from the module.
- **Applications:** - Used in over voltage/under voltage protection system.
- Electrical isolation in between high & low power sources



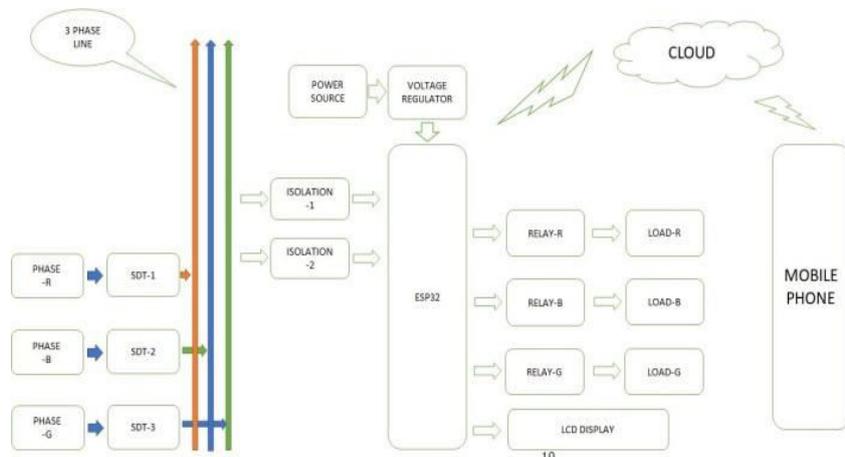
Voltage Regulator

- A **voltage regulator** is a system designed to automatically maintain a constant voltage. A voltage regulator may use a simple feed-forward design or may include negative feedback. It may use an electromechanical mechanism, or electronic components. Depending on the design, it may be used to regulate one or more AC or DC voltages.



- voltage regulator with input of 7v to 25v and optput is 5V fixedWe also add Two capacitor C1 and C2 with each end for stability for input and output supply. continually to adjust for getting the maximum amps into the battery.

System Block Diagram



- In the above block diagram we used three phase fault detection system using phase R,B and Y. The developing three phase fault detection system prototype we used 3 transformer for step down 230v AC into 12v AC for safety purpose only.
- The brain of they system is ESP32 microcontroller which is advance 32 bit microcontroller in which include Wi-Fi technology and Bluetooth connectivity via 2.4 GHz frequency.

The microcontroller is read or monitor 3 phase wire status via isolation circuit ,in this circuit we will use optocoupler 817.

C. Internet of Things (IOT):-

In short, the Internet of Things refers to **the rapidly growing network of connected objects that are able to collect and exchange data in real time using embedded sensors.**

- In our praposed model we use the BLYNK cloud platform. Blynk is an IoT platform for iOS or Android smartphones that is used to control Arduino, Raspberry Pi and NodeMCU via the Internet.
- Blynk was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, it can store data, visualize it. The process that occurs when someone presses the Button in the Blynk application is that the data will move to Blynk Cloud, where data magically finds its way to the hardware that has been installed.

Pin Diagram with Connection

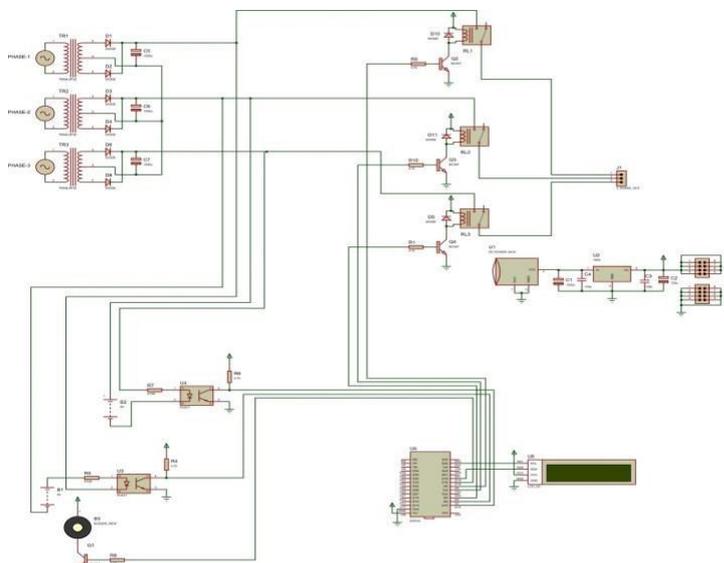


Fig: Pin diagram with connection

D. Operation & Working

- As shown in pin connection diagram we use 3 centre tapped transformer TR1,TR2,TR3, step down transformer to step down the voltage.
- 12v ac then output of transformer is connected to the full wave rectifier to convert AC To DC. in this circuit diode D1 and D2 rectifying the voltage and capacitor C5 is used as a filter this supply is go to the load via relay RL1 , RL2, RL3
- Optocouper U4 sense whenever fault is generated in circuit this give low in output. If there is no any fault in the system optocoupler is continuously gives output high.
- If any fault occur in transmission line microcontroller get low output from optocoupler. microcontroller sense that output is low then as we write in the code the generated fault is line to ground then microcontroller sense the fault is generated in the system is directly then after that relay RL1 ,RL2 ,RL3 ,s transistor Q2,Q3,Q4 gives base resistor low signal then base resistor automatically off then relay is off then output load supply is cut automatically.
- After that this signal is activate the buzzer sensor B3 . then automatically Buzzer turned off because transistor Q1 automatically goes to low.
- Then communication based LCD display gives command and the message we write in the code is display .
- As we know for all this circuit we need 5V DC supply But we have only Source voltage of 12V so we can not run this system on 12V
- Hence we use additional 12V DC adapter connected to DC jack this is connected to voltage regulator with input of 7v to 25v and optput is 5V fixed
- We also add Two capacitor C1 and C2 with each end for stability for input and output supply. As well as C3,C4 capacitor used for remove AC components on the circuit.
- And J8 and J9 5V on ground supply for external components like relay module Buzzer module.

Programing and Softwares

- Arduino IDE - All the software programing is written in Arduino integrated development environment (IDE). Arduino IDE is open-source software which makes it easy to write code and upload it to the board. The programing is done in embeded C language. After finalizing the program and required logic, the hex file of the program is created by using compiler. The hex file is then uploaded to ESP32 microcontroller . In the program there is some loops created according to flow chart . If the consumers Limit is reached, then the message will be given to the user.
- The program first you should get Authentication Token in the Blynk App. After that add wifi credential whatever device have to configure with device
- When we short transmission line manully low signal generated use of optocoupler signal is sent to microprocessor then after that the parameter's value is reflected on the LCD as well as on the mobile app .

CONCLUSION

IoT based transmission line fault monitoring system is proposed. The transmission line prototype is modelled. Fault in the transmission line is manually introduced for the purpose of demonstration. The short circuit fault at a particular distance in the transmission line is located . The system uses Arduino to analyses distance of fault occurrence with the help of software developed, which works on analyzing the voltage drop in the transmission line. The fault location is transmitted to the control center using Wi-Fi module. The benefits of this system are

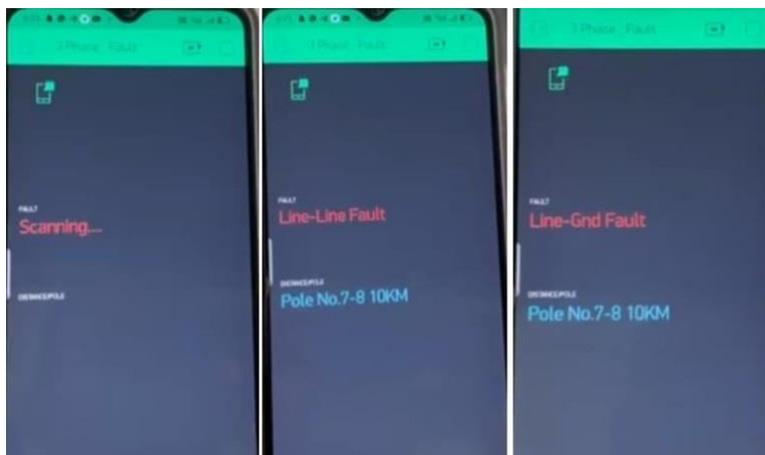
1. Reduces the time to locate the fault in the field.
2. Fast repair to revive back the power system.
3. Improves the performance of the system.
4. Reduces the operating expense.

RESULT

The proposed system identifies the fault and displays the fault location on the LCD screen and sends the data within fraction of seconds through IoT to the web application. The model is designed to solve the problems faced by power system. By using such a method, we can easily detect the fault and resolve it. It is highly

reliable and locates the fault in three phase transmission line and also supposed to data storage. It allows to record all of the real time data sheets up to date and avoiding future transmission line problems

The faults are refelected in BLYNK application as follows:



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Gender Stereotypes of Higher Secondary School Students

Shubha Vyas and Om Prakash Kumawat

School of Education, Jaipur National University, Jaipur, Rajasthan, India

ABSTRACT

Gender stereotyping is an unfair idea that refers to a generalized view or characteristics that women and men should have. To avoid gender stereotypes in the classroom, a teacher should try to place both boys and girls in non-traditional roles. The present study was aimed to determine if there is any significant difference between the gender stereotyping of boys and girls of different type of schools. The study was carried out in Tonk district of Rajasthan, India. A total of 506 students studying in class 12th of various senior secondary schools were selected randomly for the sample. A self-constructed tool "Gender-Stereotyping scale: For Students" was used to collect the data. To analyze the data, independent T-test was used. The results revealed that a significant difference was found between stereotyping of government and private senior secondary school students. No significant difference was found between boy and girl students in terms of stereotyping.

Keywords: Gender Stereotype, Higher Secondary Students.

There are many differences between men and women. To some extent, these differences are captured in the stereotyped image of women and men. Stereotypes are widely displayed in the way men and women think and behave, indicating some degree of truth in the context of stereotyping. However, stereotypical expectations not only reflect differences between men and women, but also influence the way men and women define themselves and be treated by others. Gender stereotypes affect individuals who are involved in seeking, interpreting and remembering information about themselves and others. Considering the cognitive and motivational functions of gender stereotypes helps to understand implicit beliefs about men and women and their impact on communication. (Ellemers, 2017)

Gender stereotypes are beliefs that classify men and women on the basis of gender-based characteristics. The content or content of stereotypes varies with cultures and over time. The scope of thinking of individuals is limited on the basis of stereotypes and each person starts having certain expectations from the people of different gender based on their stereotypical thinking. These expectations are often the tasks and roles performed by women and men in different cultures are related to. (Martin & Dinella, 2001)

Children learn some aspects of stereotypes at a very early age. By 2.5 to 3 years of age, children begin to show evidence of more or less knowledge of activities and objects associated with each gender (Siyanova-Chanturia, Warren, Pesciarelli, & Cacciari, 2015). At the pre-school stage, the development of gender stereotypes occurs rapidly in children through their activities and actions (Marinova, 2003). During primary school, gender stereotypes expand to include sports and subject interests in personality traits (Solomon, 2016). With age, children become increasingly aware of gender stereotypes, and yet the rigidity of their stereotypes diminishes as they increasingly recognize the cultural relativity of these norms. (Huston, 1985)

STUDY OR RELATED LITERATURE

Research on US citizens' perceptions of gender stereotyping changes from 1946 to 2018 by Eagly, Nater, Miller, Kaufmann, & Sczesny, (2019). The meta-analysis integrated data from 16 national surveys in the US that included observations of approximately 3,093 adult citizens over seven decades. The research found that there has been a significant change in the context of gender stereotypes over seven decades, especially in the role of women, the trend towards gender equality in American society has been found to improve.

A study was done by Makarova, Aeschlimann, & Herzog, (2019) on gender differences in science, technology, engineering and mathematics. Under this, the effect of gender stereotypes of mathematics and science on the career aspirations of secondary students was studied. The research found that math and science are treated as male domains, and scientists are predominantly male. However, the impact of gender image of school science subjects on the career choice of young people has not yet been analysed. For both genders, maths entered the strongest male (students), followed by physics in second place, and finally, chemistry with the lowest masculine trait.

Tabassum & Nayak, (2021) studied on gender stereotypes and their impact on women's career progression from a managerial perspective. The research found that contemporary management culture does not engage critically with the societal principles of gender studies, which can help develop a gender-neutral affirmative action-

oriented managerial approach. Women in management and the theoretical change in management led to progressive ideological changes in the management literature but gender stereotypes remain in the society.

Gender stereotypes in the context of mathematics were studied by Rossi, et al., (2022). Under this, math anxiety, self-concept and different performance in relation to math subject in men and women were studied. The study found that gender stereotyping in the context of mathematics influenced arithmetic performance through self-concept in men and women. It was associated with higher math-anxiety, lower self-concept and arithmetic performance in women, whereas in men, its effect was generally weaker but more complex.

RATIONAL OF THE STUDY

On the basis of direct or indirect study and review of related literature, it is clear that gender stereotyping of teacher-teachers and students has a very important effect on their teaching work and studies, which is very important to study and make provisions to remove them. But as it is clear from the study, there have been studies of teachers and students and gender stereotypes in India as well as the effect of gender stereotypes of teachers and students on their teaching work has been studied very little. Particularly in Rajasthan, there have been few studies that deal with the study of gender stereotypes on teachers and students and its impact on their teaching work (Yadav, 2019).

Tonk district of Rajasthan is very backward. The researcher thought of studying the gender stereotyping of students of this district. Therefore, the researcher found it expedient to study gender stereotyping on students.

OBJECTIVES

1. To study the gender stereotyping of students of different higher secondary schools of Tonk district with reference to school type.
2. To study the gender stereotyping of students of different higher secondary schools of Tonk district with reference to gender.

HYPOTHESES

1. No significant difference is found in gender stereotyping of students of different higher secondary schools of Tonk district.
2. No significant difference is found in gender stereotyping of boys and girls of different higher secondary schools of Tonk district.

SAMPLE

A sum of 506 students studying in class 12 of higher secondary level schools located in Tonk district of Rajasthan state were selected by random method and included in the sample. Of these students, 248 were studying in government schools (140 boys, 108 girls) and 258 were studying in private schools (160 boys, 98 girls).

Variables

The gender stereotyping of students was the only variable which was studied in context of type of school and gender.

Tool

A self-made instrument based on a five point Likert rating scale was used to collect data from the students. The scale has 34 items to determine the level of students in terms of stereotyping. The equipment was standardized before it was used. Standardization was done by applying standard procedures. The reliability of the tool was calculated in three ways, that is, Cronbach's alpha (.90), split-half (odd-even) correlation (.78), and split half with Spearman Brown adjustment (.87). The reliability coefficient in all three methods proved that the equipment was reliable and valid.

Statistical Analysis

Table 1: Gender Stereotypes of Students of Various Higher Secondary Schools in Tonk District

Groups	N	Df	Mean	SD	T-Value	P-Value ($\alpha=0.05$)
Students of Government Schools	258	504	119.01	4.23	9.72	0.00
Students of Private Schools	248		114.71	5.56		

From the analysis of Table 1, it is known that the gender stereotyping of students of government higher secondary schools of Tonk district was higher than that of private schools. That is, the students of government schools were found to be more gender stereotyped than the students of private schools. The difference between

the stereotyping of government and private school students was found to be significant as the P-value for the same was less than alpha ($P < 0.05$).

The students of government schools of Tonk district have more negative attitude towards opposite gender than the students of private schools. Prominent among which are- not sharing work with students of opposite gender, not sitting with students of opposite gender making gender remarks to students of opposite gender during conversation etc.

Table 2: Gender Stereotypes of Boys and Girls of Various Higher Secondary Schools in Tonk District

Groups	N	Df	Mean	SD	T-Value	P-Value ($\alpha=0.05$)
Boys	300	504	116.93	2.65	0.11	0.91
Girls	206		116.86	7.80		

From the analysis of Table 2, it is known that the gender stereotyping of boy students of different higher secondary schools of Tonk district was found to be higher than that of female students. That is, the boy students of higher secondary schools in Tonk district were found to be more gender stereotyped than their female counterparts. However, the difference between the stereotyping of boys and girls school students was not found to be significant as the P-value for the same was greater than alpha ($P > 0.05$).

FINDINGS

1. A significant difference was found between stereotyping of government and private senior secondary school students.
2. No significant difference was found between boy and girl students in terms of stereotyping.

DISCUSSION

The gender discrimination is one of the major problems of present society (UNICEF India, 2022). The entire world is suffering from this problem. This discrimination promotes gender stereotyping in one's mind. The gender stereotyping is now spreading in school going children too. In this study, it was found that the students of government schools were significantly more stereotyped than that of the private school students. This is really a challenge against gender equality and equity. Students of government schools are finding more discriminative means the steps and actions taken by government are not being fruitful in the path of gender equality and equity. Also; the boys were found more gender stereotyped than that of the girls. This is really alarming situation when we see crime against women every day. The government and society should take hard steps to eliminate gender discrimination and try to maintain gender harmony around the country.

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Metal Oxide Materials and Conducting Polymer Composites for Thermal, Electrical and Photocatalytic Activity

Ruheena Tabassum

Department of Chemistry, S.P. College, Srinagar, J & K, India

ABSTRACT

The study involves the synthesis of Polypyrrole (PPY) and Polythiophene (PTP) composites of TeO₂ via in situ oxidative polymerization procedure. These composites were characterized by FTIR, XRD and SEM, which proves the successful chemical synthesis of PPY, PTP and their composites. FTIR absorption peaks confirms the insertion of TeO₂ in the backbone of PPY and PTP and also justifies the strong interaction of TeO₂ with PTP than PPY, which is responsible for a significant increase in the conductivity value in case of PTP composite than PPY composite, which ensures its better capability in future electronics. Thermal analysis shows no change in thermal stability unlike composites of PPY and PTP with other metal oxides, hence rules out the application of these composites for higher temperature purposes, however, the PTP composite material has shown the stability up to 200 °C which ensures its use in low temperature applications. The compactness, ordered morphology, better conjugation or chain length and orientation of TeO₂ with PTP backbone are responsible for more conductivity of PTP composite than PPY. The composites also exhibited good photocatalytic activity for methyl orange dye degradation.

1. INTRODUCTION

Polyaniline (PANI), polypyrrole (PPY), polythiophene (PTP), polyfuran (PFu) etc. have been extensively studied in literature due to their multiple uses especially in electronic field due to their pi electron conjugated structure. Among these PPY is generally known to have importance because of its high conductivity, good environmental stability and ease of synthesis [1–3]. In this regard various composites of PPY have been synthesized with various organic, inorganic metal oxides, SWCNT, MWCNT, nanoparticles by chemical or electrochemical route [4–6]. These composites have shown significant enhancement in their properties with respect to the conductivity, retention of charge, enhanced thermal stability and mechanical properties. However, these composite materials face certain limitations as they are mostly infusible, insoluble and suffer from poor processibility mainly because of rigid high conjugated backbone. On comparing the composites of PPY and PTP, the latter and its derivatives have attracted considerable attention for their easy polymerization, excellent environmental and thermal stability because of the great extent of pi-electron delocalization of PT moiety over the heterocyclic ring [7–9]. For example, poly (3-alkyl thiophene), electrically and optically active polymer with high molecular weight has been synthesized by direct oxidation of 3-alkyl thiophene using FeCl₃ [10]. Various composites from these active polymers have been synthesized using insulating polymers [11, 12]. Also, composites based on thiophenes and substituted thiophenes on micro as well as nano scale have been synthesized and characterized for various applications [13–15]. Therefore, the derivatives of PTP can possess better potential for their use in molecular electronics in future. Since composites of TeO₂ with PPY and PTP have not been investigated so far. The two polymers offering different environment for the amphoteric oxide is worth studying. The amphoteric nature of the oxide was the attraction behind the selection of TeO₂ as a dopant. Moreover, TeO₂ is an important material in both amorphous as well as crystalline form, finds application in optical devices such as deflectors, modulators, X-ray detectors and gas sensors because of acousto-optic figure of merit, chemical stability and mechanical durability [16–18]. The materials based on TeO₂ as compared to other amphoteric oxides because of its acoustic-optic property have found technological interests for optical waveguides and since the material used is affecting the waveguide, therefore synthesis of composite material based on TeO₂ is also important. Keeping this in view, the present study was undertaken to have (a) a comparative study of synthesis, characterization of polypyrrole (PPY) and polythiophene (PTP) composites with tellurium oxide and (b) to study the behaviour of these composite materials with respect to electrical conductivity. The material synthesized has been characterized by various spectroscopic techniques and conductivity has been measured by four probe conductivity meter.

2 EXPERIMENTAL

2.1 Materials

Pyrrole (98%) was purchased from Sigma-Aldrich company. Thiophene (99%) was supplied by Himedia. TeO₂ was from BDH (Made in England) FeCl₃, Methanol was from Qualigens. All other reagents used were of AR grade. Triply distilled water was used for washing purposes.

2.2 Synthesis of PPY

One millilitre of pyrrole was added via syringe to 100 mL of a stirred aqueous solution containing 9.74 g of $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ at room temperature. The Fe^{3+} /pyrrole molar ratio was 2.5. Reaction was stirred for 24 h with a magnetic stirrer, which gives rise to the formation of a black precipitate. The resulting black precipitate was vacuum filtered. The precipitate was washed with copious amounts of triply distilled water until the washings were clear. The PPY so obtained was soft jet-black powder, dried in a desiccator overnight and again dried in an oven at 25 °C. The yield of the material was 1.9103 g.

2.3 Synthesis of PPY TeO_2 Composite

Weighed accurately 9.74 g of $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ and made a total volume of 100 mL in a volumetric flask. Weighed 1 g of TeO_2 . Transferred 100 mL of ferric chloride solution to a conical flask and added 1 mL of pyrrole via syringe. The weighed amount of TeO_2 was also added to this mixture.

The color of the solution abruptly changes from reddish yellow to greenish black. Stirred the reaction mixture by magnetic stirring for 24 h. The reaction mixture was vacuum filtered. A black colored precipitate was obtained with white powdery residue leaving behind. The precipitate was washed with copious amounts of triply distilled water. The material so obtained was first dried in desiccator overnight and then in oven at 25 °C. The composite material was soft black powder with yield as 1.9904g.

2.4 Synthesis of Polythiophene

Two millilitre of thiophene was taken in a titration flask containing 70 mL CHCl_3 . Nine grams of FeCl_3 was weighed and 180 mL CHCl_3 was added to this. This mixture was stirred and added to the stirring solution of thiophene in CHCl_3 . Then the whole mixture was kept for magnetic stirring. After 24 h stirring the compound was filtered and the precipitate which was black in color was washed first with CHCl_3 and then with CH_3OH . During this procedure the color of the precipitate changes from black to brown.

2.5 Synthesis of PTP- TeO_2 Composite

Two millilitre of thiophene was taken in a titration flask. To it was added 70 mL CHCl_3 . Nine grams of FeCl_3 was weighed and it was dissolved in 180 mL CHCl_3 . Then the mixture was added to thiophene solution. To this whole mixture 1 g of TeO_2 was added and the whole mixture was kept for stirring for 24 h. After 24 h stirring the compound was filtered and the precipitate which was black in colour was washed first with CHCl_3 and then with CH_3OH . During this procedure the colour of the precipitate changes from black to brown.

2.6 Measurements

FTIR were recorded on Perkin Elmer RX-1 FTIR spectrophotometer. The spectra were taken in KBr discs. Surface morphology of the samples was studied on a Hitachi SEM Model S-3600 N. XRD was recorded on PW 1719 base diffractometer with Cu K α radiations ($k = 1.5406 \text{ \AA}$). Thermogravimetric analysis (TGA) was carried on Universal TA instruments V4.1 in an argon atmosphere at a heating rate of 10 °C/min. The temperature range was from ambient to 1,000 °C. An aluminium pan was used as a reference. Compresses pellets of materials were made under hydraulic pressure of 5 tonne load. Electrical conductivity of samples was measured by standard Four Probe Technique at room temp (25 °C) with Keithley mode 2400. The photocatalytic efficiency of the samples synthesized was studied for the degradation of methyl orange dye in presence of UV-Visible light using mercury-xenon arc lamp with the range of wave length from 250-580nm.

3 RESULTS AND DISCUSSIONS

3.1 FTIR characterization The spectrum of the PPY composite clearly exhibit some shifts in the characteristic absorption peaks of PPY (Figs. 1, 2), showing the insertion of TeO_2 in the polymer matrix. The absorption peak at 1537 cm^{-1} corresponding to the C–C and C=C stretching vibrations in PPY has shifted to 1539 cm^{-1} in PPY– TeO_2 . The weak peak at 1444 cm^{-1} observed in PPY because of C–N stretching is appearing at 1449 cm^{-1} in the composite. The appearance of absorption peaks at 1295, 1162, 1040 cm^{-1} because of C–H and C–H in plane deformation modes in pure PPY have shifted to 1297, 1163, 1040 cm^{-1} , respectively, in PPY composites. The absorption peaks at 893, 784 and 672 cm^{-1} related to C–H outer bending vibrations have been observed at 891, 780 and 664 cm^{-1} in PPY– TeO_2 composite.

Fig. 1 FTIR spectra of PPY

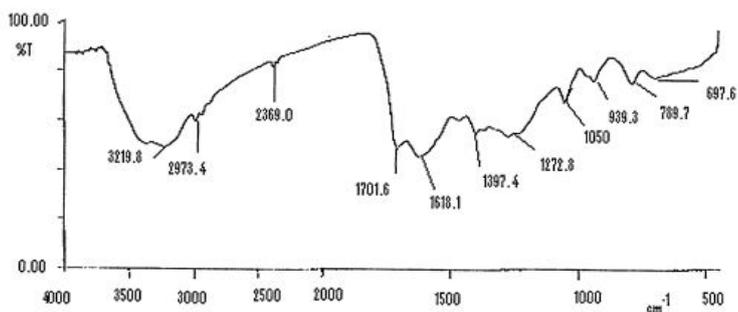
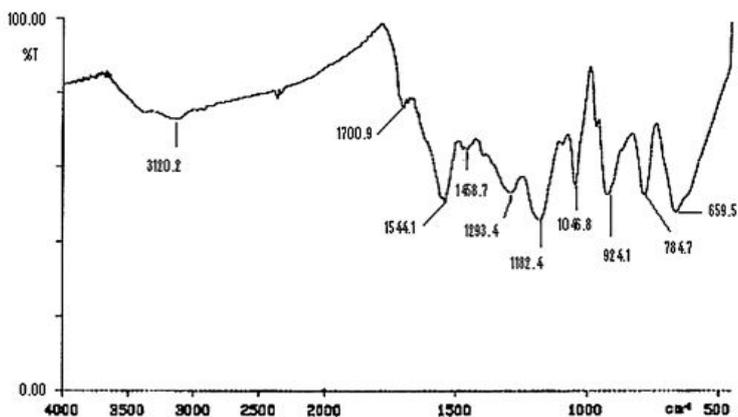


Fig. 2 FTIR spectra of PPY-TeO₂ composite



Similarly in case of PTP-TeO₂ composites, significant shifts in the characteristics absorption peaks of pure PTP have been observed (Figs. 3, 4). The peaks at 3419, 2922 and 2371 cm⁻¹ attributed to C-H stretching vibrations in pure PTP have undergone significant shifts and have been observed at 3430, 2924 and 2365 cm⁻¹, respectively. The absorption peak at 1653 cm⁻¹ because of C=C stretching vibration in pure PTP has shifted to 1635 cm⁻¹, a good shift showing the influence of TeO₂ in the PTP matrix as a result of strong interaction between PTP backbone and TeO₂. The absorption peaks at 1434, 1317, 1113, 1024 cm⁻¹ in PTP have been observed at 1431, 1325, 1116, 1031 cm⁻¹, respectively, in PTP-TeO₂ composite. The absorption peak at 787 cm⁻¹ due to C-H out of plane stretching vibration in PTP has appeared at 783 cm⁻¹ in composite. The absorption peak at 693 cm⁻¹ in PTP assigned to C-S bending mode has shifted to 646 cm⁻¹ in composite, indicating the presence of thiophene monomer.

Fig. 3 FTIR spectra of PTP

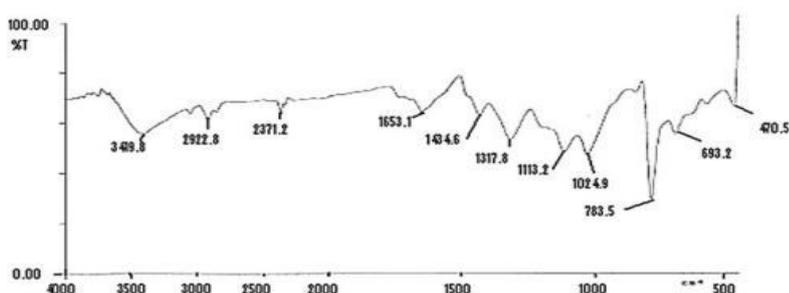
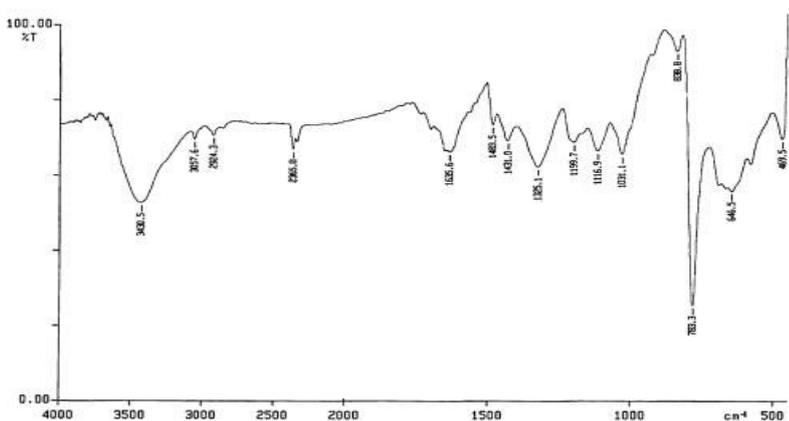
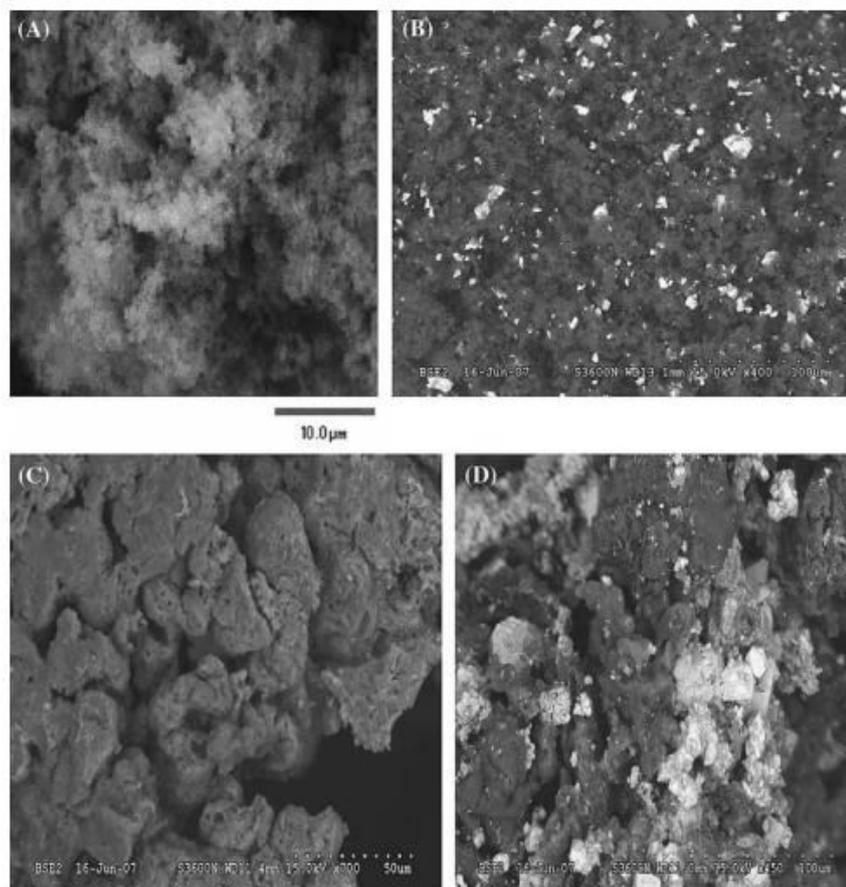


Fig. 4 FTIR spectra of PPY-TeO₂ composite



In both cases PPY-TeO₂ and PTP-TeO₂ composites, the characteristics absorption peaks of PPY and PTP have shown shifts in their respective composite materials showing the change in the environment of pure PPY and PTP. Since the shift of absorption peaks in case of PTP is more pronounced, thus better interaction of TeO₂ with PTP as compared to PPY can be expected, which can result into better conjugation or chain length. The FTIR results of pure PPY and PTP are consistent with previous reports [19–21]. The FTIR results were further confirmed by SEM, XRD and thermal analysis.

Fig. 5 SEM photographs of **a** PPY only, **b** PPY-TeO₂ composite, **c** PTP only, **d** PTP-TeO₂ composite



3.2 SEM Characterization

SEM micrographs of PPY, PTP and their composites are shown in Fig. 5a–d. The images show the compact morphology of PTP than PPY. In case of PPY composite TeO₂ is more uniformly embedded in the matrix. The incorporation of TeO₂ in the PPY and PTP matrix is very well evident, hence proves the successful chemical synthesis of PPY and PTP composites with TeO₂. The doping has significantly affected the morphology by bringing the compactness in the material

3.3 XRD Characterization

The XRD patterns of, TeO₂, PPY and PPY-TeO₂ are shown in Fig. 6a–c. On comparing the patterns it is evident that PPY is amorphous, TeO₂ is crystalline. XRD of PPY-TeO₂ is showing the prominent peaks at 21.8, 26.18, 28.7, 29.9, 37.3, 43.7, 48.56, 55.25 and 62.17 with relative intensity 7.86, 76.32, 12.73, 100, 18.98, 3.98, 51.42, 18.19 and 11.19%, respectively, which is same as that of TeO₂. PPY being amorphous shows a broad peak at 2θ value of 10 and 27. The relative intensity of these peaks being low is dominated by the intense peaks of TeO₂. Therefore, it is clear that the composite is showing all the characteristics XRD peaks of TeO₂ only hence confirming the successful synthesis. Similarly, XRD patterns of PTP and PTP-TeO₂ are shown in Fig. 6d and e. Again, PTP being amorphous shows a broad peak of low relative intensity at 2θ value of 10. XRD pattern of composite shows intense peaks because of the presence of TeO₂ ignoring the less intense peaks of PTP backbone. The peaks are observed at 2θ values of 9.13, 26.17, 29.96, 37.31, 48.57, 55.29, 62.12 with relative intensity 24.81, 93.90, 100, 25.17, 71.51, 25.72, 16.90%, respectively. Here also the composite is showing all the characteristics peaks due to presence of TeO₂, proving the successful synthesis. From comparison of XRD pattern of both the composites the successful insertion of TeO₂ in both the composite backbones is verified. The peak with 100% relative intensity appears at 2θ value of 29.9 in both the cases.

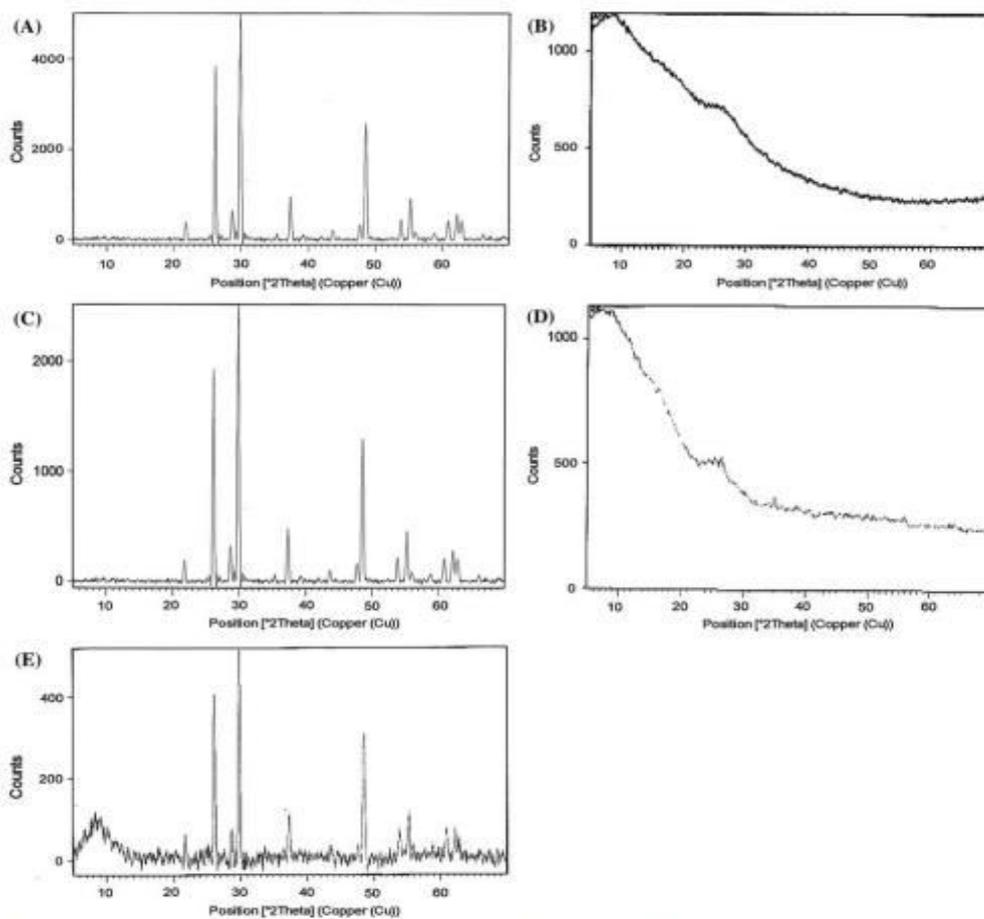
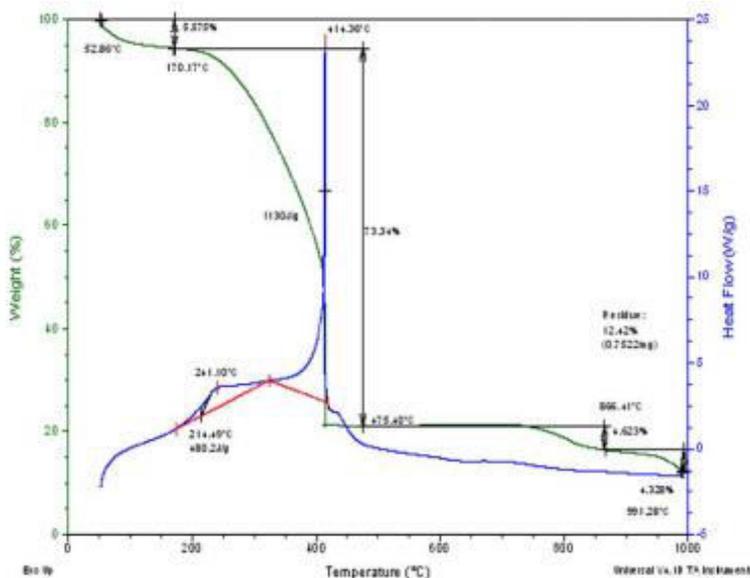


Fig. 6 XRD patterns of a TeO₂ only, b PPY only, c PPY-TeO₂ composite, d PTP only, e PTP-TeO₂ composite

Fig. 8 TGA and DSC curves of PPY-TeO₂ composite



3.4 Thermogravimetric Analysis

Thermograms of PPY and PPY-TeO₂ are shown in Figs. 7 and 8, respectively. Thermogram of PPY is showing 3% weight loss soon after the ambient temperature due to the removal of moisture. Then the thermogram is stable up to 200°C, where from a steep decomposition takes place which results into the weight loss of about 97% corresponding to the decomposition of the whole PPY. The decomposition stops at 580°C, where the residue left behind is zero. DSC curve shows a broad endothermic peak giving $\Delta H = 210$ J/g. Thermogram of PPY-TeO₂ shows again two transitions. The first starting from ambient temperature undergoing a weight loss of about 5.57% up to 100°C, can be attributed towards the loss of moisture. The curve is relatively stable upto 200°C where from another fast decomposition step initiates, resulting into the weight loss of 63.84% up to

450⁰C due to release of C, H and N moieties of PPY unit from PPY–TeO₂ composite. From 450⁰C the thermogram shows no weight loss. The curve runs parallel to X-axis up to 760⁰C where from there is again decomposition. The weight left at 760⁰C is 21% is due to the presence of TeO₂. On comparing the thermogram of PPY and its composite with TeO₂, it is clear that PPY undergoes complete decomposition at 580⁰C with 0% residue behind, while in case of composite 79.41% loss occurs up to 450⁰C only. About 20.59% weight left behind at this stage indicates the presence of TeO₂ in the polymer matrix. DSC curve shows also two peaks corresponding to the two transitions observed from TG. A less intense peak with DH value of 480.2 J/g and a very strong and narrow endothermic peak with a significant DH value of 1,345 J/g. Thermograms of PTP and PTP–TeO₂ are shown in Figs. 9 and 10. Thermograms of PTP shows complete decomposition in only one step. The thermogram is stable up to 250⁰C unlike PPy which has entrapped some moisture confirming the result of SEM. From 250⁰, thermogram shows a fast decomposition with a weight loss of 95% which ends at 400⁰C, because of the removal of all thiophene moiety. The DSC curve shows an endothermic peak with DH value 4,296 J/g The nature of thermogram of PTP–TeO₂ composite is similar to that of PTP, however it clearly shows the presence of TeO₂ in the PTP matrix. The thermogram is again stable upto 200⁰C, where from only 81.15% weight loss occurs, because of the loss of C, H and S moieties of thiophene monomers. The step ends at 400⁰C leaving the residue of 19% which is because of the presence of TeO₂. DSC of the curve shows endothermic peak of DH value as 6,961 J/g. On comparing the DSC curves of PTP and composite (Figs. 9, 10), both show only one endothermic peak but the maxima in case of composite has shifted to a higher temperature. Moreover, the DH in case of composite is much higher than PTP and PPY composite supporting the compactness and orderedness of the composite, presence of TeO₂, better chain length and better orientation. The trend of DSC curve of only PPY is different from rest of the materials. On comparing both the thermograms, the following is evident (a) PTP and PTP–TeO₂ is initially stable up to 200⁰C unlike PPY and PPY–TeO₂, (b) the PTP and its composite has not retained any kind of moisture unlike that of PPY despite proper drying, (c) PTP and its composite is more compact and ordered also verified from SEM, XRD and FTIR, (d) PTP and its composite can be used in low temperature sensor applications because of thermal stability in the range, (e) composites of both PPY and PTP cannot be used for higher temperature application purposes as TeO₂ itself being highly thermally stable, has not improved the thermal stability of PPY and PTP backbone unlike other metal oxides like Fe₂O₃, ZnO, ZrO₂ etc.

Fig. 9 TGA and DSC curves of PTP only

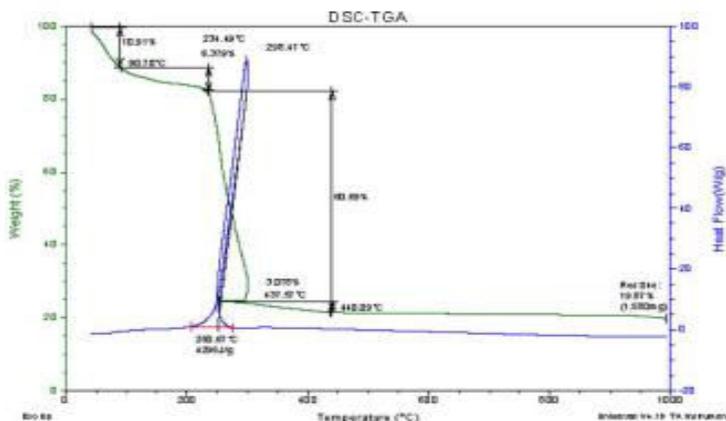
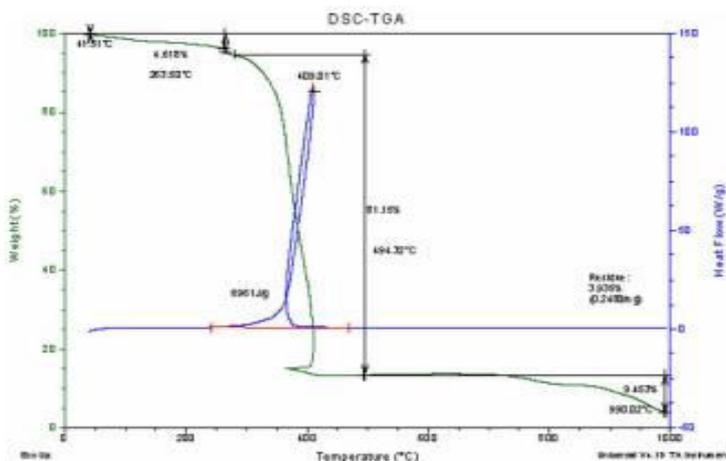


Fig. 10 TGA and DSC curves of PTP–TeO₂ composite



3.5 Conductivity

The conductivity observed by four probe conductivity meter in case of PPY was found to $0.83 \times 10^{-9} \text{ S cm}^{-1}$, which has increased in case of PPY-TeO₂ to the level of $1 \times 10^{-5} \text{ S cm}^{-1}$. The conductivity of pure PTP was found $3.2 \times 10^{-7} \text{ S cm}^{-1}$, has significantly increased to a value of $2 \times 10^{-2} \text{ S cm}^{-1}$ in case of PTP-TeO₂ composite. TeO₂ being an insulating material has increased the conductivity of both the composites. The conductivity in case of PTP composite is more can be because of compactness and ordered structure of PTP than PPY. Comparatively significant shift of FTIR absorption peaks in PTP-TeO₂ suggests better conjugation or chain length. The orientation of the TeO₂ in the PTP matrix in view of FTIR results can also be the reason for higher conductivity. Since the conductivity of the composites depend on microscopic and macroscopic factors. Conjugation length or chain length being the microscopic factor, in case of PTP composite is more because of observed significant shift in FTIR absorption peaks. The crystalline nature of the oxide has given rise to the compactness to both the composite, which is confirmed from SEM, XRD and DSC. This compactness is more in case of PTP composite than PPY as confirmed from SEM, may have contributed towards better molecular orientation of the oxide towards the backbone, hence increasing the conductivity. Fig. 9 TGA and DSC curves of PTP only Fig. 10 TGA and DSC curves of PTP-TeO₂ composite.

Photocatalytic Activity

The photocatalytic efficiency of the samples synthesized was studied for the degradation of methyl orange dye in presence of UV-Visible light using mercury-xenon arc lamp with the range of wave length from 250-580nm. The power of the lamp used was 470 watts. The distance between the lamp and the sample was about 12 cm. the intensity of the light near the solution surface was about 260 mW cm^{-2} . 0.4 gm of sample was suspended into the 50ppm aqueous solution of methyl orange (200ml). Before exposing the suspension to UV-V is irradiated, they were stirred in dark for 40 min to attain adsorption-desorption equilibrium. Then the suspension was irradiated under Mercury-Xenon arc lamp. At the given time intervals small aliquots from the suspension were taken out and separated by centrifugation. The absorbance of MO solution was then recorded at a wave length of 500 nm using double beam spectrophotometer (PG instruments T80). The samples show slight decrease in absorption in time. It may be due to absorption of methyl orange dye on the surface of composites and hence depicts the development of adsorption-desorption equilibrium. This indicates that the synthesized can act as an efficient photocatalyst for degradation of methyl orange dye. The photocatalytic activity begins with the generation of electron/hole pair. When a photocatalyst is illuminated by light with energy greater or equal to the band gap energy, the valance band electrons can be excited to the conduction band, leaving a hole in the valance band. Then these electrons and holes are transferred separately to the surface of the catalyst and react with the dye involved leading to the formation of super oxide radical anions and hydroxyl radicles. These radicles are the reactive species in the photocatalytic oxidation processes which are recognized o be the most powerful oxidizing species and hence attack organic material near the surface of the photocatalyst.

CONCLUSION

Synthesis of PPY, PTP and their corresponding composites with TeO₂ has been successfully achieved. As compared to PPY composite, PTP composite show better characteristics with respect to compactness, ordered morphology and conductivity. PTP and its composites are stable upto 200^oC, can be used in low temperature sensor applications. TeO₂ itself being highly thermally stable, has not improved the thermal stability of PPY and PTP backbone significantly. The composites also exhibited good photocatalytic activity for methyl orange dye degradation.

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Comparing Private and Government Universities: Analysing the Demography of Indian Higher Education Enrolments of Year 2019-20

Ravi Pokharna, Hires S. Luhar and Arvind S. Luhar

¹University of Mumbai, India

²VIVA Institute of Management & Research, Mumbai, India

³Department of Accountancy, Ismail Yusuf College & Board of Studies in Accountancy, University of Mumbai, India

ABSTRACT

This study aims to analyse the Higher Education enrolment data of India for the year 2019-20 and identify demographic design and trends. The study refers to the All India Survey on Higher Education conducted by Department of Higher Education, Government of India for the year 2019-20 and analyses the data further to compare Government Universities and Private Universities based on the demography of their enrolments. The study aims to highlight and present opportunities for further improving the Gross Enrolment Ratio.

Keywords: Higher Education (HE) Enrolment, Gross Enrolment Ratio (GER), Private Universities

1. INTRODUCTION

Indian Higher Education is witnessing a healthy growth with steady annual increase in Gross Enrolment Ratio (GER) and rising number of institutions both Government as well as Private. While the first Government University was set up about 250 years ago in 1857^[1], the first private university was set up only 25 years ago in 1995^[2] When the Government felt that it wasn't capable of increasing GER on its own, it decided to open up the sector for private players. Since then, GER has seen significant improvement. However Private Universities are often criticised for their pursuit of numbers by compromising on quality and education standards. The Indian Government has set up a target of achieving a GER of 50 by the year 2035^[3]. In order to achieve this, it will be very prudent to closely study the existing enrollment numbers and their demographic patterns, to find out the scope for improvement. It is with this context and background, this study has been undertaken. The study aims to focus on the Universities both Government and Private and their enrolment patterns. India is a complex society with a very plural and diverse social structure. Through this research we have attempted to study the enrolment patterns based on gender, caste and region in both Government and Private Universities. The aim was to analyse the demographic trends and develop a better understanding of the higher education enrolment decisions.

2. LITERATURE REVIEW

During our literature review we found a few studies that made similar attempts. In her research paper 'Gender Disparity: A Study of Gross Enrolment Ratio in Higher Education', Komal concluded that a significant variation exists in male and female GER^[4]. In another paper titled 'Gross Enrolment Ratio in Higher Education in India: A Study From 2001-02 to 2012-13' Rahul summarised that there has been a tremendous increase in the GER in HE from 2001-02 to 2012-13^[5]. Charu in her article "Muslims have the lowest rate of enrolment in higher education in India" argues and suggests that the dropout rate among Muslims is 17.6%, higher than the all-India average of 13.2%, according to a 2014 study based on 2005-06 National Family Health Survey data and hence it could be a reason for the lowest rate of enrolment in Muslims^[6]. However all these existing studies lack a comprehensive demographic outlook. For this study the data from Government of India's report 'All India Survey on Higher Education (2019-20)' has been considered. This is the 10th such annual report produced by the Department of Higher Education, Government of India. The findings of this research will be useful for the Government as well as other policy makers and academicians who would like to work towards the goal of taking HE GER to 50^[3].

3. Landscape of Higher Education in India

There are currently 3.85 crore students enrolled in various Higher Education programmes in India. This is a relatively low number when compared to the 14.2 crore children belonging to the age group of 18-23 years who are considered eligible for HE. The HE Institutional landscape in India consists of Government Universities, Private Universities; Government University affiliated Colleges and Stand Alone Institutions. Private Universities are not allowed to affiliate colleges or establish an off-campus centre.

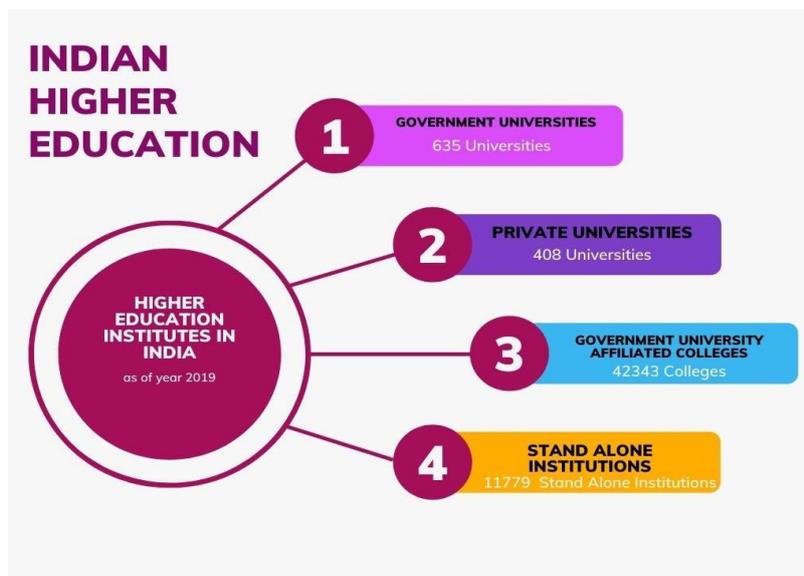


Figure 1: Indian Higher Education Institutional Landscape (2019-20) (Source: Self)

There are a total of 55165 HE institutions. There are 1043 universities including Government, Private and Deemed-to-be universities, which are degree awarding institutions and are considered to be the backbone of India's HE network. There are 42343 Colleges which may be Private, Government owned or Government aided but are affiliated to a University as they are not empowered to provide degrees in their own name. The vast outreach of these colleges play a huge role in making HE accessible in India. Then there are 11779 institutions specialised in domains like Technical, Management, Teacher training, Nursing, Paramedical, Hotel management etc, are categorised under 'Stand Alone Institutions'.

The Indian HE is formed of eight courses and programmes namely, PhD, MPhil, Post Graduate Programme, PG Diploma, Undergraduate Programme, Diploma, Certificate Course and Integrated Course. 80% of the total HE enrolments come from the Undergraduate programme while another 11% come from the Postgraduate programme.^[7]

4. Higher Education Enrolment in the year 2019-20 and its Demographic Analysis

With 3.85 crore enrolments India's Gross Enrolment Ratio (GER) in HE for the year 2019-20 stands at 27.1 percent. 49% of these are female enrolments. Females have a better GER at 27.3% to that of males which is at 26.9%.

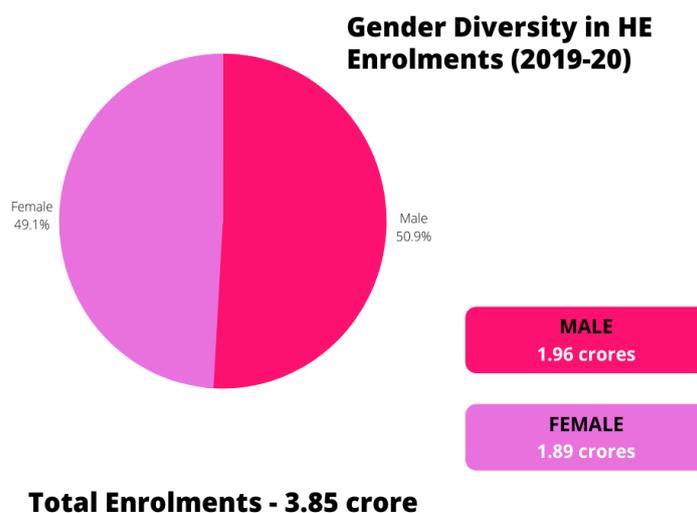


Figure 2: Gender Diversity in HE Enrolments (2019-20) (Source: Self)

However GER in Scheduled Tribes population is worryingly low at 18.0%. For Scheduled Castes it is still better at 23.4%.



Figure 3: Gross Enrolment Ratio - SC, ST (Source: Self)

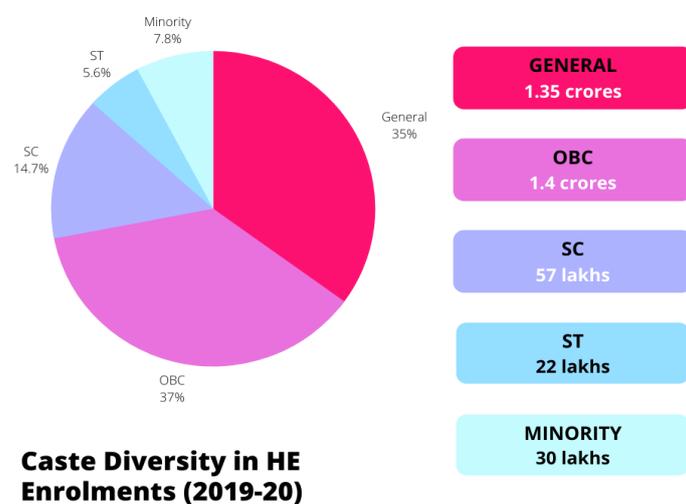


Figure 4: Caste Diversity in HE Enrolments (2019-20) (Source: Self)

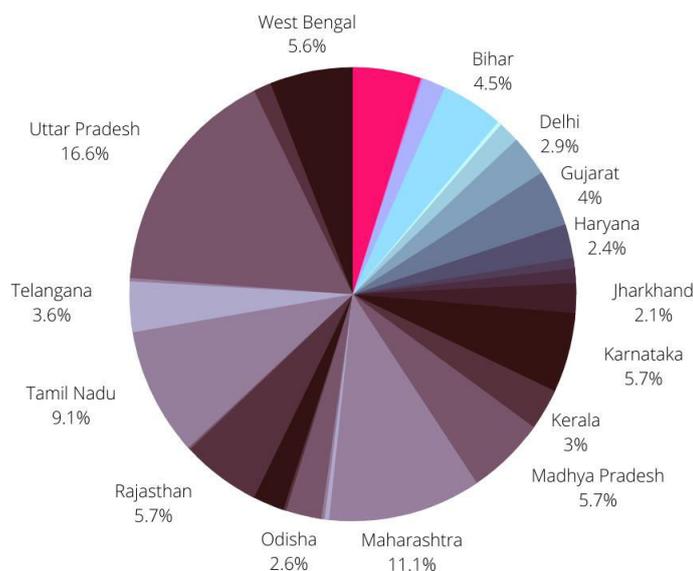


Figure 5: Gross Enrolment Ratio - SC, ST (Source: Self)

Geographically also, the GER shows a quite uneven HE enrolment scenario amongst various states and UTs with few states and UTs like Sikkim (75.8%), Chandigarh (52.1%) and Tamil Nadu (51.4%) have GER exceeding 50% while States and UTs like Bihar (14.5%), Dadra and Nagar Haveli (9.4%), Ladakh (7.9%), Lakshadweep (7.5%), Daman and Diu (6.1%) have GER less than 15%.

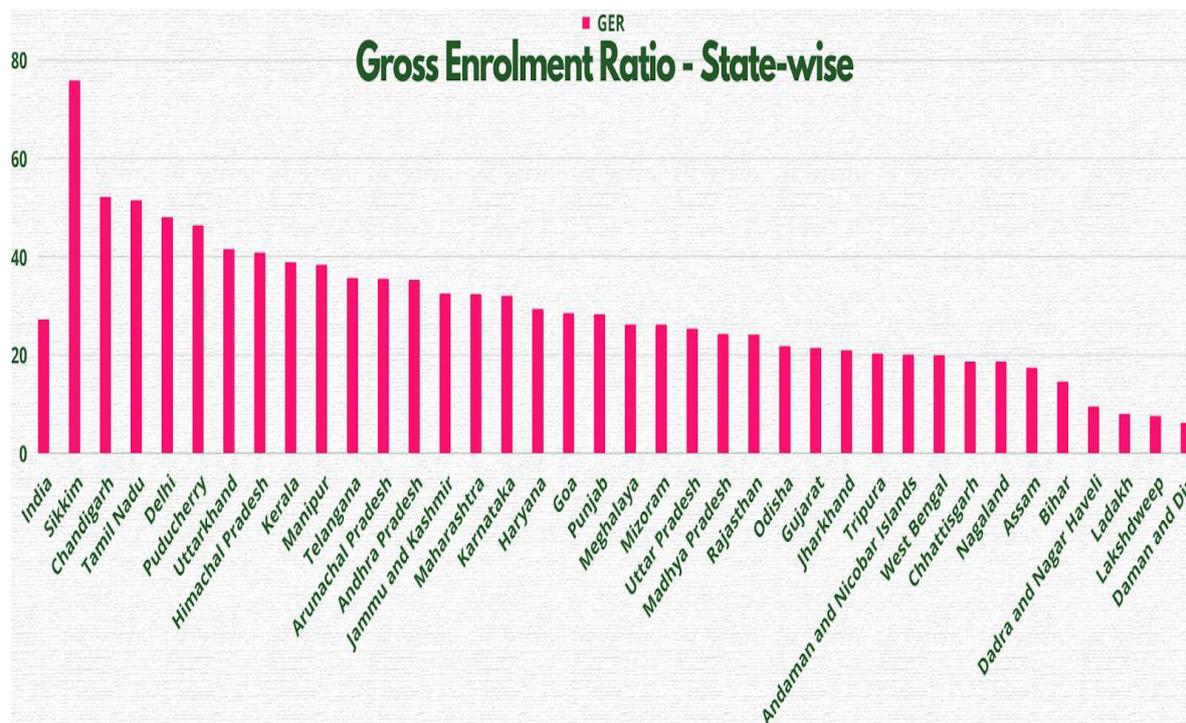


Figure 6: Gross Enrolment Ratio - State-wise (Source: Self)

However, the National GER is approximately the median, as 18 States and UTs have GER more than the National while 19 States and UTs have GER less than the National GER. The low or high HE GER of a State or UT is not completely and directly dependent on the presence of HE institutes in the region. For example Sikkim with highest GER has only 8 Universities while Bihar with one of the lowest GER has 35.

5. University Enrolments: Comparison and Analysis

Universities form the backbone of India's Higher Education landscape. Universities and their affiliated colleges account for 92% of the total enrolments (2019-20). They form 77% of the total institutes in number.

Universities alone contributed to 21% enrolments in the year 2019-20 with around 81 lakh enrolments, of the total HE enrolments in India. This doesn't include enrolments from their affiliated or constituent colleges. However 88% of the total PhD enrolments, 66% of the total MPhil enrolments and 63% of the PG Diploma enrolments in 2019-20 are contributed by Universities. Similarly for Postgraduate and Integrated courses also, students prefer Universities. In 2019-20 about 50% enrolments in both these categories were from Universities. At the same time only 17% Undergraduate enrolments and 10% Diploma enrolments have come from Universities.

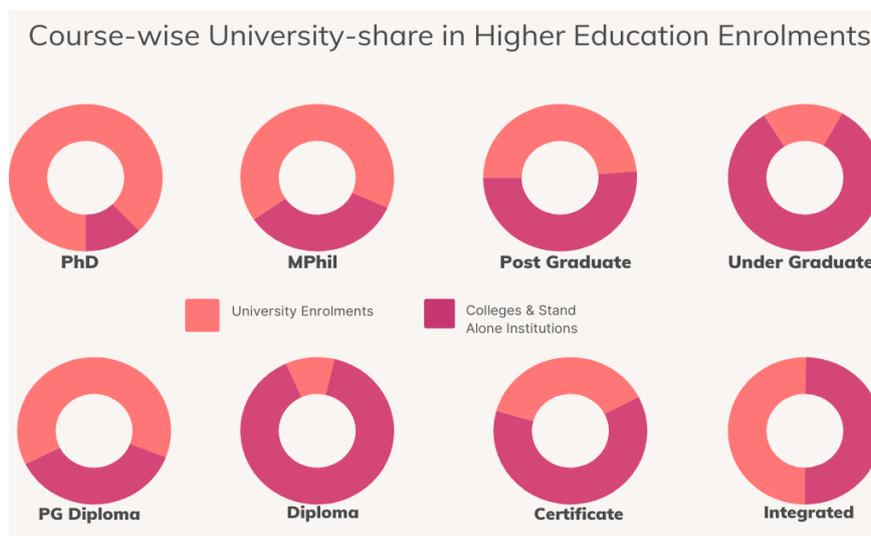


Figure 7: Course-wise University share in Higher Education Enrolments (Source: Self)

The first Indian Government University, University of Madras was set up in 1857. Owing to a very low HE GER the Government decided to allow private players to set up Universities and increase access of common India to the HE. While the first private university, Sikkim Manipal University came into existence in 1995, the sector was opened up only in early 2000s. Twenty years hence we have 408 private universities distributed across the country. While India's GER in Higher Education has increased from 10% in 2000 to 27.1% in 2019-20, a proper research will have to be conducted to ascertain how much of this progress could be credited to the Private Universities. We hereby have done a comparative demographic analysis of the enrolments in Government Universities and Private Universities.

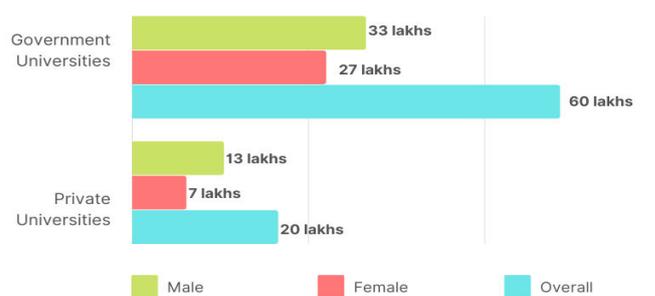
Out of the total University enrolments 75% come from the 635 Government Universities while 25% from the 408 Private Universities.

5.1 Gender Diversity

Private Universities fare poorly in terms of gender diversity in enrolments as compared to their Government counterparts. As per the below graph the male : female ratio in HE enrolments at Government vs Private Universities is 55:45 vs 65:35. The reason for low female enrolments in Private Universities could be further studied.

Gender Diversity in Enrolments - Govt vs Pvt Universities

Govt Universities include Central University, Central Open University, Institute of National Importance, State Public University, State Open University, Institute under State Legislature Act, Deemed University- Government, Deemed University- Government Aided AND Pvt Universities include State Private University, State Private Open University, Deemed University- Private



*Enrolment numbers have been rounded of

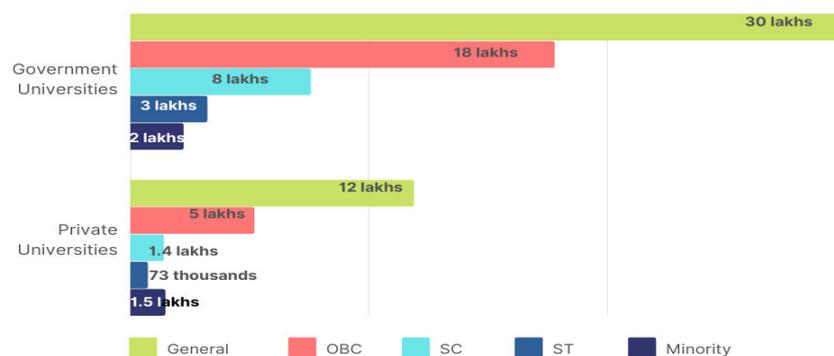
Figure 8: Gender Diversity in Enrolments - Government vs Private Universities (Source: Self)

5.2 Caste Diversity

A closer look at the chart below reveals that SC and ST students prefer Government Universities to Private. While 75% of total University Enrolments are from Government Universities. In case of SC and ST students the share is 80% and 85% respectively. However minorities have an inclination towards Private Universities as 43% minorities enrolled with Private Universities.

Caste Diversity in Enrolments - Govt vs Pvt Universities

Govt Universities include Central University, Central Open University, Institute of National Importance, State Public University, State Open University, Institute under State Legislature Act, Deemed University- Government, Deemed University- Government Aided AND Pvt Universities include State Private University, State Private Open University, Deemed University- Private



*Enrolment numbers have been rounded of

Figure 9: Caste Diversity in Enrolments - Government vs Private Universities (Source: Self)

5.3 Regional Diversity

Out of the overall HE enrolments from universities only 25% is contributed by the Private Universities. However a look at the state-wise contribution reveals a very different picture. In states like Sikkim (82%), Goa (75%), Punjab (64%), Chhattisgarh (57%), Karnataka (56%) and Gujarat (51%) more than 50% of the students enrolled in Higher Education are from Private Universities. Contrary to this, in states like Delhi (1%), Bihar (4%), Mizoram (4%), Assam (7%), Tripura (8%), Telangana (9%) and West Bengal (10%) a very small percentage of students come from Private Universities. Government universities still are the main contributors to Higher Education. In addition, there are nine states and UTs which do not have any Private University. They are Andaman and Nicobar Islands Chandigarh, Dadra and Nagar Haveli, Daman and Diu, Jammu and Kashmir, Ladakh, Lakshadweep, Manipur and Kerala. Bottom Five States and UTs having the lowest GER in Higher Education are also the ones which have zero or negligible private university presence. They are Bihar (GER 14.5), Dadra and Nagar Haveli (9.4), Ladakh (7.9), Lakshadweep (7.5) and Daman and Diu (6.1). This trend is indicative of the role of private universities in providing access to the students who want to enrol in higher education. However a detailed and separate study could be conducted to ascertain the exact correlation of GER of a state with the number of private universities in that state.

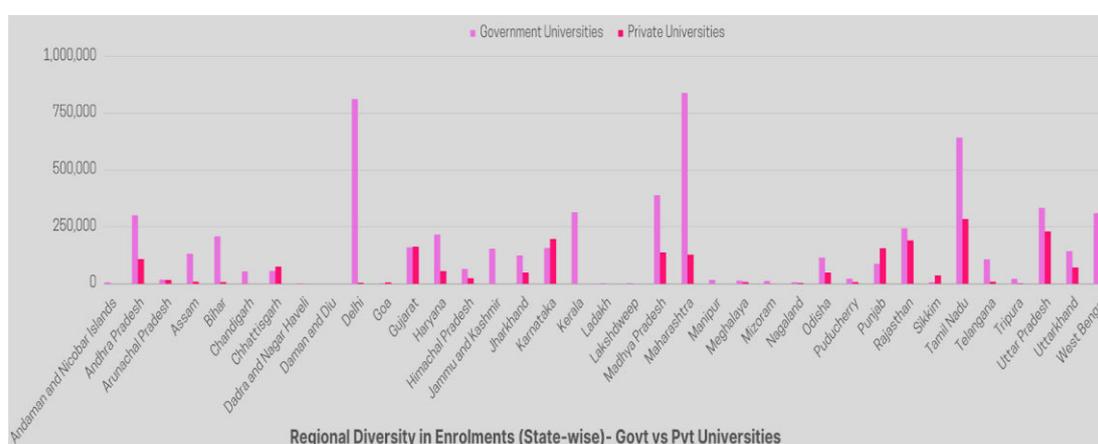


Figure 10: Regional Diversity in Enrolments (State-wise) - Government vs Private Universities (Source: Self)

5.4 Course Diversity

Out of the eight courses and programmes that constitute Higher Education in India, only in Integrated courses (51%) more students enrol with Private Universities than with Government. Rest in all seven courses and programmes Government Universities are the preferred choice of enrolment. The preference is all the more skewed towards Government Universities in Certificate courses (92%), MPhil (86%) and Postgraduate Programmes (84%).

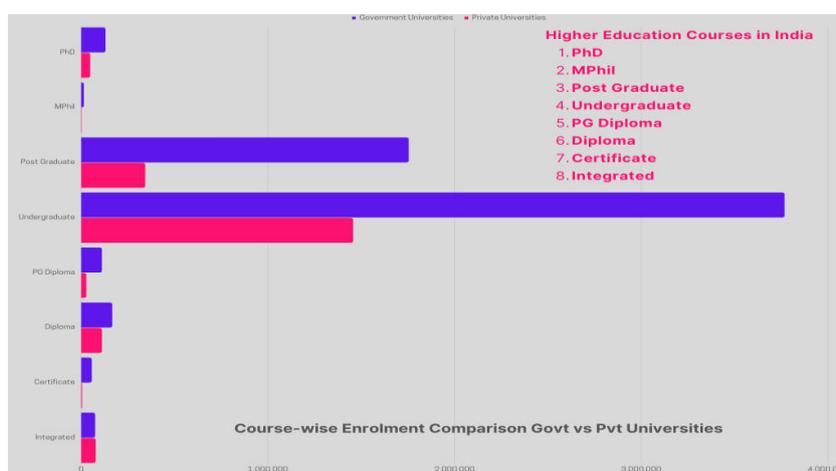


Figure 11: Course-wise Enrolment Comparison - Government vs Private Universities (Source: Self)

6. LIMITATIONS OF THE STUDY

Since the data for the study has been drawn primarily from the AISHE 2019-20 report, it is pertinent to note that the report's data is based on the responses it receives on its portal from various institutions. For this report they have collected and processed data obtained from 97.7% Universities, 94.4% colleges and 81.5% stand alone institutions.

7. CONCLUSION

In the last 25 years the Private University ecosystem has developed well and out of the total University contribution to HE Enrolments, Private University share is 25%. However as is evident from this study, the lesser privileged sections of the society like SC and ST prefer Government Universities to Private Universities. This could be investigated further in another study to find the exact reasons for this finding. The study has also shown that many states or UTs which have very low GER are the ones which have very under-developed private higher education participation. This is indicative of the fact that Private Universities have played a significant role in improving access to Higher Education to the students. The study also revealed that when it comes to integrated courses students prefer Private Universities to Government.

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9. APPENDIX

Chart 1 - Landscape Chart: Types of Higher Education Institutes in India (Government, Government Aided, Private, Government Affiliated)

Chart 2 - Pie Chart: Gender Diversity in Enrolments (Male and Female)

Chart 3 - BAR Chart: GER in Male and Females

Chart 4 - Pie Chart: Caste Diversity in Enrolments (General, OBC, SC, ST, Minority)

Chart 5 - Bar Chart: GER in General, OBC, SC, ST, Minority

Chart 6 - Pie Chart: Regional Diversity in Enrolments (State-wise)

Chart 7 - Bar Chart: GER State-wise (Descending)

Chart 8 - Bar Chart: Gender Diversity - Government Universities vs Private Universities

Chart 9 - Bar Chart: Caste Diversity - Government Universities vs Private Universities

Chart 10- Bar Chart: Regional Diversity - Government Universities vs Private Universities

Chart 11- Bar Chart: Course-wise Enrolment Comparison - Government vs Private Universities

A Novel Graph Mining Technique for Effective Social Network Analysis

Prajakta S. Vispute* and Shirish S. Sane

Computer Department, K.K. Wagh Institute of Engineering Education and Research, Nashik, Maharashtra, India

ABSTRACT

Partition of a network into essential building blocks has been referred to as community detection and is a core research topic in social network analysis. Based on the membership of nodes in the particular community or number of communities; it is classified as non-overlapping or overlapping communities. These communities will be used as base communities in the case of dynamic social network analysis. However, the usefulness of these communities needs to be comprehended. In this paper, the impact of network parameters on detected overlapping communities is studied to understand the community parameters that act as a backbone of the base community for undirected networks. This process is useful in evolving communities, where the base communities will be updated for dynamic data.

Keywords: Social Network Analysis, Community detection, Evolving communities, dynamic networks, Graph mining.

1. INTRODUCTION

Social Network Analysis (SNA) is a study of social structures through network and graph theory (Fortunato S., 2010). Networked structures are characterized in terms of nodes and edges connecting them. Nodes represent individuals, groups, or elements within the network, and communication between them is depicted by edges.

SNA uses different methods and tools to study the behavior of an individual and communication between two. SNA provides insight into densely interconnected groups of nodes known as communities (Tang L. and Liu H., 2010; Fortunato S. and Hric D., 2016; Fortunato S., 2010; Bedi P. and Sharma C., 2016; Girvan M., 2002). In social networks, actors connect with others based on their common activities and interests; this commonly connected group of actors is the community. Communities play an important role and have extensive applications in various fields of social networks. Networks provide a lot of information about the relationships between users within the network. To analyze the network in many applications it is important to discover nodes with common interests and keep them tightly connected. There are a variety of community detection algorithms to evaluate how groups of nodes are partitioned and their tendency to strengthen or break apart.

In today's world, social media platforms are used by one in three people in the world and more than two-thirds of all internet users. The rise of social media and its usage is an extraordinary example of how behavior can change. Therefore, it is very important to analyze and study the structure and behavior of communities with respect to evolving networks. The nodes can be partitioned into a single community (non-overlapping community: characterized by dense connectivity within the community) or a number of communities (overlapping community) based on application. The community detection methods are broadly classified into static and dynamic to deal with the fixed and evolving data respectively. The Static community detection process defines communities in static time slices from fixed data. In evolving networks, algorithms change the changes in nodes and connections that change over time.

1.1 Community Detection in Dynamic Social Networks

In this research, undirected networks with overlapping and non-overlapping communities are analyzed.

In literature, most of the existing algorithms reuse and update the generated communities incrementally, instead of computing the whole dynamic graph from scratch (Agarwal P., 2018; Meng F., Zhang F., Zhu M., Xing Y., Wang Z., and Shi J., 2016; Zakrzewska A., 2015; Zhao Z., Li C., Zhang X., Chiclana F., and Viedma E. H., 2019; Zhuang D., Chang M. J., and Li M., 2019). To process the evolution of a network, initially at time t_0 , the network is partitioned into communities which will be further updated. These primary communities are termed as "base communities".

The base communities act as a foundation to process evolutionary networks. Thus, it is important to understand the usefulness and robustness of the base community structure with respect to network structure. The need for identification of appropriate base communities is further enhanced due to ever-changing scale (Mislove A., 2007; Backstrom L., Huttenlocher D., Kleinberg J., and Lan X., 2006) and varying dynamics (Dodds P. S., Harris K. D., Kloumann I. M., Bliss C. A., and Danforth, C. M., 2011; Ferrara, E., 2012, November 6; Ferrara E., Interdonato R., and Tagarelli A., 2014) of communities. Here the impact of network internal parameters on

community internal parameters as well as community evaluation parameters is presented. In this study, networks of small-scale and medium-scale with non-overlapping and overlapping communities were analyzed.

Table 1:

Algorithm Name	Algorithm type	Network type	Community type	Algorithm used to detect Base communities	Dataset Used
FCDDCN []	Modularity maximization	Undirected	Non-overlapping	CNM []	DBLP
QCA []	Modularity maximization	Undirected	Non-overlapping	Louvain []	Enron, arXiv e-print citation network Facebook
Dynamic Louvain []	Modularity maximization	Undirected	Non-overlapping	Louvain []	High Energy physics theory citation network
LBTR []	Modularity maximization	Undirected	Non-overlapping	Louvain []	ArXiv, Facebook
DynaMo[]	Modularity maximization	Undirected	Non-overlapping	Louvain []	Cit-HepPh, DBLP, Facebook, Flickr YouTube
DyPerm []	Permanence optimization	Undirected	Non-overlapping	Louvain []	Coauth-C, Coauth-N, HS-11, HS-12, PS, CW
DenGraph []	Density	Undirected	Non-overlapping	IDBSCAN []	Enron
AFOCS []	Density	Undirected	Overlapping	FOCS []	LFR

2. CONCEPTUAL MODEL

To reveal the effects of network factors on detected disjoint and overlapping communities in the discipline of social networks, initially, networks of different size are generated. Using existing community detection techniques, communities are mined. Once the communities generated, network parameters are calculated for whole network as well as subpart of the network (communities). Also, performance parameters are calculated, that are used to characterise the trends of generated communities, and finally the adequacy of base community is explored. The overview of the research is illustrated in Figure 1, and further detailed information on every step is explained.

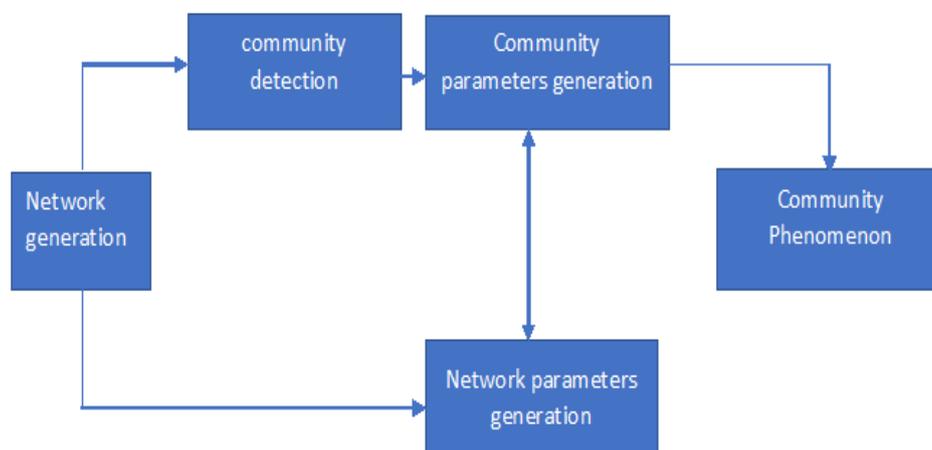


Figure 1: System framework

2.1 Dataset

Lancichinetti-Fortunato-Radicchi (LFR) (Lancichinetti, Fortunato, and Radicchi, 2008) is a widely used benchmark graph generator. It is used to build artificial networks to test the performance of communities in social network analysis. The main parameters of an LFR generator are the size of a network N , the power-law exponent for the degree distribution, and the community size distribution of the generated network. The mixing parameter μ is the fraction of inter-community edges. In this context, the LFR generator is used to generate benchmark datasets of small ($N=100$) and medium ($N=1000$) sizes with μ values ranging from 0.1 to 0.9. After the synthetic network generation phase, in the community generation phase, to detect non-overlapping and overlapping communities, well-known algorithms Leiden (Fortunato S., 2010) and clique percolation method (Palla et al., 2005) are used respectively.

2.2 Algorithms

In this section most widely and useful community detection algorithms for non-overlapping and overlapping community detection are discussed.

Leiden Algorithm

Leiden is a static community detection algorithm. This algorithm is based on modularity maximization. It divides the graph into densely connected disjoint sets of nodes. It tries to maximize the difference between the actual number of edges and the expected number of edges in the community (Traag V. A. 2019). It is an improvement of the well-known Louvain algorithm. As (Traag V. A., 2019) describes, the Leiden algorithm performs better in terms of speed and partition quality the Leiden algorithm is used to discover non-overlapping communities from undirected networks.

Clique Percolation Method

The clique percolation algorithm proposed by (Palla et al., 2005) can detect overlapping communities. It considers that the community is composed of a series of mutually reachable k-clique. It realizes overlapping communities detected by merging adjacent k-communities. This algorithm described the community as a series of mutually reachable k-clique.

2.3 Network and Community Parameters

With the in-depth study of social networks, it is observed that community detection in dynamic networks mainly focuses on undirected networks with non-overlapping communities. Whereas, in the real world, the nodes can be members of a community. Thus, in this paper, undirected networks with non-overlapping communities are analyzed. The following section mainly introduces the network and community measures required to understand the base community structure.

Definition 1: Number of nodes(#n) and number of edges(#m) describes the scale and connectivity of a network. The total number of actors in the network and interaction between them is described by number of nodes and number of edges respectively.

Definition 2: Density (D) (Darlay J., Brauner N., and Moncelcde J., 2012) of a network describes how connected a network is. The density of a network is the ratio of the total number of ties to the total number of possible ties in the network. The higher the density value, the denser the connections between the nodes in the network.

Definition 3: Clustering coefficient (CC) (Holland P. W. , and S. Leinhardt, 1971) measures the degree to which nodes in the graph tend to group together. It describes how well nodes are connected to the neighbourhood. The clustering coefficient (CC) is the same as the transitivity of a graph.

Definition 4: Small-world measure (swm): A social network is called a small-world network (Watts and Strogatz, 1998) if any two nodes in the network can reach each other through a short sequence of connections (Kleinberg, 2001). Small-world networks have two principal characteristics: a short average shortest path length and high clustering.

Definition 5: Scale-free measure (sfm): The basic concept of the S metric is defined by is to measure how interconnected the nodes of high degrees are to each other in a graph. The definition of the S metric by (Li et al., 2005) is actually a normalized version of another metric that they call the s metric. This results in a value between 0 and 1, where a graph G, $S(G)$ close to 1 is "scale-free". The normalization step allows comparing networks of variable sizes.

Definition 6: Assortivity (Ass) quantifies the extent to which connected nodes share similarity (Newman M. E. J., 2002). That means there is a tendency for nodes to connect to other nodes with similar properties. The assortativity lies in the range $-1 \leq \text{ass} \leq 1$. Positive value indicates Assortivity (a greater number of similar nodes connected) and negative value indicates disassortivity.

Definition 7: Algebraic connectivity (AC) is also known as the Fidler value of a network. The second smallest eigenvalue of the Laplacian matrix of a network defines algebraic connectivity. It is used to measure the connectivity (basic measure of robustness) and its correlation with performance of dynamic processes.

Definition 8: Network diameter (ND) is the longest (shortest paths) in the network. Network diameter conveys an average distance between two nodes that can be connected (Jackson M).

3. EVALUATION METHODOLOGY

The proposed algorithm Base Community Analyzer (BCA) is divided into three steps. Initially the synthetic data is generated. In second step, the network and community parameters computes and the third step is the analysis phase.

Algorithm BCA

Input: N

Output: Correlation between NP and CP

Step 1: LFR input value generation ()

1. for $\mu = 0.1: 0.9$ do
2. for $\tau_1 = 1.5: 5$ do
3. for $\tau_2 = 1.5: 5$ do
4. min-community = 20
5. if $G = \text{LFR_benchmark}(\tau_1, \tau_2, \mu, \text{min-com})$
6. store ($\tau_1, \tau_2, \mu, \text{min-com}$)
7. else
8. continue
9. $\tau_2 = \tau_2 + 0.5$
10. $\tau_1 = \tau_1 + 0.5$
11. $\mu = \mu + 0.1$
12. return LFR input values

Step 2: Parameter value generation

13. for every LFR input value
14. for $i = 1: 20$ do
15. $G = \text{LFR benchmark}()$
16. Partition = Leiden (G) or CPM(G) //for non-overlapping or overlapping
17. calculate NP (G)
18. calculate CP (G, partition)
19. End
20. End

Step 3: Analysis

21. for network parameter do
22. for community parameter do
23. C = correlation (NP, CP)
24. End

To understand the relation between network parameters and community evaluation as well as community parameters LFR Benchmark is used to generate undirected networks.

For medium network (N=1000), μ values range from 0.1 to 0.9 and the average degree varies from 4 to 15 with an equal interval of 1, τ_1 and τ_2 values range from 1.5 to 5 with an equal interval of 0.5, whereas the minimum community value set to 20. With these values, 1663 network points generated by the LFR benchmark are considered as shown in figure 2. For every network point, a network is defined and network parameters are calculated for the same. This process of defining a network and calculating related network parameter is repeated 20 times to understand the variety of networks it generates and the changes in the network-parameter values for the same network point.

3.1 Performance Metrics

Performance metrics quantitatively measures the attributes of the community structures. It can be difficult to decide parameters suitable to express appropriate community in a particular network. Thus, to understand overall performance, four metrics are selected for analysis as: modularity, number of communities, conductance and coverage.

Definition 1: Modularity (mod): One of the most studied and used quality function in community detection is Modularity (Newman M. E. J., and M. Girvan, 2004). Modularity measures the strength of the division of a network into communities. It measures the density of edges within the community.

Definition 2: Number of communities (#c): To understand whether small communities are detected or not. The number of communities is a very important factor in addressing the resolution limit problem.

Definition 3: Conductance (con): In understanding community structure, measuring the connectedness of community nodes plays a central role. Conductance measures how “well-connected” a graph is (Fortunato, S., 2010).

Definition 4: The coverage (cov) is the ratio of intra-community edges to the total number of edges in the graph (Fortunato, S., 2010). This measure is used to understand whether clusters are separated from each other.

Definition 5: Performance (per) is a quality function (Fortunato, S., 2010), which counts the number of pair of vertices belonging to the same community and connected by an edge or pair of vertices belonging to different communities and not connected by an edge. By definition performance value range is $0 \leq \text{Per} \leq 1$.

3.2 Analysis

In this paper, the performance of BCA algorithm on both non-overlapping and overlapping communities in undirected graphs medium size are examined. The evaluation is performed from two perspectives: first network parameters (NP) are correlated with community parameters (CP), and the network parameters (NP) are correlated to community evaluation parameters (CEP). The correlation coefficient (ρ) is a measure that measures the association between two variables. The most widely used correlation coefficient is Pearson coefficient. It ranges from +1 (strongly positive) to -1 (strongly negative), and 0 representing no relationship.

Case 1: Network Parameter Vs Community Parameters

To understand the correlation between network parameters on community parameters of overlapping communities in undirected networks (N=1000) is generated. In this case, due to the network size increases (N=1000), very few parameters are correlated. Almost all correlation values are below 0.7. The positive correlation includes CC_n to CC_c, #m_n, D_n, Cen_n, AC_n to swm_c and #m_n and D_n to ND_c. For other parameters, no significant correlation is observed between network and community parameters.

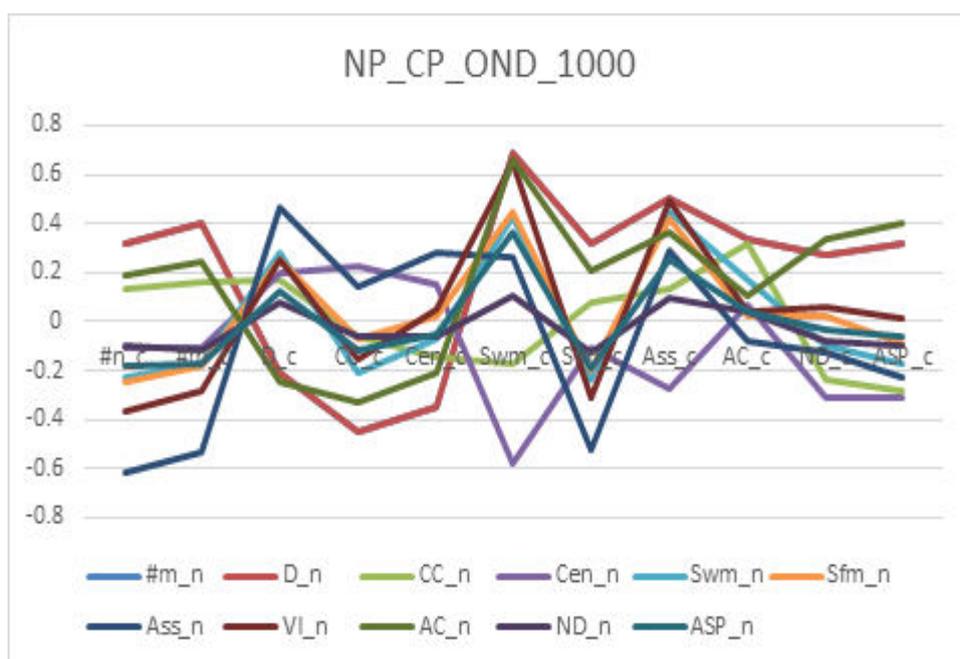


Fig. 3: Correlation between network parameters (NP) and community parameters (CP) for overlapping communities in undirected networks N=1000

Case 2: Network Parameter (NP) Vs Community Evaluation Parameters (CEP)

The performance of community detection methods is measured with the evaluation parameters like modularity, number of communities, conductance, coverage, and performance. Here, the effect of network parameters on community evolution parameters is also explored. In this case of the undirected network (N=1000) with the overlapping community as the nodes are overlapped and not separated from each other the modularity is less however modularity has a considerable impact on small-world measures. Algebraic connectivity has a moderately significant correlation with the number of edges in the community. Conductance and coverage are inversely correlated to CC_n.

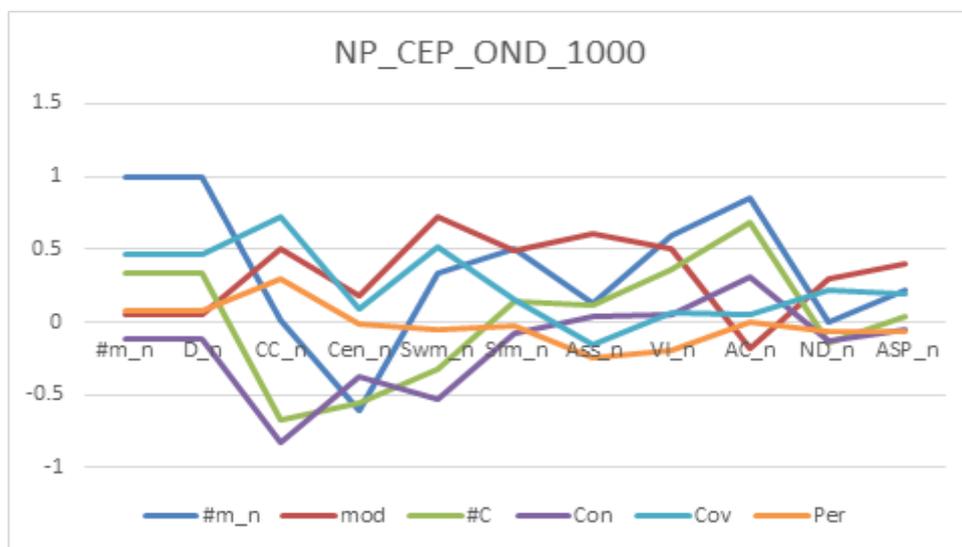


Fig. 4: Correlation between network parameters (NP) and community evaluation parameters (CEP) for overlapping communities in undirected networks N=1000

In network-community, and network-community evaluation correlation, it is observed that to understand the backbone parameters of communities, various parameters need to be explored. No fixed parameters of the network, as well as community, can define the performance of the communities and their usefulness. In the case of finding a base community in evolving network, the size of the initial network should be considered. If the community's density is high, it is difficult to add the new nodes to the existing community which means the community needs to be divided. With the change in size the internal parameters of the community change. Also, instead of having only one evaluation parameter if more parameters are considered the usefulness of the base community should be understood in depth. From figure 3 it can be observed that Assortivity and scale-free measure are negatively correlated to each other. From figure 4 it can be observed that as the clustering coefficient of the network increases the community evaluation parameters conductance and coverage decrease.

4. CONCLUSION AND FUTURE WORK

In this paper, undirected networks of medium size for the overlapping community in dynamic social networks were evaluated. The base communities were evaluated by measuring the structural properties of the network as well as their performance parameters. Most of the previous work focuses on how to update the base communities for evolving data in dynamic networks. However, it is important to study the base community structure. To understand this, the correlation of network parameters on community parameters as well as network parameters on community evaluation parameters is observed. In this study, it is observed that with the change evaluation parameters the correlation between the network parameters and community evaluation parameters changes. **To the best of our knowledge, no related research has focused on this aspect and thus observations presented here shall provide a better understanding of base communities.** Thus, to generate efficient base communities these parameters should be considered. In the future, the directed networks will be analyzed.

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Kinetic Study of Population of Reaction Intermediate and Mechanistic Interpretation of 4-Nitrophenyl Phosphate Hydrolysis

Sonia*, Ritu Rani and Pallavi Bhardwaj

Department of Chemistry, Baba Masthnath University, Asthal Bohar, Rohtak-124001, India

ABSTRACT

Extensive kinetic studies were performed on the hydrolysis of mono phosphate ester of acid 0.1 to 6.0 mol dm⁻³ HCl at 97 ± 0.5°C in a 20% dioxane water mixture. Ionic data in systematic way confirms the acid catalyzed hydrolysis monoester in the hydrolysis containing conjugate acid, neutral and mono negative species but in this discussion we considered only conjugate species. The organic phosphate found in hydrolysis is all limited by the modified form of AllenBard method. The performance of the first order is calculated using the combined form of the corresponding equation level which corresponds well with the visual test level. Estimates of temperature and concentration effect of substrate etc are limited to determine the water molecules involvement bond binding and reaction molecularity.

INTRODUCTION

Recent interest in the biochemistry of mono ester and C-N-P interactions shows the current emphasis on acid hydrolysis of mono phosphate ester [1]. Organophosphate pesticides [2] research is an emerging field of research and very demanding in coming time. As organophosphate plays an important role in human well-being, it is used as a fungitoxic, fertilizer, plant hormones, defoliating agents, rodenticides, miticides and aphicides, antimicrobials, radio tracking process, plasticizers, germicides, flame retardant [3], anti wrinkling agents, industrial fuel additive etc [4]. They are used to find a variety of ways to respond to biological changes. Keeping in mind the importance of organophosphate organic matter, it is very important that there is a strong and systematic study of all aspects of the organophosphate response. The level of phosphate ester hydrolysis is usually affected by various factors such as ionic energy, concentration, temperature, substitutes, solvent size and catalyst etc [5]. Hydrolysis of some of the aryl phosphates introduced into the area shows that the size of the acid catalysis decreases with the reduction of the energy attracting substituent [6]. In most parts of the aryl phosphate esters there was a maxima rate but a high concentration was found to be absent [7].

EXPERIMENTAL

The method of preparation of the phosphate ester of 4-nitrophenol on which the kinetic study has been done, involves the direct reaction of phosphorus oxy-trichloride (POCl₃) with respect phenol [8]. In the method of nitro phenol was dissolved in benzene to which POCl₃ was added drop wise with constant stirring. The mixture was refluxed for 39 hrs. at 65°C and distilled at reduced pressure. Unreactive POCl₃ was removed by distillation at 45 to 50°C temperature. The 2nd fraction of pungent smelling liquid was supposed to be 4-nitrophenyl phosphate di-chloride was distilled at 120°C to 140°C temperature. It was then dissolved in ice cooled water when 4-nitrophenyl dihydrogen phosphate was obtained which was then extracted with either after removing the solvent either an orange color solid was obtained, which on recrystallization with ethanol gave a light yellow crystalline solid [9]. It was indentified to be 4-nitrophenyl phosphate with following physical characteristics:

Melting Point Temperature = 196°C

Theoretical Percentage of Phosphorus = 14.15%

Observed Percentage of Phosphorus = 16.56%

The I.R. Spectrum showed the appearance of absorption band characteristics of following:

—OH group = 3400 – 3000 cm⁻¹

Aromatic Ring = 3100 – 2950 cm⁻¹

O

|| = 1650 – 1500 cm⁻¹

P – OH

—NO₂ = 1550– 1345 cm⁻¹

C—O—P = 900 – 800 cm⁻¹

P-substitution = 845 – 955 cm⁻¹

Above characteristics confirm the structure of mono-4-nitrophenyl phosphate.

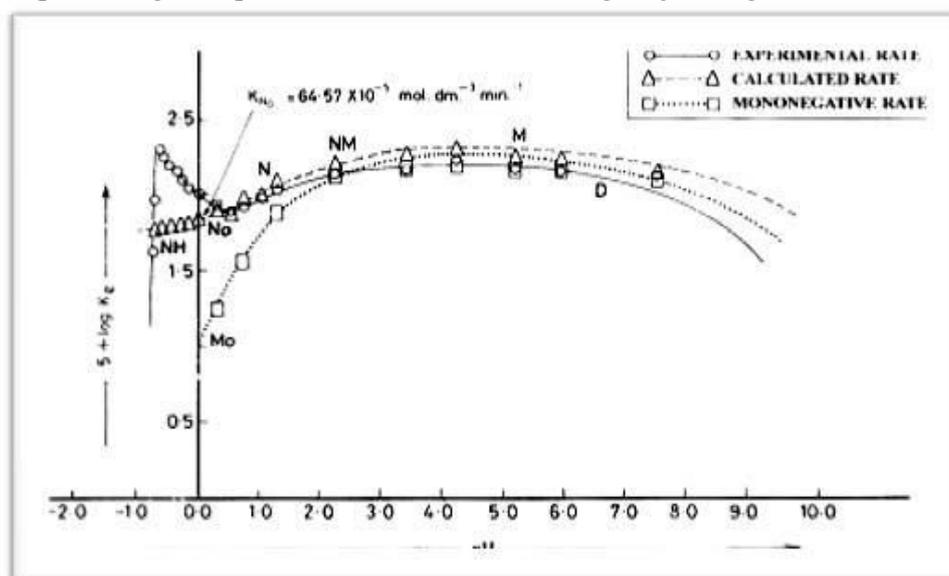
RESULT AND DISCUSSION

Hydrolysis of mono-4-nitrophenyl phosphate ester has been shown to work with neutral, mononegative and conjugate acid types [10]. A kinetic study of hydrolysis over mono ester was performed in acid and buffer media in regions 0.1 to 6.0 mol. dm⁻³HCl with pH 1.24 to 7.46 to 97 ± 0.5°C. The kinetic run is made in 20% aqueous dioxane due to its soluble properties [11]. The mono phosphate ester filter was stored at 5.0 × 10⁻⁴ mol. dm⁻³ for all kinetic runs. Pseudo First order co-efficient hydrolysis rate is summarized in (Table-1) and (Figure - 1) defines the pH and log rate profile.

Table – 1: pH-log Rate Profile of mono-4-nitro phenyl Phosphate at 97 ± 0.5 °C

HCl(mol.dm ⁻³)	pH	10 ⁵ K _e (mol.dm ⁻³ . Min ⁻¹) observed	5+log K _e Calculated
6.0	-0.778	42.30	1.63
5.0	-0.699	88.67	1.95
4.0	-0.602	171.07	2.23
3.5	-0.544	163.54	2.21
3.0	-0.477	153.20	2.18
2.5	-0.397	141.66	2.15
2.0	-0.300	128.48	2.10
1.5	-0.176	116.28	2.06
1.0	0.000	103.60	2.01
.5	0.301	80.36	1.91
.4	0.400	77.23	1.89
.3	0.520	74.14	1.87
.2	0.700	84.38	1.93
.1	1.00	95.46	1.98
Buffers:	1.24	106.46	2.03
Composition of buffers have been mentioned in experimental section	2.20	133.87	2.13
	3.33	142.23	2.15
	4.17	144.23	2.16
	5.60	140.44	2.15
	6.43	137.42	2.14
7.46	135.84	2.13	

Figure – 1: pH-Log Rate Profile of Mono-4-Nitrophenyl Phosphate at 97±0.5 °C



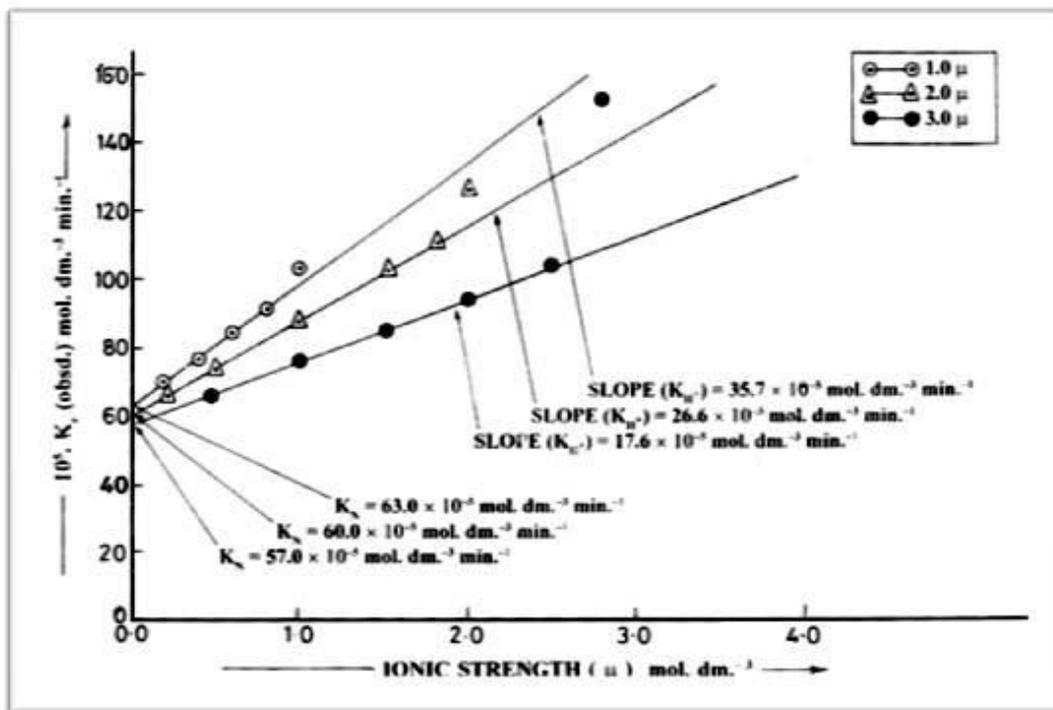
The results show that the level rises with the rise in acid strength upto 4.0 ml. dm⁻³HCl. A continuous increase in acidity leads to a decrease in the degree of rate profile. The bending is due to the effect of ionic energy and could be determined at the constant ionic strength [12]. The reason for the curve may not be as high protonation

as esters belong a class which are very feebly basic substances [13]. Bend can also be formed due to the effect of water activity or the result of ionic energy due to both [14].

Table (2)

Ionic Strength (μ) Mol.dm ⁻³	Composition HCl	Composition KCl	10 K _c Mol. dm. ⁻³ min. ⁻¹ Obsd
1.0	0.2	0.8	69.73
1.0	0.4	0.6	76.81
1.0	0.6	0.4	84.12
1.0	0.8	0.2	91.01
1.0	1.0	0.0	103.60
2.0	0.2	1.8	66.01
2.0	0.5	1.5	74.22
2.0	1.0	1.0	87.98
2.0	1.5	0.5	102.34
2.0	2.0	0.0	126.48
3.0	0.5	2.5	66.88
3.0	1.0	2.0	76.22
3.0	1.5	1.5	85.00
3.0	2.0	1.0	94.16
3.0	2.5	0.5	104.14
3.0	3.0	0.0	153.20

Figure – 2: Hydrolysis of Mono-4-Nitrophenyl Phosphate at Constant Ionic Strength at 97±0.5°C



$$K_{H^+} = K_{H_0^+} \cdot \exp.b_{H^+} \cdot \mu \quad \dots (1)$$

$$K_{H^+} \cdot C_{H^+} = K_{H_0^+} \cdot C_{H^+} \cdot \exp.b_{H^+} \cdot \mu \quad \dots (2)$$

$$5 + \log K_{H^+} \cdot C_{H^+} = 5 + \log K_{H_0^+} + \log C_{H^+} + b'_{H^+} \cdot \mu \quad \dots (3)$$

Where;

K_{H^+} = Specific Rate

$K_{H_0^+}$ = Acid catalysed Rate

$b'_H = \text{Constant}$

$\mu = \text{Ionic Strength}$

$K_N = K_{N_0} \cdot \exp.b_N \mu$ are certain neutral values in those ionic forces at zero ionic power respectively.

Equation (2) and (3) can be used to calculate the acid released and the degree of neutrality can be represented as

$$K_e = K_{H^+} \cdot C_{H^+} + K_N$$

Specific acid binding and specific $[K_N]$ neutral levels of hydrolysis of Mono -4- nitrophenyl phosphate at $97 \pm 0.5^\circ\text{C}$.

Table (3)

Ionic strength(μ)	$10^5 k_h (\text{mol} \cdot \text{dm}^{-3} \cdot \text{min}^{-1})$	$5 + \log K_{H_0}$	$10^5 \cdot K_N (\text{mol} \cdot \text{dm}^{-3} \cdot \text{min}^{-1})$	$5 + \log K_N$
1.0	35.50	1.55	63.00	1.80
2.0	26.60	1.42	60.00	1.78
3.0	17.60	1.25	57.00	1.76

With the help of the above equation, the calculated and theoretical values can be compared with the test levels and there are significant similarities between them up to $4.0 \text{ ml dm}^{-3} \text{HCl}$. The total number of acidic values included in the catalog ($5 + \log K_{H_0} = 1.68$) and a certain degree of neutrality ($5 + \log K_{N_0} = 1.60$) can be found in intercepts on the standard axis of $b_{H^+} = -0.042$ and $b_n = 00.027$ can be found on the slope.

Figure – 3: Hydrolysis of Mono-4-Nitrophenyl Phosphate at $97 \pm 0.5^\circ\text{C}$

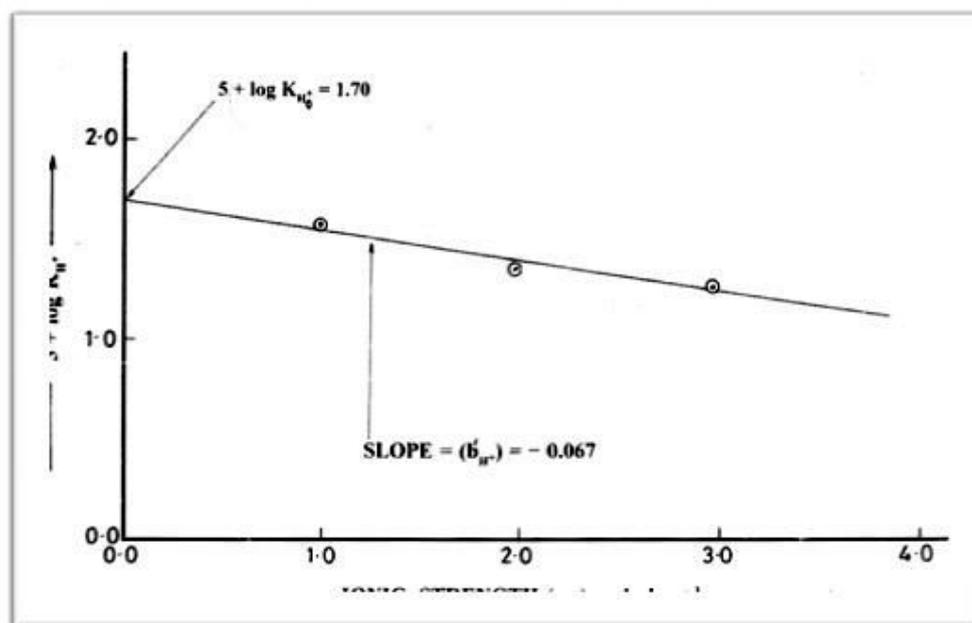


Table (4) summarizes both experimental and calculated levels of hydrolytic reaction in the low pH region i.e. 1.0 to 6.0 mol. $\text{dm}^{-3} \text{HCl}$. It is reflected from the data that there is an excellent correlation between calculated and experimental values of up to $4.0 \text{ ml dm}^{-3} \text{HCl}$. There are certain steps falls in the rates, which are considered due to the involvement of the water molecule as a secondary reaction partner. In addition, therate also starts lower due to the negative effect of ionic strength[15]. Therefore fair agreement between experimental and theoretical have been searched by introducing water activity parameters [16]. In this way both acid catalyzed and neutral rate levels are differentiated by the converted form proposed by Bronsted -Bjerrum [17].

$$K_{H^+} \cdot C_{H^+} = K_{H_0^+} \cdot C_{H^+} \exp.b_{H^+} \cdot \mu (a_{H_2O})^n$$

And its logarithmic form can be represented as below

$$5 + \log K_{H^+} \cdot C_{H^+} = 5 + \log K_{H_0^+} + \log C_{H^+} + b'_{H^+} \cdot \mu + n \log (a_{H_2O})$$

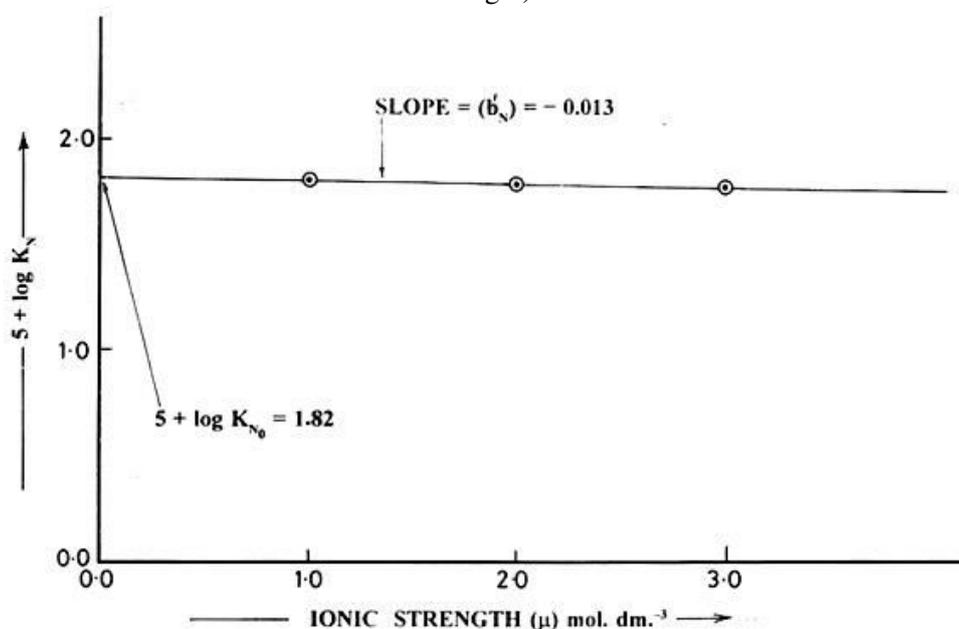
(Table 4) Calculated and observed level of hydrolysis of 4-Nitrophenyl phosphate at 97 ± 0.5 °C.

Table (4)

HCl	pH	$10^5 \cdot k_n$ ($\text{mol dm}^{-3} \text{min}^{-1}$)	$5 + \log K_n$	$10^5 \cdot k_n$ ($\text{mol dm}^{-3} \text{min}^{-1}$)	$10^5 \cdot k_n$ ($C_H \text{ mol.dm}^{-3} \text{min}^{-1}$)	$10^5 \cdot K_n$ ($\text{mol.dm}^{-3} \text{min}^{-1}$)	$10 \cdot K_e$ ($\text{mol.dm}^{-3} \text{min}^{-1}$) Calculated	$10^5 \cdot K_e \text{ mol.dm}^{-3} \text{min}^{-1}$ Observed
1.0	0.000	64.57	1.81	42.95	----	----	107.57	103.60
1.5	-0.176	63.09	1.80	58.27	----	----	121.36	116.28
2.0	-0.300	62.23	1.79	73.45	----	----	135.68	126.48
2.5	-0.397	61.30	1.78	85.01	----	----	146.31	141.66
3.0	-0.477	60.39	1.78	94.62	----	----	155.01	153.20
3.5	-0.544	59.49	1.77	102.21	----	----	161.70	163.07
4.0	-0.602	58.61	1.76	105.68	----	----	164.24	171.07
5.0	-0.699	56.88	1.75	115.88	56.75	27.86	84.61	88.67
6.0	-0.778	54.95	1.74	119.12	27.73	12.85	40.58	142.32

When $n = 0$ of 0.1 to 4.0 mol.dm^{-3} HCl and $n = 2, 3$ for 5.0 and 6.0 mol dm^{-3} HCl.

Figure – 4: Hydrolysis of Mono-4-Nitrophenyl Phosphate at 97 ± 0.5 °C (log specific neutral rate vs ionic strength)



Neutral values for high concentration are as follows

$K_N = K_{N_0} \cdot \exp.b_N \cdot \mu$ and its logarithmic form can be represented as :

$5 + \log K_N = 5 + \log K_{N_0} + b'_N \cdot \mu + n \log (a_{H_2O})$ where (a_{H_2O}) shows water activity and 'n' is an integer.

Table (5) summarizes the Arrhenius parameter of the mono ester at 3.0 and 5.0 mol dm^{-3} HCl. The value indicates the mechanistic similarity of these acids and also indicates the bimolecular nature of hydrolysis [18].

Table (5): Arrhenius parameters via conjugate acid species

HCl(mol.dm^{-3})	Activation Energy (Ea) (K.Cal.mol)	Frequency factor (A)	Entropy $-\Delta S^\ddagger$
3.0	18.76	3.07×10^6	31.27
5.0	18.35	3.99×10^6	30.75

Table (6) summarizes the comparative isokinetic rate data of some aryl phosphate compounds obtained from hydrolysis by P–O bond fission [19]. Figure (6) shows the isokinetic plot corresponding to comparative rate data of kinetics of the hydrolysis of mono-4-nitrophenyl phosphate [20]. The linear graph shows the similarity of the acid catalyzed mechanism of monoester hydrolysis [21]. On that fact this is worthwhile considering the

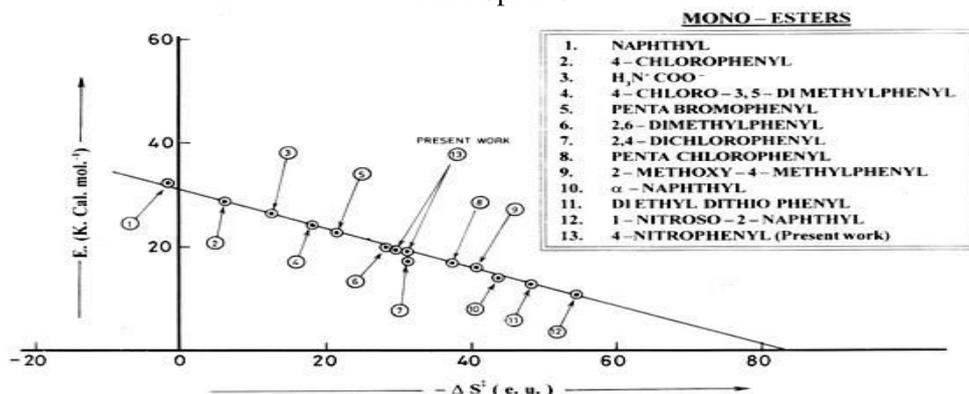
P-O bond fission of the current mono ester. In Table (6) comparing the specificity of the isokinetic data of hydrolysis of particular phosphate ester is summarized with their conjugate acid [22].

Table (6)

S.No	Phosphate mono ester	Activation energy	$-\Delta S^\ddagger$ (e.u)	Bond Fission
1.	Naphthyl	30.48	-1.76	P-O
2.	4-Chlorophenyl	28.46	5.57	P-O
3.	H ₃ N ⁺ COO ⁻	26.00	12.23	P-O
4.	4-Chloro-3,5 Phenyl Diethyl	23.79	17.75	P-O
5.	Pentabromophenyl	22.42	21.56	P-O
6.	2,6- dimethylphenyl	19.67	29.17	P-O
7.	2,4-Dichlorophenyl	16.67	31.30	P-O
8.	Pentachlorophenyl	16.47	37.78	P-O
9.	2-Methoxy-4-methyl phenyl	15.10	41.00	P-O
10.	A Naphthyl	13.68	44.15	P-O
11.	Di-ethyl-dithiophenyl	12.36	48.54	P-O
12.	1-nitroso-2-naphthyl phenyl	10.49	49.76	P-O
13.	4-nitrophenyl Phosphate	18.76	31.27	P-O*
14.	4-nitrophenyl Phosphate	19.39	30.75	P-O*

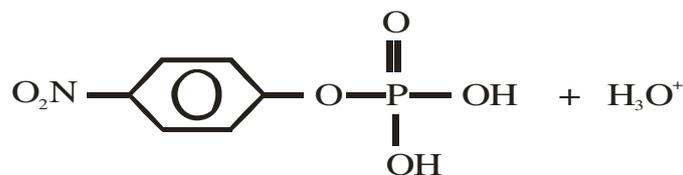
Here P-O* represent the present work.

Figure – 5: Isokinetic Relationship Plot for the Hydrolysis of some Phosphate Mono-Esters Via their Conjugate Acid Species

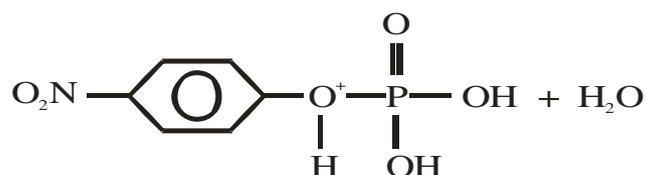
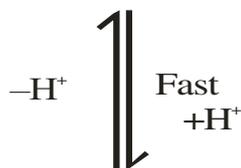


Thus hydrolysis method of mono-4-Nitrophenyl phosphate have different steps. The hydrolysis mechanism of mono-4-Nitrophenyl phosphate observed on the basis of the experimental rate data and all the above considerations of conjugate acid types can be made as follows:

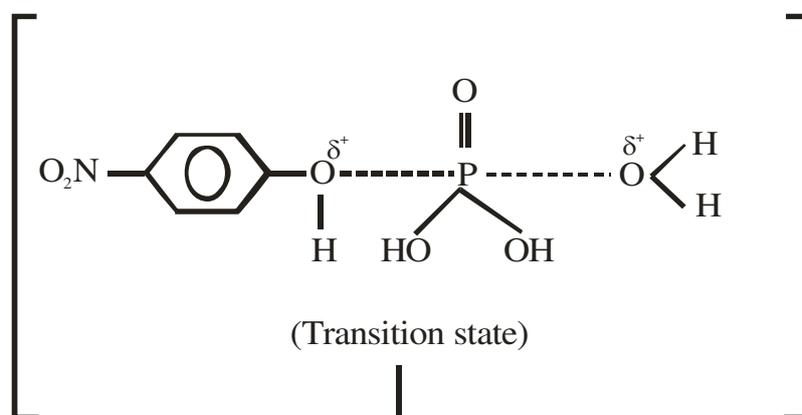
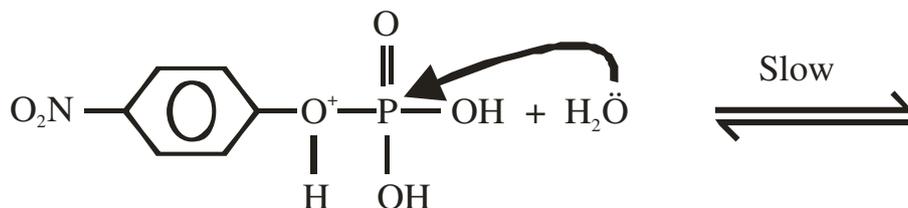
1) Formation of Conjugate Acid Species by Fast Pre Equilibrium Proton Transfer.



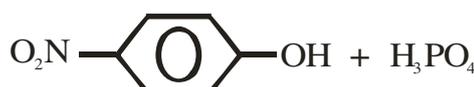
(Neutral Species)



2) Bimolecular nucleophilic attack of water on phosphate of conjugate acid species involving P-O bond fission.



(Transition state)



(Parent compound)

CONCLUSION

In the kinetic study of Mono-4-nitrophenol phosphate via conjugate acid species [23]. The experimental data proved that formation of conjugate acid species by the fast pre-equilibrium proton transfer [24] between conjugated and neutral species [25]. Both conjugate acid and neutral rate are accelerated by ionic strength from 1.0 to 4.0 mol.dm⁻³ HCl. A further increase of pH slowly decreases the rate. A bend in rate profile is due to water activity [26]. It is established that at higher acid concentration. The rate is mainly governed by conjugate acid species. As the rate of hydrolysis decreases with the increase of ionic strength, ionic strength effect is subjected to ionic retardation effect or negative salt effect [27].

The transition state formed by the attack of water is a slow step and rate determining [28]. Thus it is a bimolecular reaction. Hence it is a bimolecular change and as water is presented in excess its molar concentration does not change appreciably [29]. That is why the transformation is considered to be of 1st order reaction. This way the hydrolysis of 4-nitrophenyl phosphate ester via conjugate acid species is a pseudo-first order reaction (Bimolecular and first order) [30].

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Study on Service Quality of E-Banking

Vivek Kumar Tiwari and S. D. Sharma

Maharishi University of Information Technology, Lucknow, U.P. 226013, India

ABSTRACT

Mean and standard deviation in like manner were resolved to recognize the level of dispersing in the evaluation of customers. The results uncovered that with respect to financial execution, public region banks were better performers in credit-store extent and hypothesis store extent, while private region banks were ahead to the extent NPA the board, return on assets, return on esteem, net income edge and keeping up capital adequacy extent. Cost of stores of both the bank packs was found to be almost at standard. The delayed consequences of money related fuse deduced that private region banks were ahead in ATM invasion, Public region banks need to propel the use of check cards other than using it as an ATM card. In shopper faithfulness, convenient and web banking included concern for both public and private region banks. Private region bank customers were almost more joyful with feasibility, steadfastness and considerable quality pointers. Of course open region banks were savvy. Accessibility is at this point a question of stress for public region banks, however private region banks need to keep up better straightforwardness concerning demanding costs and charges on organizations.

Keywords: Banking, Economic, Administration

INTRODUCTION

Since the change of the financial area, the Indian financial area has created with the expanding accentuation on rivalry and innovation based administrations towards Universal Banking. The bank has carried out a financial center arrangement, organization hazard the executives and reengineering of business measures and arrived at social financial which has enrooted the presentation, usefulness and effectiveness of the Indian financial area. The change of the financial area in India was started in 1992 with one of the principle destinations as the reinforcing of Indian banks by expanding their usefulness, effectiveness and benefit. The headway of data innovation (IT) in the Indian financial area and other monetary middle people brings about the development and advancement of bank usefulness and productivity.

A huge improvement has been seen in the exhibition of monetary organizations and the assistance area while joining IT into their usefulness. (Leeladhar, 2006). The Indian financial industry is going through the time of modernisation and improvement. Mechanical changes happen, which can change the business. New guidelines and guidelines are propelling rivalry and decision for customers, while innovative progressions open new plans of action and way to deal with monetary establishments. Amidst this load of changes and development, it is significant for the business not to fail to remember those in danger of slacking and separated from monetary administrations, similar to those living in distant regions and low-pay nations.

As indicated by the focal point of monetary consideration, just 24% of individuals in low-pay nations have financial balances, contrasted with 89% of major league salary nations. This paper will offer a nitty gritty gander at the development of ATM as a conveyance channel of the Indian financial industry. As the most strongly utilized client contact direct in retail banking, the ATM is a significant touchpoint. The most recent ATM advancement offers monetary organizations freedoms to change ATMs from cash gadgets to buyer relations the board instruments, assist with expanding unwaveringness among all shoppers, particularly the individuals who are only utilizing ATMs. Self-administration conveyance channels, for example, ATMs assist with decreasing expenses by moving exchanges from branch clerks to ATMs.

In one enormous bank, office workers spend a normal of 60% of their experience on exchanges, organization, and low-esteem worth time. Eliminating numerous tellers from branches and supplanting it with a full usefulness ATM will permit this bank to wipe out 15% branch staff and move it to the action of high-esteem counsels. (Bain capital, 2012) The motorization of stores has gotten one of the quickest developing new financial advances. It offers buyers of cutting edge usefulness and the advantages they need, and permit monetary organizations to reduce expenses while they keep up with or increment their customer base. As per the investigation of pinnacle gatherings, programmed stores at ATMs can likewise lessen the store preparing costs by 65%. Albeit the ATM's center usefulness stays immaculate since first experience with very nearly forty years prior, the most recent mechanical progressions give ATMs another life and give critical freedoms to monetary foundations to change the part of ATMs in shopper cooperation significantly. To keep an upper hand, it is fundamental to have a refreshed ATM network with current innovation and usefulness. Refreshing

hardware additionally ensures your assent with Government and Industrial Regulations. ATMs are a demonstrated, moderate way for monetary establishments to work on their signs and cut expenses related with offering types of assistance in the branch.

DEVELOPMENT OF E-BANKING

Shopper faithfulness should be the extent of how things and organizations given by any affiliation meet the supposition for a customer. The viability of the monetary region depends upon how it passes on the organizations to its customers. To make due in this genuine environment, it is huge for banks to offer speedy and compelling kinds of help to its customers. People working in banks are the underlying ones to consider the specific necessities of the customer and go probably as an expansion between the bank and customer. In the present genuine environment it's anything but a test for especially open region banks to keep hold of the current customers and attract new ones (Bhatt, 1990).

In any case, even ensuing to offering adequate extent of organizations there exists an opening between the organizations given by the banks and the suppositions for the customers. In this speedy changing circumstance it is huge that banks go for customer division and give reliable, free, reasonable appraisal and altered treatment that customers by and by expect. Considering the growing contention among banks the buyer dedication's will go probably as a sole isolating segment to stay around here (The Hindu, 2012). The chance of customer dependability is a speculative thought with the state of satisfaction contrasting from one individual to another and organization to help; as the state of satisfaction depends upon the both mental and real factors (Kanojia and Yadav, 2012).

The above discussion and various assessments show that the private and public region banks have acquired basic ground during the change time period. All the while, in the current circumstance Indian monetary system is going up against gigantic troubles and solidified contention due to movement of development. The genuine person has furthermore been progressed by empowering the entry of new banks in addition. From now on, it was accepted to be fundamental to consider the financial show of private and public region banks versus the new developments and besides to appreciate the parts which choose the money related presentation of the banks. It has been brought out by various examinations that there have been upgrades in actual resources in monetary region over the earlier years. In any case, not all sections of the overall population are getting benefitted by this and accordingly looking at the financial completeness obtains importance. Thus, money related exhaustiveness was taken as an objective to address such requests in this assessment. In like manner, to keep the energy on and to make due in the strong genuine environment and keep the customer satisfied, it is expected to perseveringly further develop the organizations provided for its customers. It had been uncovered that 5% rising in customer support can fabricate advantages of the banks by 35%. Thusly, banks have been reliably endeavoring to hold the customers and to extend its slice of the pie (Chothani et.al. 2004). Thusly, the issue of buyer unwaveringness with respect to the organizations given by open and private region banks has in like manner been tended to in this investigation. Against this setting, a close to write about execution of private and public region banks in India was driven with following as the specific objectives of the examination.

WHY E-BANKING IS IMPORTANT

Understanding E-banking is huge for a couple of accomplices, not least of which is the leaders of banking related relationship, since it urges them to get varying benefits from it. The Internet as a station for organizations transport is from an overall perspective not exactly equivalent to various stations, for instance, branch associations, telephone banking or Automated Teller Machines (ATMs). As such, it raises exceptional kinds of troubles and requires innovative courses of action.

"E-banking generally pulls in conspicuous customers with higher than ordinary compensation and tutoring levels, which helps with growing the size of revenue sources. For a retail bank, E-banking customers are consequently uncommonly convincing, and such customers are most likely going to have a greater fame for banking things. Most of them are using on the web channels regularly for a collection of purposes, and for some there is no prerequisite for typical individual contacts with the bank's office network which is an expensive channel for banks to run".

Some investigation suggests that adding the Internet transport channel to a current course of action of organization movement coordinates achieves non-minor developments in bank efficiency (Young (2007). These extra salaries basically come from increases in non-interest pay from organization charges on store/current records. These customers also will overall be of major association compensation laborers with more conspicuous advantage potential.

Extended livelihoods as a result of offering e channels are routinely point by point, considering possible extensions in the amount of customers, support of existing customers, and deliberately pitching openings. Whether or not these wages are adequate for reasonable Return on Investment (ROI) from these channels is a persistent conversation". It has moreover allowed banks to expand their value creation works out. E-banking has changed the standard retail banking strategy according to various perspectives, for example by making it serviceable for banks to allow the creation and movement of money related organizations to be detached into different associations. This suggests that banks can sell and manage organizations offered by various banks (often new banks) to extend their salaries. This is an especially engaging chances for more humble keeps cash with a limited thing range.

OBJECTIVES

1. To recognize the opening between suspicions for customers and certifiable organizations offered by banks
2. To evaluate the ATM Services given by Public and Private Sector Banks in India.
3. To introduce critical recommendations to impel ATM organization of both public and private region banks.

REVIEW LITERATURE

Warning gathering on the Financial System (1991) named by the GOI (Narasimham Committee) in 1991 investigated the expense sythesis and ampleness of the capital design of money related foundations and worked on the pieces of various types of financial associations in a money related structure. Warning gathering proposed capital adequacy principles, prudential guidelines for cash affirmation, provisioning for horrendous commitments, straightforwardness of bank financial records and liberal branch approving procedure as ways to deal with further develop usefulness and ampleness of the system.

Kaushik (1995) in his hypothesis named, "Social objections and efficiency of Indian banks," attempted to ponder the effect of social obligation on advantage of Indian Banking Industry. Distinctive genuine strategies like extent examination, yearly advancement rates, backslide assessment, and relationship assessment were used to consider the consequences of social responsibilities on bank's efficiency. Further, advantage of Indian banks was assessed using various procedures like degree of working resources, complete business and total stores, while gainfully was chosen by discovering credits per delegate, stores per laborer, hard and fast business per agent, stores per branch, progresses per branch and full scale business per branch. It was assumed that social factors are not liable for any change in advantage of the Indian business banks.

Thomas (1995) in his suggestion named "Execution Effectiveness of Nationalized Banks – A Case Study of Syndicate Bank" separated the introduction of Syndicate Bank for a period of quite a while from 1984 to 1994 using EMEE model. Execution practicality was focused on various perspectives like development and advancement of banking industry, change in capital adequacy, asset quality, advantage, productivity, social banking and customer help. In the wake of concentrating all viewpoints and differentiating the show ampleness of Syndicate Bank with other nationalized banks, it was found that five nationalized banks exhibited low prosperity execution, seven demonstrated low need execution and other eleven demonstrated low capability in connection with Syndicate Bank.

Das (1997) in his examination on "Assessment of Productivity, Efficiency and its Decomposition in Indian Banking Industry", dissected the wellness of 65 business banks using cross region data for year 1995. On analyzing the data it was found that Indian banks are truth be told handy and there are no basic differences in adequacy extents of public and private banks isolated from the size of capability.

Athma (1997) in his proposition, "Execution of Public Sector Commercial Banks – A Case Study of State Bank of Hyderabad," thought about the presentation of State Bank of Hyderabad (SBH) from year 1980 to 1994. The examination was coordinated ward on the limits like advances, store get together, credit-store extent, premium spread, delegate productivity, advantage to working resources and customer organizations, etc It was assumed that the advantages of bank showed a rising example, addressing more than a proportionate climb in spread interestingly with inconvenience. Further it was viewed as that abatement in working cost was the away from for growing productivity of banks.

Subramanian et.al, (2001) in their book named "Functional Efficiency of Banks – Banking in India in the New Millennium; Issues Challenges and Strategies", uncovered that Bank of Baroda from public region banks and Indus land from private region banks showed most vital working advantage per bank agent, while wide assortment usefulness was found in among nationalized banks.

Bisht et.al, (2002) pondered the impact of movement on the Indian monetary region. They were of the view that normal monetary system is a consequence of three critical stages for instance before nationalization, after nationalization and post movement. After the beginning of web, gigantic essential changes, for instance, show of electronic transport channels instead of actual branches had given more options in contrast to the customers. The quantum hop in development had changed the norms of the game. It was deduced that in case Indian PSBs need to suffer, by then they need to unite the new development to work in everyday capability, effectiveness and usefulness.

Das and Lal (2002) essentially evaluated the Lead Bank Scheme in the light of Banking Sector changes. It was revealed that rising Non-performing assets (NPAs), over staff, low advantage and standard techniques for exercises had been one the reasons behind low capability of banks. Study uncovered that to get by in the resistance it is necessary that monetary region should be changed by the creating need of customers. It was similarly communicated that natural zones should be covered so a steadily expanding number of people can go under the umbrella of banking.

Patak (2003) endeavored to study and consider the money related show of private region banks from year 1996-97 to 2000-01 using four critical limits for instance financial capability, functional sufficiency, advantage and benefit. IndusInd Bank, HDFC Bank, ICICI Bank and UTI Bank were picked as the case of the assessment to measure the money related show of banks. In the wake of analyzing it was set up that working of banks was adequate in any case HDFC Bank emerged as the top performer followed by ICICI Bank.

RESEARCH METHEDODOLOGY

Other than Cash Withdrawal and Balance Inquiry trades, before long, NFS supports other Value Added Services (VAS) like Pin Change and Mini Statement through the ATMs. There are plans to extend the VAS, for instance, Card-to-Card Transfer, Check Book Request, Statement Request, etc through the ATMs. For all intents and purposes every one of the ATMS in the country are fundamental for NPCIS public financial switch (NFS) network which supports directing of ATM trades through cover accessibility between the Bank's structures, therefore engaging the ATM/charge cardholders of the country to utilize the organizations in any ATM of a related bank.

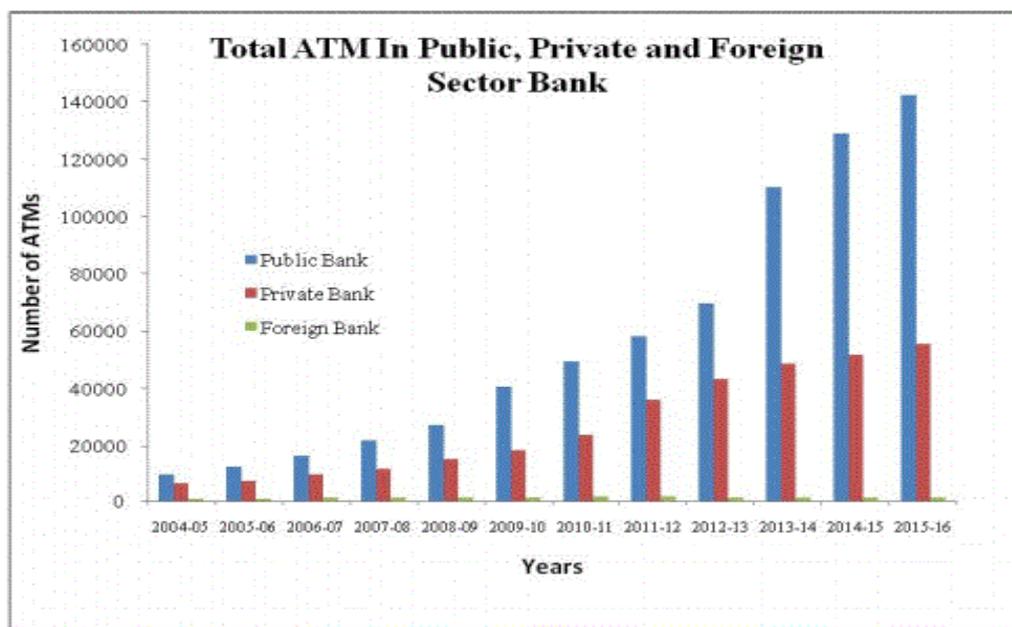


Chart show the comparative turn of events and headway of ATM banking in open region bank, private region banks and new region banks from 2004-05 to 2015-16. Average improvement of public region during the period is 26% and 22.5 % is in private region .On the other hand new region banks have recently 3.3% ordinary advancement rate . ATMs foundation of public Sector banks and Private Banks is creating with a catalyst rate yet new region banks didn't show their display exactly as expected in a decades prior. Their improvement of e-banking assignments foundation part is very moderate, believe it or not there has been 8.8% typical negative advancement rate moreover during the latest four years for instance from 2012 to 2016 in new region. Public and private region banks are endeavoring to get in new customers through huge number of engaging plans and besides advancing endeavors toward the way to help old customers also.

CONCLUSION

The most recent technique is in the utilization of charge/ATM cards in all handling stages regardless of the retail banks. At the end of the day a solitary credit/charge/ATM card can be utilized in any of the ATM machine with no handling or exchange expense. Retail banks received the procedure of reinforcing the online contributions by carrying out new direct net highlights and furthermore incorporating the fresher and the conventional deals channels for the customers who are technically knowledgeable and utilize the web for their exchanges and managing in the banks. Retail banks embrace the methodology of expanding their item infiltration to the current customers in the conventional market while for the metropolitan or metro markets, expanding the circulation and selling of particular business items to business clients is centered more. Numerous banks center around those business sectors that furnish them with the best blend market development and target customers fixation.

The wide goals of the exploration were to discover the similarity among objective and Service Quality of Retail Banking in India. The investigation additionally pointed toward discovering the hole in view of clients on the Service Quality Dimension between Public Sector Banks and Private Sector Banks. The speculations developed have been tried through the review directed to evoke the impression of clients on the Service Quality measurement (Tangibles, Reliability, Responsiveness, Assurance and ATM Service Quality) between Public Sector Banks and Private Sector Banks. The investigation of the information gathered through the overview has not many positive outcomes and affirmed the speculation of the examination.

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A Study on Bank Nationalization Era

Vivek Kumar Tiwari and S. D. Sharma

Maharishi University of Information Technology, Lucknow, U.P. 226013, India

ABSTRACT

The current examination has been coordinated to analyze close to money related execution and financial extensiveness of public and private region banks. The examination moreover took apart relative shopper faithfulness levels of public and private region banks. The assessment of money related execution breadth of picked bank bundles was done dependent on discretionary data accumulated over 10 years (2005-06 to 2014-15), since the legitimate start of financial thoroughness in 2005-06. Diverse quantifiable systems like rate procedure, aggregated yearly improvement rate and extent examination were applied to study and take a gander at the money related show and breadth of picked bank social occasions. To obtain a comprehension into the level of shopper unwaveringness as to organizations given by open and private region banks. An illustration of 900 customers from three northern district states for instance Punjab, Haryana and Himachal Pradesh was picked for fundamental survey. A particularly coordinated survey was used to assemble the data. Customer devotion was focused dependent on various limits like feasibility, receptiveness, cost, impacts, constancy and compassion. Connection between the picked limits and monetary factors for instance age, sex, enlightening ability, occupation, yearly compensation and district was considered using chi square test.

Keywords: Banking, Nationalization, Monetary, Administration

INTRODUCTION

Banking structure accepts a critical part in working of the current monetary world. The advancement of trade and industry, which contributes basically towards in everyday financial turn of events, depends earnestly on the smooth movement of money through banks. The presence of amazing monetary structure thusly is basic for the money related progression of a country; and the Indian monetary advancement story bounteously includes the significance of a sound monetary system.

Stream of money or banking is reflected in references available in our old holy messages. The issue of money crediting was extremely typical during the Vedic time span and during the hour of Mughal period local financial backers accepted a fundamental occupation by advancing money for progressing new trade and business. Further, the vendors of East India Company set up their own association houses at the ports of Bombay, Calcutta and Madras (by and by Mumbai, Kolkata and Chennai independently) in seventeenth century to perform trade and exchange works out, under which they similarly carried on the monetary associations.

NATIONALIZATION ERA

A critical development to control banking structure happened in 1948, when the RBI was nationalized and transformed into the establishment totally moved by the GOI. Further, the Banking Regulation Act was passed during 1949 which brought RBI vigorously affected by the public power and vested it with wide extent of powers to coordinate and supervise business banks. Under this Act, it was ensured that none of the banks can open another branch and no new bank can be set up without due approval and grant from RBI.

Further, with an objective of extending banking organizations, especially into commonplace regions, the Imperial Bank of India was nationalized and was renamed as State Bank of India (SBI) in 1955. This bank was offered powers to function as the essential representative to keep control over the monetary trades all through the country and offer wide extent of organizations to nation and semi-metropolitan locales. As the objective was augmentation of the bank, hence seven unique banks which were significant for illustrious states were nationalized and made helpers of the State Bank of India. From that point, as the solicitations of need regions, restricted extension adventures (SSIs) were not being fulfilled, the GOI by passing a rule nationalized other fourteen essential business banks on July 19, 1969. From 1969 to 1979, the 14 nationalized banks opened a bigger number of than 21 thousand new bank working environments raising the number from 8262 to 30202 independently.

Thusly, six additional business banks were given nationalized status in 1980 and before the completion of 1980 about 80% of the banks were vigorously affected by the public position. The fundamental place of bank nationalization was to offer need to meeting the credit requirements of the borrowers from in invert region, restricted degree organizations, and agriculture and admission region. The crediting objective of 33.3% of supreme advances was described for need region crediting. All through the length from 1969-1984, banks gave

colossal number of organizations to its customers in country zones and set forth expansive endeavors to spread bank workplaces for enacting the stores of customers and advancing it to borrowers from more delicate fragment of the overall population.

After the second time of nationalization the public authority of India had the control more than 91% of the monetary business of the country. The banks were as of now fit for serving the tremendous section of the people for monetary improvement of the country Nationalization of banks happened into the thorough program of branch augmentation, opening of saving records and need region advancing. Banking region showed basic results during the seventies and eighties in accomplishing the objections set by the public position. Nationalized banks were working in less genuine environment, with very few private and new banks around then, at that point, and in this manner, during late eighties, social banking and customer support transformed into the issue of stress in view of the un-caring mindset of bank staff and ordinary method of working of the banks. Long queues at bank counters, delay inside legitimate cutoff points opportunity, and non-openness of designs were similarly a bit of the issues which constantly lamented the customers. Also, the banks were crediting to advantaged class for social banking, instead of helping the under-uncommon

During late eighties the portion of stores with nationalized banks began declining; till 1984 the nationalized banks had a portion of 63.30% of all out stores, which dropped down to 62.75% by March 31st 1991 Besides, some inner just as outer requirements of banks prompted low operational effectiveness, lacking capital base, increment in NPAs, decline in benefits and unacceptable client care. The suggestions made by Narsimham Committee in 1991, featured that Indian business banks were burdened with huge measure of NPAs and accordingly banks went monetarily powerless. Accentuation on need area loaning, bank office development, increment in foundation costs, decline in non-premium pay and store arrangement were some different elements which influenced the productivity of nationalized banks The RBI took a few measures to guarantee security and consistency of banks and urged them to assume a lead job in quickening the financial development.

CHANGE ERA

As to settings, Narasimham Committee-I introduced money related and financial region changes in 1991 with an expect to make Indian monetary region more capable, strong and enthusiastic. The vital change measures recommended by the Committee changed the appearance and potential outcomes of banking industry. The time period between 1992-97 saw different change gauges like reduction for conceivable later use necessities, capital sufficiency norms, and freedom of advance expenses, further developing earnestness and invigorating of bank the board.

In 1993, the public position offered licenses to seven new private region banks to propel the spirit of competition and to widen the scope of banking in until recently stayed away from regions. The recognizable among these banks were ICICI (Industrial Credit and Investment Corporation of India), GTB (Global Trust Bank), HDFC (Housing Development Finance Corporation) and IDBI (Industrial Development Bank of India) bank (Gauba, 2012). This development and speedy improvement in Indian economy reestablished the monetary plan of the country. The critical provider towards this advancement was the monetary region; all region banks specifically open region banks, private region banks and new banks. Despite 27 public region banks, 24 new private region banks were added during 1993-1998. The total of business banks, banishing RRBs extended from 75 of each 1992 to 99 out of 1998 (Malli, 2011). Private region banks, which were broadly known as New Generation all around educated banks, made monetary more genuine and customer cheerful. Improvement of these banks brought public region banks out of vanity and made them more genuine (Vohra, 2011). Public region banks were unparalleled in case of customer dedication, picture and customer heading, while new private region banks were seen as more customer neighborly.

Progression and globalization of the Indian economy, concerning addition in the section of new banks and private region banks opened new vistas for the improvement of banking structure in the country (Anita and Singh, 2013). Despite of reformist developments, in the wake of banking region changes and section of actually learned banks, gigantic degrees of mistreated were at this point restricted from formal money related organizations net. Keeping in see the present circumstance it had gotten essential for banks to work for holding the current customer base and work on the level of credit movement structure for updating the force of financial thought. Since opportunity the public power had been taking various measures to expand banking in natural and unbanked domains to hinder people getting from private money advance subject matter experts. Social monetary game plans were made to move the point of convergence of business banks from specific banking to mass keeping money with the fixation to develop new bank workplaces and spread monetary workplaces to consolidate the unbanked into banking. In 2005, the Reserve Bank of India, with the powerful pilot project in affiliation district of Pondicherry, formally introduced the game plan of financial thought. Mangalam town was

the main town in Quite some time to get an opportunity to have every single monetary office. Despite this RBI released up KYC (Know Your Customer) norms for the customers to open record with yearly store of under '0.05 million While inspecting financial fuse, the Rangarajan Committee (2008) recognized venture reserves, progresses, assurance, recognize, and portions as the parts which choosing money related completeness.

CURRENT SCENARIO

As of now, banking in India is truly completely mature to give wide thing arrive at a great deal; in spite of the way that the extension in specific spaces of provincial India is at this point a test for the private region and new banks. As of now in any occasion 80% of the business is at this point intensely affected by open region banks (Singh and Arora, 2011). Individuals overall and private region banks of India give expansive extent of banking organizations specifically opening a speculation account, web banking, yielding advances, selling assurance, giving stockpiling workplaces to moving money abroad thus. Each bank needs to work for satisfying the customers who come from different classes of the overall population. Since latest few decades, due to continuously genuine, drenched and staggering business environment, retail banks in various countries have accepted customer big-hearted perspectives to defeat any hindrance among bank and the customer.

The present moment, there are 93 booked business banks in India and these consolidate 27 public region banks, 20 private region banks and 46 new banks. Private region banks have around 19975 branches and around 51490 ATMs in the country. All through the time span enormous turn of events and achievements have been seen by present monetary plan of India. These have been attributed to the technique of expansion, re-affiliation, mix, and approach of web and specifically to the creative changes which have changed the complete circumstance. Wide exertion has been a striking achievement in Indian banking all through the past couple of many years. Banking is by and by not simply confined to metropolitan networks; rather the monetary organizations are coming to even the far off areas of the country. Banking organizations have moreover exhibited monster improvement by offering wide extent of organizations.

OBJECTIVES

1. To research the impact of different organizations given by ATM relying upon customers satisfaction.
2. To find the critical deterrents in ATM banking and to suggest restorative methodology measures.
3. To recognize the opening between presumptions for customers and real organizations offered by banks

REVIEW LITERATURE

Shetty (1978) in his assessment on "Execution of Commercial Banks since Nationalization of huge Banks-Promise and Reality" had included the level achieve by banks to achieve the objections chose during the nationalization of banks. It was assumed that design of stores remained unaltered and credit-store extent had shown no improvement over the period. Further, it was represented that common zones were disregarded for opening of new branches.

Divatia and Venkatechalam (1978) proposed to make a composite document by pondering functional usefulness and advantage of individual banks using factor assessment strategy. Complete 15 public region banks were considered using eighteen pointers of effectiveness, advantage and social targets. The pointers picked for the examination were parceled into effectiveness, social objectives and usefulness. The eventual outcomes of the assessment uncovered that basic differentiation was found similar to social responsibility, productivity and advantage.

Varghese (1983) took apart the advantages and usefulness of Commercial Banks in India for the period from year 1970 to 1971 using working results, working edges, improvement yield on assets and spread extents. The outcomes of the assessment uncovered that during the hour of study Statutory Liquidity Ratio (SLR) and Cash Reserve Ratio (CRR) necessities of both Indian and new bank bundles were found to be same. The immense yield differential between them gives a proof as for the declining proficiency of Indian banks. The examination contemplated that monetary course of action gauges taken by RBI influenced the advantages and usefulness of Indian business banks during mid 1970s.

Chakravarthy Committee (1985) while commenting on the functional capability of banks conveyed the view that the possibility of functional expertise of business banks in India is associated with various perspectives specifically cost usefulness, advantage, need region pushes, customer organizations, readiness of stores and credit association. The board additionally conveyed a need to introduce some part of significant worth contention among banks. The 'controlled contention' was recommended by the board in such way.

Chopra (1987) in her book named "Managing Profits, Profitability and Productivity in Public Sector Banking", analyzed about the changing examples in advantage of picked public region banks. It was referred to in the book that it is huge for banks to make frameworks for further developing advantage and moreover need to work for diminishing the costs for better benefit.

Ojha (1987) in his paper discussed the effectiveness and efficiency of public region banks in India. Resulting to pondering various markers of advantage and effectiveness the end was drawn in that with the addition productivity almost no change was found in the efficiency of banks, however Indian banks exhibited low productivity and advantage, when differentiated and International banks. It was suggested that more broad and multi-dimensional procedure ought to be embraced to overhaul effectiveness and usefulness.

RESEARCH METHODOLOGY

Benefit is a fundamental pointer of monetary execution and it shows association between the yield and the information sources used to make it (Bansal, 2010). Productivity of banking region, as raised earlier, is critical for financial advancement of a country. It is acknowledged that strong and productive monetary structure prompts faster money related turn of events (Singla, 2013). Disregarding the way that the monetary region has acquired extraordinary ground in impacts yet there still are troubles and banks would have to continually notice the same. Likewise, evaluation of execution has gotten critical for the banks since it helps in protecting the monetary exercises from the constant risk related with capital market (Hays et.al. 2009). Today, keeping an eye out for bank execution has gotten a supported subject for certain accomplices, for instance, customers, examiners and the general populace. Different financial markets are available to assess the money related show. Be that as it may, indisputably the main standards to choose the likeness and adequacy of a money related affiliation are distinctive extent gauges like credit store extent return on assets extent, net NPA to net advances extent, capital adequacy, asset quality, nature of the board, etc In this assessment the extent measures have been used. These rating are for the most part recognized for surveying execution of banks and other money related foundations.

In India, HSBC set the trend and set up the fundamental ATM machine in 1987 in Mumbai. Later new private region banks have begun to stand out in introducing ATMs unbelievably and the public region banks moreover pursued the foundation of ATMs wherever on the country. As one completion of August 2016 the hard and fast number of ATMs is 215,763 in the country. Public region Banks and State Bank bundle with around 144599 ATMs addressed 67% of the ATMs. The private region banks have 57198 ATMs addressing 26.5% of the ATMs and the 0.46% (1004) ATMs are passed on by new banks and balance 12962 (6%) are WLAs presented by NBFCs. Nearly 200 million trades are arranged every month in NFS, of which 75 % are cash withdrawal trades with a typical ticket size of Rs. 3,300/- . The harmony 25% trades are non money related trades.

"Other than Cash Withdrawal and Balance Inquiry trades, before long, NFS supports other Value Added Services (VAS) like Pin Change and Mini Statement through the ATMs. There are plans to grow the VAS, for instance, Card-to-Card Transfer, Check Book Request, Statement Request, etc through the ATMs. Basically every one of the ATMS in the country are fundamental for NPCI'S public financial switch (NFS) network which energizes controlling of ATM trades through cover accessibility between the Bank's systems, therefore enabling the ATM/charge cardholders of the country to utilize the organizations in any ATM of a related bank".

"Concerning/rules, simply banks were permitted by Reserve Bank of India (RBI) to set up Automated Teller Machines (ATMs) as widened movement channels till June 2012. Banks accepted a critical occupation in enabling ATM choice by customers and changing behavior frameworks in the space of individual banking. The interests in ATMs have been used for transport of a wide grouping of banking organizations to customers across the monetary business and stretched out the degree of banking to at whatever point, wherever banking through interoperable stages given by the supported common ATM Network Operators/Card Payment Network Operators. Though in June 2012, there had been very nearly 23-25 % year-on year advancement in the amount of ATMs (90,000+), their association had been predominantly in Tier I and II core interests. So there was a need to develop the compass of ATMs in Tier III to VI centers (request of centers as embraced under the Census of India 2011).

Notwithstanding the banks' leading undertakings toward this way, much ought to be done. In like manner, the RBI gave the principles on June, 20, 2012 to permit non-bank components melded in India under the Companies Act 1956, to set up, have and work ATMs in India. Non-bank components that mean setting up, asserting and working ATMs, would be started "White Label ATM Operators" (WLAO) and such ATMs are arranged "White Label ATMs" (WLAs). They give the monetary organizations to the customers of banks in India, taking into account the cards (charge/credit/paid early) gave by banks. The WLAO's work would be confined to getting of

trades of every one of banks' customers and subsequently they would need to set up specific accessibility with the current endorsed shared ATM Network Operators/Card Payment Network Operators".

DATA ANALYSIS

The first ATM was established in Quite a while by HSBC Bank in 1987, yet it was bound to metropolitan urban areas until 2000. The biggest number of clients was in huge urban communities, however the improvement of parts of new private area banks in little urban areas expanded the compass of the ATM. These days, people incline toward ATM exchanges as opposed to visiting a similar bank office..

Time period	Public				Private			
	No. Of Customers		Cumulative Value		No. Of Customers		Percentage	
	Value	%	Value	%	Value	%	Value	%
Above 10 years	11	7.33	11	7.33	13	8.67	13	8.67
10years	19	12.67	30	20	22	14.67	35	23.34
8 years	32	21.33	62	41.33	29	19.33	64	42.67
8 years	29	19.33	91	60.67	26	17.33	90	60
10 years	23	15.33	114	76.00	18	12.00	108	72
From 2 year	36	24.00	150	100	42	28.00	150	100

The above table shows from what time-frame ATMs are utilized by clients of public and private area banks. Throughout the most recent 10 years, just 20% of public area banks' clients have utilized ATM, while this figure is 23.34% in private area banks. Of each of the 24% of public area banks' clients and 28 percent of private area banks, the individuals who have begun utilizing ATMs in the previous two years are those.

CONCLUSION

The retail banking industry is confronting hardened contest and the current situation is that of natural selection. Every one of the banks are attempting to extend their client base and are fostering their own drawn out methodologies to remain on the lookout. To further develop the client administrations and relationship the executives a significant number of the retail banks adjust data innovation that has helped in incorporating and uniting banking activity. Contest in retail banking is expanding between the current players, from worldwide players and even from the new contestants. Retail banks should adapt to the opposition by offering astounding support through client direction for which can be accomplished through specialization.

Retail banks in India are planning specific and modified items remembering their client section. To have the option to up-sell and strategically pitch their items, retail banks need to keep a decent connection with their customer section. The customer portion is sorted by the area of retail banks too like the metropolitan and rustic regions. Methodologies are grown diversely for various portions. Retail banks execute fragment explicit channel systems to foster superior by relocating customers to practical direct channel. Another technique embraced by retail banks are the advancement of contact focus administrations and cycles for very good quality and low-end clients. Retail banks are expanding their strategically pitching and up-scaling exercises for private financial customers determined to build their client base and further develop their client connection. Item advancement is another procedure applied by retail banks. The diverse customer fragments are offered different administrations like protection or renting administrations.

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Education of Children with Disability in Uttar Pradesh

Alendra Tripathi and A. P. Bharti

School of Humanities & Arts, MUIT, Lucknow, India

ABSTRACT

Persons with disabilities are most marginalized and suffer from social deviance, stigma and social exclusion and oppression. As it is estimated that 600 million persons with disabilities are all over the world, while in India about 26.81 million persons with disabilities live. The prevalence of disability is increasing as globalization, liberalization and modern life style have promoted accidents rate causing impairments and disabilities. Disability has become a focused attention in the recent times with the rise in political activism and voluntarism at the international and national level and also increasing debate about the development of 'alternative' service programmes, particularly, community based rehabilitation. Against this backdrop, the present purports to examine the status of education of children with disability in Uttar Pradesh. The paper is based on secondary data and pertinent literature.

INTRODUCTION

As per Census 2011, there are 2.68 crore Persons with Disabilities in India who constitute 2.21 percent of the total population. Only six states have dedicated departments for disabled. The six states are Andhra Pradesh, Madhya Pradesh, Odisha, Rajasthan, Tamil Nadu and Uttar Pradesh. For the overall development, benefit and smooth operation of schemes made for inclusive growth and welfare of the persons (with disabilities) Empowerment of Persons with Disabilities Department was established on 20 September, 1995 by Government of Uttar Pradesh. As per 2011 census, In Uttar Pradesh the total number of Person with various disabilities was 41.36 lakh which is approximately 2.08 percent of total population of the state. These include persons with Seeing, Hearing, Speech, Movement, Mental Retardation, Mental Illness, Multiple Disability and any other disabilities. The Department in-keeping with its goals has established a network of schools catering to different categories of disability and age-group/literacy levels, residential hostels for students, establishment and operationalisation of Braille Press as well as a University meant primarily to serve the differently-abled segment (challenged students) of the society. It has taken various welfare measures such as shelter houses -cum-training centers for divyang destitute, skill development centers along with provisions of grants, pensions, aids and assistive devices/artificial limbs etc.

Education is the most effective vehicle for social and economic empowerment. In keeping with the spirit of Article 21A of the Constitution, the Fundamental Rights of Persons with Disabilities and the Guarantee of Education Act, 1995 as Section 26, children with disabilities up to the minimum age of 18 have been provided free and compulsory education. The Government of India is providing scholarships to students with disabilities to study at school level. The government will continue to support the scholarship and expand itself. Persons with disabilities will be given access to universities, technical institutes and other institutions of higher education to pursue higher and vocational courses with scholarship and fellowship facilities.

Children with disabilities are the most vulnerable group and require special attention: (i) ensure the right to care, safety and security for children with disabilities. (ii) ensuring the right to development with dignity and equality so as to create an enabling environment where children can exercise their rights, enjoy equal opportunities and full participation according to different circumstances; (iii) ensuring inclusion and effective access to education, health, vocational training with special rehabilitation services for children with disabilities; and (iv) ensure recognition of special needs and care as well as the right to development and protection of children with severe disabilities. Women with disabilities need protection against exploitation and exploitation. Special programs have been developed to provide education, employment and other rehabilitation services to women with disabilities keeping in mind their special needs. Individuals with disabilities, their families and care takers have to bear substantial additional expenses to facilitate activities of daily living, medical care, transportation, assistive devices, etc. Therefore, they need to provide social security in various ways. The Central Government is providing tax relief to persons with disabilities and their parents. State Governments / UTs Administrators have been providing unemployment allowance or disability pension. State governments have been encouraged to develop a comprehensive social security policy for persons with disabilities. Parents of severely disabled individuals with autism, cerebral palsy, mental disabilities, and many disabilities feel a sense of insecurity about the welfare of their wards after their deaths. The National Trust for Individuals with Autism, Cerebral Palsy, Mental Retardation and many disabilities is providing legal protectors through the Local Safety

Committee. They are also implementing a supported parent scheme to provide financial protection to the above severely disabled persons, who are destitute and abandoned by supporting the cost of guardianship. However, virtually no research work has been done on the employment of people with disabilities in public sectors, particularly in the Indian (Karna, 2008; Rungta, 2004; ILO, 2003; Mishra and Gupta, 2006; Mitra, and Sambamoorthi, 2008; World Bank, 2007; Abidi, 1999; Devi and Reddy, 2006); whereas in Western countries the situation is completely reversed. Burkhauser and Daly (2001) state that household income from incomes of disabled women and men declined during the 1990s. Although work can be more difficult due to a defect in itself, other factors also reduce employment rates for people with disabilities. These include lack of access to essential work space, imposed by public disability benefit programs (Bound & Burkhauser, 2000) and discrimination (Baldwin & Johnson, 1994). Those who have a low level of education are doubly disadvantaged and have been shown to have poor job prospects (Burkhauser et al., 1993). There may also be studies in a large number of countries that have shown that individuals with disabilities are less likely to be employed than non-disabled peers (Bames, 1991; Furrie and Coombs, 1990; Haveman et al, 1984; United Nations, 1990). A report (Neufeldt, Stoelting and Fraser, 1991) shows that a similar pattern occurs for self-employment. The social welfare model views disability as a medical deficiency in an individual that renders them unable to work or function in society in traditional ways. Disability is an excuse for work obligation and a ground for denial of employment. Exclusion of persons with disabilities is an inevitable natural consequence of medical realities. The rights-based model, on the other hand, sees disability as a reason for reform in mainstream institutions. It rejects the premise that social exclusion is an inevitable consequence of disability. Under this approach, persons with disabilities have historically been excluded from social institutions, because those institutions have failed to adapt to the needs of the disabled, even as they regularly adapt to the needs of others (Shapiro, 1993). Under the civil rights model, disability policy aims to reform mainstream social institutions, so as not to include individuals with disabilities, but exclude them. Furthermore, due to increasing contact with non-disabled majority people with disabilities, prejudice decreases (Waddington and Diller: 2001, cited in Kim England: 2003). Mishra, V. K. & Shyam, H. S. (2016) have studied on managing disability of persons with superior attributes - a few cases from India. Authors have highlighted in the study on the delivery of appropriate assistive technologies for ensuring long-term inclusive growth. Ashappa, R. & Gudagunti, R. (2014) have discussed on rehabilitation measures and various social welfare schemes for the physically challenged in Karnataka state.

EDUCATIONAL DEVELOPMENT

About half of disabled population was found belonging to the age group of 20-59 years. However, about 29 per cent disabled populations belong to child population i.e. less than 20 years. Thus, about 21 per cent PwD population was belonging to the higher age group i.e. above 60 years. Uttar Pradesh, Bihar, Maharashtra, West Bengal, Andhra Pradesh, Madhya Pradesh, Karnataka, Rajasthan, Odisha and Gujarat are the major states where large chunk of disabled children are living. Bihar, Meghalaya, Uttar Pradesh Dadra Nagar Haveli, Jharkhand, Manipur, Arunachal Pradesh Jammu and Kashmir, Madhya Pradesh and Assam constituted most of the children with disability in India. Children with disability not attending educational institutions are shown in Table 4. More than 1/4th disabled children are not attending educational institutions. This was found more pronouncing in Nagaland (39 per cent) followed by Assam (36 per cent), Meghalaya (35 per cent), Daman and Diu (34 per cent), Bihar (34 per cent) and Arunachal Pradesh (33 per cent). About 29 per cent disabled children are not attending educational institutions in Uttar Pradesh.

State government has established Sanket (government school for deaf and dumb) at Lucknow, Agra, Bareilly, Farrukhabad and Gorakhpur. In these schools, vocational education is being provided to deaf and dumb students besides providing education. The students whose parent's income is less than Rs. 1000 per month are also getting scholarship of Rs. 2000 per month besides residential facilities. Out of total residential capacity during 2017-18, about 67 per cent students were enrolled while about 3/4th students were found enrolled in non-residential schools against the capacity. State government has established Sparsh (government schools for blind boys and girls) at Lucknow, Gorakhpur, Banda, Saharanpur and Meerut. The enrolled students are also getting Rs. 2000 per month as scholarship besides free transport facility of non-residential school students. About 72 per cent students in residential schools and about 50 per cent students in non-residential schools against the capacity were found enrolled during 2017-18. Under Mamta Scheme for children with mental disability schools were setup by the state government at Lucknow and Allahabad. The children whose parent's income is less than Rs. 1000 per month, government is bearing Rs. 2000 per inmates for fooding and lodging per month. However, out of the capacity, only 39 students were found enrolled in residential schools during 2017-18. There has been drastic decline in the number of inmates during 2013-14 to 2017-18. Government has setup school for physically challenged boys at Lucknow and Pratapgarh. These schools provide free education upto high school. Government bears the cost of Rs. 2000 per month for food and lodging of enrolled students whose parent's

income is less than Rs. 1000 per month. In these schools, 64 per cent students were found enrolled against the capacity during 2017-18. The numbers of students have declined over the period of 2013-14 to 2017-18.

Government has established skill development centres for blind students at Lucknow, Gorakhpur and Banda. However, about 15 per cent students were found enrolled in the residential centres against the capacity during 2017-18. In non-residential centres no student was found enrolled. Government has set up multipurpose skill development centres at Meerut and Moradabad. However, only 36 students were found enrolled during 2017-18 against the capacity of 100 students. State government has set up shelter-cum-training centres for destitute mentally retarded students at Bareilly, Gorakhpur and Meerut. In these centres, 123 students were found enrolled against their capacity of 150 students during 2017-18.

State government has set up hostels for blind students to acquire higher education at Lucknow, Gorakhpur, Allahabad and Meerut. 6 hostels with the capacity of 200 students each are providing accommodation facility to the disabled children. During the financial year 2018-19, Rs. 2278.85 lakh were budgeted for the scheme. State government has also set up Amrawati Purushottam Multipurpose PwD Empowerment Institute at Varanasi. The Institute provides shelter-cum-training to the mentally challenged students. Similarly, state government has set up psychological development centre at BRD Medial College, Gorakhpur for rehabilitation of Japanese Encephalitis. During 2018-19, Rs. 21.53 lakh were budgeted. Bachpan Day Care Centres under Education for All Programme were set up by the state at Lucknow, Allahabad, Varanasi, Agra, Saharanpur, Jhansi, Bareilly and Gautam Buddha Nagar. During 2018-19, Rs. 332.8 lakh were budgeted for running of the Day Care Centres. Dr. Shakuntala Mishra National Rehabilitation University was set up by the state government. The university is providing higher education to students with disability as 50 per cent seats have been reserved for disabled students. There is provision of 9 Faculties and 29 Departments however, 21 Departments are functioning. During 2017-18, Rs. 4176.58 lakh for wages and other emergency expenses and Rs. 1030.52 lakh for capital expenditure were budgeted. Government has also budgeted Rs. 3591.58 lakh for salary and other emergency expenses and Rs. 630.41 lakh for capital expenditure were budgeted during 2018-19. Besides, state government has sanctioned Rs. 166.57 lakh and Rs. 974.84 lakh for construction of stadium and artificial limb and rehabilitation centre in university.

CONCLUSION

Persons with disabilities are most marginalized and suffer from social deviance, stigma and social exclusion and oppression. The prevalence of disability is increasing as globalization, liberalization and modern life style have promoted accidents rate causing impairments and disabilities. Though, efforts on the part of government agencies and non government agencies have been made to rehabilitate disabled, however in absence of a national policy on disabled, only a small proportion of disabled has got benefits from rehabilitation services and programmes. The majority of them are living in rural areas where awareness about government programmes and services is very low and thus they are deprived of such benefit. Moreover, poverty, illiteracy, malnutrition, poor health, drug abuse and alcoholism, diseases etc. are causing disabilities and impairments. About half of the disabilities and impairments are presentable therefore strategies and approaches to address them effectively and also to rehabilitate physically and mentally challenged persons are needed to our focused attention. With the change of time, there has been paradigm shifting towards addressing the problem of disability. There is more focus on empowerment and rehabilitation of physically and mentally challenged persons rather than welfare orientation. The analysis of physical and financial performance of various educational programmes and schemes shows that there has been remarkable progress in the state; however, there is dearth of funds and inadequate coverage of various schemes. The present amount of funds under various schemes is grossly inadequate while economic norms for availing the benefits under these schemes are also tough to achieve. The large number of applications of persons with disabilities is not being timely processed and forwarded to government of India for availing benefits under various educational and social development schemes.

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Antioxidant Activity Composition of Methanolic Extract of Various Parts of *Pluchea Lanceolata* by DPPH Assay

Kusum Soni* and Sangeeta Loonker

Department of Chemistry, Jai Narain Vyas University, Jodhpur, Rajasthan, India

ABSTRACT

Antioxidant activity and total phenolic content (TPC) of various medicinal plants (halophytes versus non-halophytes) typically used as herbal teas were examined in the search for natural antioxidant sources. Nutrients and phytochemical composition, particularly phenolic metabolites, were also evaluated in medicinal plants with increased antioxidant activity. *Pluchea lanceolata*'s antioxidant activity was substantially higher than that of synthetic antioxidants. The antioxidant activity of different parts of the plant *Pluchea lanceolata* was determined using the DPPH (2,2-diphenyl-1-picryl-hydrazyl-hydrate) test. The goal of this study was to find the best solvent for extracting *pluchea lanceolata* components and determining their antioxidant activity. *Pluchea Lanceolata* has a high antioxidant activity. The DPPH radical scavenging method was used to measure the antioxidant capability. For plant extraction, 80 percent methanol appeared to be the most successful among the solvents of various polarity and methanolic extract of all plant part were also obtaining using soxhlet apparatus. Extract were examined for primary and secondary metabolites, the antioxidant activity was determined using uv- visible spectrophotometer. Percentage radical scavenging activity and IC50 values were also calculated.

Keywords: DPPH (2, 2-diphenyl-1-picryl-hydrazyl-hydrate), Soxhlet Apparatus, *Pluchea Lanceolata*, Antioxidant Activity, % RSA (radical scavenging activity).

INTRODUCTION

Herbal / medicinal plant are gaining popularity day by day owing to their lesser side effects. Traditional herbal medicines can be prepared using a combination of plants, minerals, inorganic and organic substances.¹ These traditional herbal medicines have a broad spectrum of anti bacterial activity and have insignificant side effects .

Traditional herbal remedies are more extensively utilized now a days due to their lack of significant side effects, chemical variety, and a broad spectrum of antibacterial activity.² d.Plumchine, Sorghumal, boehmerol acetate, moretenol, taraxasterol, neolupenol, pluchioside, sesquiterpene, pluchiol, stigmasterol, quercetrin, and isorhamnetin are the active chemicals in *P. Lanceolata*.³ Cadmium chloride stimulates oxidative stress and extensive chromosomal damage, which is suppressed by a methanolic extract of entire plant parts of *P. Lanceolata*.⁴ The extract of *P. Lanceolata* reduces the oxidative stress caused by ferric nitrilotriacetate.⁵ By normalizing glutathione peroxidase levels in the brain of rats with ischemic hippocampus injury, a hydroalcoholic extract of *P. Lanceolata* rhizome can restore cognitive function.⁶ In indigenous medicine, all parts of the plant are used extensively. It is used to treat rheumatoid arthritis, neurological illnesses, sciatica, edema, bronchitis, dyspepsia, cough, psoriasis, and piles because it has anti-inflammatory and analgesic properties.⁷⁻¹⁰

The asteraceae family includes the medicinal herb *Pluchea Lanceolata*. It is a little woody shrub that grows to be 60-200 cm tall and is locally called rasna. *Pluchea Arabica*'s antioxidant capabilities were found to suppress the DPPH radical by 89-93 percent in a recent study. *Pluchea Arabica* fresh twigs were recently tested for key components such as -cadinol, caryophyllene.¹¹ The herb has been found to have a variety of traditional pharmaceutical applications. ^[12-19] Plant extracts or plant-derived antioxidant chemicals boost the antioxidant defence of the human body and are preferred over synthetic antioxidants due to their safety. As a result, recent research is focused on finding plants with antioxidant potential that can protect against a variety of illnesses.²⁰ Antimicrobial substances found in medicinal plants have been studied extensively, specially antibacterial, antioxidant, anticancer, anti-inflammatory, hypo-glycemic, and other properties, have been studied extensively.²¹⁻²⁶



Figure 1: Pluchea Lanceolata Plant



Figure 2: Pluchea Lanceolata Roots

MATERIAL AND METHOD

I. Collection of Plant Sample

A healthy and disease-free Plant of *P. Lanceolata* (leaf,stem,root) was collected from , Afri (Arid Forest Research Institute), Jodhpur, Rajasthan, India [2019] during the month of August and September. The leaves, root, and stem were cleaned, dried in the dark, then pulverized in a mechanical grinder before being sieved at 40 mesh and were stored in air tight containers. . The leaf, stem and root of *P. Lanceolata* powder were extracted with methanol (solvent) by Soxhlet apparatus at 60°C. The extracts were dried by rotary evaporator and concentrated using a concentrator. The extracted powder was stored in air-tight container at room temperature.

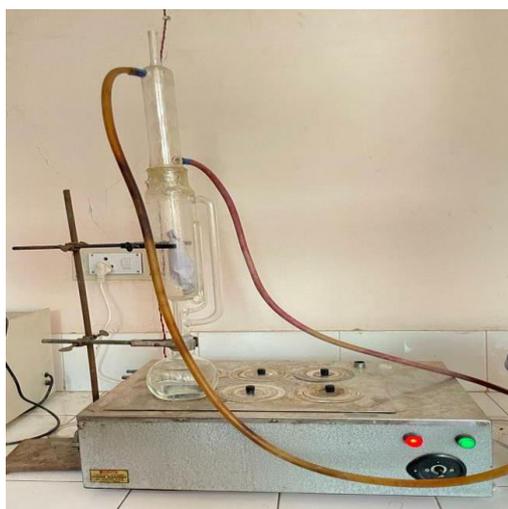


Figure 3: Soxhlet Apparatus

II. Chemicals Used

DPPH (2,2-diphenyl-1-picryl-hydrazyl) (MOLYCHEM, MUMBAI), Ascorbic acid (MOLYCHEM, MUMBAI), methanol were used. All chemicals were of A.R. Grade .

III. Estimation of Antioxidant Activity Using DPPH Via Free Radical Scavenging Activity:

The antioxidant activity in the methanolic extracts were determined by DPPH (2,2- diphenyl-1-picryl-hydrazyl) free radical scavenging activity (% RSA) . DPPH is a stable free radical with an odd electron in its structure that is commonly used in chemical analysis to determine radical scavenging action. The phenomena of free radical discoloration caused by neutralization of the plant extract was employed to estimate the activity.

METHOD

The dried samples of leaves, stem and root (20g) were extracted in 80 percent methanol at 60°C for 24 hours . The extracts were then utilized to make several dilutions in methanol, ranging from 50µg/ml to 600µg/ml concentrations. 3 ml of methanolic DPPH solution was added to 1 ml of each of the test samples (plant extracts), standard (ascorbic acid), and blank (methanol). The samples were then incubated at room temperature for 30 minutes.

Using a UV-visible spectrophotometer, the absorbance was measured at 517 nm. IC50 values were used to represent the results were express as ic50. The DPPH free scavenging activity was shown the decolourisation of the sample and is calculated using the formula given below .

$$\text{DPPH free radical scavenging activity (\% RSA)} = \frac{A_{\text{blank}} - A_{\text{test}}}{A_{\text{blank}}} \times 100$$

The ascorbic acid. Was used as positive control and ic50 values were calculated by plotting the % RSA of free radicals with the sample concentration.

RESULTS AND DISCUSSION

The DPPH free radical scavenging activity of the leaf, stem, and root of *Pluchea Lanceolata* are expressed in the table 1-4. The analysis of data shows that all plant part have different level of activity . leaf extract shows highest antioxidant behaviour . It is also observed (figure 4-7) that with increase in sample concentration antioxidant activity of various plant parts of *Pluchea Lanceolata* also increases.

The IC50 value is the concentration at which the % RSA value, i.e. the inhibition value, hits 50%. The lower IC50 value suggest that the analyte has a high antioxidant value. The IC50 values of *Pluchea Lanceolata* leaf, stem and root extract were found to be 397.03,654.922 and 755.9 µg/ml, respectively.

CONCLUSION

The data reveals that plant *Pluchea Lanceolata* leaf as high antioxidant activity in comparison to stem and root extract . it can be insert that the plant fine therapeutic use .

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S. No.	Concentration (ppm)	Absorbance (nm)	% RSA	IC50 value (µg/ml)
1	10	0.529	42.50	148.05
2	50	0.429	53.36	
3	100	0.399	56.63	
4	200	0.280	69.56	

5	300	0.268	70.86	
	Control	0.920		

Table 2: DPPH Radical Scavenging Assay of pluchea lanceolata leaves.

S. No.	Concentration (ppm)	Absorbance (nm)	%RSA	IC50 value (µg/ml)
1	50	0.596	35.21	397.03
2	100	0.543	40.97	
3	200	0.505	45.10	
4	300	0.487	47.06	
5	400	0.449	51.19	
6	600	0.410	55.43	
	Control	0.920		

Table 3: DPPH Radical Scavenging Assay of pluchea lanceolata stem

S. No.	Concentration (ppm)	Absorbance (nm)	% RSA	IC50 value (µg/ml)
1	50	0.672	26.95	654.96
2	100	0.605	34.23	
3	200	0.595	35.32	
4	300	0.547	40.54	
5	400	0.516	43.91	
6	600	0.498	45.86	
	Control	0.920		

Table 4: DPPH Radical Scavenging Assay of pluchea lanceolata root

S. No.	Concentration (ppm)	Absorbance (nm)	% RSA	IC50 value (µg/ml)
1	50	0.703	23.58	755.94
2	100	0.689	25.10	
3	200	0.640	30.43	
4	300	0.605	34.23	
5	400	0.587	36.19	
6	600	0.512	44.34	
	Control	0.920		

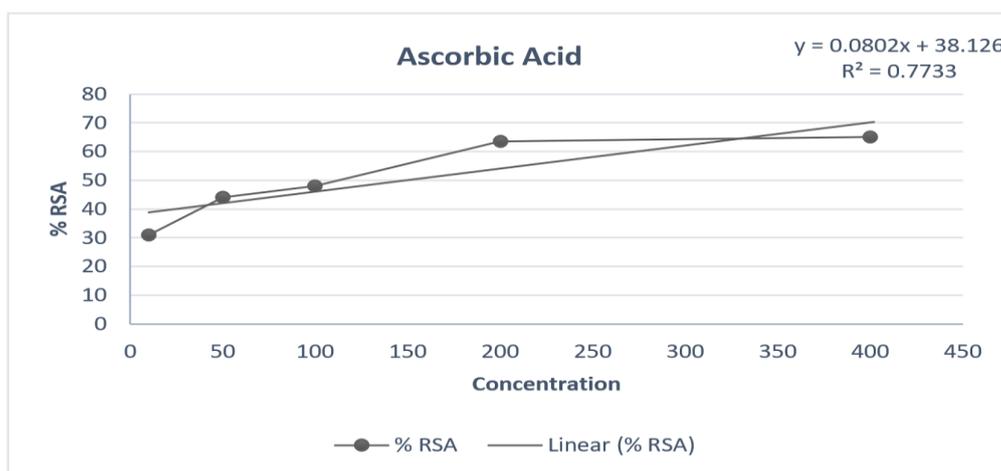


Figure 4: DPPH Radical Scavenging Assay of Ascorbic Acid.

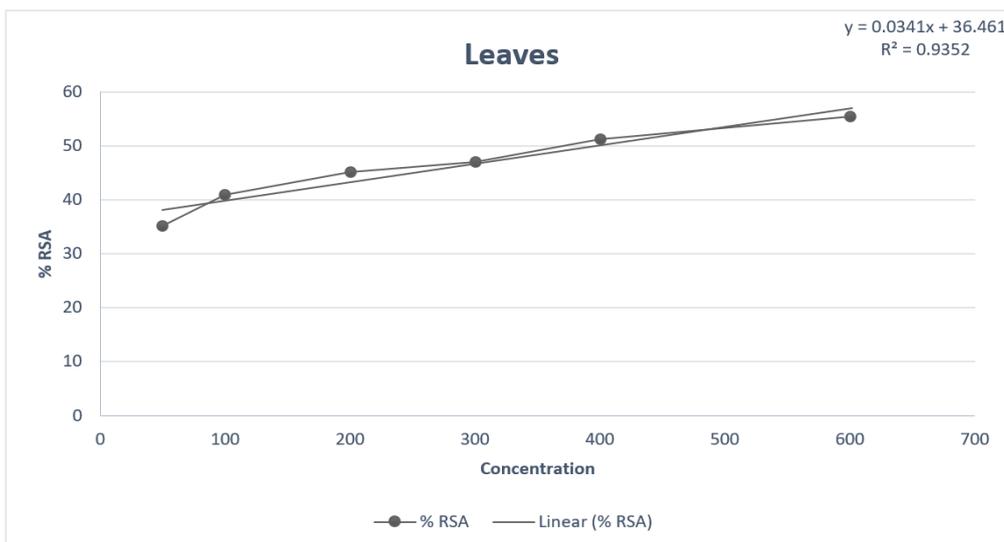


Figure 5: DPPH Radical Scavenging Assay of pluchea lanceolata leaves.

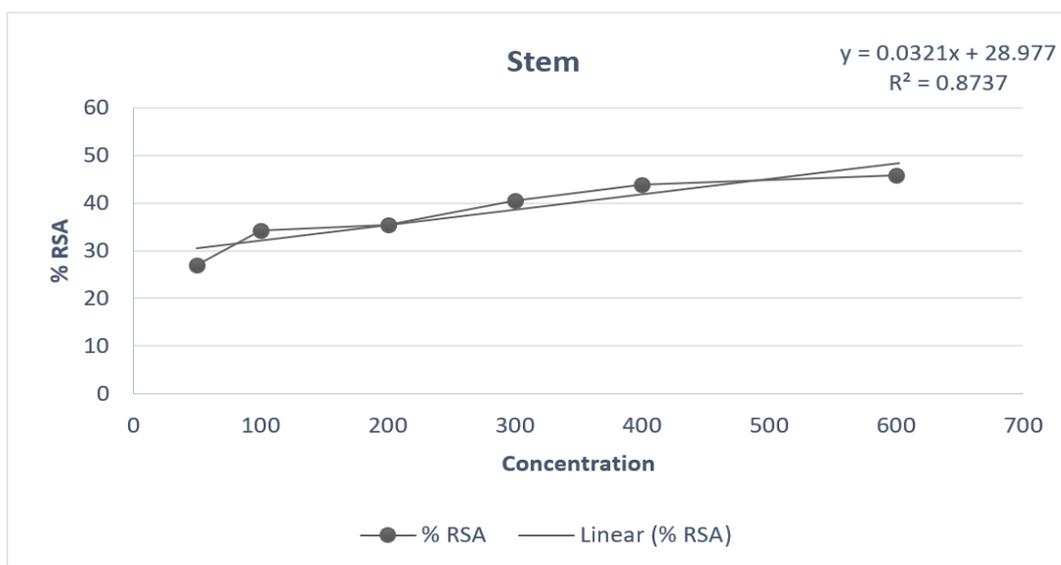


Figure 6: DPPH Radical Scavenging Assay of Pluchea lanceolata stem

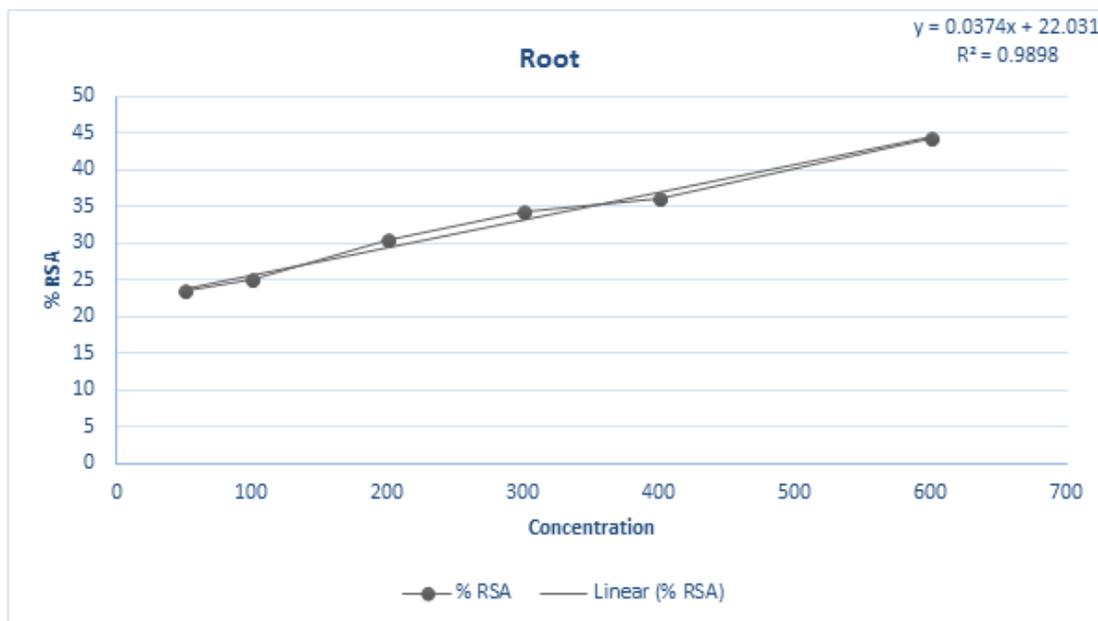


Figure 7: DPPH Radical Scavenging Assay of Pluchea lanceolata root

A Study on Investment Behavior of Women from Urban and Semi-Urban Society

Hardeep Kaur Mundra, Chintan Vora, Apoorv Bhiwandkar, Apoorva Nadkarni, Dhanraj Nikam and Rujuta Bhangaonkar

Vivekanand Business School, Mumbai, India

ABSTRACT

“A woman is the full circle. Within her is the power to save, invest and transform. According to current trends, this potential in our society is mainly untapped. In India, the woman is the family's principal source of savings. Women, on the general, prefer to have objectives that are focused on their families over goals that are focused on themselves (Dr.R. Sellapan,2013). Some negative stereotypes regarding women's financial ability persist, leading some women to assume they shouldn't make investing decisions for themselves. Some women delegate decision-making to their husbands so that they can handle their finances if they live longer than their wives.

The goal of this study was to investigate into the investment patterns of socially literate women in metropolitan and semi-urban areas, mainly those between the ages of 25 and 45. The study examines how much individuals are aware of it and how they are now investing in it.

To pick 250 women respondents from throughout India, simple random selection was utilized. The design employs a questionnaire as the primary data collection tool, allowing the researcher to extrapolate the findings to a larger population.

It was also discovered that women with little financial expertise are less likely to invest. Indian women's financial decisions are mainly made by their families, or by their spouses. Any investment decision made by women does not reflect their personal tastes, but rather is influenced by family members.

Keywords: Financial decision making in women, investment behaviour, women self-centric goals.

1. INTRODUCTION

In our country, the household sector is regarded as the most important source of savings. A common proverb regarding women says, "The hand that rocks the cradle commands the world." The data below demonstrates that women and men invest differently, with males making the majority of the decisions. Women have a lower risk tolerance and obtain a lower return on their investments than males (R.Harini,2021). Unlike in the past, when women's primary goal was to support their families, we discovered that women spend the majority of their leisure time watching television, using social media, browsing streaming platforms, online shopping, and pampering themselves.

Furthermore, the profile of women in terms of investment is evolving with time. However, they trail behind in a number of investment areas. As a result, a study is being done to assess their awareness of investment and various investment venues. When it comes to financial investments, women have traditionally been more hesitant. When it comes to money, they are more careful.

2. REVIEW OF LITERATURE

1.Amsaveni M & Nithyadevi M, (2018), Profitability was determined to be the most influencing element, followed by safety, liquidity, prestige, stability, transferability, and speculation, in a survey of 100 working women in Tripura district to discover their investing patterns and attitudes about investment outlets.

2. Kaur J & Arora N, (2018) analysed 150 investor answers in Punjab to determine how they feel about mutual funds as an investment alternative. Due to the better returns in growth fund schemes, investors preferred to invest in mutual funds. It was also discovered that each investor has his unique mutual fund investment objectives.

3. Jisha V G, (2017), the study looked into the perceptions of investing patterns among urban working women in Coimbatore and discovered the elements that influence savings and investment patterns. The findings demonstrated a link between factors impacting awareness and factors determining benefits. Investors prioritised the safety of their cash when making investments.

4.National Council of applied economic research (NCEA) (1961) “Urban saving survey” noticed that irrespective of occupation followed and education level and age attained, households in each group thought of saving for the future was desirable. It was discovered that the urge to save for old age was mostly motivated by the need to be prepared for emergencies.

5. Quantitative and qualitative research carried out in the UK indicates that attitudes to investment risk depend on factors such as personality, circumstances, educational attainment, level of financial knowledge and experience, and extent of financial product portfolio (Conquest Research Limited, 2004; Distribution Technology, 2005). Quantitative research carried out in the US identifies a similar range of factors, including income, wealth, age, marital status, gender and level of education (Finke and Huston, 2003).

6. However there exist some studies which deny the existence of any gender gap. For example Schubert et al. (1999) find no influence of gender on financial decisions. Masters and Meier (1988) found no difference in the risk taking propensity of male and female entrepreneurs.

7. Dr. N. Dharani Dr. M. Inbalakshmi, J. Murugapandi, (Investment Pattern of Working Women in Dindigul District, European academic research volume II issue 7, 2014 ISSN 2286-4822) The author of this study attempted to argue that in recent years, the success of every investment decision has grown increasingly significant. Making wise investment choices involves both knowledge and skill. Working women investors have distinct expectations from investments due to differences in their needs, such as savings, safety, interest, and capital appreciation. The association between elements determining the level of awareness of various investments and factors influencing the rewards was discovered by the researcher. When it comes to investing, investors say that the safety of their cash is their top priority. As a result, the government should give additional investor protection mechanisms, such as improved laws and regulations.

8. Dawar & Wadhwa (2011) in their study observed that generally men dominate when it comes to investments. Women are more cautious when it comes to investing since they have less awareness of the financial sector. Investment decisions, according to the studies, are communal decisions based on information and expertise obtained from a variety of sources (Bramabhatt et al. (2012).

9. Volpe, Chen, and Pavlicko (1996) Find out about the personal investment data of 454 students and how it relates to literacy levels in terms of investment and sex, academic regulation, and knowledge and experience. The researchers employed a questionnaire that included a wide range of investment subjects, including bond and mutual fund performance, financial advice, risk, tax planning, stock market valuation, business math, diversification, worldwide investing, and interest rates. They come to the conclusion that most college students lack knowledge and information regarding personal investment, specifically stock market valuation, global investing, the impact of interest rate changes, and tax calculation and planning. Female students knew much less about personal investing than male students, especially when it came to stock valuation, business mathematics, mutual fund success, and worldwide investing.

10. Grable and Lytton (1999) examine whether demographic factors would be good predictors of financial tolerance based on a university survey from 1997 that includes both teachers and staff. They claim that financial education is a key factor in establishing risk tolerance. They claimed that investors with a higher level of financial education took more risks.

11. Kim and Nofsinger (2007) Examine and analyse investors in Japan's markets, as well as their activities and results. They analyse market-level data to discover that investors own riskier and high book-to-market stocks, trade frequently, make poor investment selections, and buy current winners. Furthermore, these qualities appear to vary based on market ups and downs. They discovered that in a bull market, investors prefer high book-to-market equities, and in a bad market, investors prefer high beta stocks. City, India. The result of finding showed 60% investors were aware about the investment avenues whereas 40% were unaware

10. Sonali Patil (2014) studied preferred investment avenues among salaried people with reference to Pune City, India. A sample size of 40 investors has been taken from the Pune City, India. The result of finding showed 60% investors were aware about the investment avenues whereas 40% were unaware Sonali Patil (2014) studied preferred investment avenues among salaried people with reference to Pune City, India. A sample size of 40 investors has been taken from the Pune City, India. The result of finding showed 60% investors were aware about the investment avenues whereas 40% were unaware 9. V.R.Palanivelu & K.Chandrakumar (2013) examined the Investment choices of salaried class in Namakkal Taluk, Tamil Nādu, India with the help of 100 respondents as a sample size & it reveals that as per Income level of employees, invest in different avenues. Age factor is also important while doing investment

3. OBJECTIVE OF STUDY

- To study the intensity of inquisitiveness in women from the age group of 25-45 about financial situation of their family.

- To study the internal power of decision making after knowing the situation.
- To study the execution of the financial decision taken by the women individually.
- To study the pattern followed in the investment process by women.

4. LIMITATION OF STUDY

- The study is based on the perception of women only from the urban and semi urban society.
- The study mostly covers only the age group of 25-45.
- The focus of the study is more towards financially literate women.

5. RESEARCH METHODOLOGY

This research is both descriptive and analytical. To pick 250 women respondents from throughout India, simple random selection was utilized. A well-structured questionnaire was used to obtain the primary data. The design employs a questionnaire as the primary data collection tool, allowing the researcher to extrapolate the findings to a larger population. It aids in the collection of quantitative data that may then be analyzed via inferential statistics. The questionnaire is broken down into three sections: level of awareness, factors influencing investment decisions, and level of satisfaction.

The research begins by analyzing behavioral finance theories in general, and stock market theories, to gain a theoretical and conceptual backdrop, as well as empirical findings from previous studies, from which the research model and hypotheses are developed. After that, the interview and questionnaire questions are prepared (Mercy Silvester & Vijayakumar Gajenderan, 2020). Anova test, basic random sampling, regression, correlation, and graphing were all used in the study.

6. ANALYSIS OF DATA

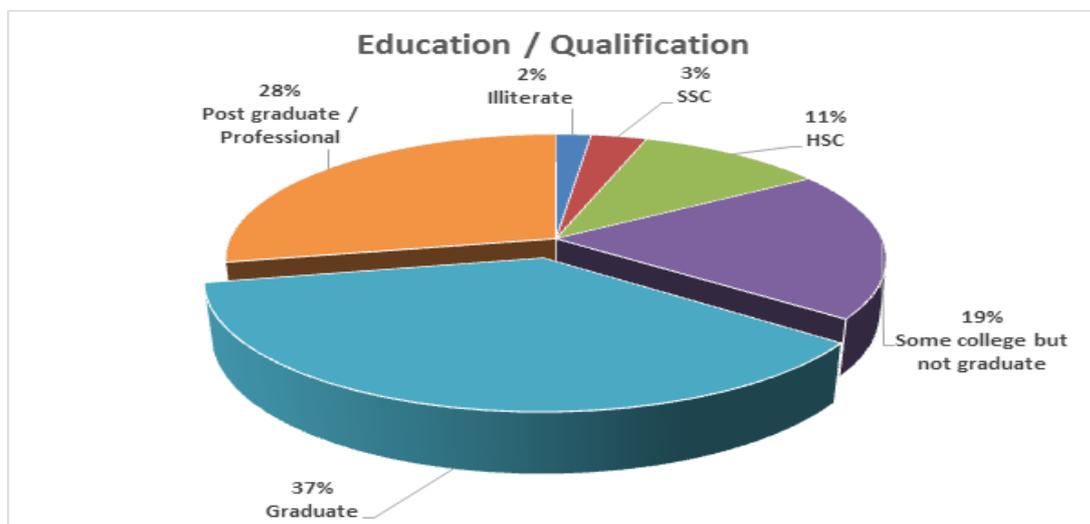
1. QUALIFICATION OF WOMEN

Table1: Qualification of women from urban and semi urban society.

Table 1

QUALIFICATION	COUNT	PERCENTAGE
Illiterate	5	2%
SSC	8	3%
HSC	27	11%
Some college but not graduate	48	19%
Graduate	92	37%
Postgraduate/professional	70	28%

Source-primary



INTERPRETATION

Table1. According to the data 37% are graduates, 28% women are postgraduate which also happens to be the highest qualification recorded from the data, while 2% of the women are illiterate.

From the above pie chart, it clearly depicts the educational qualification of the women.

Relationship between Financial Product and Actual Investment.

H0: There is no association between financial product knowledge and actual investment in women.

H1: There is association between financial product knowledge and actual investment in women.

For this purpose, of knowing whether there is any association between financial product and actual investment decision of women, regression analysis was conducted, and the result are discussed below

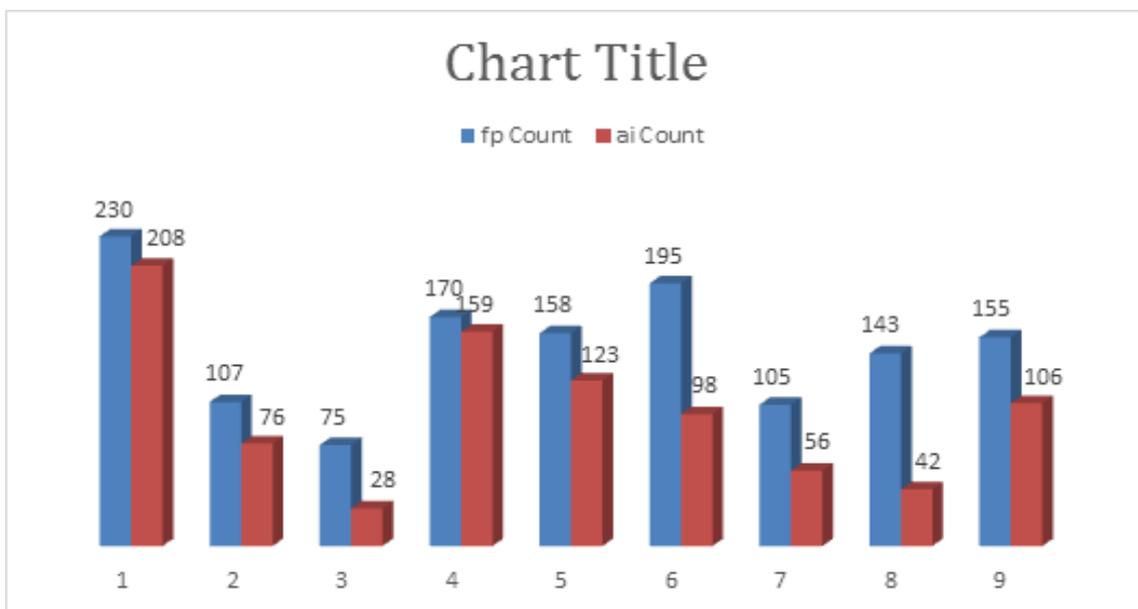
2. CORRELATION TEST

Table 2

	Financial product	Actual investment
Financial product	1	0.84
Actual investment	0.84	1

Source-primary

Table 2 indicates there is a positive relation between actual investment and financial product. As we can depict from the above table that $r = 0.84$ which is positive effect.



Source-table2

3.REGRESSION STATISTICS	
Table 3	
Multiple R	0.8440
R ²	0.7124
Adjusted R square	0.6713
Standard Error	27.529
Observation	9

In table 3, the regression test done between the financial product and actual investment decision frequency has yielded R² value of 0.7124 which implies that two factor together predict 71% percent of the variation in financial investment decision. The R value is 0.8440 which indicates that there is high degree of correlation between financial product knowledge and actual investment (independent variable) with women decision (dependent variable). This shows there is significant relationship between the investment decision. Furthermore, behavioural characteristics are thought to be powerful predictors.

Table 4: Analysis of variance through dependent and independent variables. ANOVA^b

	df	SS	MS	F	Significance F
Regression	1	13140.95414	13140.95	17.33947	0.004220265
Residual	7	5305.04586	757.8637		
Total	8	18446			

This table 4, indicates the statistical significance of the regression model that was run. The value of $p < 0.05$ denotes that the regression model is statistically significant and accurately predicts the outcome variable. That appears to be a good match for the data.

Table 5: Coefficient between dependent and independent variable

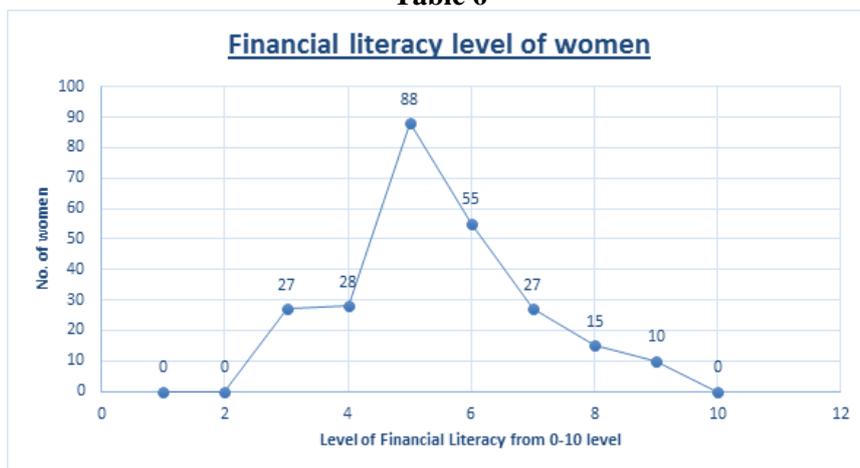
	Coefficients	Standard Error	t-Stat	P-value
Intercept	78.91786678	19.09907808	4.132025	0.004393
Ai count	0.700601785	0.168249329	4.164069	0.00422

The coefficient table 5, shows that one point increase in financial product correspond to increase in actual investment. At 5% level of significance all the p-value shows 0.00 level of significance which means that $p < 0.05$ therefore our null hypothesis is rejected. This means there is association between financial product and actual investment in women. It's also clear that any rise or decrease in the level of factor will result in changes in the level of investment. ("A Study on Attitude of Women Investors towards Stock Market Investment ...")

Here, the regression analysis suggest that the factors are positively associated with the investment decision and perceived risk is significantly positively associated with the investment decision. The value of R^2 is 0.7124, implying that the regression coefficient's explanatory power will increase if additional related variables are added to the model.

4. Financial Literacy of Women

Table 6

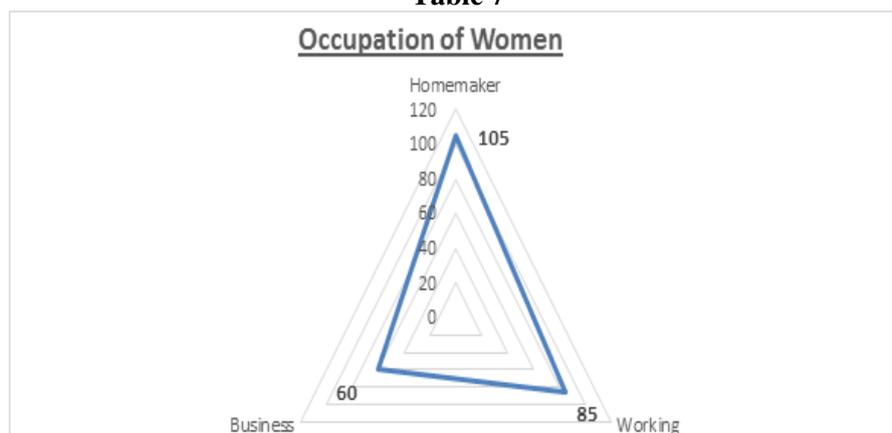


Source- Primary

INTERPRETATION: Based on the data of 250 women, here we can see that the women have rated themselves on a scale of 0-10 on the basis of their financial literacy. The maximum no (88) of women have rated themselves as 5 whereas only 2.5% of women have rated themselves as 9 which is the highest financial literacy.

5. Occupation of Women

Table 7



Source-Primary

INTERPRETATION

Out of the 250 women, 145 women are either working or have a business of their own and the rest of them are home makers from this data we can interpret that more than 50% women are capable of earning their own money.

7. FINDINGS

- The respondents are very conventional as 37% are graduate, 28% are postgraduate and 2% are illiterate.
- Implication of the two factors together predict 71% percent of variation in financial investment decision.
- There is positive association between financial product knowledge and actual investment among women.
- 46% of women prefer low risk financial product.
- 85% of women prefer to invest in product for a period up to 10 years.
- 32% of the women are looking for return where as 39% wants safety of capital

8. SUGGESTION

- Encourage women to save more by conducting investment programmes.
- Encourage women to invest in new and innovative instruments by educating them about the risks and benefits from these avenues.
- A role can be played by the employers who can offer the retirement education to women employees as working women spend nearly fifty percentage of the entire day at work.

9. PARAMETERS TO CONCLUDE THE STUDY

While designing the financial product we have to keep the respective parameters in mind.

- 46% of investments made by women are in low risk financial products.
- 72% of women take financial advice from their family and friends (based on others talk factor).
- 91% of the women expect returns of 20% or less than 20%.
- 45% of women are investing in the range of 5k-10k.

10. CONCLUSION

The study concludes that women's financial confidence is based on their investment knowledge and education, as stated in the World Bank Review 2015. It was also discovered that women with little or no financial understanding are less likely to invest. The decision to invest is usually made by the families of Indian women, or their husbands. Any investment decision made by women does not reflect their own tastes, but rather is influenced by family members.

As a result, policymakers are urged to develop and promote women-focused initiatives that improve financial literacy and increase employment opportunities for women. Also, investment schemes that are specifically targeted at women and advantageous to their futures should be established in order to encourage women to invest. The government should support awareness campaigns that emphasise the importance of women's financial independence and the eventual result, which is their empowerment. Only then can women realise their full potential and how they may contribute to the economy's growth. Women have acknowledged that their lack of financial literacy prevents them from making sound financial decisions. Only half of the 250 women polled are capable of earning their own money. Only a few women are knowledgeable about the financial markets and capable of making investing judgments. Because of their financial understanding, these ladies are on the right route for future financial planning. As a result, it is advised that a financial product be developed that can guarantee capital safety and total returns of 15% to 20% per year.

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Poaching - Challenges and Solutions in Preserving the Wildlife with Special Reference to India

Vidya V Devan¹, Daan P Van Uhm² and Samir Sinha³

¹Bharata Mata School of Legal Studies, Aluva, Ernakulam, Kerala, India

²The Illegal wildlife Trade inside the World of Poachers, Smugglers and Traders

³Handbook on Wildlife Law Enforcement in India

ABSTRACT

The world belongs to all living creatures and not for human beings only. Transforming the world to a prosperous, peaceful destination cannot be achieved without addressing the crime against the wildlife. Hence the United Nations highlights the need for protection of wildlife by incorporating this as a core point under the fifteenth agenda among the seventeen agendas drawn out for achieving the sustainable development 2030. Poaching is resorted to for food, pleasure, illegal trade of wildlife products, to acquire the land for use, aspiration for valuable and rare animal products such as ivory, bones, fur, skin, or teeth, medicinal purposes etc. Impacts of poaching are varied. The devastating consequences of poaching are extinction, sufferings of the animals, imbalance of the eco system, destruction of the environment etc. It has also become a grave transnational menace to the stability, security and economy of entire nations. While environmentalists, ecologists and biologists are researching upon the causes and consequences of the wildlife trade and measures to prevent this illegal activity and measures for the resurgence, the attempts from the criminologists are rare. This paper analyses the causes for the wildlife crime, consequences and imperative solutions to prevent the destruction to the wildlife and the echo system from a criminological perspective.

INTRODUCTION

“A number of times I have heard trophy hunters - not subsistence hunters - say that more wolves should be killed in order to help ensure that there will be adequate opportunities to hunt deer. I simply have no words...”

- Peter Nichols

Poaching was always a part of human life from the time immemorial. In olden days the animals were hunted for food, but later on through the ages reasons for poaching widened. Human found a market in wildlife for food, clothing, perfumes, medicines, as pet or companions or as curious or strange objects. Section 2 (37) of the Wildlife (Protection) Act, 1972 defines “wildlife to includes any animal, aquatic or land vegetation which forms part of any habitat.” The term wildlife effectively encompasses all forms of life, whether plant or animal which are found in nature. Marine, freshwater and coastal ecosystems also find place in the definition. Thus ‘Wildlife’ comprises all wild fauna and flora, animals, fish, birds, and forest products like timber and non-timber. ‘Poaching or Wildlife crime’ refers trading, importing, exporting, processing, possessing, and consumption of wild fauna and flora which includes animals, birds, timber and other forest products, in contravention of law.

It has been globally realised that deforestation and extinction of many species of wildlife is the grave issues which has to be addressed immediately for ensuring the wellbeing of the world. The matter was discussed in a meeting of International Union for Conservation of Nature (IUCN) in 1963 and decided to take measures to protect the wildlife. Accordingly CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) an international agreement between governments was drafted. It was signed by eighty countries on March 3, 1973, and was enforced with effect from July 1, 1975. The main objective of the agreement was to protect the species of animals and plants from the wildlife crime, trafficking and trade.

Even though the efforts for the protection of wildlife was effectively progressing the world witnessed the unprecedented increase in wildlife crime. Wildlife crime become a threat to the nations when the forest was used for many illegal activities like growing of the drug plants and other gambling activities. On this realisation an International Consortium on Combating Wildlife Crime (ICWC) which is a collaborative effort of five inter-governmental organizations was launched on November 23, 2010. The main aim was to provide support to the national wildlife law enforcement agencies and to the sub-regional and regional networks in the protection of natural resources. The “2030 Agenda for Sustainable Development” adopted in September 2015 by the United Nations Sustainable Development Summit highlighted the need for the protection of wild fauna and flora and the ecosystems upon which they depend. Among the 17 Sustainable Development Goals (SDGs), emphasis has been given to the protection of wildlife and adopted "Life on Land" as Goal 15. It advocates the immediate need to think how to tackle illegal trafficking in wildlife. Article concentrates on the causes and consequences poaching.

EVOLUTION OF POACHING

Wildlife was poached from the olden days. The Egyptian rulers used ivory in their jewellery from (3500 – 500 BCE). Leopard skin, giraffe tail and ostrich feathers were traded for religious ceremonies, medicine and luxuries. Possessing exclusive species was regarded as a symbol of spirituality, status, and power by the ancient Egypt. After 700 BCE, it became common in Greek and Roman Empire to capture, tame and keeping variety of exotic mammal and reptile species in house hold. The rulers-maintained elephants, lions, leopards, cheetahs, exotic sheep, ostriches as part of their spectacular armour. Animals were also used in Roman games.

In the medieval era with the fall of Roman empire in 476 BCE the animal sacrifices for games reduced comparatively. The practice of animals being used as the status and power symbol continued and also the trade of animal products like ivory, leopard skin exotic furs etc.

In the early modern period trade of ostriches, penguins, monkeys, parrots etc augmented. The imported exotic animals and produces from the colonies were visualised as a symbolic representation of the conquest of all distant & exotic countries.

The modern period witnessed the extensive trade in live exotic animals, including elephants, leopards, lions, jaguars, giraffes, rhinos and exotic birds. All form of Wilde crime like poaching, illegal trafficking, drug trafficking from the flora and fauna of the forest etc increased in alarming rate. Last 50 years (1970-2020), witnessed a decline of 60% of the species population.

CAUSES OF THE WILDLIFE CRIME

The poaching or wildlife crime is resorted to for food, medicinal use and health care. Cosmetics, fragrances, jewellery, accessories, curious collections are other attractions. It is also restored to as part of religious and cultural traditions. Wildlife including the flora and fauna are utilised by man for furniture's, constructions, to tame animals as pets and exhibit in zoos etc. This section analyses the causes of increase in wildlife crime even after the subnational, national and international efforts to defend it.

1. INADEQUATE LAW ENFORCEMENT.

India has enacted the Wild Life Protection Act in 1972 itself. Being the signatory of the international agreements India is taking measures in accordance with the guidelines prescribed by them. But we are not able to effectively address the problem of poaching due to the regulations that can be easily circumvented. Many Government officials are the direct beneficiaries from the profits of poaching. Many receives bribe from the poachers and aids them in the illegal wild trafficking. With the help of the corrupt forest officials hunting become more easier for the invaders.

Lack of stringent rules and minor punishments which is not sufficient to deter them is a reason that these activities cannot be controlled. In India the fine ranges from ten thousand rupees to twenty-five thousand rupees and imprisonment which may range from seven to ten years. Due to insufficient and ineffective prosecution majority of the poachers manage to escape out of the clutches of law. The conviction of a poacher for even up to three years are rare in India, which shows how liberal is the legislation and enforcement authority.

2. HIGH DEMAND FOR THE WILDLIFE AND FOREST PRODUCTS.

Illegal wild trafficking is most profitable business in world as a whole. The United Nations assesses that profit from the illegal wildlife trade in world is between \$7 billion and \$23 billion a year. It is one of the most profitable criminal enterprises in the world. The poachers, intermediaries the governmental officials all are drawing a huge profit form the business of wildlife. Ivory -like casque of the helmeted hornbill, tusk of the elephants, skin of leopards and jaguars, pangolins for their meat and scales etc are having the high demand in the market. Wild life crime is a threat to the existence of many wild species across the globe.

3. FOR RELIGIOUS AND CULTURAL TRADITION

Certain animals are believed to be sacred for certain religion. Some other are part of various traditional cultures all around the world. Animals are hunted and slaughtered as part of religious rituals. Leopard skin, hooves, feathers, tails, skin, fur, teeth, horns, heads, ivory etc are used as ceremonial objects for religious rituals. At the same time several animals are believed to be the vehicles of the God and are protected.

4. FOR MEDICINAL PURPOSES

The rhinos were extensively hunted apart for its skin, it is believed that its horn possess medicinal values. In China turtles, snakes, orangutans, pangolins and seahorses, etc are used in traditional medicine to cure numerous diseases like cancer. The scales of pangolins and turtle blood are ground into a powder and used in medicines. They are found for healing powers. Buffalo horns, tiger male parts and fresh snake blood, are used for aphrodisiac and virility potency.

5. FOOD AND EXOTIC DISHES

Human being depended on the wildlife for food from the primitive time. When the population was limited and man hunted barely for food it did not cause much destruction for wildlife. But in the modern period with much sophisticated weapons man hunted extensively for food that too for variety of cuisines. Trading on animals for food also flourished which added to the destruction of endangered species. Zebras, Hippos, Lions, Elephants, Snakes, Gazelles and Giraffe are killed for their meat, traditionally denoted as “bush meat.”

In Asia, demand was for snakes, turtles, pangolins, bats, whales, and orangutans and was traded to restaurants to serve elite in exclusive.

6. AS SPORTS

Many animals are poached for sports and recreation. These animals have to suffer injuries and end up in painful death. Along with the many domestic animals many wild animals are also hunted for the entertainment of man. Royal Society for the Prevention of Cruelty to Animals (RSPCA) which is working for the protection of animals since 1824, “opposes recreational hunting, or the act of stalking or pursuing an animal and then killing it for sport, due to the inherent and inevitable pain and suffering caused”. But due to lack of stringent laws to prevent hunting and utilising the animals for sports these types of activities are continuing. Certain sports which are traditionally practiced also hinders the law making in certain areas.

7. EXPANSION OF HUMAN SETTLEMENT

As the population exploded the man started encroaching to the forest area for domicile and cultivation affecting the natural habitat of the wildlife. This often resulted in the wild animal and human conflicts. Though many men are killed in these conflicts major victims are the animals as man used many modern techniques like electricity and other weapons to evacuate the animals. Many animals starved to death due to the destruction of their natural habitat.

8. ORGANIZED CRIMINAL NETWORK

As the illegal activities expanded the wildlife crime also extended. The trade of wildlife products become more structured. The sub national, national and international trade flourished well, as this was a business which provide huge profits. The drug cultivation and trafficking also caused much damage to the wildlife.

Consequences of Poaching

Causes and reasons for the poaching vary but ultimately it leads to the destruction of the biodiversity and ecosystem of the world which is becoming a threat to the existence of the earth itself. Along with the extinction of many charismatic wildlife species like elephants, tigers, rhinos, and leopards, thousands of lesser-known endangered species are also being driven to extinction by poaching. Many animals poached for their body parts are driven into painful death. The poachers shoot the animals and many often take their valuable body parts even when they are alive and leave them to the painful end.

Many officials and rangers are also killed by the poachers who hinders the hunting. The organised criminal networks which flourish along with the poaching like illegal trafficking drug trafficking etc is becoming a threat to the human life. Poaching is also now becoming a reason for the spread of infectious and deadly diseases from the animals to the human beings.

Imbalance in the ecosystem- the nature is built as there should be predator and the prey. Many species being pouched is disrupting the food chain which is threat to the existence of the man and earth.

Realising the immediate need to prevent poaching and protect the wildlife, the protection of wildlife has been included as the 15th Goal under the tile ‘Life on Land’. The next session discusses what all measures which we have to adopt to protect the wildlife and attain a sustainable use of territorial ecosystem, to protect the biodiversity and the forest.

Measures to Prevent the Poaching.

Imperative solutions to prevent the destruction to the wildlife and the echo system are to be adopted analysing the specific conditions of each area rather than applying same techniques everywhere. Stringent laws alone cannot restrict the offences. Scientific and criminological approach is to be adopted.

Assessing the Challenges

Challenges faced by each area has to be assessed first like what is the hindrance in preventing the wildlife crime whether it is lack of proper law, whether enforcement machinery is inefficient. Is there any deficiency in the information circulating machinery, are the official equipped to deal with the poachers who are using modern weapons, is the government able to give protection to the officers working in the forest against the poachers?

There should be a clear evaluation of the current efforts in preventing the poaching and understand what are the draw backs of the present system. On the basis of this assessment necessary measures should be adopted.

Proper Legislation to Address the Poaching.

All nations already possess the legislations and the enforcing authority for the protection of wild life. Since the poaching is continuing in an alarming rate these laws are to be amended and if needed made stringent so as to deter the poachers. Severe punishment and heavier fines should be imposed.

Enforcement mechanisms also had to be modified and efficient officials should be appointed. The government should also take necessary measures for the protection of the officials entrusted with this responsible duty.

Ensure Effective Prosecution

Cases filed against the poachers always lacks the proper evidences. As the cases are not strongly built up during the trial by the prosecution, many of the accused find it easy to get acquitted. This encourages the poachers to continue their activities. So, the approach of the prosecution has to be improved. The investigating officers should try to collect all the possible evidences that the prosecution will be able to prove the guilt beyond doubts and the accused may not escape from the clutches of law.

The concerned authorities ought to provide with sufficient monetary support to improve the criminal justice response to poaching. Authorities which possess adequate money and facilities can effectively recover the traded wildlife products.

Provide Training to the Rangers.

All the officers are not corrupt nor bribe seeking persons. Several times they are not able to tackle the highly trained poachers who uses highly modernised weapons. Training should be provided to the forest officials and the rangers which equip them to improve their effectiveness. Trained rangers may be able to protect the wildlife without putting themselves in danger. The rangers also should be provided with the proper data and information's in the proper time so that they may act effectively at the crucial moments.

Involve the Public and Encourage Collaborative Efforts

The community residing near by the forest can play a vital role in preventing the poaching. small troops including the ordinary people may be created. They can very well give the information regarding the invasion of poachers in the forest. If small rewards are provided to such well-wishers, they will be more involved in the prevention and the endangered species can be protected.

The awareness to the public is essential for preventing the wildlife crime. Many may unknowingly buy the wildlife products which increases their demands.

Collaborative efforts with certain NGO's and civil societies working for the protection of the animals can effectively prevent the wild crime. World Wide Fund for Nature an international non-governmental organization launched in 1961 work for the protection of wildlife and tries to restrict the human activities in the forest. The United Nations Environment Programme (UNEP) is also providing support for the preventive activities. The collaboration with national and international agencies enables to find easy solution for the wild trafficking.

Use More Sophisticated Techniques

Undetectable and harmless trackers need to be installed to track the wildlife. This enables the officials to have accurate data on the number of the animals in their location from the control rooms itself. Cameras may also be fixed in the areas where the endangered species are co habiting. This will help the officials to resist the poachers. Implementing a patrolling and reaction system will enables the effective protection system.

The criminological approach will have a positive impact. The study of why and patterns followed in wildlife crimes will help to develop appropriate solutions with the help of communities and the local ranger force.

Create Sanctuaries for Animals

Sanctuaries can alone preserve the animals who are at the verge of extinction. Sanctuaries provide comfortable living habitat to the animals free from external disturbances. Tourists may not be allowed where the endangered species are housed. Special protection and monitoring should be made that the poachers may not be invaded.

Protection of Wildlife in India

In India animal protection was given importance from the ancient period itself. Kautilya's Arthasatra prescribes how a ruler has to protect the forest and the wildlife. Except in the medieval period when reigned by Mughal rulers who were fond of hunting, the animals were well protected in India. From the nineteenth century the

legislative protection was initiated for the preservation of animals first being the statute for the protection of elephants in 1873 in Madras. Elephant Preservation Act, 1879, The Wild Birds Protection Act, 1887 The Wild Birds and Animal Protection Act, 1912 which was amended in 1935 etc were the earlier legislations enacted to protect the wildlife.

Article 48A of the Constitution of India made it the duty of the state to protect the wild life. It states that “The State shall endeavour to protect and improve the environment and to safeguard the forests and wildlife of the country”.

To give effect to the obligation under article 48A, it was in 1972 the first comprehensive legislation for the protection of wild animals and birds was enacted which is termed as The Wild life (Protection) Act, 1972.

The main objective of The Wild life (Protection) Act, 1972 was to have a uniform animal protection act applicable throughout India, to establish national parks and sanctuaries for protecting the endangered species and regulate the illicit trade in the wildlife. The Act was amended in 1986, 1991 and 2003. The Act consists of 60 sections, eight chapters and six schedules. Hunting of wild animals is prohibited under section 9 of the Act. Further the act prescribes certain act as offences and imposes penalty. The 2021 Amendment Bill introduced on December 17, 2021 in Lok Sabha is referred to the Standing Committee. The bill along with many protective measures proposes the increase of penalty up to one lakh.

Judiciary in India always decided in favour of the protection of animals and natural flora and fauna for the sustainable development of the country. Environmental law, World wide Fund-India v. Union of India the case was for the protection and preservation of ‘Asiatic Lion’ including their translocation and their natural habitat as their number was increasing. The court in an eco-centric approach ordered for taking necessary safeguards for protecting rare species of animals.

CONCLUSION

Although hunting was resorted to by the primitive man for the survival now man is hunting the wildlife for the greed which ultimately cause the destruction of the human habitat itself. Article 51A(g) of The Constitution of India makes it the fundamental duty of the citizen to protect the wild life. It is clear from the above discussion that along with the stringent laws and proper law enforcing machinery, the efforts of each member of community can better preserve our wildlife for the better future.

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17. With the exception provided under section 11 and 12. Where the chief wild life warden is empowered to give order in killing some animals in certain situations.

COP26: A Special Focus on the Role of Women in Mitigating Climate Crisis and Ensuring Sustainability of Environment

Raveena Bhargava

Guru Gobind Singh Indraprastha University, Delhi, India

ABSTRACT

The COP26 witnessed the acceptance and promotion of a Gender Sensitive Approach towards regulating climate change in efforts to reach environmental sustainability across the globe. Gender was put at the forefront of climate action with many countries making specified commitments. Bolivia, Canada, Ecuador, Germany, Nigeria, Sweden, United Kingdom and the United States of America all came forward in the collective spirit of ensuring adequate financial contributions to tackle the inter-twined problem of climate change and gender inequality, having adverse effects particularly for women. Initially, the Gender Action Plan was agreed at COP25 and it has been mutually addressed by all nations to be brought at the centre of the table to give full effect to its implementation value. It has been strongly advocated at the international level how women's participation and enhanced decision making could help improve environment related aspects in the society and lead to an overall development of the economy. Policy makers, political leaders, women's rights activists and academicians believe that only an integrated and systematic approach towards addressing Sustainable Development Goals (SDGs) is ultimately going to yield results. There is a need to maximise the social, economic and environmental role of women by creating public policies that strongly recommend a gender based perspective by closing the gender gap. This paper seeks to address three key areas- (I) the need to include gender mainstreaming public policies in the paradigm of environmental sustainability, (II) women's role in sustainable economic growth and (III) to build gender responsive climate change adaptation strategies for sustainable environmental change. The synthesis of these three key areas could provide a strong analysis towards the role of women in being active contributors to sustain our environment through inclusivity and gender based action.

INTRODUCTION

Environment and Gender are closely connected as the roles performed by men and women in the society offer an understanding of their close relationship with nature and its resources. To understand this perspective an interdisciplinary approach provides a holistic overview of the interconnectedness of natural ecosystems and the special role played by women in their surroundings. It is also important to mention the impact of the landmark Beijing Platform for Action which created a noteworthy awareness regarding the linkages that exist between natural disasters, health problems, sanitation, poverty, unsustainable development and gender inequalities. The Platform for Action proposed three key agendas, to apply a gendered perspective to developing policies and programmes for environment sustainability, to actively involve women in environmental decision making and finally to create national, regional and international mechanisms which could analyse the effect of developmental and environmental policies on women and as such on the society.

The patterns of consumption and production in the post modern and post globalised world have created extreme pressures on the environment. Large ecosystems including the world's depleting water bodies, the poor air quality, soil and forest degradation alongside huge biodiversity loss has created a massive disequilibrium in the ecology. This ecological imbalance has been reported to impact women across the globe adversely. Women as per the attributed gender roles are mainly involved in the household chores including taking care of cleanliness, sanitation and usage of water. Reports reveal that women and girls take the main responsibility of water collection in developing countries.

Historical accounts also record the inter relationship between women recognised as the positive symbols of nature. At the same time the biological role of women bearing life has also been connected with the major part played by them in being nature protectors and conservators. Moving towards modern times, it can be stated that a high percentage of women are found to be part of the agricultural economies, specially in the developing countries, hence strongly connected with their ecosystems in a more livelihood and earning based way. Yet women own a very small percentage of land assets in various parts of the world. This complexity of the scenario has created the urgent need to include gender mainstreaming framework within public policy and execution of laws and government programmes.

KEYAREAS

(I) Gender Mainstreaming of Public Policies in the Paradigm of Environmental Sustainability

Gender Mainstreaming is a scientifically recognised approach towards balancing the gender inequalities within economic, political, social and cultural systems. A similar methodology has been observed to have proven instrumental by recognising gender dynamics within the discourse of environmental sustainability. Women have been recognised as both contributors in sustaining the environment as well as users facing the larger brunt of environmental degradation. An integrated and multidisciplinary approach has been advocated by policy groups and women environmentalists.

But there lies a major challenge in collection and verification of evidentiary data in how the gender sustainability nexus works to bring positive changes. The OECD Policy Framework for Inclusive Growth encourages the adoption of an integrated approach by including women into all spheres of economic, political and social spheres of the discourse on sustainability and environment.

The Gender Mainstreaming approach at its heart works on the principles of inclusivity of the different conflicts and challenges faced by men and women in their ecosystems. It calls for inclusivity, integration and strengthening focused strategies in creating a more sustainable change by elimination of gender inequalities. A strong foundational policy formation could be the first step in such a direction. This could take place by the application of a gender mainstreaming perspective at three levels, at the individual level, by addressing the concerns and challenges faced by women and maintaining a cordial balance between women's well being and the issue of environmental sustainability. The familial role attributed to women is directly connected to the factors of health and sanitation that affect women and their children in dire conditions. At the societal or regional level, by ensuring women's participation in the decision making processes, creation of laws including sectoral policies and ensuring gender equality within labour markets could support the gender sustainability nexus. Globally, the developmental policies and all areas of trade, investment and capitalist tendencies of the market will have to aspire for a trans boundary gendered perspective to safeguard nature.

The practical side of this framework would require a strong dependency upon data gathering, policy formulation and analysis and development of empirical research in the field. Studies enumerate the importance of having consistency between economic and social policies at the national and international level, by investing time and energy at the legislative stage to formulate laws and legal policies which work in the long term and are suitable to the needs of people belonging to different backgrounds. The impact of a gender based action plan could reveal the need to further strengthen the intersection of women's participation in sustaining and conserving the environment at the community level.

(II) Women's Role in Sustainable Economic Growth

The economic patterns emerging out of processes of industrialisation and capitalist market trends paints a paradoxical picture while understanding the need to adopt sustainable development practices. A recent study brings to light the importance of paying attention to the differences faced by men and women in financially securing themselves. The empirical research suggested discriminatory trends in terms of men holding greater share and power in having an overall economic advantage over women across countries like United States, Germany, United Kingdom, Canada, France, Australia, South Korea, China, India, Japan and Switzerland. It is interesting to note that Asia holds a bright spot in this scenario whereby women in countries like China, India and South Korea now find themselves economically contributing almost at par with men. Another significant finding is the encouraging existence of as many as seventy one percent in comparison to seventy three percent of men in India, today, thinking about investing into the stock market. Women also hold greater access to holding independent bank accounts.

As early as 1988, a report published by the World Commission on Environment and Development found that the problem is worsening specially for women interlinked with the problems of poverty, illiteracy and unemployment. This was further attached to the existing North South divide. With women sharing the elementary responsibilities of nutrition, sanitation, water collection and management, being farmers and animal tenders, hold the power to pivot the discourse in the favour of environmental conservation. But statistics reflect that there is an immediate and urgent need to include women on the decision making level and administrative processes at the local, national and global levels. The post pandemic consequences on the global economy have further pushed women in the corner in many parts of the world. An extreme strain on the natural resources has already been seen and felt in the form of natural disasters and mankind's incessant ecology draining activities.

The Rio Earth Summit and Agenda 21 are symbolic in obtaining a separate chapter on Women and Sustainable Development. The present global consensus also reflects an advancement in this ideology of fostering change by considering women as agents or drivers of sustaining ecosystems. COP25 and COP26 have laid down a strong focus on the need to apply this perspective by adopting national policies which are gender inclusive and are useful in applying an integrated approach towards gender sustainability equilibrium. Gender sensitivity needs to be understood in this light for bringing change at the root of the problem. It is a cause and effect situation which requires regulation through legislative and policy level changes which create spaces for women's participation and relying on their experiential knowledge to sustain the environment.

The aspiration of building a strong women's participation at the economic front is to create a favourable environment whereby women have ownership of resources and can also lead development. Rather than being marginalised and economically disadvantaged. It has been reported that gender inequalities are causing a huge chunk of monetary loss to various economies across the globe. Due to the social roles ascribed to women, their career trajectory is starkly different from men. An analysis of the problem leads to an important realisation of how the gender gap has taken the world a few steps back in its development agenda. For maintaining suitable and sustainable environmental spaces, the gender gap needs to be addressed as a priority area at both national and international levels.

(III) Building gender responsive climate change adaptation strategies for sustainable environmental change

Women continue to be under-represented in the decision making processes at the governmental and administrative levels. The major reasons include, poverty, illiteracy, lack of awareness and training, gender stereotypes, lack of sex disaggregated data and research on the issue of gender and sustainability. One of the eye awakening situations connected to environmental protection and conservation includes the fast changing climate. A gendered perspective to climate recovery and environmental sustainability is based on the following relevant factors which requires a closer look:

- Lack of proper Gender based impact assessment of environment
- Impact of natural disasters on men and women
- Women's economic insecurity
- Gender barriers in public space
- Women share dual responsibility to manage home and work

One of the core areas which has been recognised in encouraging the role of women in environmental sustainability is the integration of financial planning and concerns related to gender inequities to bring about awareness. Further this integration is only possible when the right tools and indices are utilised to reach a more coherent analysis. For instance, the United Nations Environment Programme(UNEP) has pointed out that most of the Environment Impact assessment is based on "quantitative biophysical data" rather than addressing it from the point of view of a qualitative social sciences approach.

Gender responsive climate change adaptation strategies for sustainable environmental change could be applied in specific environmental areas. Women's participation in conservation of the world's drylands is an interesting case in point. The traditional roles ascribed to women have brought them closer to preserving nature. The experiential learning possessed by women is crucial in management of natural resources and maintaining food security. The varying roles and responsibilities carried out by men and women affects organisation of resources at home and at the larger community level. In developing regions, 45 percent to 80 percent of all food production is attributed to women farmers. In contrast women are offered minimum spaces to make decisions in areas of land ownership and usage of resources impacting their means of livelihood.

Men and women living in the rural areas largely depend upon wood, forests and biomass for their food consumption and other livelihood based needs. Due to the crippling effect of climate change seen over the past few decades, biodiversity in general is declining. This creates uncomfortable pressure on people's choices, health and access to security. Therefore, the situation of climate change, biodiversity preservation and environmental sustainability requires that immediate steps are taken in this regard. The effects of increasing global warming has already led to imminent problems of world hunger, malnutrition, deterioration of public health and declining access to water resources. Hence it is important to understand the desperate need to adopt adequate strategies to mitigate the effects of human intervention on the environment. Climate Change inevitably impacts humanity by affecting the economic and social rights of the citizens across the globe. Women find a special place in this regard and gender responsive strategies could prove to be highly beneficial in the long run.

CONCLUSION

While the international community looks towards a sustainable future, time is of the essence. Women hold a unique position in bringing change beginning at the local and regional levels. The post 2020 global biodiversity framework is based on the commitment of framing gender inclusive national and international policies and programmes for sustainable development.

But this comes at a time when the statistics point towards the increasing level of gender inequalities pushing a high percentage of women out of work, a falling female labour force participation rate, increased violence against women in public and private spaces and discouraging figures of women's political participation. The problem further gets complicated in case of indigeneous and tribal communities. Women suffer exclusion in terms of decision making and planning processes within state structures. The situation is not very encouraging for urban women.

The Sustainable Development Goals (SDGs) 2030 incorporate gender equality under SDG 5. But it does not exist in vacuum to the fulfilment of other goals. There is a strongly established gender environment nexus which makes gender mainstreaming of environmental issues necessary. It has been recognised as an appropriate methodology to understand the complex linkages between gender and environment in different ecological systems across the globe. This understanding has been strongly reflected in the collective commitment of states at COP26 urging to adopt gender centric strategies to study the environmental impact upon gender and vice versa.

The theme for International Women's Day celebrated on 8th March, 2022 was "Gender Equality for a Sustainable Tomorrow" putting into focus the role played by women. Women have been universally recognised as the agents capable of adapting, mitigating and conserving the environment globally.

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Spoils of Adam and Eve on Eden: The Misfortune Bought on Mother Nature by Wars & Nuclear/Scientific Interferences Made by the Mankind

¹Megha Chaturvedi and ²Karan Bhola

¹University of Vienna, Austria

²Kurukshetra University, India

ABSTRACT

From belonging to land of consciousness which has witnessed a time where every element of mother nature was worshipped for its divinity, to recalling the times of man being a hairy mammal to a man in suit and tie, we can comprehend that the ways of warfare have shifted from a head on collision to a war of sanctions. Time and again, it has come forth that warfare has been a rule but what has changed is the degree of destruction of environment. In Vedic age, any event causing any environment damage was done in dire need only and now continuous environmental degradation is being carried out because of man's greed. It comes down raining when the air he breathes becomes toxic each day, ironically, he has fought and hurt himself and it will be so till eternity lasts, for example a man fights another man for something then blood drips in the stream nearby, with the poison he gave the other, now although he has won the battle but has assured his demise one or the other way.

This paper attempts to reveal the fruits of a man's greed of mankind since inception, thereby, reflecting the historical, present and future scenario with highlights over wars differentiated by timeline with special emphasis on their impact on mother nature while analysing a nuclear fallout and disposal of spoils/remains of war. By way of this research, we further tend to analyse the response by International Community in form of Legal Framework, Agendas and Goals while exploring deeper into the question- "Is sustainable development really sustaining environment?". With understanding of the aforesaid, the conclusion follows along with suggestions to prevent further destruction.

Keywords: Land of Consciousness, War of Sanctions, Environmental degradation, Nuclear & scientific launches, nuclear fallout, Spoils/Remains of War.

INTRODUCTION

The greatest threat to earth is the belief that someone else will save it.

-Robert Swan.

And so, he said right.

Impact of Wars on Environment- Digging into the Historical Facts

It is no new discovery that wars pose a great threat to earth's environment while nuclear weapons used in warfare remain to be the greatest of all the threats upon environment and human race. With advancement of technology, the destruction in wars have proven to be more fatal than it ever was. Since the World War I, excessive bloodshed has been witnessed by our forefathers in all the wars fought till now and the war zones have been impacted by long term adverse effects on the environment. More recently, the environment obliteration has crossed all the appalling levels. With the advancement of weapons of mass destruction to include chemical, nuclear, and biological warfare, damage of the environment has increased by massive proportions. Here is a timeline of most profound wars and a measure of their impact on environment.

A. World War I (1914 - 1918)

World War I is seen as the first major conflict in which new level of environmental destruction was witnessed. In greed of acquiring power and dominance over the world, the countries unleashed new deadly weapons which were capable of deadly consequences leading to a bloody war. The farmland and countryside in France were destroyed in trench warfare and similarly over 250,000 acres of farmland was devastated in the battle of the Somme, the destruction went till the extent that these lands were deemed unfit for agriculture and additionally, 494,000 acres of French forest were destroyed as a direct outcome of the war. The destruction of forests also adversely affected the European animal population and the devastation was such that the population of European buffalo, wisent, was lead to near extinction. Europe was not the only area that suffered environmental destruction throughout World War I but the war had significant impact on the environmental health of countries in Asia and also of United States. Farmers were forced to produce beyond their means in order to feed the war effort yet famines, draughts and natural calamities due to disruptions in nature's order was a common sight. "The consequences of World War I on the environment were far reaching, spreading across the globe. But unfortunately, the environment was never given a chance to heal, for World War II was right around the corner."

B. World War II (1939 - 1945)

Although World War I had a major negative impact on the environment, but no toll was quite as great as that suffered during World War II. With advancement of technology and unleashing the newly introduced nuclear power, the destruction was taken to an unprecedented level in World War II. The environmental effects of World War II were seen across the globe, from forest fires in the United States, to severe sand-storms in North Africa. There were three regions that suffered the most environmental damage: Europe, Japanese occupied Pacific Islands, and Japan. Talking about Europe, Norway witnessed the devastation of 15 million acres of fauna and flora. No resources were left in Germany as the Germans themselves destroyed all their resources as they did not want their enemies to use them. "Further, Their allies also exploited the environment to their advantage in the European campaign. This was most directly seen in the allied bombing of "two large dams in the Ruhr Valley...in an attempt to destroy Germany's industrial economic base and to make it impossible for Hitler to produce any additional equipment". As a result, 6,500 livestock and 7,500 acres of farmland were destroyed."

The environmental destruction in the Pacific theatre was different than that seen in the European campaign. Many of the tactics used by the U.S. Marines on these islands had catastrophic affects on their ecosystems, "Once on the island, the Americans used flame throwers, tanks, and bulldozers, and any other means available at the time to clear the land". Further, the environmental destruction continued as the remaining resources used to for military purposes in order to keep the war supplies moving. "Engineers used live coral as the base for building these impromptu airfields. Wildlife populations of these fragile habitats were also severely damaged. Countless species of birds were killed, and a handful even met an early extinction as a result of the Pacific campaign." No matter how terrible destruction was suffered by ecosystems in Europe and Pacific Islands but nothing could be as horrific as obliteration suffered by the Japanese homeland. "The Nuclear Bombs dropped on Hiroshima and Nagasaki are the two single most destructive events in human history, The heat, as intense as the interior of the sun, had turned the city to cinders, cremated every blade of grass, collapsed hundreds of structures with its awful wind, and polluted every repository of water". Apart from the immediate bloodshed and destruction caused by the bombings, the environment continues to suffer till today. "Massive amounts of radiation were found in both the soil and water, making the land inhospitable to both plants and animals. In addition, there were considerable fires, acid rain, and massive erosion. The Japanese ecosystem is still recovering from the effects of nuclear warfare." The environment has yet to fully recover from World War II, and many wonder if it ever will.

C. Vietnam War

The next major conflict that significantly disturbed the environment was War of Vietnam. The major parts of the war were fought in the jungles of Vietnam. In this war, the world witnessed the usage of weaponries which were categorically designed to cause environmental destruction. "There were two main weapons used by the U.S. in their massive destruction of the Vietnamese Jungles, Agent Orange and napalm. Agent Orange was commissioned for use in Vietnam by Defense Secretary Robert McNamara due to the fact that, Guerrilla warfare was carried out by the Vietcong under the cover of the mangrove forest. The reasoning was that if the mangroves were removed, the enemy would lose its cover and be forced into the open. In accordance with this plan, Operation Ranch Hand was created. By 1967, Ranch Hand had destroyed over 3.8 million acres of land, 1,000 peasants, and 13,000 livestock." Agent Orange was seen as lethal combination of chemicals designed to kill grass, foliage, woody species, and further leaving the soil too infertile to support life. "The deadliest aspect of Agent Orange was the presence of the chemical dioxin. Dioxin is "one of the most lethal of all substances developed by humans and deadly not only to the person afflicted but to future generations". Agent Orange was not only responsible for the destruction of plant life, but also causes death and birth defects in animals, including humans.

D. Iraq Invasion- The Gulf War (Operation Desert Storm by United States)

Desert Storm Operation is widely known as Iraq invasion by United States when US fought an enemy with an inferior army, thus the result of could be pre-determined. Therefore, the Iraqi army resorted to unorthodox tactics which included environmental destruction, "Never has a war been so purposely destructive of the environment as the Gulf War. In Kuwait, the Iraqi army lit oil fields on fire, forming immense plumes of smoke, causing devastating environmental destruction. The smoke caused by these fires resulted in air pollution. The soot from oil fires released carbon dioxide into the environment, combining with water in the atmosphere and forming acid rain." This acid rain caused severe destruction to the surrounding area and also polluted both water and food supplies. Livestock died because of drinking contaminated water and breathing toxic air. Saddam Hussein also engaged in another tactic of environmental destruction wherein destroying hundreds of pipelines

of oil and released millions of gallons of oil into the ocean. Though the impact of this war cannot be compared to previous wars, but it was the first time the environment was attacked tactically for gainful purposes.

Many other incidents and accidents including cold wars can be recalled which had severe impact on environment including the accident of Chernobyl or the war in Yemen or Syria, Israel-Gaza conflict or the ongoing crisis in Ukraine. All the human conflicts have always been accompanied by devastating sights of unavoidable environmental destruction. The international community has time and again risen this issue and need to protect environment including policies on 'sustainable development' which are also deliberated further.

Legal Action by World Community- Focusing on International Legal Framework and Un Actions/Responses

With rising concerns due to global warming, ozone layer depletion or other serious outcomes of environmental destruction which pose a serious threat to human life, the international community has come up together on several occasions to discuss and draft legal framework to protect the environment. "Stockholm Convention, Bonn Convention, Vienna Convention, Montreal Protocol, Kyoto Protocol, Rotterdam Convention" are few of the many conventions which have taken place with aim to safeguard environment.

Prior to Stockholm Conference in 1972, the majority of environmental conventions were related to the conservation of wildlife. But from 1972 Stockholm Conference to 1992 Rio Summit, a variety of international environmental law instruments were observed including Declaration of the United Nations Conference on the Human Environment 1972 developed a 109-point Environmental Action Plan and a Resolution recommending institutional and financial implementation by the UN. The result of these recommendations was the establishment of the United Nations Environment Programme (UNEP), established by UN General Assembly Resolution (UNGA 1972) and based eventually in Nairobi. In 1992, Rio Conference, the idea of sustainable development was thoroughly conceptualized, and action plans and strategies were put forth. They are still continuing in form of Sustainable Development Goals in United Nations Climate Change Conference (COP21, COP24, COP25, COP26) and to accelerate its actions in 2030 Agenda and the Paris Agreement. The Commission on Sustainable Development (CSD) was also established as subsidiary of ECOSOC with primary responsibility of addressing environmental issues and concerns, yet the alarming situation of environmental degradation is only worsening with time. This gives rise to an important question as to "whether Sustainable development really sustaining the environment?". The idea of forming SDGs and other agendas was to contribute to development while safeguarding environment which is now failing in procuring the desired results thus putting a question mark on the whole idea.

There are also many principles in International Humanitarian Law including specific provisions in Geneva Conventions which aim to protect environment during warfare. Further, conventions like Nuclear Test Ban Treaty and Non-Proliferation Treaty have been aiding to the cause of safeguarding environment from nuclear destruction by banning the act of testing nuclear weapons by member states and further making countries to give up their nuclear weapons to prevent any future destruction. Though many countries including India, Pakistan and many other countries have not ratified these treaties for maintaining their dominance in case of war which is understood as right step during current Ukraine crisis and possibility to initiation of World War III as already threatened by Russia. Though, the remains and chilling aftereffects of World War I and II have made it clear that World War III will not leave any ounce of environment or nature unaffected on mother earth. Thus, legal frameworks are not effective solution to safeguarding environment till the nations pledge to maintain world peace in all costs and humans choose sustainability over development.

Exploring the Present

The race is revolving around one's existence, from addressing questions that has haunted mankind since time to addressing the question that will be his nightmares now, in much simpler terms, discovering outside earths blue sky meaning the scientific launch and the other is beyond the black smoke meaning protecting the sovereignty by military show-down.

Innovation and discovery have led humans to great distance, quiet literally and ironically, the discovery Rankine cycle in the first century AD, discovery by George Brayton in 1872 then by Mr. Robert Goddard in 1882-1945 and finally, to Mr. J. Robert. Oppenheimer for developing nuclear bomb. Growth Always comes at a price, with a vision to excel we forget about our existence as is in the present.

I. Non-Scientific Launch

The launch or use of any energy creating or converting process that man has either discovered or developed which is used for not scientific purpose, major portion of which is Arms Showdown. Every year and every month one or the other military exercise take place around the globe to name some: -

1. **Exvayushakti2022:** India, as in its army, prepares in full swing for its weapons and power demonstration.
2. Escalated tensions in South-China Sea: USA holds joint military exercise with Japan in South China Sea.

II. Scientific Launch

Each and every launch is based on the principle of burning the fuel and there has been always a word for environmentally friendly ways, scientific launch consists every launch done in the name of scene to name some:

1. Sputnik 1: The first artificial satellite launched by the then Soviet Union.
2. James Webb: Satellite Launched for deep space observation. Previously, Hubble Telescope which was launched in 24.04.1990 was used for the same purpose.

Justification lies in mentioning that the launch is meant for scientific purpose only.

Cause and Effect of Warfare in Short and Long Term

Warfare be a short victory or a long battle and no matter the outcome of the battle, the battle is always lost. The cause of a war may be varied but majority of them are rooted in the battle of Sovereignty. The effect even of short fought wars are long term for the sole reason that in the modern times battles are often fought behind the actual war zone, i.e., its more sanctions and trade tariffs war rather than guns-blazing. As an example, by the report published RERF short for Radiation Effects Research Foundation, the attack on Hiroshima during WWII was so menacing that by fact the children born of the survivors of that incident are genetically modified or say now genetically, handicapped, even after 70 years.

Dependent on the Kinds of Weapons Used in the War: Analyzing a Nuclear Fallout

It should not now come to notice that the age has shifted to Nuclear weapons or better called as weapons of mass destruction, no deterrence, no reform is asked if its not on the peak of a nuclear bomb, capable of wiping the entire human race these weapons depend on a radioactive metal called as "Uranium" and along with it a process called as nuclear fusion which simply means mixing together. To carefully examine and analyses a nuclear fallout we must unfortunately note from the findings and observations written or orated by the people who have actually faced it. Throughout various interviews and research we have concluded this in 3 stages, first being the flash, then the boom and in the last the fallout/ash.

As a nuclear weapon detonates, it creates a reaction and a flash of white light is seen, then comes the sound, which is so loud that it breaks the nearest window and might even destroy houses to nothing, followed up by fire and in the last comes the ash rain and that is what nuclear fallout is about. Now, depending on the radius and the distance from the place of detonation, one might survive the first effects but then comes the radiation poisoning which is far worse.

These Nuclear-weapons are extremely dangerous and although meant for a good purpose initially but today the use has become much more of a "planet-killer". Recently, as innovating as humans are they have evolved this nuclear reaction based on fusion to fission, developed by Russia initially the reaction whereas was based on mixing of atoms, fission is separation of atoms and that is evaluated to be 12 times more powerful than a fusion-based bomb.

Environmental Problems Creating War

Sometimes, the objective of a particular warfare is based on environmental factors only, for an example, although there is an exclusive economic zone of every state/country over international water body which is 200 nm, this simplifies that the particular state/country can mine and dig out the natural resources in that area along with other rights but when the largest stock of gold is found to be in a particular zone which is outside this economic zone, then war like circumstances arise.

FUTURE/ CONCLUSION

Use of Nuclear Products and Spoils of War (Disposing the Waste and Pollution)

Twenty first century is the century of Nuclear Products and alongside its nuclear waste and they need to be addressed properly. Nuclear Products and byproducts as the word say is nuclear material at the core. Which although is present in the environment as is but is not present in this particular quantity or form which is highly radioactive. Radioactive means the atoms are not particularly stable, which makes them all the more dangerous, nuclear waste is another problem to deal with, when we address the waste we generally mean the used nuclear core used by energy plants of a country, since radioactivity still persists in those cores they need to be disposed of properly, therefore various countries have formed various policies regarding disposal of the same.

Should Change in the Thinking, Don't Put Me First

As long as man has existed, he has been working on two tasks, first is gathering knowledge and second is passing on that knowledge but as man is developing, he is worried about his possession, his entitlement and his work and this has created ample war fronts and eventually this will fall on his head because he is hurting himself in long run by using any and everything that harms the environment. Not worried about his health, man is focused on his next possession where as he should put the other first by that meaning, put the nature before him and ask direct questions, that will this benefit the environment somehow and if the answer affirms to anyhow, he must endeavor to follow it because future generation depends on what today is.

Take National and International Initiatives and Diversify the Fauna

Another suggestion to rectify the harm already done is creating awareness at the initial stage, people must digest that their deeds might lead to human extinction, not today, not tomorrow but eventually.

Till date various initiatives are already in place by internationally funded organizations who are working day and day out to promote environmentally friendly ways in out day to day work.

Even Mr. Oppenheim and Einstein were not in favor of how human is marching forward, Mr. Oppenheim after hearing about the bombing and aftermath of Hiroshima and Nagasaki started crying and said that he had no idea that his invention would be put up to such a deed and also quoting Mr. Stephan Hawking he said that human will lead itself to destruction.

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Green Accounting: A Study of Disclosure Practices and Its Impact on Financial Performance of Selected Indian Companies

Rathod Viraj Harjivanbhai and Sagar R. Dave
Gujarat University, Ahmedabad, India

ABSTRACT

Business needs to reconsider the definition of growth. It is nowadays not only limited to ecological growth but also requires to think on environmental growth. An economist and Professor Peter Wood gave the concept of environmental environment simply known as Green Accounting in 1980. Our Indian constitution has Article 51 A of Directive Principles saying that, it shall be the duty of every Indian citizen to protect conserve and improve the natural environment including forests, rivers, lakes, wildlife and to have compassion for living creatures. Since 1948, India has list of Acts considering the environment. Later in 1986, the Environment protection Act came into existence after Bhopal gas trag medy considering various laws rules provisions and amendments which are directly related and indirectly related to environment protection. In the year 1991, the very first announcement was made regarding Green Accounting in India. The ministry of Environment and Forest has proposed that every company shall disclose briefly, the particulars of steps taken or proposed to be taken towards the adoption of clean technologies for the prevention of pollution, waste minimization, waste recycling & utilisation, pollution control measures, investment and impact of these measures on waste reduction, water and other resources consumption, through to the reports of board of directors. Ultimately it refers to sustainable development. Hence it has become the duty and responsibility of an organisation to reduce the cost affecting to the environment. This study is aiming and mainly focusing on the disclosure of Indian companies by adopting Global reporting initiative- GRI. The study has used GRI ratings as a key variable of disclosure of environmental liabilities of firm to analyse various significant impact on performance of selected Indian companies.

Keywords: Green Accounting, Environmental Cost and Benefits, Environmental Acts, GRI- Global Reporting Initiative

1. INTRODUCTION

“**Vasudhaiva Kutumbkam**”- a Sanskrit phrase found in the Rigveda and Mahaupnishad- an ancient Indian collection of vedic Sanskrit hymns, - says that the **WHOLE WORLD IS ONE FAMILY**. Indian society, culture and devotees have been continued to believe that Nature or Environment is God and every living being on the earth is an incarnation of God. Man must protect the Earth and the Environment. Man should limit the usage of the non-renewable energy resources to be able to provide the same to next generation and should start the consumption of renewable energy sources. That thought brings a concept i.e. “Sustainable Development”.

More than a century before the term Sustainable Development has been used. But it appeared for the first time in the meantime year 1987. It formed a base for United Nations conference on Environment and Development held in Rio-de-Jenerio, Brazil in the year 1992, as a ‘solution’ of Environmental Degradation problem discussed by Brundtland commission in 1987. The Brundtland Report defines Sustainable Development under the head **Our Common Future**. It stated that, “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. Since this report more focuses on the goals of socially inclusive and environmentally sustainable economic growth, in 1992, UN conference on Environment and Development published the Earth chapter outlining the vision of sustainable and peaceful Global Soceity in 21st Century called **Agenda 21**, an action plan of UN, divided into 4 sections.

- 1) Social and Economic Dimensions
- 2) Conservation and Management of Resources
- 3) Strengthening the Role of Major Groups
- 4) Means of Implementation

Furthermore, in 2015 the United Nations has setup 17 Goals of sustainable development that are meant to be achieved by 2030 throughout the world. There are some countries who already have started focusing on the environmental part along with economic growth before this sustainable development goals were decided, viz. Norway, Philippines, Nambia, Netherland, Chile, Japan, USA and India. Norway was the first country who prepared Environmental Accounts in 1970 by collecting data on Energy Resources, Fisheries, Forest and

Minerals. But India has been giving importance to Environment since ancient times. Recently, in the year 2018, India ranked 112 out of the total 156 countries with a score of 59.1 by an Index measuring progress towards sustainable development goals

The main goal of Sustainable Development is to ensure a **society** where living conditions and resources are continued to meet human needs without weakening the environment. The significance of Environment health, protection and conservation are redefining the term- **GROWTH** of a country which cannot be achieved without involvement of Industry sector. Hence in the year 1980, a new concept came across the world that incorporates environmental sources and assets in company's accounts called "**Green Accounting**". It was introduced by an Economist and Professor Peter Wood. Now-a-days it's becoming very popular as Corporate Sustainability Reporting.

Globally there is a growing trend towards business providing economics, environment and social information into the public domain through "Sustainability Reports". It also increases business performance through communication of information with shareholders. A key purpose of sustainability reporting is to assist organizations to identify the cross cutting dimension of triple bottom line performance and to understand the process of measuring, reporting and improving the business decisions which the organization can run into business. Global Reporting Initiative (GRI) is a leading organization in the sustainability field. GRI promotes the use of sustainability reporting as a way for organizations to become more sustainable and contribute to sustainable development. GRI Sustainability Reporting Guideline 2011 defined sustainability reporting as "the practice of publicizing a company's environmental and social risks, responsibilities, and opportunities". The GRI Sustainability Reporting Framework provides direction on how organisations can release their sustainability performance.

Corporate Sustainability and its impact on financial performance have emerged as important areas for research in recent years. The purpose of this paper is to find whether sustainable companies are more profitable or not?

2. CONCEPT OF GREEN ACCOUNTING

Green accounting will help the organizations to identify the resource utilization and the cost incurred on the eco system by the activities of the industries. Companies are incorporating the concept of environmental element in their business operations. Green accounting will help the organizations to identify the resource utilization and the incurred cost. This method records cost and benefits rendered by the ecosystem to a business concern. Green accounting is considered to be an important tool for understanding the influential aspects of natural environment with respect to the economy. The data and information provided by environmental accounts are determined to be in relation to the involvement of natural resources in economic development and costs occurred due to pollution or resource degradation. The environmental costs that occur due to the financial outcomes of the firm's operation can be determined by means of a green accounting tool.

Green accounting is using management tools to conduct in various purposes for example, improving environment performance, controlling costs, investing in cleaner technologies, developing greener processes, and performing related to product mix, product retention and product pricing.

Green accounting is a growing field that identifies resource use, measures and communicates costs of a company or the national economy actual or potential impact on the environment. For sustainable development of country, a well-defined environmental policy as well as proper follow up and proper accounting procedure is needed.

3. COMPONENTS OF GREEN ACCOUNTING

Following are the considered factors for green accounting and reporting practices.

- Environmental Policy,
- Health Safety and Environment,
- Energy conservation,
- Corporate Sustainability,
- Environmental Initiatives,
- Sustainability Reporting,
- Water Management,
- Waste Management,

- Renewable Energy sources
- Environmental information system
- Environmental disclosure practice
- Environmental targets
- Environmental reporting indicators
- Environmental costs and benefits
- Environmental liabilities
- Environmental assets

4. DISCLOSURE POLICY OF INDIA

United Nations first issued a handbook on a System for integrated Environmental and Economic Accounting (SEEA) in 1993.

Indian constitution has **Article 51 A** of Directive Principles saying that, “It shall be the duty of every Indian citizen to protect conserve and improve the natural environment including forests, rivers, lakes, wildlife and to have compassion for living creatures”.

Since 1948, India has list of Acts considering the environment. Later in 1986, the Environment protection Act came into existence after Bhopal gas tragedy considering various laws rules provisions and amendments which are directly related and indirectly related to environment protection.

- The first announcement regarding this green accounting was made in the year 1991. The Ministry of Environment and Forests has proposed that “Every company shall, in the Report of its Board of Directors, disclose briefly the particulars of steps taken or proposed to be taken towards the adoption of clean technologies for prevention of pollution, waste minimization, waste recycling and utilization, pollution control measures, investment on environmental protection and impact of these measures on waste reduction, water and other resources conservation.”
- The Union Ministry of Environment and Forests has issued various instructions in to prepare environment statements.
- It is mandatory in the country to get an environmental clearance for all new projects that concerns both the Union Ministry of Environment and Forests and the corresponding State Government department of environment. The following set of information is disclosed.
 - a) Type of devices installed to control pollution
 - b) Steps taken for energy conservation.
 - c) Optimum utilization of resources.
 - d) Steps for decomposition of waste.
 - e) Steps taken for improving quality of the product.

In This Environment Statement, The Concerned Industry is Required to Provide Information On:

- a) Water and raw material consumption.
- b) Pollution generated
- c) Impact of pollution control measures on conservation of natural resources.
- d) Nature of hazardous and solid wastes produced and disposal practices adopted
- e) Measures taken for environmental protection
- f) Steps taken to popularize the benefits of environmental accounting and reporting among the corporate sector.

Green Accounting is in preliminary stage in India and whatever shows in the accounts in this regard is more or less compliance of relevant rules and regulation in the Act. GRI Database-2020 shows that there are only 110 listed Indian Companies who are presenting their data voluntarily through GRI.

5. LITERATURE REVIEW

Magablihi (2017) studied the Impact of Green Accounting for Reducing the Environmental Cost in Production Companies of Jordan and found that there were no statistically significant differences between the arithmetic Average of the possibility of measuring the environment cost of disclosure. **Kumar (2016)** studied green accounting as an effective tool for sustainable development. The study found that Green accounting is necessary to place value on environmental resources as the worldwide businesses agree on the benefits of the adoption of green accounting. **Jui-CheTu (2015)** analysed the relationship of green accounting and green design of an enterprise. The study revealed that there is a requirement of green accounting is with a redesign of the product for protection of environment and manufacturing of clean product. **Magara (2015)** examined Effect of Environmental Accounting on Company Financial Performance in Kisi County. The study revealed that the perceived financial performance of the corporate organization in general was in good status as perceived by the employees. Analysis of individual financial performance parameters shows that revenue generation has been improving, cash flows are seen to be in a good state and profitability has been on the increase. **Malik (2015)** has studied the green accounting reporting practices in India found that green accounting is in preliminary stage in India hence the companies are preparing their account in compliance of relevant rules and regulations of the Act. **Jolly(2014)** has studied the green accounting in India and the study reveals that there is a need to develop system of national accounting that fully incorporates the capital stock that determines India's earnings. **Moorthy(2013)** studied the green accounting with respect to cost measure aiming to find the issues of the firms for financial reporting of green accounting and found that the green accounting still faces a number of problems, such as, the lack of support of information, specialized personnel as well as the absence of proportional international accounting models. **Talebnia(2013)** has studied the social and environmental disclosure of a corporate of developing countries to investigate the extent of social and environmental disclosure (SED) in corporate annual reports and revealed that there is significant positive relationship between company size and level of SED & significant negative relationship between environment sensitive industries and level of SED. **Farouk(2012)** studied the green accounting for sustainable manufacturing and concluded that the establishment of an accounting system will enable the identification of environmental performance of different companies and organizations. **Sukoharsono(2007)** studied the accountability and environmental issues of Green Accounting in Indonesia and revealed that green accounting in Indonesia is necessary for organisation's accountability function and should be a key component in the corporate strategic process.

6. RESEARCH METHODOLOGY

✚ **RESEARCH OBJECTIVES:** are as follows-

- To provide an overview on Green Accounting and its various components.
- To give an outline of the Disclosure Policy of India
- To analyse the Green Accounting Disclosure Impact on Financial Performance of Indian corporates and
- To find out whether the adoption of GRI is profitable or not.

✚ **Study Period & Sample Size**

The present study makes use of secondary data. The average data over a period of 12 years from FY 2008-09 to FY 201-20 has been used to enable cross sectional analysis. A series of statistical tools like multiple regression, correlation and t-test have been used to analyse the. Thus, the final sample comprises of 10 companies; listed on the NSE; which have continuously been included in NIFTY 50 Index as on 31st March, 2020 with easily available financial and sustainability data, and which issue sustainability report as per GRI guidelines. The sample companies and the industry to which they belong are shown below in Table.

Table 1: Sample description

No.	Sample Companies	Industry
1.	Adani Enterprise Ltd	Conglomerate
2.	Reliance Industries Ltd	Conglomerate
3.	Dabour India Ltd	Conglomerate
4.	Bharati Airtel Ltd	Tele Communication
5.	Bharat Petroleum Ltd	Petroleum
6.	Gas Authority India Ltd	Energy
7.	Bharat Heavy Electronics Ltd	Electrical Equipment
8.	TATA Consultancy services	Information Technology
9.	WIPRO Ltd	Information Technology
10.	Steel Authority India Ltd	Steel

Variable Description and Data Sources

Five Accounting - based measures namely Cash Flow (CF), Profit Margin (PM), Return on Capital Employed (ROCE) and Return on Assets (ROA) have been used as proxies for financial performance as they are likely to be authentic and credible & also not influenced by market speculations and thus considered less disturbed. Green Reporting Initiatives (GRI) and Environmental Performance Rating (ENV) have been used as proxies for green accounting disclosures of company.

The financial data has been obtained from company's website, audited financial statements and annual reports. Green Accounting data have been obtained from "GRI database", which claims to be world's largest Green Reporting Initiatives database and principally adheres to GRI guidelines.

Research Model

This research paper tests one models using Multiple Regression Analysis as statistical tool in IBM SPSS Statistics software, in order to examine and analyse the relationship between GRI disclosure and financial performance. These models are described in the following section.

$$CF = \alpha + \alpha_1.GRI + \alpha_2.ENV \quad (1)$$

$$PM = \alpha + \alpha_1.GRI + \alpha_2.ENV \quad (2)$$

$$ROCE = \alpha + \alpha_1.GRI + \alpha_2.ENV \quad (3)$$

$$ROA = \alpha + \alpha_1.GRI + \alpha_2.ENV \quad (4)$$

7. DATA ANALYSIS AND RESULTS

The descriptive statistics for various variables used in this study have been shown in Table below

Table 2: Descriptive statistics

Variables	N	Minimum	Maximum	Mean	Std. Deviation	Coefficient of Variation
CF	10	-696.67	606.92	-76.745	385.9429	-5.0289
PM	10	-400.51	25.75	-30.883	130.0416	-4.2107
ROCE	10	9.02	39.02	18.94	11.0751	0.5848
ROA	10	2.39	28.9	10.135	8.5872	0.8473
GRI	10	128	137	132.7	2.9078	0.0220
ENV	10	25	28	26.7	0.9487	0.0355

From the table 1 it is observed that mean value of GRI ratings are more than 50% noting that GRI values are more than 100 in general sense. Whereas the CF and PM values are negative. This implies that selected Indian companies should improve Cash Flow and Margin of Profit along with other along with other components to improve their sustainability performance rating. The coefficient of variation for GRI is 0.0220 which is least among all the components. That means it is the least disturbing variable among all. ENV, ROA, ROCE also have coefficient values nearer to zero. It means- they are highly consistent variables having less fluctuation during the period under study. The coefficient of variation of CF is the highest i.e. -5.0289 and PM follows the same i.e. -4.2107. Thus shows that CF and PM are the least consistent variables. The results of first model regarding the impact of overall green accounting disclosure on financial performance of company have been summarized in table 3 below.

Table 3: Summarized Result of Regression Model

Particulars	R	R ²	Adjusted R ²	F	Sig. F	Regression Coefficient for GRI	Regression Coefficient for ENV
CF	0.128	0.016	-0.265	0.058	0.944	-0.111	0.160
PM	0.492	0.243	0.026	1.121	0.378	-0.518	0.586
ROCE	0.273	0.074	-0.190	0.281	0.763	-0.254	0.338
ROA	0.259	0.067	-0.199	0.252	0.784	-0.218	0.325

*significant @ 5% level of significance.

Above table 3 is revealing that all p values are more than 0.05. The result shows that the dependent variables GRI and ENV have positive significant impact only one variable PM with F_c 1.121. Here the study observed that F_c is greater than 1 for PM that shows both variables GRI and ENV are highly affecting PM. Whereas, on the other three variables CF, ROCE and ROA, both dependent variables GRI and ENV have insignificant but positive impact. CF is the lowest contributing variable and PM is the highest contributing variable.

8. CONCLUSION

From the above analysis and interpretation of results, it is found that the total profit margin or the overall revenue data of these selected Indian companies are highly influenced by Green Accounting Disclosure and Environmental Performance ratings. It is because of the disclosure cost and size of corporates confirming the findings of another research which states that there is significant a positive relationship between company size and level of extent of social and environmental disclosure (Talebna,2013). From this we can conclude that the adoption of GRI will be profitable for companies.

On other side, the Cash Flows, Return of Capital Employed and Return on Assets are not at all affected by Green Accounting Disclosures nor by Environmental Performance ratings. We can say that Capital Employed, Assets and Cash flows are not much affected even after accepting all disclosure parameters of green accounting. They are having insignificant positive association with and also impact on GRI.

9. LIMITATION OF STUDY

The present study is subject to certain limitations. Firstly, the sample size is small (i.e. 10 listed Indian companies). Secondly, market-based measures of financial performance are not considered in this paper. Lastly, the study ignores control variables like age of firm, growth of firm, capital intensity, leverage, risk, R&D intensity, industry type etc. that may have significant influence on this relationship. The results of study should be interpreted in light of these limitations and the future researchers should attempt to overcome them while doing further research in this area.

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Role of Judiciary in Protection of Environment in South Asia: A Shift from Anthropocentric to Eco-Centric Approach

Sapresh Devidas

Govind Ramnath Kare College of Law, Goa, India

ABSTRACT

Ever since the environment and non humanity became a major ethical topic, humans have been blamed for all that is morally wrong about human dealings with nature. Environment law can be looked upon from two perspectives- anthropocentric and ecocentric, the former is essentially human-centric, while the latter is nature-centric. The former gives prime importance to mankind, while the latter gives equal importance to all the components of nature. As we live in imbalanced ecology, The human Endeavour to restore the balance can be evidenced by an array of measures which are taken to prevent the frightening prospect of ecocide. The efforts have warranted international environmental cooperation cutting across nation-states. However, all these efforts were surrounded towards the interest of human being i.e. anthropocentric approach was prevalent. However, judiciary shifted its focus from Anthropocentric to Eco-Centric approach. Judiciary through its judgments, clearly stated that, human interest does not take automatic precedence and humans have obligations to non-humans independently of human interest. Eco-centrism is, therefore, life as well as nature-centered where nature includes both humans and non-humans. So, this paper focus upon a shift From Anthropocentric to Eco-centric approach for protection of environment by judiciary. This article also aims at studying different aspects of these approaches and also the changing trends in South Asia, especially in India.

Keywords: environment, anthropocentrism, ecocentrism, strategy, sustainability

INTRODUCTION

As we all know environment is that the wellspring of life on earth which determines the presence, development and improvement of humanity and every one its activities. The concept of ecological protection and preservation isn't new. it's been intrinsic through civilizations. there's little question that environment is heritage and that we have to protect it. at this time new innovations like, thermal power, atomic plant so on with none sufficient natural assurance pose another danger to the environment, the after effect of which ends in issues like heating, global climate change, acid rain, etc. Therefore, there arises a requirement for a comprehensive analysis of the protection of the environment. In South Asian Countries like other Countries of the planet, there is environmental degradation thanks to over exploitation of resources, depletion of traditional resources, industrialization, urbanization and population explosion; However, South Asian Countries have not been oblivious of this fact. In fact, South Asian Countries have always been within the forefront of taking all possible steps for the protection and improvement of the environment and aiming at sustainable development South Asian Countries have enacted various laws at almost regular intervals to accommodate the issues of environmental degradation. At the identical time the judiciary in South Asian Countries like India, Nepal, Bangladesh, Sri Lanka have played a pivotal role in interpreting the laws in such a fashion which not only helped in protecting environment but also in promoting sustainable development. In fact, the judiciary in Counties of South Asia has created a replacement "environmental jurisprudence". In recent years, there has been a sustained specialise in the role played by the upper judiciary of in devising and monitoring the implementation of measures for pollution control, conservation of forests and wildlife protection.

MEANING OF ENVIRONMENT

The word "environment" relates to surroundings. It includes virtually everything. It can be can defined as anything which may be treated as covering the physical surroundings that are common to all of us, including air, space, land, water, plants and wildlife. According to the Webster Dictionary, it is defined as the "Aggregate of all the external condition and influences affecting the life and development of an organism." Thus, after analyzing all the above definitions, the basic idea that can be concluded is that environment means the surroundings in which we live and is essential for our life.

Environmental Ethics

It is one in every of a branch of study which deals with the connection that humankind shares with the environment. the topic matter of this field comprises the various constituents of nature and their dealings with each other. Humans and other organisms are treated as a component of nature and are expected to

measure harmoniously with each other. The peaceful co-existence of those species is feasible provided that each of those species respects the rights of the opposite. There are majorly two branches of thought during this respect. One is of the view that nature primarily exists for humans. Humans have intrinsic value, however, all other species acquire value only they're successfully utilized by humans for fulfilling their personal needs. this idea is named Anthropocentrism. Contrary to the Anthropocentric approach is that the eco-centric approach. this idea is predicated on a nature-centric value system. It believes that human species could be a mere component of the ecosystem. the previous exists as a constituent of the latter and hence exists at the behest of the latter. Humans have a responsibility to safeguard and preserve the environment and exist harmonised with the opposite elements of nature.

Anthropocentric Approach to Environmental Law

Anthropocentrism could be a branch of philosophy and jurisprudence that treats man because the most vital being within the world. Everything that exists during this world has the prime purpose to serve humankind. Nature exists for the welfare of humankind and humans are speculated to be in particular of nature's organisms. This text has often been interpreted to determine the prevalence of humans over all living creatures on this planet. Value is accredited to nature only if it's utilised for the good thing about mankind. this suggests that nature exists instrumentally to serve mankind. Jurists with an anthropocentric approach never admit that a rise within the population of humans or any human action is that the reason for the depletion of natural resources. Therefore, they feel that there's no need for any legal measures to curb environmental exploitation by humans.

Ecocentric Approach to Environmental Law

Ecocentrism could be a branch of thought that finds intrinsic value altogether living organisms. It takes a holistic view of the planet, as opposition the narrower approach adopted by anthropocentrism. Ecocentrism contains a larger view than even biocentrism and zoo centrism. Biocentrism sees intrinsic value all told living beings, on the opposite hand, Ecocentrism additionally to the present gives due weightage to abiotic aspects and perceives environmental systems as wholes. Similarly, Zoo centrism sees intrinsic value in animals only.

Judiciary in South Asia: From Anthropocentric to Eco-Centric Approach

It is evident that within the changing times' ecocentric approach has gained more support. Various reasons are often ascribed to the identical. The foremost being, the knowledge that the preservation of flora and fauna is that the only key to the preservation of mankind, practically speaking, without the previous the latter cannot exist. It also has been realised that the legislations that protect flora and fauna are to an oversized extent generic in nature. Some species are on the verge of extinction, as thanks to their increasing demand, they need been overused. Hence, these specific species require specific attention. allow us to take a glance at the changing trends within the Judiciary. The Judiciary in Countries of South Asia has played a really important role within the environmental protection and has applied the principles of sustainable development while deciding the cases. There are number of cases on now and, therefore, it'll be necessary to review some important cases in these Countries specially India, Bangladesh and land and Nepal. the identical is discussed as follows.

POSITION IN INDIA

Initial Inclination towards Anthropocentrism

The earliest international declarations on environment protection, just like the Stockholm Declaration of 1972, the Rio Declaration of 1992, Johannesburg Declaration of 2002, etc were essentially anthropocentric. Take, for instance, the definition of sustainable development as given by the Brundtland Commission Report Of 1987. it absolutely was defined because the fulfilment of the requirements of this generation without compromising the flexibility of future generations to fulfil their needs. This definition gives prime importance to the fulfilment of the requirements of human civilization for achieving sustainable development. The rights of other species find no place during this definition. Initially, the reasoning of those conventions were adopted by Indian judges to administer their judgments. Some important cases propagating this view are:

M.C. Mehta v. Kamal Nath

In the case of **M.C. Mehta c. Kamal Nath**, reliance was made on the Brundtland Commission Report and Stockholm Declaration, 1972 and it was pronounced that sustainable development and polluter pays principle are a part of the Indian environmental jurisprudence. These concepts are heavily anthropocentric.

Vellore Citizens Welfare Forum v. Union of India

In **Vellore Citizens Welfare Forum v. Union of India**, it was observed that the above-mentioned principles can be invoked only when it is proved that they cause harm to humans. Additionally, the concept of intergenerational equity, that is environmental exploitation of nature should be equitably divided between the present and future generations.

Indian Judicial System Adopts Ecocentrism

The Indian judiciary has over time made a radical shift to ecocentrism from anthropocentrism. This noted change has been made from the following landmark judgments:

T.N. Godavarman Thirumulpad case of 2012

In the case of **T.N. Godavarman Thirumulpad**, the animal in question was Asiatic wild Buffalo, which are found exclusively in the western and Easter ghats of India. The court while explaining the ecocentric approach, elaborated on the necessity of application of the same.

Godavarman Thirumulpad v. Union of India, 2012

The subject matter of **Godavarman Thirumulpad v. Union of India** was the preservation of the endangered species of 'Red Sandalwood', which is found in Andhra Pradesh. In this case, like the previous one, the court elaborated on the importance of an ecocentric approach.

Centre for Environment Law, WWFI v. Union of India, 2013

In **Centre for Environment Law, WWFI v. Union of India**, the court initiated the judgment with the application of the ecocentric principle. The court threw light on the intrinsic value of all living beings, although the case was filed for saving the Asiatic wild lion. This judgment was rooted in ecocentric principles because it gave importance to all species of animals, especially those who were endangered, irrespective of the fact that they were instrumental for human survival or not. Basing its judgment on the reports of experts, the court held that Asiatic white lions constitute an endangered species. Keeping this into consideration, the construction of a second home for them to ensure their survival becomes necessary.

Position in Sri Lanka

Within the Environmental Foundation Limited et al. vs. the Attorney General et al., during this case petitioners include residents Nawimana and Weragampita Villages within the South of Srilanka, likewise as an organization which is dedicated to environmental protection. In 1987 the Southern Group took over a rock quarry near Petitioners villages. Petitioners allege that they need suffered serious injury to their physical and psychological state, and high damage to their property, as a results of large-scale blasting which commenced at the quarry in 1987. Among others allegations, Petitioners state that pieces or rock 20 centimetres in diameter were projected into their village, that the blasting created unbearable noise, severe vibrations & thick smoke, destruction of homes, and harm to their health and livelihoods.

The Supreme Court of Srilanka held that the court listed the terms of the settlement. The number of blasting was limited to three days a week (Monday, Wednesday and Friday), and if there is necessity to increase the number, the Monitoring Committee (two persons nominated by Petitioners and two persons from the Southern Group, the Gamma Niladhari of the villages Nowimana and Weragampita, and the Government Agent, Matara) must approve the change. If the blasting cannot be done on one of three days, it can be done on an alternative day suitable to the Southern Group if 24 hours writer notice is given to the Gamma Niladhari. Contingencies preventing a scheduled blasting include bad weather and inability of the police to be present.

Position in Bangladesh

In **Dr. Mahiuddin Faroogue vs. Bangladesh**, Represented by the Secretary, Ministry of Irrigation, Water Resources and Flood Control and Other. The petitioner, the Secretary General of the Bangladesh Environmental Lawyers Association (BELA), appealed against an order of the High Court Division summarily dismissing a writ petition filed on behalf of a group of people in the district of Tangail whose life property, livelihood, vocation, and environmental security were being seriously threatened by the implementation of a flood control plan, the compartmentalization Pilot Project, FAP-20. The petition was dismissed by the High Court on the ground that BELA was not an "aggrieved person" within the meaning of Article 102 of the Constitution of Bangladesh. Article 31 and 32 of the Constitution protects the right to life as a fundamental right, but there is no express right to a healthy environment. The question before the court was weather the fundamental right to life included the protection and preservation of the environment, the ecological balance and an environment free from pollution essential for the enjoyment of the right to life.

Position in Nepal

In "**Surya Prasad Dhungel vs. Godawari Marble Industries**" a full bench of the Supreme Court, however, accepted the locus standi to file a case under Article 26(4) of the Constitution of the Kingdom of Nepal 1990, or in case whether the matter of public concern or interest is involved. In this landmark case, the court for the first time recognized the right to clean environment as a "right to life" and accepted environmental degradation as public problem and matter of public interest. The court also emphasized that it is necessary to enact the comprehensive Environment Protection Act and to implement it effectively.

In **Shree Distillery Case**, The Supreme Court not only widened the scope of the role of the court in protection of environment but also made responsible the local authority to protect environment. The petition sought an order to stop discharging of pollutants in the Arun River and air as well as installation of treatment plant by the Shree Distillery Industry. The court pronounced that having license for operation of an industry does not alleviate the industry from its duty towards protection of environment and sustainable development. An industry cannot be permitted for its operation at the cost endangering environment. Industry must adopt the measures by which environment can be preserved and protected. Every industry has an obligation of sustainable development.

CONCLUSION

Thus, after the analysis of above cases, we discover that, the Supreme Court is, at the current time, stretching the various legal provisions for environmental protection. during this way, the judiciary tries to fill within the gaps where there's laciness of the legislation. These new innovations and developments in South Asian Countries by the broad interpretation open the many approaches to assist the countries. The courts are extremely cognizant and cautious about the special nature of environmental rights, considering that the loss of natural resources can't be renewed. this can be the most cause to shift from anthropocentric to eco-centric approach. South Asian countries are entertaining environmental cases under extra-ordinary jurisdiction, more specially, on the bottom of public interest litigation under their Constitutions. during this context, South Asian countries have played a really important role within the field of promoting environment and sustainable development. Thus, it's evident that the role of judiciary in promoting environment and sustainable development in South Asian countries are significance when deciding cases, it's supported the principles of sustainable development.

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Resolving Environmental Disputes in India through Arbitration: Prospects & Challenges

Priyansha Badoni and Faizanur Rahman

Faculty of Law, Jamia Millia Islamia, New Delhi, India

ABSTRACT

In recent years, environment and climate change have received paramount attention which was much a due. Especially, after the conclusion of Paris Accord in 2015, nations across the world have renewed their commitment towards environment protection and climate change. The citizenry has become more vigilant and exerts pressure on their governments to perform 'environment conscious governance'. Corporates are making a move to be more environment friendly in their ambitions. Systems are being established to ensure that mankind's actions and dreams of development do not come in conflict with environment. Environmental law is a vast and dynamic topic that usually addresses the repercussions of human activity on the environment. It is an area of law that provides the base for responding to all the problems caused as a result of climate change, pollution, exploitation of natural resources, etc. Environmental disputes are very complex and difficult to resolve because of its widespread effect on the interests of the individuals, communities, etc. India has a long history of resolving environment disputes through litigation. Judiciary has played an important role in establishing Indian Environmental Jurisprudence. The increasing complexities of environmental disputes, calls for an expert-based and a speedier method their resolution. Arbitration can play an essential role in this regard.

Keywords: Environment Law, Dispute Resolution, Arbitration, Climate Change, Environmental Disputes

I. INTRODUCTION

Mankind has suffered some of the worst, environmental disasters in the last two decades. There is a transformed consciousness that these calamities were not natural but were in fact a result of humankind's intrusion into the environmental system and an impact of his unchecked ambitions of development. Climate Change, resulting in melting of glaciers and rising sea levels; deforestation, air and water pollution are some of the onslaughts that have been inflicted on nature by human. The list is long, but to enumerate a few, these injuries inflicted on the environment has resulted into rapid extinction of species of fauna and flora, change in crop-pattern, long spells of flood and draught, extremity in weather conditions etc. Hence the impact of environment are global and not individualistic. Therefore, while looking for solutions one has to think globally.

In India, the impact of environment degradation is being felt for long now. Reasons for the same can be classified under three headings, social, economic and institutional. Huge population, excessive poverty, unchecked urbanization, migration are the social factors impacting environment in India. Economic factors are, lack of 'environment consciousness' in business activities, absence of environment audit of economic activities, more weightage being given to developmental projects at the cost of environment and rapid industrialisation in environmentally sensitive areas. At global level, India is also the third largest emitter of greenhouse gases. The argument, that India is a developing nation and thereby industrialisation is a necessity does not hold good in terms of the injury to the environment that is being caused.

Legally, India's consciousness towards the environment is reflected in its Constitution and various environment-related legislation. India has laws and systems in place for environment-friendly human activities, even though their implementation and functioning is contradictory. The Supreme Court of India has read various aspects of a healthy environment such as clean water, clean air into Article 21 of the Constitution of India. The Directive Principle of State Policy under Article 48A states that "the State shall endeavor to protect and improve the environment and to safeguard the forests and wildlife of the country". Respect towards environment has also been embedded as a fundamental duty of the Indian citizens under Article 51A which establishes that "it shall be the duty of every citizen of India to protect and improve natural environment including forests, lakes, rivers and wildlife and to have compassion for living creatures." There are various legislations catering especially to specific environmental concern such as, The Environment (Protection) Act, 1986, The Forest (Conservation) Act, 1980, The Wildlife Protection Act, 1972, Water (Prevention and Control of Pollution) Act, 1974, Air (Prevention and Control of Pollution) Act, 1981 and The Indian Forest Act, 1927. The National Green Tribunal has been established under the National Green Tribunal Act, 2010. It is a specialised court, specifically dealing with matters relating to environment. It has the jurisdiction to adjudicate over violation of environmental law, provide compensation to the victims of pollution, relief for environmental damage and restitution of the environment. The NGT is also serves as an appellate court against the orders

passed by regulatory agencies. The Indian Judiciary has played a commendable role in establishing environment jurisprudential principles of polluter pays, precautionary principle and the public trust doctrine. The Supreme Court in *Vellore Citizens' Welfare Forum v. Union of India*, has held that "the precautionary principle" and "the polluter pays principle" are essential features of sustainable development and that they have been accepted as part of the law of the land.

However, with all laws and systems in place, the citizens of India are not sensitive towards environment. Their activities are not environment-friendly and the repercussions of which they are now facing as massive and frequent climatic tragedies. The rapidity at which environment is degrading due to human activities and is now threatening its survival, calls for global attention. It is a problem created by humans, and solutions have to be sought at various levels. The mankind is compelled to think differently, due to the seriousness of the issue. This paper calls for a new approach in the way disputes concerning environment are resolved. In earlier times, there were only a few limited ways of dealing with environmental disputes. These ways usually involved litigation and political action, but mostly litigation. This was because Arbitration was not a popular concept back then. Arbitration has become the most sought-after method of dispute resolution because of the various benefits it offers. Since environmental disputes affect the society at large, in such cases the waiting for a court's decision may prove to be hazardous for mankind, this paper works out on the proposal of instead diverting the environmental matters to faster process such as Arbitration.

II. Arbitration for Resolving Environmental Disputes

In the present times, the nature of environmental disputes has become so complex and urgent, that the traditional set up of courts may not be the best possible way of resolving them. Hence the legal community has to be creative in devising ways of speedier disposal of such cases and also ensure that the resolution mechanism is guided by experts. One such method of dispute resolution is arbitration. It is a speedier, more effective and less time-consuming process, thereby can prove to be a better alternative to litigation in the coming time. It may also prove to relax the burden of the constitutional courts, where they are so overburdened with other cases that environmental matters may not be a priority for their attention. However, waiting for a decision in a litigation pertaining to environment, may prove to be hazardous, hence quick disposal of cases is the need of the time.

In present times, due to the strict liability provisions in environmental statutes, parties in commercial contracts beforehand allocate any environmental risk that their agreement is likely to have. There may be indemnity clause or exclusions to the same. There could also be an allocation of liability provision. These are amongst the clauses that may generate disputes in future. Providing for arbitration as a way of resolving such disputes can prove to be effective in mitigating and resolving disputes of environmental damage through contractual obligations. Not all environment and climate related disputes can be resolved through arbitration. However, contractual and commercial disputes in which environmental component may arise can be subject to resolution through arbitration.

Arbitration has become the most preferred way of resolving commercial disputes in the contemporary times. The special characteristics of arbitration make it an ideal method for resolving disputes with environmental concerns. It allows the parties at dispute to choose their arbitrator. Hence unlike litigation, the parties are able to choose who presides over their dispute and they can appoint an expert in environmental science as arbitrator. The outcome of such arbitration is likely to be more sensitive towards the environmental needs and accordingly deciding parties' liability. Arbitration is a speedier process; therefore, quick action may be taken especially in cases which require urgent actions to avoid irreversible damage to environment. Public participation through appointment of *amicus curiae* and allowing for third party participation can also ensure that public interests are taken care of in a process which is otherwise confidential. Arbitration's ability to customise itself, can prove to be advantageous for resolving environmental disputes which need quick disposal in order to stop environmental degradation through human activity. During the Covid-19 pandemic, the ease with which the arbitration community conducted its operations in virtual mode, ensures that the new found commitment of the mankind towards environment conservation, receives no-set back due to unforeseen circumstances. In the next section, the author assesses the present mode of dealing with environmental disputes in India and how arbitration can help in fixing such limitations.

III. Dispute Resolution Framework in India for Environmental Matters

Disputes relating to environment have mostly been resolved through litigation in India. The Constitution of India does give importance to environmental conservation. The Supreme Court of India has played an instrumental role in developing environmental jurisprudence in India. The polluter pays principle, the public trust doctrine and the precautionary principle, all have been devised by the Apex Court in matters concerning

environment. The National Green Tribunal (NGT) was setup under the National Green Tribunal Act, 2010. It is a specialised court established for the sole purpose of adjudicating and disposing environmental disputes. The NGT has the jurisdiction to deal with violations of environmental law, to provide compensation to victims of pollution, relief for environmental damage and restitution of environment. The Tribunal is also empowered with appellate jurisdiction against orders passed by regulatory agencies. However it has its own limitations. It is neither an administrative tribunal nor constitutional tribunal and does not have the power for judicial review. The jurisdiction of NGT is only limited to the seven statutes, hence it cannot take any matter which may fall outside these seven statutes making the Environment Law in India. The bench of NGT lacks diversity and does not hold stakeholders from various sectors as is mandated by the NGT Act itself. It majorly comprises of persons only from the legal background. The Central Pollution Control Board and the State Pollution Control Board have quasi-judicial powers, but the issue is that not everyone is empowered to file an appeal there. The appointments to these boards are political, thereby defeating the purpose of establishing such bodies.

Hence in India, the resolution of disputes concerning environment are either caught in the slow-moving justice dispensation mechanism of the courts or in the red-tapism of the bureaucracy. Since injury to environment can have repercussions which are not individualistic and are rather community based or can even have trans-border impacts, better, specialised and more effective methods of dispute resolution such as arbitration should be preferred.

IV. International Practices in Resolving Environment Disputes through Arbitration

At international level there has been an increased awareness regarding resolution of environmental disputes through arbitration. Various instruments and institutions are adopting arbitration as a preferred way of resolving dispute. The Permanent Court of Arbitration has made relevant changes in its rules to incorporate procedures for arbitrating environmental disputes. The New York Convention on Enforcement of Arbitral Awards provides certainty as to enforcement of awards. In November 2019, an International Chamber of Commerce (ICC) task force published a report resolving climate change related disputes through arbitration and ADR. The report in fact examined the potential role for arbitration in the resolution of international disputes relating to climate change. Dispute resolution mechanism in the Paris Agreement also provide for arbitration. The dispute resolution clause of the Paris Agreement refers to the dispute settlement clause in the UN Framework Convention on Climate Change, which enables parties to declare that they accept arbitration in accordance with the procedures to be adopted by the Conference of the Parties of the UNFCCC. Other climate change protocols which provide for arbitration as a means of settling disputes include, the Montreal Protocol on Substances that Deplete the Ozone Layer. The UN Convention on the Law of the Sea also contains arbitration as a dispute resolution mechanism. This convention plays an essential role in marine-related climate change disputes. In India, arbitration has been used to resolve environment related disputes. The prominent amongst these has been the Kishenganga Hydroelectric Project in the erstwhile State of Jammu and Kashmir. Pakistan took India to arbitration at Permanent Court of Arbitration.

With an increase in international bodies making way for arbitration in dispute resolution of environmental matters, it is a welcoming gesture for India to promote arbitration in this area.

V. CONCLUSION

Environment which should be of paramount importance to human, sadly comes in least of his priorities. However, in recent times due to the advent of catastrophic environmental calamities, there is a collective consciousness in the world community, that human activities leading to environmental degradation is a major concern and has to be addressed on urgent basis. This man-made issue has to be approached at various levels for its correction. From the dispute resolution aspect, quicker and more effective ways of resolving disputes which have environment component has to be resorted to. Arbitration, proves to be a more effective, speedier and time saving method of resolving disputes concerning environment. The customised approach of resolving dispute allows for better and faster decision-making process in environmental cases which demand quick disposal as environment conservation cannot wait for the delayed judgements of traditional courts. An expert of environmental science and law can preside as an arbitrator. This will lead to better outcome due to involvement of expertise of the arbitrator. Since arbitration is free from any procedural formalities, the disposal of cases will be much faster than the court machinery. Hence arbitration is a better way of resolving environmental disputes and should be promoted.

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Environmental Sustainability Training for the Civil Servants of India

Mrunal Patel¹ and Anurag Srivastava²

¹Unacademy

²School of Liberal Studies (SLS), Pandit Deendayal Energy University-PDEU (Formerly Pt. Deendayal Petroleum University (PDP), Gandhinagar, Gujarat

INTRODUCTION

The global risks report 2022 by the World Economic Forum has identified Environmental risks - particularly “extreme weather” and “climate action failure”— as the top risks in its short-term, medium-term and long-term outlooks. Across the world we are witnessing disasters caused by global warming and climate change whether it is wildfires in Australia and USA or the increase in the frequency of cyclones in the Indian Ocean. These climate change situations have drawn our critical attention to the anthropogenic factors that are harming our environment such as the rapid expansion of industries throughout the world, increased emissions of greenhouse gases, and consumerism, which is generating tonnes of plastic waste and electronic waste every day- resulting into degradation of soil, water and environment in general. In order to solve these issues, it is imperative that we finally make some changes and put in place some policies to address them. Although governments make promises at various global and national level summits, the key thing to watch is how much action these countries take on the ground, because the situation regarding environmental sustainability and protection has reached a point where we must act now or face extinction as a species very soon.

Climate change and environmental deterioration know no geographical boundaries, even if one person harms the environment, it harms the entire world, not just the country in question.

Environmental Challenges Faced by India

India is the second most populated country in the world. We lack the funding and technology commensurate to the size of our population, to fulfill the need for a sustainable environment. For example - electric cars, which are considered to be environment friendly, but currently unaffordable for the majority of Indian households.

India is among the fastest growing economies of the world- this means increased industrialization, increased production, and ultimately increased pollution and environmental damage. As a result, the Indian government must adopt aggressive methods to deal with and address these environmental issues, which are not only critical, but also complex and difficult to deal with.

The pollution of air water and soil is among the major challenges of India. This is further aggravated by deforestation. Deforestation continues to be a serious problem in the country, not only because of firewood burning, but also because of the massive infrastructure projects proposed by the Indian government sometimes for economic growth, and sometimes for national security. Among the most recent example is the expansion of the Char Dham highway, in Uttarakhand to enable speedy deployment of men, machinery and armament by the armed forces on the India-China borders.

Other problems associated with deforestation that have plagued and continue to plague India include adverse climate conditions that have become extreme, such as floods in Eastern India during rainy seasons, drought in Maharashtra, Rajasthan, and other parts of middle and northwestern India during summers, and ice and rock avalanches (which were previously rare) in northern India, such as Uttarakhand and Arunachal Pradesh. These events not only have a negative impact on the lives of people, but they also have a negative impact on the economy because a large sum of money must be set aside for the sole purpose of dealing with these extreme calamities in the country, which has an impact on the country's overall financial stability, which is likely to worsen in the future.

Now that we have gained an understanding of the problem, including the urgency and seriousness of the situation, we should consider what can be done at the national level to mitigate these issues. While there is no overnight solution to these problems, they are capable of being resolved slowly and gradually. The most effective method to advocate for a solution to these challenges is to instill environmental preservation principles in our hearts as well as in our government laws and in the training and capacity building of the civil servants.

Role of Civil Servants in Environmental Sustainability

Civil servants play an important role in design and implementation of the government policies and ensure these policies are beneficial to the majority of the population of the country in question. Not only do the civil servants look at how policies are affecting the overall development of the country, but they also examine how those

policies are affecting the only stakeholders in the country-the citizens-by establishing a suitable system of administrative procedure, oversight, and feedback.

Civil Servants' Recruitment, Training and Capacity Building

Organizational efficiency, productivity, and retention are all enhanced when employees are trained and empowered. This is true for all sorts and levels of organisations, in public and private sector.

The Union Public Service Commission (UPSC) selects the Indian Administrative Service (IAS) officers and other public servants at the national level, and the State Public Service Commissions select officers and civil servants for the state services. They are selected through a three-level selection process that includes a preliminary examination, a mains examination, and an interview, and it is through this process that the best brains of the country are chosen for the civil services. In recent years, the Public service commissions at union and state have incorporated the subjects of environment and disaster management in the competitive exam itself. For example, the General Studies Mains paper-3 of UPSC civil service examination consists of following topics related to environment: Environmental conservation; Environmental pollution and degradation; Environmental Impact Assessment, Disasters & Disaster Management.

Civil Servants' Training at National Level

The training module for an IAS officer is traditionally divided into five parts, each of which includes following phases- foundation course, phase 1, district training, phase 2, and assistant secretaryship. In addition to this induction training for direct recruits, the Lal Bahadur Shastri National Administrative Academy (LBSNAA) also trains the civil servants promoted from state service positions. Mid-career programmes are also conducted for upskilling of the senior officers.

However, upon studying the training module for young IAS officers, we can see that environmental research and real-life environmental concerns, as well as how to cope with them, are not given any special consideration. For disaster management, sustainable environment, and environmental challenges, there is no specific organization in place to train the candidates.

As an organisation with a broad reach to civil servants at all levels, LBSNAA ought to incorporate the serious subject of environment into its curriculum. This is because, in the structure of civil servant training, the inclusion of a well-structured environment sustainability module has become more significant than ever now that India has made big promises at environmental related summits and conferences, which are now growing in importance and the countries around the world are now taking them seriously.

Civil Servants' Training at State and District Level

In each state, an Annual Training Plan is developed by the Apex Administrative Training Institute (ATI), which informs and guides the District Training Institutes (DTIs).

After the approval of the plan, the ATI and DTI institutes distribute the letters to all concerned departments, providing training information as well as a request for personnel information for upcoming training programmes. Departments give a list of potential participants, along with their phone numbers. However, various studies have found following problems in conducting of the training programmes of the employees of the State Government services:

1. **Absenteeism-** Government officials are not relieved by the concerned Head of the department due to workload, election duty, budget preparation and staff shortage. If the minimal quorum requirement is not satisfied, the training program is cancelled.
2. Shortage of the trainers. Outdated syllabus, chalk-and-talk methods of teaching, without attention to case studies and field trips.
3. Lack of attention to post-training monitoring and evaluation mechanisms i.e. whether the trainee actually implements the lessons learned from the classroom to his/her real job or not?
4. Distribution of training materials to participants does not follow a regular protocol; Sometimes soft copies are distributed through email if accessible, physical copies are distributed if available. Sometimes trainees are provided with no material to study at all.
5. Lack of permanent academic staff in the training Institute. Retired government officials are invited to deliver lectures on ad hoc basis. While retired officers may have provide a plethora of knowledge and experience but every successful athlete cannot automatically become a successful coach. Therefore, Training of the trainers (ToT) is required but usually such programmes are not carried out in regular fashion.

Civil Servants Training for Environmental Sustainability- A Case Of Rajasthan

A brief examination of state government administrative training regulations and the annual training calendars of India's administrative training institutions (ATI) reveals that environmental-related topics/courses are either completely absent or given a low priority. For example, Rajasthan State's Administrative Training Institute which is officially known as Harish Chandra Mathur Rajasthan State Institute of Public Administration (HCMRIPA) has listed following core-areas in their training manual:

Table 1: Core subjects of Training in Rajasthan State's Administrative Training Institute

– Good Governance	– Urban Development and Urban Services Management
– Development Administration	– Public Ethics
– Administration and Laws	– Public Policy and Managerial Accounting Programmes
– Financial Administration in Government	– Public Systems Management/Delivery of Public Services
– e-Governance and Information Technology	– Disaster Management
– Management and Soft Skills	– Training of Trainers (Delivery and Design of Training)
– Right to Information	– Sensitization on Issues of Minorities and Marginalized Groups.
– Gender Issues and Gender Budgeting	

Further upon analysing the annual training calendar program of Rajasthan State's Administrative Training Institute for the year 2021 – we find that while training programmes related to women and children were conducted multiple times in a year but training programme for environment was conducted only once in the entire year:

Table 2: An Analysis of the training calendar of HCMRIPA

Training Course(s)	Duration	How many times training course conducted in 2021?
women and children (laws, trafficking, honour killing etc)	3 days	6 times (Feb, March, May, June November, September.)
Impact of climate change and urban development	3 days	Once in entire year. In Sept-2021.

This is not to say that training programs about women and children should be less frequent, but climate change training classes need to be organized more than once in single year. Because often climate change is a driving factor behind problems faced by women and children- such as drudgery in collecting drinking water and firewood, rural poverty, migration, etc.

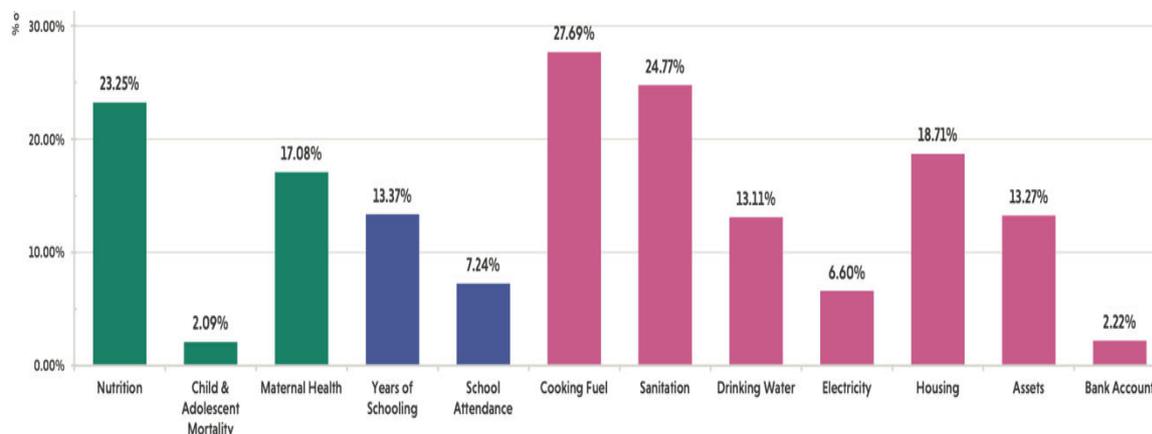


Figure 1: Percentage population of Rajasthan deprived in various indicators of multidimensional poverty identified by the NITI Aayog in 2021

As per the Multidimensional Poverty Index (MPI) released by the NITI Aayog in 2021, approximately 27% of the population of Rajasthan does not have access to modern cooking fuel such as LPG cylinder. Then it is inevitable that women of such household may be using firewood, cattle-dung and kerosene which are cause of indoor air pollution and respiratory disorders. 13% population of Rajasthan does not have access to drinking water. Consequently, the daily responsibility of collecting drinking water from faraway places would be affecting the school attendance of the daughters, resulting into learning poverty, which ultimately translates into income poverty in their adulthood. Such poor families then continues to more vulnerable to climate change and disasters compared to a financially and educationally affluent family.

Addressing such challenges of environment and poverty requires inter-ministerial coordination between Ministry of education, Ministry of energy, Ministry of water resources which ultimately necessitates the joint training programs for capacity building of the concerned civil servants in individual ministries.

Civil Servants Training for Environmental Sustainability- A Case of Uttarakhand

A brief analysis of the annual training calendar schedule of Uttarakhand Academy of Administration, Nainital which is the administrative training Institute of Uttarakhand Government reveals that-

Training Course	Duration	How many times conducted in 2021
Disaster Management: Post-disaster assessment, Psycho-Social problems, role of Panchayati Bodies, Urban Flood Management	3 Days	Only once in Jan-2021
Role of Women in Agriculture	2 days	Only once in Sept-2021
Crowd Management for Kumbh Mela	2 Days	Only once in Feb-2021

Uttarakhand is a hill state which frequently witnesses disasters related to climate change such as landslides, cloudburst, flooding. While it is appreciable that training institution has been organizing the programmes but the duration and frequency could have been higher considering the level of vulnerability Uttarakhand faces from climate change.

Uttarakhand is also a major destination for pilgrim tourism and adventure tourism so environmental sustainability aspects may also be added in the training programmes in addition to the crowd management.

Mitigating the effects of a disaster is a technique that administrators must learn now because disasters are unavoidable due to the damage that has already been done to the environment; now we can only try to minimize their effects as much as humanly possible.

Thus, based on the analysis of the administrative training calendars of the State governments of Uttarakhand and Rajasthan, we have discovered that environmental courses are not offered in the required frequency. In order to achieve this, the Ministry of the Environment should establish some common minimum guidelines for the number of environmental sustainability-related courses that should be taught and incorporated into various training programmes of the State Governments, along with financial support for attracting best trainers, development of Study material in local language, conducting field trips etc.

Civil servants training for Environmental sustainability – case of Gujarat

Our area of research in Ph.D is Role of Administrative Training in the capacity building of the Gujarat state secretariat staff. We want to give the reference of our own research regarding the training module and work profile of deputy section officers (DySO). In this analysis, we found that no attention is given to environmental sustainability, even though many such officials may be working in the ministries and departments dealing with environment, transportation, agriculture and irrigation. The syllabus of the pre-service training program of DySO in Gujarat consists of following five papers:

Paper 1: Constitution of India, Panchayati Raj and Five year plans:

(1) Article -32,226, 309, 310 and 311. (2) Fundamental Rights (3) Directive Principles (4) Role of Gujarat Public Service Commission (Article 320) / The Gujarat Civil Services Tribunal Act, 1972. (5) Provisions of Panchayats and Municipality - with focus on 73rd and 74th Amendments. (6) Supreme Court and High Courts (7) Election Commission (Centre and State) (8) Finance Commission (Centre and State) (9) Union list, State list and Concurrent list (10) Panchayati Raj and structure of Panchayati Raj in Gujarat, its power and limitations (11) Planning Commission (Centre and State) (12) Five year plan (Centre and State) and Concepts of inclusive growth and sustainable development.

Paper 2: Office Procedure, Acts and Manuals

(1) Office procedure for Secretariat department, 2009, (2) Secretariat and field relationship, (3) Administrative reforms - Need and measures, (4) Right to Information act, 2005 (with all amendments), (5) Departmental examination rules/Recruitment rules, (6) Lokasabha/Rajyasabha questions - their types and procedure, (7) Channel of submission and delegation of Power, (8) The Gujarat Civil Services Classification and Recruitment (General) Rules-1967.

Paper 3: Service Matters:

(1) Gujarat Legislative Assembly Rules, (2) Gujarat Civil Service (Conduct) Rules, 1971, (3) Gujarat Civil Service (Discipline and Appeal) Rules, 1971, (4) Gujarat Civil Services Rules, 2002 (Vol. 1 to 8), (5) Confidential Report Rules and Guidelines, (6) Roster Manual (How to prepare, maintain roster register and allocation of Roster points), (7) Gujarat Public Service Commission (Consultation) Regulation, 1960, (8) Prevention of Corruption Act, 1988, (9) Rules of Business and instruction issued there under.

Paper 4: Financial Matters:

(1) Gujarat Budget Manual, Part 1 & 2., (2) Gujarat Financial Rules, 1971, (3) Gujarat Treasury Rules, 2000, (4) Delegation of Financial Powers., (5) Purchase policy of Government of Gujarat., (6) Bombay Contingent Expenditure Rules, 1959,

Paper 5: Gujarati and English Language:

Drafting and Noting and communication skill

In the aforementioned syllabus, we find only a single mention of sustainable development in Paper-1 Topic number 12. Union government has already discontinued the planning commission in 2014, so there is a need for removing or shrinking the Paper1: Topic number-11 (Planning Commission) to make room for more attention to environmental sustainability and disaster management.

Civil Servants' Training & Capacity Building for Harnessing Solar Energy

As part of the world's most ambitious climate change goal ever set by a developing country, Prime Minister Narendra Modi announced at the United Nations Climate Change Conference in Glasgow in November 2021 that India would achieve net-zero carbon emissions by 2070, which means the country has committed to balancing all of the carbon it emits with an equal amount of carbon captured. In addition, the Prime Minister stated that India would achieve a non-fossil energy capacity of up to 500 Megawatts by 2030 and that renewable energy would meet 50 percent of the country's energy needs. Finally, he stated that India would reduce carbon emissions by a billion tonnes between 2021 and 2030. Now, in order to achieve these goals, India must overcome a number of obstacles, the most significant of which is the transition to solar energy. Several challenges exist at the national level, such as-

1. A lack of manufacturing capacity for solar panels and investment in research and development to discover more efficient methods of solar energy production.
2. A lack of skilled manpower to operate solar power.
3. Low voltage grid connectivity for variable renewable resources, and regulatory deficiency in the country.
4. At World Trade Organization (WTO) – case is filed by USA against the subsidies and preferential treatment given to Indian manufacturers under the solar energy programme of Government of India.
5. Economic Survey 2020-21 observed that solar irrigation pumps are being subsidized all over the country without any incentive for farmers to use ground water judiciously. While such schemes have an immense impact in reducing production losses during dry periods; but can also lead to unsustainable extraction of ground water.

Addressing above challenges requires the training and capacity building of the civil servants functioning in the Ministry of new and Renewable energy, Ministry of education, Ministry of commerce, Ministry of agriculture, Ministry of water resources among others to foresee the problems arising in achievement of targets and nipping them in the bud.

India aspires to achieve Net Zero Emission target by 2070. Solar energy is the most appropriate, sustainable, and advantageous option, the administration must set aside a portion of its budget for research and development in this field in order to become more widely available and affordable.

While the Government of India is taking steps to popularise the initiative by providing subsidies to people who choose solar energy in their commercial and private areas, the hope is that a shift towards solar energy can be initiated by taking a small step in the right direction at the right time. Not only that, but the government is also pushing electric vehicles and integrating electric vehicles into public transit systems in order for the country to accomplish its goal of zero percent carbon emissions and to set an example for the rest of the globe in this positive direction as well.

On the other hand, if policymakers receive training in the field of sustainable environment, they will be able to formulate policies that take into consideration the environmental impact of any proposals or projects, allowing them to make a demonstrable difference by including innovative ideas to address environmental issues and their impact on development at the same time preventing any fallout at World Trade Organisation.

Budget 2022 Renewed Focus on Climate Change

The Budget 2022 presented by the union finance minister had announced following initiatives, which have certain direct or indirect bearings to the environment and sustainable development:

1. Chemical-free Natural Farming will be promoted especially on farmers' lands in 5-km wide corridors along river Ganga.
2. 2023 is to be observed as International Year of Millets- we'll promote millet food processing and purchase.
3. Funding for Ken-Betwa Link Project, Damanganga-Pinjal, Tapi-Narmada, Godavari-Krishna, Krishna-Pennar and Pennar-Cauvery river interlinking.
4. Farmers to be given funding for agro forestry.
5. Focus on Sunrise Sectors: such as Green Energy, and Clean Mobility Systems.
6. Focus on Circular Economy especially on electronic waste, end-of-life vehicles, used oil waste, and toxic & hazardous industrial waste.
7. Solar Power: goal of 280 GW of installed solar capacity by 2030. Production Linked Incentive for manufacture of solar cells.
8. Carbon Neutral Economy: 5-7% biomass pellets will be co-fired in thermal power plants resulting in CO₂ savings of 38 MMT annually. It'll also provide extra income to farmers and job opportunities to locals and help avoid stubble burning in agriculture fields.
9. Urban transport: shift to use of public transport in urban areas. special mobility zones with zero fossil-fuel policy, and EV vehicles.

These are appreciable steps taken by the Government of India. Such schemes, policies and initiatives are to be implemented by ultimately by the officials at the state and district level. Therefore, need of the hour is to reform the administrative training programmes of the civil servants to increase the efficacy and impact of the funding provided under the Budget 2022 environment conservation and sustainable development.

CONCLUSION

We can conclude by emphasizing and understanding how critical it is to not only include environmental sustainability in the training curriculum of civil servants, but also to act on it in the real world to meet global environmental protection needs while also ensuring that the national economy continues to grow and progress upward in the development graph.

Lack of investment in the training and capacity building of the rank and file of civil services ultimately increases the reliance on outsourcing firms and consultancy firms even for the most routine of jobs.

To accomplish this, we must upgrade administrative skills among those performing administrative activities from the top to the bottom of the scalar chain, and change habits by adopting small changes and making a big impact. Therefore, politicians, civil servants and citizens- all must work together to make an impact in the country as well as the world, because, as the saying goes, "the greatest threat to our planet is the belief that someone else will save it."

It is high time for the Government to pursue reforms in the civil services rather than blaming bureaucracy for all the issues that the country is currently experiencing. It should begin with the recruitment and training process with greater emphasis on environmental sustainability, as well as encouraging civil officials to be more result-oriented.

Goal of a nation cannot be economic development, but sustainable economic development, because we do not borrow the environment from our ancestors, but rather borrow it from our children. As a result, civil servants play an indispensable role in advising ministers on potential environmental issues and solutions, as well as in framing policies to ensure that environment and development go hand in hand and that nothing is left behind in the race against time.

As a result, including an appropriately planned environmental training programme as an integrated element of the learning module for civil officials could play an immensely crucial role in environmental preservation and recovery efforts in the future.

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Governance of Municipal Solid Waste Management (MSWM) For Smart Cities: Case Study of Indore- India's Cleanest City

Samita Gupta

ABSTRACT

This paper introspects into the effective governance and implementation of municipal solid waste management in Indore, which has been the cleanest city of India, and proposes for its better implementation in smart cities. Article outlines the initiatives taken by most active Municipal Corporation to transform Indore into the cleanest city of the country. Article delves into various solid waste management activities introduced by Indore Municipal Corporation and the techniques through which the city topped in Swachh Survekshan (Cleanliness Survey). Paper explores and investigates the distinct original ideas of Indore Municipal Corporation which lead to perform exceptionally in the biggest Swachhta Survey in the country, Swachh Survekshan, in which Indore has been ranked top position for five consecutive years 2017, 2018 and 2019, 2020, 2021. Thus, paper proposes the same model to be adapted in the smart cities for better life by governance. In this structure, paper addresses effective governance and implementation of municipal solid waste management.

Keywords: "Smart City, Municipal Solid Waste management, Indore, Municipal Corporation, Swachh Bharat Mission, Swachh Survekshan"

1. INTRODUCTION

Rapid urbanization and life style changes leads to increased generation of per capita solid waste. It is estimated that 2.01 billion metric tons of Municipal Solid Waste (MSW) is generated annually world-wide, which is projected to increase to 3.40 billion metric tons by 2050.¹ Waste management is one of the most serious environmental and public health issues faced by developing countries, especially for populations residing in urban areas.² A rapid change in economic growth and human civilization have led to a dramatic increase in MSW generation in the urban and rural levels, especially in the least developed countries.³ In the global south, more than half of the total MSW generated is dumped openly and during the course of its growth, it causes grim environmental and health implications necessitating urgent interventions. Disposal of wastes in unauthorized, public spaces, sewerage systems and ditches, lack of understanding the factors affecting the different stages of waste management and the linkages necessary to establish among the various stakeholders have complicated the entire waste handling system. (B) Managing waste properly is essential for building sustainable and liveable cities. The Sustainable Development Goal 6 (SDG 6), the Paris Agreement on Climate Change and the New Urban Agenda (NUA) have addressed the issue of Solid Waste Management and urged commitment to practice "environmentally sound management and minimization of all such wastes."⁵

Municipal solid waste is one of the most important environmental problems in many countries therefore, the basic principal and regulation of packing waste must be applied to their management in order to reduce their production, ensuring reuse of used packing recycling and some other form of packing waste recovery and consequently reducing the amount requiring final disposal assuring a high level of environmental protection.⁶ Nowadays, more facilities of municipal solid waste treatment and disposal are in great demand because of pressure from solid waste pollution.⁷ they requires detailed information on the quantity and character of municipal solid waste and their physical and chemical properties, they requires also reliable data on quantity and quality of municipal solid waste generated in state⁸ reason why the sustainable management practices are necessary to keep the environment clean and green.

MSWM (Municipal Solid Waste management) is an essential municipal service that requires integrated approach, which is efficient, sustainable and socially acceptable. Developing countries typically face grim challenges while addressing the issues related to MSWM. Although many countries have relevant legislations, the implementation is inadequate, i.e. waste collection services are simply not available to each strata of inhabitants. The situation used to be familiar in India as well, but after the commencement of Swachh Bharat Mission (SBM), the state is swiftly retreating.

Rule 3 of Solid waste Management Rules 2016, defines solid waste as "solid or semi-solid domestic waste, sanitary waste, commercial waste, institutional waste, catering and market waste and other non-residential wastes, street sweepings, silt removed or collected from the surface drains, horticulture waste, agriculture and dairy waste, treated bio-medical waste excluding industrial waste, bio-medical waste and e-waste, battery waste, radio-active waste generated in the area under the local authorities and other entities"⁹. Whereas, solid waste management is an organized and integrated process of collection, transportation, processing and disposal of solid waste, also comprising of several collection methods, varied transportation equipment and recovery

mechanisms for recyclable material. The greatest challenge frequently faced by ULBs in India is the lack of source segregation until its disposal.

The paper presents a case for Indore city, which has changed the MSWM discourse in India. Indore is the most populous and the largest city in the state of Madhya Pradesh. The state's grander city offers a spectacle of majestic palaces co-existing with commercial centers. It is the commercial capital of Madhya Pradesh and one of the fastest growing cities in India. It has a total area of 3898 sq.km with the population of 32,76,697 (Census 2011) 10 and generates a total of 1115 MT 11 of MSW per day.

After securing 25th position in Swachh Survekshan 2016 12, Indore was declared the cleanest city continuously for five years during 2017 13, 2018 14 and 201915 2020 and 2021. Not only has Indore achieved the distinction of excelling in all Swachhata (cleanliness) parameters, it has also laid new standards for other cities to follow. Indore is the first million plus city to achieve 100% segregation at source,

i.e. at HH level. Indore Municipal Corporation (IMC) has successfully implemented IEC/ BCC campaigns to achieve source segregation with the help of local NGOs to cover over 5 Lakh HHs in 19 zones and 85 wards of the city. Within a span of one- year IMC has effectively sensitized citizens for source segregation and curbed the matter of open dumping.

IMC has introduced a 100% financially sustainable model to recover operation & maintenance (O&M) cost of MSWM through property tax cum user charges. The city is certified as 'Open Defecation Free' (ODF) and all the existing community/ public toilets are well-maintained. The O&M costs incurred for such CTs/ PTs are recovered by espousing monetization strategies like outsourcing. The Swachhata (Cleanliness) story of Indore is truly transformational which has been achieved by implementing strong institutional mechanism and frameworks, administrative efforts, community participation and involvement of NGOs, CBOs, etc.

Dealing with methodology, paper reviews various methods deployed by Indore Municipal Corporation to deal with the problem of solid waste management. Paper reviews wide range of literature in social sciences about solid waste management. Finally, author has developed insight how Indore has become the cleanest city of India by exploring and investigating various methods deployed to effectively manage solid waste. Article proposes to present the most active initiatives of Indore Municipal Corporation in order to accomplish the task of transforming city into the cleanest city of the country. Author's outlook in the paper that sincere efforts to construct solutions to solid waste management can indeed lead to exceptional results, which can be replicated to other cities as well. In this structure, paper addresses effective governance and implementation of municipal solid waste management.

The paper has been split into five sections. Section 2 explores Indore Municipal Corporation approach in dealing with Solid waste management problem. Section 3 probes into results of remarkable, exclusive, original and active initiatives of Indore Municipal Corporation in segregation, collection, processing and disposal of solid waste. Section 4 will take up concluding remarks in the analysis of result, to the conceptual problem.

2. INDORE MUNICIPAL CORPORATION APPROACH

Indore Municipal Corporation (IMC) adopted 5-pronged approach in dealing with MSWM, which are given below:

- 1) Building robust solid waste management framework
- 2) Creating favorable sustainable model for waste management
- 3) Enhancing environmental aspects for sustainable development
- 4) Creating conducive ecosystem for environmental up- gradation and sustainability
- 5) Achieving behavioral change in the citizens and ensuring their involvement towards efficient and effective management of solid waste

While dealing with the approach adopted by Indore Municipal Corporation (IMC), the following enabling frameworks were created to establish a robust MSWM system in Indore.

2.1. Regulatory Framework

Indore Municipal Corporation has framed various regulatory roles and responsibilities for various organizations and institutions under several waste management rules and regulations. These provide a framework for MSWM across the nation. The duties and responsibilities to be carried out by various institutions, bodies, groups and individuals shall be in accordance with these rules and guidelines or any other waste management rules notified from time to time.

2.2. Institutional Framework

The institutional framework consists of municipalities (Municipal Corporation, Municipal Council and Municipal Board) level institutions. To strengthen the existing institutional framework, Indore Municipal Corporation created Solid waste management (SWM) cell at Corporation level, enhanced manpower to meet the requirements.

2.3. Legal Framework

Indore Municipal Corporation has framed various legal roles with one of the basic responsibilities to manage their solid waste to keep the environment clean. Indore Municipal Corporation has also framed municipal bye laws, 2018 for managing municipal corporation solid waste management 16.

2.4. Procurement Framework

Indore Municipal Corporation has framed Public procurement framework which involves purchasing of goods or services by different entities such as ministries and departments of the government for public service delivery, and it encompasses activities ranging from assessment of procurement needs to award of contract and final payment.

2.5. Information Technology Framework

The institutional framework by IMC plays an important role in Solid Waste Management (SWM) that the local body delivers for its residents as the most significant municipal service and a prerequisite for other complicated municipal services. The overall target of IMC is to monitor, collect, treat, and dispose solid waste generated by the residents, in a cost effective, environmentally and socially satisfactory manner. The Information Technology plays crucial role in monitoring and evaluation activities related to solid waste management and involves design, development, installation, operation and maintenance of the system for pan city.

2.6. Sustainable MSWM

To achieve Sustainability in Solid Waste Management, Indore Municipal Corporation initiated working on the Environment Sustainability, Economic Sustainability and Social Sustainability. Sustainability is broadly defined as "Meeting the needs of the present generation without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987)¹⁷. IMC met with the improvement towards sustainability of waste management in Indore as per the rules and guidelines issued by MoHUA (Manual on Municipal Solid Waste management, CPHEEO (Central Public Health and Environment Engineering Organization)).¹⁸. The following models were established to achieve sustainability in MSWM.

2.6.1. Environment Sustainability

Environmental Sustainability is the ability to maintain things or qualities that are valued in the physical environment. The physical environment includes the natural and biological environments. To achieve environmental sustainability, Indore Municipal Corporation adopted multipronged approach that includes the 5Rs principle to Reduce, Reuse, Recycle, Recover and Remove.

2.6.2. Economic Sustainability

Economic sustainability broadly comprises of equitable allocation of resources, sustained levels of growth and consumption, optimum utilization of natural resources and the belief that the economic growth trickles down to the poorest. In order to achieve Economic sustainability, IMC establishes new enterprises, waste sector of Indore started generating secondary material in a cost- effective manner, minimizes the amount of residual waste disposed.

2.6.3. Social Sustainability

Social Sustainability establishes the nexus between social conditions and environmental decay. Social sustainability encompasses notions of equity, empowerment, accessibility, participation, sharing, cultural identity, and institutional stability. It seeks to preserve the environment through economic growth and the alleviation of poverty. It ensures that development in waste management lays down the foundation for clean environment and improved public health. IMC has made provision for receiving complaints, feedbacks and grievances through mechanisms such as toll-free numbers, SWM Apps etc.

2.7. Operational Excellence

In order to achieve operational excellence in the area of waste management, IMC has created a detailed plan covering all aspects of waste management including segregation, collection, transportation, processing and disposal. The detailed plan includes various methodologies which have been adopted by Indore Municipal Corporation to increase the effectiveness which are discussed in upcoming sections.

3. RESULT AND FINDINGS

Indore's performance in management on the Solid Waste has been of paramount importance. The initiatives taken by the Indore Municipal Corporation has resulted in remarkable achievements. This has been done through optimizing the waste value chain through efficient monitoring, governance and behavior change activities which are as follows:

3.1. Water Segregation at Source

The mission to achieve 100% Source Segregation was initiated in January 2017 after IMC achieved door to door coverage in December 2016. It was achieved through extensive IEC Activities with the handholding support of NGOs in order to reach out to public and involve them in the task. The approach and methodology adopted by IMC to achieve 100% segregation of waste into Wet and Dry at the source consisted of creating a conducive atmosphere in a way to promote and maximize public participation in the drive.

3.1.1. Administrative Framework

Indore Municipal Commissioner introduced multiple administrative and policy interventions to mandate the public and bulk waste generators for disposal of waste through Indore Municipal C only. This was done by releasing notification on Segregation at Source 19 and releasing an order mandating Onsite Wet Waste Processing by Bulk Generators 20 and elimination of GVPs 21.

3.1.2. Education and Communication

IMC has led multiple campaigns to promote awareness on waste segregation at source among the citizens. IMC launched several community engagement initiatives like street plays, walkathons, formation of Swachh committees and schools, rallies, making of radio jingles and advertisements, print & outdoor media, organized walkathons. IMC also partnered with 9 brand ambassadors to spread the message under Swachh Bharat Mission who engaged with citizens on regular basis creating awareness amongst them on different aspects of cleanliness including source segregation. IMC organized oath events where people took the Swachhta pledge to the goals of segregating waste at the source. IMC also distributed two sets of dustbins to the people to promote waste segregation. It also involved NGOs to bridge the gap between IMC and the citizens of Indore.

3.2. 100 % Collection and Transportation

Indore is a garbage container free city hence 100% of waste generated meant for centralized processing is collected and transported. Collection of waste from domestic sources is done through compartmentalized tippers, four-wheeled vehicle with chambers at the back which has been divided to collect wet and dry waste. In order to collect segregated waste at source, all the tippers have three compartments:

- Blue compartment is for dry waste
- Green Compartment is for wet waste
- Bucket is located at the back of the tipper for collection of sanitary waste and domestic hazardous waste.

Collection in the areas where motorized vehicles cannot navigate to narrow lanes is carried out by deployment of compartmentalized wheel barrows and twin bags. The approach and methodology adopted to ensure that the waste segregated at source is collected and transported in segregated form is as follows:

3.2.1. Administrative and Process Framework

IMC has released a staff order to collect waste in segregated manner only and refused the collection of mix waste from anyone who fails to segregate the waste at the premises. They also created a bulk collection system and implemented user charges to collect the waste from semi-bulk and bulk generators in segregated manner. It introduced strategic route plan for every ward required for complete coverage of the city. The fields involved items like registration number of vehicles, type of vehicle (tipper, dumper, etc.), ratio of the partition of collection chamber in Wet and Dry, ID of the GPS Device installed in the vehicle which enabled the IMC Staff to track the vehicle.

3.2.2. Capacity Building

IMC undertook Capacity Building initiatives like training of senior Staff Members (Sanitary Inspectors, Darogas, Health Officers) who were trained, organized orientation programmes for field level staff (Safai Mitra) (Cleanliness friend) who were directly in touch with the community for the whole initiative of D2D waste collection and changing the behavior of communities.

3.2.3. Strengthening Infrastructure

A pilot project was initiated by IMC in Wards 42 and 71 in the year 2015. In both these wards, 40 cycle rickshaws were deployed for waste collection and during this period one motorized tipper was used for waste

collection. Based on this, it was estimated that one tipper can cover 1000 households in one trip. The pilot project facilitated in the assessment of the transport requirement for waste collection in Indore.

3.2.4. Monitoring

IMC undertook monitoring of collection and transportation of waste to ensure that the waste is collected from all households and transported to the processing plants via transfer station. IMC introduced Manual Monitoring to be done daily by senior officials. IMC had mandated provision for the vehicle to maintain a feedback register in the vehicle. The feedbacks were recorded on random basis- Door to Door Feedback Register for Morning Shift and Evening Shift. (14) IMC also promoted use of ICT based biometric attendance and payroll system to reduce staff absenteeism and use of GPS based Vehicles Tracking and Monitoring System (VTMS).

3.3. 100% Processing Waste

IMC has taken considerable initiatives to ensure 100% processing of wet waste by mandating and promoting decentralized processing by engaging Bulk Waste Generator to establish on-site waste processing. This includes:

3.3.1. Administrative Framework

IMC identified Bulk Waste Generators and initiated administrative decisions to enforce duties and responsibilities of Bulk Waste Generators (BWGs). It introduced incentive mechanisms for BWGs to promote onsite waste processing and to reduce their financial burden (e.g. a rebate of 6% in the 'Vyapak Swachhata Kar', defined user charges to be implemented on BWGs by IMC. The assessed the waste generated in markets and mandis (vegetable market) via random sampling and made a feasibility plan of the waste processing facility at each examined site.

3.3.2. Iec/Bcc & Capacity Building

IMC engaged veteran brand ambassadors to create awareness for onsite waste processing, promoted waste processing and compost at multiple locations in Indore, and educated the bulk waste generators about the methods for decentralized processing by bridging the information gap. As a result, leading newspapers invited companies dealing with processing equipment's to showcase their technology that can be adopted by BWGs. IMC started open composting on plane open surface of garden/parks along with the construction of Composting Pits. They have conducted practical training of garden staff to ensure effective composting process implementation.

3.3.3. Building and Strengthening Of Infrastructure

IMC initiated pilot projects like Organic Waste Composter (OWC) machine in park and created infrastructure for composting or biogas in all mandis, religious places etc. for processing waste.

3.3.4. Monitoring

IMC created a special Monitoring Cell for Bulk Waste Generators led by a Health Officer (HO). The cell was entrusted to ensure that all BWGs undertake onsite processing and maintain records in the log books relevant to the waste processed by them. In this regard, strict monitoring was done by IMC staff by enforcing spot fines on defaulters.

3.3.5. Waste Processing in Parks and Gardens

IMC has categorized the dry waste into 9 categories: Carton Paper, Grey Boards, Polyethylene Bags, Polythene, Plastic, Metal, Glass, Rubber and Scrap". The dry waste from the transfer stations and the bulk collection vehicles is offloaded at the MRF centers, where they are further segregated and processed. IMC establishes plastic waste collection center where the rag picker segregates the waste as it is unloaded at the plant and is sent to the plastic collection center. This plastic waste is sold to IMC vendors for construction of roads and it is also being supplied to Madhya Pradesh Rural Road Development Authority (MPRRDA). Through this IMC is encouraging the use of plastic waste that cannot be further recycled, for road construction as per Indian Road Congress Guidelines 23.

3.3.6. Informal Integration of Waste Pickers in Solid Waste Management

To integrate the rag pickers in the formal sector IMC has established a system to recognize informal waste collector and facilitated their participation in Solid Waste Management including D2D Collection of waste. For this, IMC has engaged NGOs to manage the MRF facilities dealing with rag pickers and Kabadis (scrap dealers). Several initiatives were taken by IMC to facilitate rag pickers employed at MRF facilities. This includes Bus passes to all the rag pickers coming to MRF at concessional rates, provision of space to scrap dealers (kabadis) is near the trenching ground. The rag pickers were also motivated to open bank accounts and were given creche

facility for their infants and children. Through the deployment of two MRF facilities and one plastic collection center. IMC ensure that 100% of dry waste is processed.

3.4. Final and Safe Disposal of Waste in Indore

Indore city has a sanitary landfill which is complying of all the criteria and specifications as specified in the SWM rules of 2016 and the Municipal Solid Waste Management Rules of CPHEEO, MoHUA (Manual on Municipal Solid Waste, Government of India. Unplanned dumping of entire waste at dumpsite resulted in huge gap of waste agglomerated at the trenching ground. The waste disposed in this manner led to the contamination of the trenching ground. To deal with this, IMC has initiated Bioremediation, “a waste management technique that involves bio mining, thereafter use of organisms to treat if any organic mass remains undigested and screening and segregation of MSW” 24 , of dumpsites in Indore to overcome harmful impacts of unplanned dumping.

As a result, of 100% source segregation and waste processing, the quantity of the inert waste generated has come down significantly. As the quantity of waste to be disposed in sanitary landfill is decreased, the active life of landfill cell is increased by several years.

In addition to this, since IMC managed the Construction and Demolition waste separately, the amount of inert waste to be transferred to the landfill decreased and didn't mix with the C&D waste. Through the enactment of measures, creation of processes and infrastructure to process dry and wet waste, IMC has been successful in ensuring that only inert is transferred to the landfill.

4. CONCLUSION

The model of Solid Waste Management in Indore can be used as a decision support tool for effective handling and disposal of municipal waste.

IMC has performed exceptionally well in the biggest Swachhta Survey in the country, Swachh Survekshan. It has secured Rank 1 for five consecutive years 2017, 2018 and 2019, 2020, 2021. In the Direct Observation component, Indore Municipal Corporation has a near-perfect score of 1189 marks out of a maximum of 1200. A total of 162 locations were sampled and surveyed by an independent assessor, out of which 160 locations were found to be impeccably clean and satisfying the requirement of the assessment criteria. The city has also been able to achieve more than 90% segregation of waste at source from both residential and commercial areas. Indore's remarkable performance remains an example for other cities to follow. The city also has a well functional Sewage treatment plant which is highly efficient. A dedicated PIU (Program Implementation Unit) has been engaged by Indore Municipal Corporation, which is highly active towards Swachhata activities.

The city has also developed its own cleanliness mobile application. With respect to direct feedback taken from citizens, the Indore Municipal Corporation was positively reviewed by over 75% of respondents who were satisfied with the current level of cleanliness in the city, have seen improvements in the city over the past year, and general satisfaction over the public sanitation facilities provided to the citizens and their maintenance.

Indore has been able to achieve the rank by capitalizing on the community support and participation in SWM to sustain its waste management activities. It has shown that awareness among the people makes them realize the importance of source segregation at the generation. IMC's series of efforts to install viable decentralized composting plants to reduce the load on ULBs for collection and transportation of MSW resulted in the reduction of the pressure exerted on the landfills through disposal of inert waste.

IMC treated the waste generated as a resource and formal recycling sector/industries was developed to recycle non- biodegradable recyclable component from the waste thereby providing employment to rag-pickers and absorb them in the formal sector.

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The Critique of Anthropocentrism; A New Idea of Sustainability

Aman Karan

Delhi Metropolitan Education, India

ABSTRACT

The leading researches on Environmental Sustainability or Sustainability in general has been restrained to mean sustainability of human species. This idea of sustainability is anthropocentric or human-centered. In this article, the parochial definition of environmental sustainability along with the instrumentalist view of environmental sustainability, that the factors of environment are just for the use of humankind and environmental sustainability should only be sustainability of human beings, has been criticized by comparing the definitions of sustainability provided by experts and organizations like UN and US EPA. Further, this paper has tried to elucidate a comprehensive or biocentric (in environment lingo) idea of environmental sustainability, where all the life forms on the Earth can come under the umbrella of sustainability. The attempt to giving an exhaustive idea of sustainability has been approached with an understanding of different environmental philosophies, from criticism of anthropocentrism to importance of ecocentrism, and analyzing the concept of environmental sustainability in terms of each of these philosophies.

INTRODUCTION

Anthropocentrism in the simplest terms is defined as a belief that regards human beings as the most important life form. Britannica defines anthropocentrism as a philosophical belief which advocates human beings as the most important and central entity in the world. Anthropocentrism says that human life has intrinsic value while other life forms and species are just resources that are to only be used by human kind. Basically, anthropocentrism is the philosophy that human beings are at the center of the ecosystem and every biotic or abiotic and sentient or non-sentient thing has only instrumental value as opposed to former, who have intrinsic value. In the context of environment sustainability, the critique of anthropocentrism is necessary in the contemporary time to change traditionalist view. Anthropocentrism relates to environmental sustainability in a narrow sense. The more this belief of anthropocentrism is commended, the worse it will get for environment because the natural components of environment will only be regarded as instruments or tools to fulfill human needs.

A clear understanding of anthropocentrism is vital in understanding its effect on the environment and environmental sustainability. Environmental sustainability refers to responsibility of preserving and protecting the ecosystem and natural resources for present and future generations. This responsibility has been needing a major consideration in the modern times. It was long believed that the resources of environment were abundant and infinite when the human ecosystem was small. Even though the regenerative and assimilative capacity of the environment were very large in ancient times, the exponential growth of human ecosystem has exceeded these capacities which has resulted in scarcity of resources. The empirical evidence of this claim can be derived from history. During the prehistoric period of Stone Age, human beings were not evolved enough for civilization. Since there was no civilization, there was relatively very regulated use of natural resources as paleolithic humans lived in the wild (in caves or forests) and required less to sustain themselves. As these humans evolved and civilization started to develop, the need for environmental resources increased to sustain this development. From cutting a fruit or two from a tree to taking down several trees and even forests, the natural resources of environment were started being used to make space for sustaining and developing civilization. This is why as human ecosystem progressed, the apparent infinite environmental resources became finite and in contemporary times the large-scale use of these resources has resulted in exploitation of the environment which is clear from deforestation and the increase of greenhouse gases. This is why changing the idea of environmental sustainability has become a cause of great concern in today's times.

THE PAROCHIALISM OF ENVIRONMENTAL SUSTAINABILITY

In 1987, the *United Nations Brundtland Commission*, defined sustainability as "meeting the needs of present without compromising the ability of future generations to meet their own needs". The definition of environmental sustainability is not much different than the definition of sustainability, but it only considers sustainability of the environment whereas sustainability in general includes economy and society as well. Environmental sustainability, in the most fundamental sense, refers to the concern or action to preserve the environment and its natural resources for present and future generations of humanity. It means the responsibility to use natural resources such as coal, natural gas, water etc. in such a way that it fulfills the needs of present

generation without damaging the environment for the future generations. A number of practices has been devised to sustain the environment. Some of these practices include using reusable alternatives, using renewable energy, going paperless which would prevent deforestation, etc. But the problem lies in the parochial view that is associated with environmental sustainability. Often when the concept of sustainability is discussed, it is defined in a very instrumentalist view. For example, the UCLA Sustainability Charter defines sustainability as the “integration of environmental health, social equity and economic vitality in order to create.... healthy and resilient communities for this generation and generations to come”. This definition of sustainability implies that the practice of sustaining or preserving the environment should be taken up so that the communities of humans of the present and the future could be resilient and healthy. The meaning of environmental sustainability has been constrained to mean preserving the environment for human beings. It implies that the resources of environment are just for use for present and future generations and it should be preserved with that notion only. This definition feeds to the instrumentalist view that regards the environment as a tool for the human species. Such an instrumentalist view is a harmful notion of sustainability.

This concise meaning of environmental sustainability or sustainability in general can be dangerous. It is restricted in the regards to inclusion of other species. The concept of anthropocentrism helps to understand this exclusivity of the idea of sustainability. Can it really be enough to associate sustainability with preserving the environment for humans only? This anthropocentric narrative leads to conservation of environment not for environment’s sake but for the sake of humanity. The belief of anthropocentrism is deeply embedded in the idea of sustainability. For instance, the United States Environmental Protection Agency (US EPA) bases sustainability on a simple principle that everything we need for our survival depends on our natural environment. It is evident from this definition that human-centeredness is foundational in the notion of sustainability. An exhaustive idea of sustainability would emerge by changing the narrative from an anthropocentric view to a biocentric or ecocentric view that considers all the species of the Earth. Defining sustainability in comprehensive terms could be difficult without understanding different environmental philosophies.

ENVIRONMENTAL PHILOSOPHIES AND SUSTAINABILITY

Environmental philosophies are different belief systems that center around nature, ecology, species and environment. It deals with moral relationships between humans and nature as well as the value and moral status of environment and its nonhuman contents. Some of these environmental philosophies are anthropocentrism, biocentrism, speciesism, etc. Some regard humans as the center of the ecosystem while others believe in the importance of all species. Every environmental philosophy propounds a different idea of sustainability and different criticisms to that idea.

The contemporary idea of sustainability is based around anthropocentrism or human-centeredness. Anthropocentrism is the belief that regard human beings as the most important species of the ecosystem and all the other species are just tools for their use. Anthropocentrism implies that human beings have intrinsic value and other species, sentient or non-sentient, have instrumental value which is why they should be used to sustain human lives. The comparison between instrumental value and intrinsic value is a question that is often at the frontlines of environmental ethics. Anthropocentrism regards other life forms as instrumental because this belief requires that a society have concept of humanity, assign privilege to it and measure all other beings according to this standard. So a plant’s value is judged by its use to humankind. This also means that anthropocentrism compels that humanity should be central to a society, assign a degree of utmost importance to it and judge all the other beings according to this humanity. It proves to be a dangerous belief as the idea of humanity installed in the society is discriminatory to the other beings in the environment. It can be harmful to judge all the other species according to this idea that is, in the first place, developed by humans only. The privilege and importance that is given to humankind, results in ignorance and negligence of other beings in the environment. It can be seen how perilous this notion can be when we look at the extinction of other species on Earth due to development of humankind. For example, one of the reasons for the extinction of Dodo bird (a bird of Mauritius island), is destroying of their habitat for building artificial things such as roads, buildings, etc. These are built to make the human lives easier and develop their civilization at the cost of other species. This is why humanity and the standards set by it to judge the value of beings is very faulty and wrong. Consequently, the idea of environmental sustainability according to the belief of anthropocentrism is very concise and restricted. Preserving environment so that it can be used by humans, not only of present generations but also of future generations, is perilous to other beings.

Environmental ethics deal with the philosophical relationship between human beings and the natural environment. Anthropocentrism gives birth to another type of environmental ethics, known as, Non-

anthropocentrism or nature-centeredness. Non-anthropocentrism emerged as a counterargument to anthropocentrism. Non-anthropocentrism refers to a belief that gives the utmost importance to nature. On a general scale, where anthropocentrism assigns moral value to only human beings, non-anthropocentrism assigns moral value to natural objects like plants, animals, etc. In simple terms, non-anthropocentrism is the belief of putting nature first and ahead of humans, which is why it is also called nature-centeredness. A theory of sustainability with a foundation of non-anthropocentric principles would be a virtuous theory but it will be biased against human beings. The instrumentalist view would cease to exist when a non-anthropocentric system is adopted. Defining sustainability in non-anthropocentric view would mean preserving nature and environment at the cost of humans. For instance, this idea of sustainability would require human beings to stop using environmental resources such as trees, water, etc. at their will which would consequently result in perishing of humankind. This is why non-anthropocentric notion of sustainability would be disadvantageous and incomplete.

Transcending both anthropocentrism and non-anthropocentrism, is another environmental philosophy known as Ecocentrism. Where anthropocentrism assigns moral value exclusively to human beings and non-anthropocentrism assigns moral value to natural objects, ecocentrism is the belief that assigns moral values to all objects existing in nature, biotic or abiotic and sentient or non-sentient. Ecocentrism is a comprehensive environmental belief. It includes both human beings and other life forms in the environment and ecosystem, from plants and animals to reptiles and amphibians, from bacteria and fungi to even abiotic factors of environment such as atmosphere, water, radiation, etc. Ecocentrism regards all these biotic and non-biotic and sentient and non-sentient factors of environment and nature as having intrinsic value. It disregards the instrumentalist view of anthropocentrism. Ecocentrism is regarded as an ideal for sustainability as it compels recognition of humanity's moral duties towards nature. An ecocentric view gives intrinsic values to all objects existing in nature which coerces humankind to consider using these ecological objects for their comfort as immoral and install a sense of duty to preserve these organisms and their surroundings. The idea of sustainability in the ecocentric view proves to be exhaustive as it considers all the organisms and their habitat as important and crucial to sustain.

A NEW IDEA OF SUSTAINABILITY

As was discussed earlier, the concept of sustainability arising out of ecocentrism proves to be comprehensive and inclusive. It doesn't value any species more than the other and eliminates any instrumentalist belief against the ecosystem. In a paper published in *The Ecological Citizen*, titled "Why ecocentrism is the key pathway to sustainability", authors Haydn Washington, Bron Taylor, Helen Kopnina, Paul Cryer and John J Piccolo, argued strongly for ecocentric sustainability. They based their arguments on ethical terms, ecological terms, spiritual terms and in evolutionary terms. Ethically, it was argued that, ecocentrism expands the moral community from only human beings to other life forms on Earth, biotic or abiotic and sentient or non-sentient. It meant that ecocentrism extends respect and care to not only humankind but also to all life and ecosystems themselves. So, sustainability that is based on ecocentric view would prove to be more effective and ideal. Further, importance of ecocentrism in sustainability was argued on evolutionary grounds, stating that human beings or homo sapiens evolved from the ecosystem's rich web of life that connects humans to the ecosystem with a biological kinship. This will make humanity respectful and meticulous with their environment and understand the importance to preserve it not only to sustain themselves but to sustain the ecosystem also.

The importance of ecocentrism in sustainability can be explained in spiritual terms also. Spiritually or religiously, there are many beliefs that regard preserving of nature and environment as a significant practice, and even regard such a practice as necessary for attaining enlightenment. The instrumentalist view that objects of nature and environment are just tools for humanity is disregarded even in religious scriptures. For example, in Jainism, it is believed that enlightenment is earned through non-violence and reducing harm to living things (including plants and animals). This signifies that, Jainism extends the practice of non-violence to animals and even plants. It rejects the instrumentalist view of environment and nature and encourages the ecocentric perspective that living things are equal and have intrinsic value, which is why they shouldn't be harmed. This is ecocentrism as an ideal for sustainability is defended and promoted with a spiritual lens. The last argument that was put forth by the authors (mentioned above) was in ecological context. It was contended that, ecocentrism highlights the fact that all living things on earth are connected in the ecosystem as it sustains life through natural processes, therefore the idea of sustainability should not only work to preserve humanity but also this ecosystem.

These arguments provide reasonings as to why sustainability should be based on ecocentric values and anthropocentrism should be dropped. The inclusive nature of ecocentrism proves to be beneficial both for human beings and the environment in the long run. The key difference between anthropocentrism and

ecocentrism, that causes the paradigm shift in the framework of environmental sustainability, is rejection of the traditional instrumentalist view of the environmental sustainability. This instrumentalist view is the result of the assertion of anthropocentrism that other life forms on the planet do not have intrinsic value like human beings, so they should become tools for humanity to use to sustain themselves. Ecocentrism and non-anthropocentrism rejects this view that plants and other organisms do not have intrinsic value like human beings does. John O'Neil, a professor of political economy, argued on the biocentric view and intrinsic value of organisms other than human beings. He contended that a thing is said to have intrinsic value if it is valued non-instrumentally, which means that if the organism's value is not depended on it being a useful tool. He further contended that anything which has a *good* for itself, is said to have intrinsic value. For example, in case of plants, water, sunlight, fertile soil, carbon dioxide, etc. are needed by plants to survive, which means they have *good* for them, so, according to O'Neil, plants can be said to have intrinsic value. Where anthropocentric notion of sustainability states that environment should be preserved so that future generations of humankind can enjoy it as much as the present generation, ecocentric notion of sustainability would work to explain sustainability in comprehensive and exhaustive terms where it won't be for any specific species. Therefore, sustainability, in an ecocentric view can be defined as preserving the environment and nature for human beings, plants, animals and other life forms, sentient or non-sentient and biotic or abiotic, without compromising the ecosystem at large.

CONCLUSION

Ecocentric environmental sustainability means sustainability where environment and nature are preserved for all the species and life forms on Earth, whether sentient or non-sentient and whether biotic or abiotic. It includes preserving these natural resources without compromising and damaging the ecosystem. One such way of doing so is using more renewable resources like solar energy, wind energy, hydropower etc. and less non-renewable resources like oil, natural gas, coal, etc. This is because renewable resources are recurring in nature. These resources replenish themselves on their own. So, using these does not harm the environment directly. Using non-renewable resources in excess, on the other hand, would cause harm to the ecosystem as these are limited (even scarce in contemporary times). For example, natural gas is extracted from the Earth by drilling into the Earth's surface vertically. This damages the ecosystem by disrupting wildlife, damaging lands and polluting rivers and streams. The ecosystem is damaged by these practices. But for this method of using renewable energy to persist and overcome other harmful practices, a shift to a more ecocentric view is necessary for anthropocentrism ignores the nature of these resources. Ecocentrism would also play a role in indicating collective responsibility or responsibility of humanity as a community to be empathetic towards other life forms. For instance, an anthropocentric view would justify deforestation as the individual responsibility of humankind to sustain themselves. But an ecocentric view would compel humankind to realize their collective responsibility towards the forests and tress and reduce practices like deforestation, if not prevent it.

Whereas it is necessary to change the idea of sustainability, ecocentrism becomes an ideal, which creates difficulty in actually following it. Carl Jung, a swiss psychanalyst, said, "Every form of addiction is bad, no matter whether the narcotic be alcohol or morphine or idealism". Jung proposed that addiction to ideals, or idealism, is problematic because ideals are based on perfection and chasing perfection proves to be endless. This is the problem with ecocentrism. As an ideal, ecocentrism becomes difficult to practice in reality. The collective responsibility that it induces often gets dominated by the individualism of humanity. The individual personalities of humans, more often than not, ignore the environment and nature and focus on their individual responsibilities. To give you an idea, using vehicles that emit carbon dioxide causes global warming which harms the habitat of many animals and harms the ecosystem on a large scale. Collective responsibility of humankind would require every human being to cut down on their use of vehicles so that emissions of carbon dioxide and, consequently, temperature of Earth could be regulated. This solution gets overridden by the individual reasoning of human beings to use these vehicles for comfort in day-to-day work. This is why ecocentrism becomes difficult to practice. It requires cooperation from each one of us to realize our joint responsibility towards environment and nature.

To conclude, even if ecocentrism is an ideal, practicing sustainability in the ambit of ecocentrism would suffice for the time being. What is necessary is the shift from anthropocentric principles of sustainability to an ecocentric principles. Human beings, being the superior life form, have a responsibility to help sustain other inferior life forms. Gautam Buddha talked about this responsibility by using an analogy of a mother and her child. He recited how a mother has a responsibility to take care of her child (an inferior being), even if that child cannot give anything in return to the mother. According to Buddha, it is our duty to take care of things even if we get nothing in return. The realization of collective responsibility towards nature and other life forms and cooperation by human beings is fundamental for the paradigm shift in sustainability.

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Protecting the Marine Environment from Ships and International Shipping - Understanding and Critically Analysing the Role of International Maritime Organisation and Sustainable Development Goal -14 in Promoting Sustainability

Apoorva Vednarayan Misra and Gurujit Singh

Guru Gobind Singh Indraprastha University, (University School of Law and Legal Studies) Sector 16-C
Dwarka, New Delhi, 110078, India

Earth and its component are very conveniently presumed to be 'The Resources' available for meeting the wants and desire of the human beings. The ancient debate on, what is human need and human wants are evolving and convoluted. The anthropogenic epoch has considerably accelerated the adverse impacts on environment and raised an alarm for its protection. Oceans and Seas are one of the vital components of biosphere which has bestowed life to human being and non-human being. On the contrary, human greed and unsustainable consumerism has pose colossal demand for products in the market leading to pressure on transportation. Shipping Industry which transports more than 80 % of commodities globally poses great threat to our aquatic and non-aquatic life (for e.g., oil discharge/ ballast water from vessel, accidental or negligent oil spills into oceans, noise pollution from vessels, seeping chemical or non -bio-degradable waste into seas).

The article intends to highlight various sources, polluting the marine environment and their impacts on aquatic life. Astoundingly, number of governmental and non- governmental actors are playing notable role in protecting and preventing ecological harm. Few of them are constituted and functioning under the ambit of comprehensive international or regional agreements, conventions, or legal framework such as (UNCLOS, UNEP, FAO, WMO, UNESCO). The article is confined to understand and analyse the role of International Maritime organisation (IMO) in preventing pollution sourced from vessels through it's law-making process and conventions adopted underneath.

The issue of Marine pollution is diverse and intertwined with various other factors. In furtherance to which article will also critically analyse the potential and limitations of International Maritime Organisation in achieving Sustainable Development Goal-14 comprising of several targets and indicators. It is an undisputed fact that our planet needs core attention and speedy resolution.

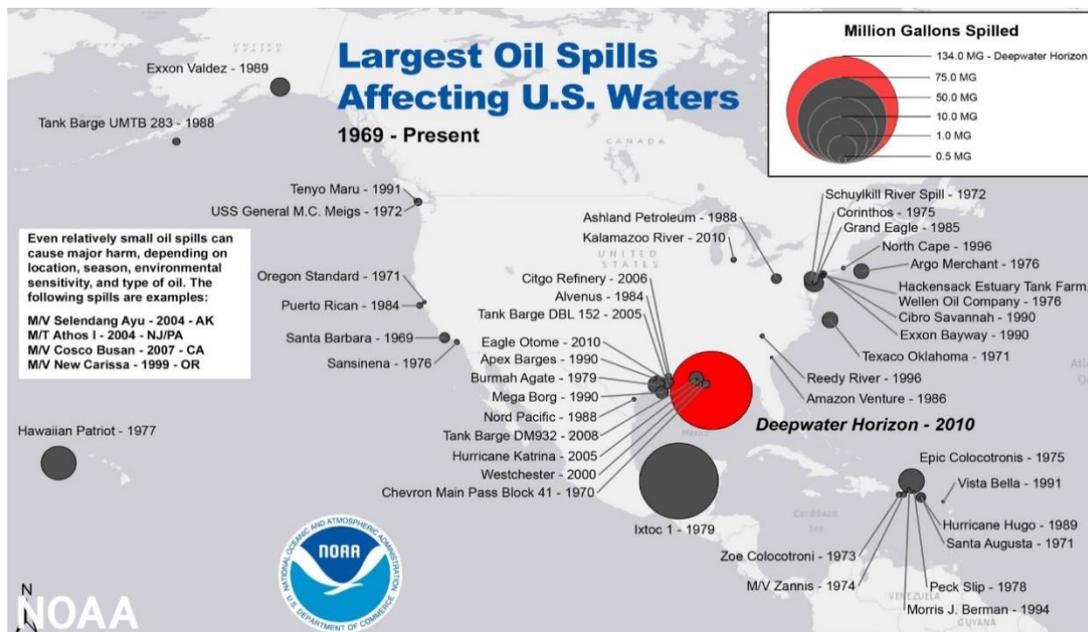
The growing marine pollution has attracted the world's attention for its ecological rescue and protection in past few years. Oceans and other water bodies has bestowed human and non-humans with life, shelter and food. Although, anthropogenic activities have inimically affected the oceans, leading to languish the life of the oceans and other water bodies, extinguishing various species and their habitats and largely affecting the marine ecosystem. Marine pollution is a very complex subject as it composed of pollution sweeping in from varied sources like unsustainable human induced land-based pollution, constructing underwater gas pipelines, tourism, noise pollution, light pollution, toxic substances flowing through contaminated atmosphere and alike. Further, Article 1 of United Nation Convention on law of seas defines marine Pollution as, "introduction by man, directly or indirectly, of substances or energy into the marine environment, including estuaries, which results or is likely to result in such deleterious effects as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities."

One of the major pollutants which has escorted penitence into marine life is pollution through vessels or ships either by deliberate human induced activities or by accidents. Shipping and its related activities infuse marine environment majorly by six different polluting sources namely discharge from untreated ballast water and bilge water, discarding non-biodegradable solid waste into the marine environment, Accidental oil spills from vessel, emission from operational ships, hazardous chemical or toxic substances running from the ship's engine or power supplies and construction of infrastructure for ships and related activities. In addition, it is vital to briefly understand the nature and impact of the above-mentioned pollutants sourced from vessels on the marine ecosystem.

A) Pollutants Discharged From Operational Ships

Various studies shows, two major pollutants impacting the marine life intensively during the ships are in operation, one called as oily pollutant discarded from vessel (for e.g., oil spills, bilge water from vessels, illegal cleaning of bunker tanks in sea water or ballasting) and other be anti-fouling paints. Ballast Water is the product of the ballasting, where unloaded ships pull water from the oceans during the voyage to evenly distribute the weight of the ship before it's loaded again. During this process, ships unload its cargo on one port and fills their

tanks with unclean sea water contaminated with oil, invasive species and other toxic substance and release at the port where it loads the cargo back on the ship, resulting in posing great threat to marine life. Further, oil spills from vessels in oceans has largely impacted the marine ecosystem by suffocating birds /aquatic animals, or poisoning the sediments of the seafloor, destroying the DNA of aquatic animals. For instance, environmental catastrophe at Huntington beach, southern California coast, reported by Kim Carr, the mayor of Huntington Beach, that “oil spills destroyed an estimated 126,000 gallons, or 3,000 barrels, had spread into an oil slick covering about 13 square miles of the Pacific Ocean”.



Source: National Oceanic and Atmospheric Administration- reflecting the terrible impact of Oil spill on marine ecosystem.

Another terrible incident which drew world's attention and holds a vital position in America's marine oil drilling history of the year 2010 is “Deepwater Horizon Oil Spill” resulting in colossal oil spill weighing four million barrels of oil spill flowed for approx. 87 days from Gulf of Mexico (Macondo) and on 15th December 2010, complaint was filed by United states in this regard.

B) Wastewater Discharge From Vessel

Ship wastewater is usually categorized as black or gray water. Black water (for e.g., nutrients, bacteria, viruses, heavy metals and pharmaceuticals) permeate out from toilets constructed on the ship, whereas Gray water consist of wastewater seeping through kitchen, laundry services and showers provided onboard. Which includes numerous toxic pollutants, chemicals from detergents, micro plastic and waste from food. Few studies also highlight the excessive infusion of nutrients in the sea water is harmful for the aquatic life. For instance, annually shipping industry has contributed approx. 0.3% of phosphorus in the Baltic Sea, or excessive quantity of fecal bacteria in the oceans possess ability to highly contaminate the ocean water and generate the risk of ill health of aquatic life. In fact heavy metals or other lethal pollutants may adversely affect directly or indirectly the aquatic environment.

C) Emissions from Vessel on Voyage

The pollutants like sulfur oxides (Sox), nitrogen oxide (NOx), greenhouse gases (GHG's), volatile organic compounds (VOC), ozone depleting substances and particles which emits during voyage may react differently depending upon the area, circumstances and other factors. For instance, shipping contributes approximately 1.25–3.3% of nitrogen inclusive of air emission and water discharges. Another pollutant is volatile organic compounds (VOC) which emerged while handling cargo carrying crude oil. Also, when volatile organic compound comes in contact with nitrogen oxide results in precursors of ground level ozone. Although, sometimes these pollutants emitted by anthropogenic activities may contribute to climate change in a perplexed way. For instance, pollutants which emits from GHG's have warming effect on climate and whereas pollutants like sulphur oxide or nitrogen oxide have a cooling impact over the climate, or through ocean acidification- a chemical process, where carbon dioxide (CO₂) combines with ocean water, resulting in forming carbonic acid by decreasing ocean's PH level. Although, the impact of ocean acidification may vary, for instance, such reaction is much faster in polar and tropical regions.

D) Discharge of Solid Waste from Vessel

Solid waste produced through vessels consist of varied elements like marine litter, food waste, paper, plastic, tin and glass. United nation environment programme explains marine litter as, "Marine litter is any persistent, manufactured or processed solid material discarded, disposed of or abandoned in the marine and coastal environment". Thereby, suffocating and entangle the aquatic animals, thus, reducing the life span and of the marine ecosystem. Plastic, which is the pro-active element in marine litter makes it more vulnerable for oceans and its dependants. Ocean currents also plays an important role in affecting the areas, for instance, current at the oceans may accumulate the marine litter or debris mostly affecting the coastal areas.

E) Noise and Light Pollution Sourced from Vessels

Human induced activities may impact environment in various forms. Noise and light pollution generated due to regressive development of marine industries, have been ignored from a very long time when compared to water or air pollution. Noise pollution from ships can occur either by machines, vibrations, sonar or pro-peller cavitation and their impact on marine environment is rampant, cover wide areas and meddling. The consequences of continuous underwater noise pollution may be more vulnerable to aquatic mammals, for instance, few studies suggests that due to noise pollution generated by the continuous movement of commercial ships might interfere in marine life's communication, navigation, mating process, capacity to identify their prey and alike. Light pollution is another anthropogenic activity which has interfered with natural process of ocean ecosystem and deeply affected the natural behaviour of the aquatic life. For instance, there is a study conducted by Prof. Jonathan Cohen, University of Delaware, on how artificial light sourced from ships on polar night affects the behaviour of zooplankton and artic fish around 200 metres or deep. One of the major findings was "In the paper, we demonstrated that there's a sphere of light around the vessel that causes an influence, and we see it easily through the upper 200 meters of the water column," said Cohen. "So the effect of artificial light isn't just limited to the surface. It goes down quite deep in terms of an avoidance of the organisms. They just go away and so you end up predicting the number of organisms to be a lot lower than you might expect". Further, polluting artificial lights, hampers the genetic and reproductive abilities of the marine animals, deteriorate the navigation and communication of aquatic life.

Undoubtedly, pollution generated due to shipping industry has enormously affected the marine life leading to many marine deaths, poisoning the seabed, extinction of various species and other lethal reactions on marine environment. The escalating pollution in marine environment has catered the world's attention and calls for a unity in bringing potential solution to alleviate the marine pollution, thereby creating a legislative framework and international organisation for its effective implementation. One of the international organisations, which is "International Maritime Organisation", specialised agency of United nation, entrusted with a duty in creating international collaboration of governments representing the member countries to prevent and protect oceans from the pollution generated from ships and related activities. Also, it carries various conventions under its ambit, few of them which are related in protecting ocean from pollution sourced from vessels are as following.

International maritime organisation was formerly established under the title "International Maritime Consultative Organisation" presently known as International maritime organisation, which primarily dealt with maritime safety, then with the global demand for petroleum products and rising number of vessels in the oceans, in 1954, first multilateral agreement highlighting the issue of marine pollution was adopted in London conference titled as "the International Convention for the Prevention of Pollution of the Sea by Oil" (came into force in 1958). The convention focussed on operation pollution emerged from vessels like cleaning of tanks or ballasting and also restricted discarding of oily waste into the areas demarcated under the convention called as "prohibited zones", though convention didn't fetch much success due to unwelcomed response of several maritime states or flag states as it was believed that the convention poses restriction on their freedom of navigation over the seas.

Further, a perilous incident happened on March 1967, Torrey Canyon, reported to be the largest marine oil spill, polluting the coasts of Britain and France, resulting in creation of other conventions like, International Convention on Civil Liability for Oil Pollution Damage and International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties 1969. Thereby, with the great provocative events and rising environmental consciousness during this time has convince several maritime states to adopt an updated version known to be the primary legal documents, protecting the ocean from oil and related pollutants i.e., International Convention for the Prevention of Pollution from Ships (MARPOL 73). The convention faces a slow enactment and parallely there were terrible incidents was happening at the sea (1976-1977), resulting in combined convention in the year 1983, called as MARPOL 73/78.

The convention also includes six annexures dealing with various subjects like prevent ocean pollution from ships, deliberate or accidental; controlling pollution from noxious liquid; preventing oceans from packed harmful substances; sewage pollution; garbage from vessels; air pollutant emits from vessel like NO_x, SO_x, GHG's and particulate matter. For instance, Annex I under MARPOL, provides mandates to regulate oil pollution from vessels on operation or accidental and mandating ships to possess double hulls for their oil tankers. Annex I formed the guidelines that ships below 400 grt are allowed to discharge oily waste if, treated by oil separator and restrict the limit to 15ppm before final discharge. Also, ships above 400grt only allowed to discharge their oily waste if they comply with conditions formed under the annex-I. Annex II, provide mandate measures for protecting oceans from noxious substances transported in large quantity and these noxious substances are divided into X, Y, Z and other substances and out of the specified groups, Group-X is prohibited to be discharged at sea. Although, substances stipulated under remaining categories can be discharged as per limitations specified under the annex-II. Annex-III, focussed over sustainable packaging or labelling, documentation and alike to prevent and protect oceans from "Harmful Substances" defined as "those substances which are identified as marine pollutants in the International Maritime Dangerous Goods Code (IMDG Code) or which meet the criteria in the Appendix of this Annex".

On 1st August 2005, committee adopted a revised Annex IV under MARPOL, entails those ships containing 400 grt or above to construct approved sewage treatment plants onboard, to protect oceans from pollutants emerged from garbage. Also, it defined "Special areas and the procedure to dispose of waste in those areas" under resolution MEPC 200(62) and Baltic Sea to be identified as only special area under the regulation 11.3, Annex IV, MARPOL. Annex V, optional annexure, intends to annihilate garbage pollution from vessels and ensures member states to provide port reception facility at ports and special areas (for e.g., Mediterranean Sea, Baltic Sea, gulfs, Antarctic Sea) stipulated under Annex V. Annex VI, primarily regulates pollutants like sulphur and nitrous oxides (Regulation 13, 14 & 15), shipboard incinerators (Regulation 16), volatile organic compounds (Regulation 15) and pollutants depleting ozone generated through vessels (Regulation 12) and adopted a revised annex VI, 2010, where it also included Emission control areas (ECA's) and reduced the sulphur limit from 3.50% to 0.50%.

IMO & Sustainable Development Goal 14

In 2015, 193 Members states of United nation took a pledge by adopting 17 sustainable development goals and agenda 2030 (Plan of Action for people, planet, prosperity peace, and partnership) to work for a sustainable future and IMO being the family member of the United nation and international organisation protecting oceans from pollutants sourced from ships and related activities makes it important for IMO to oblige for achieving sustainable shipping. Keeping the essence intact, IMO selected the theme for world maritime theme 2020, "Sustainable Shipping for a Sustainable Planet" to achieve sustainable development goals. The issues arising from shipping industry are acute, complex and diverse and important question here is how IMO will contribute in achieving the targets formed under SDG's? Kitack Lim, Secretary General comprehensively acknowledged contribution of IMO for a sustainable shipping by adopting Ballast water management, reduction of GHG's and sulfur pollutants, endeavours to shrink marine litter and alike. The anthropogenic shipping activities has a direct and indirect impact on all the three pillars of Sustainable Development- Economy, Society and Environment. The SDG's which laid the foundation for IMO to preserve and protect the biosphere are Sustainable Development Goal 6-Clean water and Sanitation; 13-Climate action; 14-Life below water & 15-Life on land.

The matrix of studying International maritime organisation and SDG 14 (Life below water) is the dire need of the contemporary times, where the rising greed, heat and unsustainable human behaviour has introduced appalling impacts on life below water. Life below water (SDG 14)- it reads as "Conserve and sustainably use the oceans, seas and marine resources for sustainable development". It consists of targets ranging from 14.1 – 14.7 & 14.a, b & c, pledging various norms to achieve this goal but the path of achieving sustainable development goal is filled with obstacles and opportunities. IMO possess certain shortcomings which pulls the ladder away in achieving SDG 14. For instance, MARPOL 73/78, has been acknowledge globally in reducing marine pollution sourced from vessels, although study was conducted by US national academy of sciences, that highlighted the ineffectiveness of the convention due to its slow implantation worldwide and severe state port control regulations.

Another reason for ineffective implementation of the IMO convention is, imbibing IMO convention into national legal framework, because few states consider the convention to be against their sovereign legislation and due to high technicality involved in the convention makes it mandate to have experts incorporating it to the domestic legislations. In common parlance, protecting environment has been an opposing activity towards economic development, thereby making it difficult for the developing countries and least developed countries to

make stringent policies in this regard. Lack of political will plays a major role in shrinking the effectiveness of the IMO convention. For e.g., one literature reflects the view on acknowledging IMO convention from developing states that “view international marine environmental law as offering too inadequate an answer to their needs”. Also, some countries face lack of scientific expertise, contracting economy, old technology makes it more vulnerable for its effective implementation.

Economy and sustainable technology, also plays an effective role in implementing the policies and laws in a state, especially least developed countries (LDC), due to their deficit economic situation these LDC’s fails to provide basic need to their citizens and forced to believe that complying environmental regulation can be an opulence rather than a need for e.g., providing reception facilities at the ports, capacity building of the related stakeholders, ensuring treatment plants onboard which give aggressive stress to ship owners leading to non-compliance of the regulation, providing proper infrastructure for disposing harmful or hazardous substances emerged from vessel.

The issue of pollution sourced through ships has the potential of not only casting inimicality to marine life but also drew the global attention in alleviating the same. Indeed, sustainable development framework has much influenced the perspective about protecting marine life but this problem requires prompt action by the member states in the form of Government funded Projects and Quantitative research in shipping industry, Incorporating curriculum in primary, secondary and tertiary in achieving Oceans sustainability, finding alternative sustainable source of energy for its operation, applying environmental consciousness, while framing any policy, law or rules in this regard, encouraging sustainable consumption & consumerism, ensuring effective environment training to the seafarers, transparency in reporting and documentation process, ratio of representation from developed, developing and least developing countries to be proportionate and effective implementation of the policies in their national legislations.

The contribution must be made collectively and inclusively by all the stakeholders (including private companies, industries or factory, universities dedicated in marine protection) as the issue, demands interdisciplinary resolution for the present and future of sustainable shipping. Also, issue of marine pollution possesses the characteristics of technical and scientific complexities, thereby member states require strong assessment tools and updated technology to examine and interrogate the scientific and technical part of the issue. To conclude, these are some of the potential suggestions which may contribute in accelerating the speed in achieving sustainability for our marine environment. Although, there is a commonly used phrase, one size doesn’t fit all.

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FOOT NOTES

1. Unsustainable Human Induced Land Based Pollution may include various activities like Untreated sewage from industries, residence or chemical factories; medical waste; radioactive waste; pesticides used in agriculture, dumping hazardous waste in oceans, marine litter or inordinate use of plastics on land, offshore or underwater list is not exhaustive.
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Climate Change: A Critical Analysis of Its Inextricable Link with Global Security

Bright Phiri and Nibedita Basu

Faculty of Law, Marwadi University, Rajkot, Guajarati, India

ABSTRACT

The effect of climate change is quite apparent, they range from rising sea levels, longer droughts, melting glaciers, and hotter heatwaves, among others, climate change has evolved from a mere natural environmental problem to a threat to international peace, today we're witnessing people fighting over land, water and resources, as President Joe Biden once said climate change is an "existential threat" to national security, there is an inextricable link between climate change and global security,

It's undisputed fact that most richer countries amassed their wealth on the premise of colonialism or industrialization, it's also another fact that the same richer countries are the biggest emitters of greenhouse gasses in the atmosphere, studies suggest that 10% of rich countries account for more than half of the world's greenhouse gas emissions, African and other poor countries, on the other hand, suffer disproportionately due to effects of climate change. We have noted an increase in the number of climate refugees, it is causing divisions among Countries due to border closures, fueling conflicts among indigenous and people claiming asylum. Countries like Zambia can't cope with the effects of climate change and people are displaced because it depends on agriculture and natural resources, normal weather pattern is of paramount importance.

The paper explores three main avenues through which the inequality aggravating effect of climate change materializes, namely. (1) non-compliance by western countries to cut down on emissions of greenhouse gasses to acceptable levels, (2) non-adherence to the pledges made of helping poor countries in terms of green funding, (3) and the increase in natural disasters and other related damages caused by climate change and the link to how they link to global security. This will be achieved by way of doctrinal method of research and web-based data sources to support the facts.

The paper will conclude by providing solutions to the problems raised thereof and analyzing making them relevant to policy decisions and scholars.

Keywords: Climate Change, Global Security, Conflicts

1. INTRODUCTION

It's not a coincidence that seventy percent of the countries which are ravaged by the effects of climate change are economically vulnerable and suffer conflicts, nearly 1/2 of the fifteen countries most vulnerable to climate-related risks host a UN peacekeeping or special political mission.

Although Climate change might not be directly causing conflicts, it certainly does exacerbate and amplify existing threats to peace and development. It will impede access to water, food, health, and housing, and people who are already in vulnerable places, together with those living in impoverishment or conflict-prone areas, may be left in worst conditions than they were and less capable of handling the damage with fewer resources.

The nature of Climate change as an "existential threat" has become copiously clear, with discussions over the way to combat it taking prominence on the agendas of global leaders. main international players recognize the effects of Climate change on national and global security and have taken steps to outline Climate change as a security threat.

The UN has been at the forefront of sounding the alarm bells over Climate change, from a council report that quotes David Attenborough's speech "Climate amendment is that the biggest threat to security that humans have ever round-faced," to recent remarks by executive Antonio Guterres.

Climate change has been enclosed within the national security and defense documents of many countries, among them the USA, UK, France, Germany, Russia, and Turkey, nevertheless, despite the apparent presence of Climate change as a prevailing issue within the security priorities of states, the measures taken against combating Climate change are completely different from what is on paper.

A few days ago, COP26, the twenty-sixth international organization Climate change Conference dubbed by main as the world's "last hope" to fight climate change, resulted in an exceedingly convincing agreement that fell "far short of" guaranteeing effective measures.

COP26 was "just another meeting in an exceedingly series of conferences," Kurnaz aforementioned. "Like the twenty-five conferences before, this one did not bring out something tangible.

2. EFFECTS OF GLOBAL CLIMATE CHANGE AND THE POOR

The broader social impacts of climate change and their resultant effects received more attention over time, associate degree early study during this regard was the report by the World Bank (2002) and bestowed at the eighth conference of the UNFCCC. It noted that climate change was making the action of MDGs tough by reducing access to water, increasing food insecurity, and having adverse health effects.

The 2007/2008 Human Development Report dedicated a chapter to the discussion of vulnerability and risks arising from climate change (UNDP, 2008). the world Bank's international observation Report 2008, titled "MDGs and therefore the Environment: Agenda for inclusive and property Development, pointed to potential impacts on the less privileged. Some scholars have noted that climate change is widening the gap between the rich and the poor.

Some studies which focused on certain areas, like Paavola (2008) focused on the Morogoro, Tanzania, Somanathan, India, and Narayan mountain communities in Nepal. These studies were taking into consideration the level of vulnerability and susceptibility to the effects of climate change.

3. DIFFERENCE IN SUSCEPTIBLENESS TO DAMAGES CAUSED BY CLIMATE CHANGE

Given the identical levels of exposure, the underprivileged suffer more harm from climate threats, as noted from the aforementioned, of the people living within the same area, those with houses built with flimsy materials or grass-thatched suffer the most from floods than those built with durable materials. Similarly, in developed cities, people with air-con are less affected by excessive heat which is associated with climate change than those that don't have such facilities. The living standards of people differentiate them on how they will be affected by climate change.

This applies on the regional and State level, climate change effects are more severe in low and middle-income counties than in high-income countries. Hill and Mejia-Mantilla (2015) indicate that small-scale farmers in Zambia suffer more severely due to effects than those in developed countries.

As a result of the foregoing, the poor become even poorer because even the little they had is either swept away by floods or infrastructure damaged by heavy rains and the cannot be re-built because of the limited resources, while in richer countries there is little or no infrastructure damage because buildings are built to withstand climate change unpredictable weather patterns, even if the worst is to happen governments are there to help people rebuilt their lives, this cycle continues from generation to generation, as Children of the poor families are left with diminished future capacities.

The same can be said when it comes to the susceptibility to health effects, because of poor health facilities in Sub-Saharan Africa people living in remote areas are more susceptible to illness and health complications that are associated with climate change such as Cholera and diarrhea in short and long-term, this may result in loss of productivity, employment and businesses. within the long term, they suffer from a loss of human capital.

4. RECOVERY TRAJECTORIES

To see, however, the lack of ability to deal with and recover from climate effects exacerbates inequalities, take into account recovery trajectories. In the wake of a climate disaster, notwithstanding one assumes equal exposure and susceptibleness to break between privileged and underprivileged populations the rate of recovery is an important determinant of future inequalities. Take for instance Japan, it's island nation prone to environmental calamities and disasters but it manages to rebuild even more modern infrastructure because it has the capacity, the point is we cannot avoid or stop bad weather but if the country can rebuild after a disaster, then will lessen the gap between the rich and the poor.

5. NOT HONORING CLIMATE FUNDING PLEDGES

This is important for richer countries to take some responsibility for helping poor countries which are suffering due to the effects of global climate change than others. in keeping to one study, the gross domestic product of sixty-five countries within the global South may fall by 19.6% by 2050 and 63. 9% by 2100 supported current climate policies. Even in Paris Agreement-aligned, 1.5°C world those countries would suffer a still devastating 13.1% hit by 2050 and 33.1% by 2100.

Many of the people which are worst affected by the effect of climate change do not deserve the pain and the suffering being inflicted upon them because they barely contribute to global greenhouse gas emissions. In 2020, an ordinary Zambian man was responsible for 0.43t of carbon dioxide emissions 33 times in comparison of a U.S Citizen.

Wealthier countries pledged 100 billion dollars in 2010 per year in terms of climate financing to developing countries in 2023, the money was supposed to have helped smaller countries put in measures to adapt to the effects of climate change but its now 12 years and that money hasn't been given, the UN concluded that the only realistic scenarios" showed the \$100 billion targets were out of reach, "we are not there yet" UN Secretary-General, Antonio Guterres. A lack of clear boundaries of what counts towards the \$100bn pledge makes it laborious to seek out reliable information and so to work out whether or not developed countries have delivered. However, studies, as well as one from the OECD, indicate that they did not.

The reason why richer countries failed to honor the pledge, was that it was unrealistic and difficult, this was a well-known fact, and as a result, there was no accounting place in situ. The parameters square measure therefore imprecise that it's not possible to mention whether or not it's been met or not," says Romain Weikmans, senior analysis fellow at the Finnish Institute of world affairs. "It's up to every developed country to decide on the allocation of its funds, and every one has its definition of climate finance."

We cannot put the and judge every wealthier country by the blanket statement, some countries are doing remarkable well like Canada could be a purpose case. The oil and gas producers pay a carbon tax and it's sent overseas through climate financing than the other G20 country between 2016 and 2019, in keeping with the International Institute for property Development. Export Development North American country (EDC), the country's ECA, spends around seven times a lot of on oil and gas than on clean technology – that's, products or services that amend or avoid environmental injury.

The government has no answer to why that's, says Eddy Pérez, climate diplomacy manager at the Climate Action Network in the metropolis. "The government desires to be seen as a robust partner of developing countries however continues to use its own companies to finance the matter itself."

The oil and gas sector remains a crucial component of Canada's economy and "will play a very important role within the transition to a low-carbon future", an associate EDC representative tells Capital Monitor. However, EDC's support for the world has fallen by thirty-fifth to \$8.1bn over the past 3 years, throughout which period its investment in cleantech has matured by one hundred twenty to \$4.5bn.

Australia is another example of an equally contradictory state of affairs. several of its superannuation funds – that superintend some A\$3.3trn (\$2.36trn) of assets – square measure pushing laborious to take their domestic and international portfolios, as the govt seeks to hold up the country's massive industry.

6. DIFFERENT STYLES OF SUPPORT

While the \$100bn pledge covers each adaptation and mitigation, thou it lumps the 2 along – developing countries that had hoped that Cop26 negotiations would lead to a transparent setup for a loss and injury funding facility to accompany it. That also failed to happen.

Another issue is that whereas the finance will embody grants, loans account for an outsized chunk of it – seventieth in 2019 – thereby pushing developing countries more into debt. Felson sees this as unacceptable.

Data from the OECD indicates that countries on average received an average of 43% of the climate finance in 2019-19, while Africa received 26%, these figures come at a backdrop of temperatures rising faster in Africa than the global average, which means droughts, extreme heatwaves, floods, Zambia like many African countries depends on cutting down trees for cooking, its economy is heavily reliant on mining copper, hydro-electrical power is the main source of electricity for both domestic and industrial, to put it simple terms everything evolves favorable climate weather.

Insinuating that countries in Africa can switch to expensive renewable energy without climate funding is impossible, it's like calling on the people in such places to stop living to save the environment.

7. CLIMATE CHANGE AND ARMED CONFLICTS

The effects of Climate change are notably profound after they overlap with fragility and past or current conflicts. Climate change increases security threats. when the place is a certain area is experiencing environmental disasters and lacks capacity building, there's high dependence on a few natural resources and scheme services, like water and fertile land, grievances and tensions will explode, complicating efforts to stop conflict and sustain peace.

In Somalia, extreme heat, intense droughts, and floods are undermining food security, increasing competition over scarce resources, and aggravating existing community tensions from the Shabaab extremists. East and

North Africa which are among the world's driest and climate-vulnerable regions, a serious decline in precipitation and an increase in extreme weather events are harming water and food security.

Last year, about thirty million people were displaced by climate-related disasters. 90% of refugees come from countries that are poorest and least able to adapt to the effects of Climate change. Most of the refugees have been taken by countries that also are vulnerable and suffering from the impacts of Climate change, this, in turn, puts more pressure on strained national budgets.

The Security Council connected climate change's effect to a conflict zone in recent council Resolutions. In its endeavor to identify threats to international peace and security in conflict places, can the Council repose on these efforts in addressing climate change's role in resource wars and conflict?

- **Nation Extinction.** Scientists currently predict that four Pacific tiny Island Developing States are going to be unlivable by mid-century because of climate change-driven water level rise and wave-driven flooding. These nations can lose a massive amount of their territory, probably resulting in the entire state being abandoned. Can the Council, which has the categorical responsibility to take care of peace and security, stand by whereas nations lose their territorial integrity and, probably, their sovereignty?

These four examples, extreme weather, climate migration, armed conflict, and nation extinction are mere examples of climate change's security impacts this century.

Despite these threats, our international community seems to be doing very little and turning lip service when it comes to putting in place legislative measures and mechanisms to handle climate change's security implications. As I am writing this paper, there is no legal binding or way forward to lower international GHG emissions. Indeed, scientists and security professionals estimate that our collective failure to act on threats posed by climate change will increase global temperatures by 2 degrees.

Much to our delight, scientists and policymakers have started adopting and discussing security language. Climate change isn't simply associated with environmental concerns, it's a "threat multiplier" and a "catalyst for conflict." The 2015 Paris Climate Agreement classifies climate change as an "urgent threat" whereas recognizing climate change's pernicious impacts on food security. Because of scientific advances, we tend to currently have a way clearer understanding of the relationship between human action, climate change, and international security.

8. CLIMATE CHANGE PUTS PRESSURE ON STATE AND COMMUNITY STRUCTURES

Climate change contributes to slow-onset and extreme weather events, requiring state establishments to direct their attention and resources. Meanwhile, the decrease in living opportunities caused by a dynamic climate will expose unit and community-level vulnerabilities, impact livelihoods, compound economic differences, and erode social structures that may supply support and protection.

A recent report on climate-related security risks and peacebuilding in African countries found that unpredictable weather patterns have put pressure on farmers, markets, families, and whole communities. Over the past four decades, African countries have seen an increase in mud storms and droughts, this is making a government that was meant for security to be diverted to attending to environmental disasters an urgent issue.

9. CLIMATE CHANGE DISPLACING PEOPLE

Extreme weather and different adverse effects of Climate change will result in displacement. The most recent international report on Internal Displacement found that, in 2020, thirty million individuals were newly displaced as a result of weather-related disasters – compared with nine. 8 million as a result of conflict and violence. In addition to being displaced from their homes, internally displaced persons tend to be poorer and less food secure.

A recent report by the World Bank found that as several as 216 million individuals may move among their own countries thanks to slow-onset Climate change impacts by 2050. Their enjoyment of civil, political, economic, social, and cultural rights may be compromised.

10. SUGGESTIONS

It's not too late to act to make sure that climate action contributes to international peace and security. Let us highlight 3 absolute priorities in climate action.

First, we want well-defined commitments and concrete actions by all countries to limit heating to 1.5°C to avoid the catastrophic impacts of Climate change. She urged all Member States to adhere to commitments made by

COP26 and to translate the same into concrete and immediate action. conjointly, we want a forty-five percent cut in international emissions by 2030.

Second, not worsen the already dire impacts of climate disasters on the people's livelihood in Africa, there must be a serious breakthrough in adaptation and resilience. it's essential that a minimum of 50% of climate finance is allocated to resilience and supporting adaptation. This will likely help in rebuilding and mitigating climate change effects. Annual adaptation costs in developing countries currently stand at \$70 billion, and they are expected to exceed \$300 billion a year by 2030.

Developed countries should uphold their promise to deliver, now that COP26 has come and gone. There must be a concrete action and sanctions on those countries which fail to cut down on emissions, this ensures that countries penalize manufacturers within. Grant funding is crucial, as loans can lead to a debt trap.

Third, climate adaptation and peacebuilding will and may reinforce one another. for instance, within the Lake Chad region, dialogue platforms for hand and glove managing natural resources, supported by the Peacebuilding Fund, have promoted re-forestation and improved access to property livelihoods. In West and African nation, cross-border earnings have enabled dialogue and promoted clear management of scarce natural resources, an element of peace.

And as Climate change is impacting water resources worldwide, water can be used to bring about peace, drawing lessons from the past, within the Sava geographical area in the Russo-Japanese war, transboundary water cooperation was the place to start regional reconciliation and cooperation once the war within the Balkans in the '90s.

11. CONCLUSION

This paper offers an analytical framework for studying the link between social difference and Climate change. It shows that this relationship is characterized by a regeneration, whereby initial inequality makes deprived communities suffer the disproportionate loss of their assets and resources resulting in wider gaps between the rich and the poor. The paper provided proof that high-income countries are the main drivers of climate hence they must take concrete steps to ensure that they scale down on emissions to the environment, the paper pointed out the fact that richer countries have lamentably failed live up to their pledges when it comes to climate funding.

The climate discussion has proceeded through the paper. At the initial stage, the main target was the physical effects of Climate change. The second part was dedicated to social effects. The discussion at this stage often actor inferences concerning differences, however, didn't quite concentrate on it. The third part discussed the relationship between climate change and international security and how it's not only an environmental threat and a danger for countries around the world.

At an additional concrete level, the excellence created by the paper among "exposure," "susceptibility," and "ability to cope and recover" ought to be of a lot facilitate in formulating policies that may address these different inequality-enhancing effects. The paper concluded by providing solutions to address the challenges raised in the paper.

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Environmental Issue and Their Consideration by United Nation

Teena Parmar

ABSTRACT

Environment is derived from the word from the French word 'environer' – which means to 'surround, enclose, and encircle'. Environment refers to the surroundings in which living beings such as humans, animals, and plants land non-living things which exists together. Environment is not confined to a particular country rather it is a global issue, where all the countries show their concern. After the establishment of UN, even UN has shown its concern towards the environment though the concern for environment protection is not mentioned in the Charter of UN. But there have been lot of Conventions and Conferences which are taken over by the UN to create awareness and to resolve environmental issues which is of great concern. It act as a catalyst and plays an important role to guide the States in relation to environmental issues. It was in 1972 through Stockholm Declaration and coming a long way till Rio Declaration 1992 has laid certain principles which helps in guiding the States and UN in activities related to environment.

This paper will analyze and discuss the important role played by UN in discussing or taking up the issues related to the environment.

Keywords: Environment, Environment Protection, Environmental Issues, United Nations, International Norms, International Environment Jurisprudence.

INTRODUCTION

The extent of development of law for a particular area or subject is depended upon the concern which States along with non-state actors and international organization have. Until and unless Nations have intent to enter into legal binding obligation, international law cannot become an effective means to address any issue or matter. Last thing to be considered is the role of International Adjudicating authorities like the ICJ and some International Tribunals, as they are also creating some jurisprudence related to the International Environmental Law. This is because the environmental threats are increasing and matters are going to the international adjudicating authorities very frequently, thus their contribution is important to be taken into consideration. The development of International Environmental Law begin with formation of bilateral fisheries treaty in the start of nineteenth century and with the conclusion of International Organizations formed in the year 1945, the first era of development completed. This can also be classified as first period of development of International Environmental Law. Under this time frame Individuals and State started to understand that the process of Industrialization is degrading the natural resources and thus exploitation of natural resources needs to be limited by adopting new legal mechanism for the protection of Environment. Further, the second period begins with the formation of United Nations and associated with the UN Conference on Human Environment. This conference is the most important one in the field of International Environmental Law, as it was held in Stockholm in June 1972, it was also known as Stockholm Conference. This leads to creation of some competent authorities and organizations related with Environment matters. Similarly, adoption of International Legal instruments at national as well as international level which deals with some source of pollution and protection of environment in general. The third phase of development runs from the Stockholm Conference and reached to its end at UN Conference on Environment and Development (Hereinafter UNCED) concluded in June 1992. This period UN role come out in picture as it tried to tie up and coordinate the responses to environmental threat from international perspective. This phase had also seen a ban on production, consumption and International Trade of materials which is potentially harmful for the environment. Many regional and international conventions were made for dealing with environmental threats.

Stockholm Convention- The Stockholm Declaration was not embraced as a settlement and isn't legitimately authoritative in complete sense. In addition, few of the standards in the Stockholm Declaration indicate to be regularizing. Rather, the greater part of them speak to a concurred articulation of the ecological issues distinguished amid the Stockholm Conference, the then current comprehension of the reasons for these issues, and a lot of applicable monetary and political contemplations to be considered in settling the issues. However, at the whole shutting session which received the Stockholm Declaration, a few agents alluded to the content as the beginning stage for the improvement of universal ecological law. The director of the gathering thought of the Stockholm Declaration as 'an exceptionally critical report mirroring a network of interests among countries.

United Nation Environment Programme

Stockholm declaration is the cornerstone in the protection of environment in the year 1972. In the same year United Nation Environment Programme was adopted as an outcome of Stockholm Convention. UNEP not only finds solutions of environment problems but also focuses on various aspects such as marine life, deforestation, drought, ozone layer depletion and global warning.

Significant debate has erupted about the scientific basis for environmental concerns, as well as how to reconcile environmental protection with development goals. However, both developed and developing countries understand the importance of protecting natural resources, developing countries frequently claim that the environment has been despoiled primarily by advanced industrialized countries, whose tardy environmental awareness is now impeding development in other countries. With the help and support of General Assembly UNEP established a World Commission on Environment and Development in the year of 1988. The Earth Summit which was held in Rio de Janeiro was outcome of this commission that contributed a lot in the development of environment protection.

Rio Declaration

The Rio Summit was held in the Brazilian city of Rio de Janeiro, between June 3 and 14, 1992. The Second Earth Summit on Development and the Environment was sorted out by the UN. Its general secretary was Maurice Strong. It was represented by 178 nations, spoke for the most part by their heads of state, notwithstanding somewhere in the range of 400 delegates of non-administrative associations. Then again, approximately 17,000 individuals went to the Forum of NGOs, held in parallel to the Summit.

It took a long time since the Stockholm Conference, the First Earth Summit, to praise the second portion of these occasions. Truth be told, very little advancement was made in these two decades in atmosphere, in spite of the high expectations that were epitomized in the 26 number of principles issued by the Stockholm Declaration.

The feature of this period was the emanation of the Montreal Protocol for the security of the ozone layer. The understanding was consulted in 1987 and went into power on January 1, 1989. As of now in 1985, 20 nations that included most makers of chlorofluorocarbons (CFCs), in charge of the broadening of the supposed "ozone holes", they had marked the Vienna Convention, which built up the system for arranging worldwide guidelines on ozone-draining substances. The CFCs were supplanted by HCFCs, whose impact is multiple times lower, despite the fact that they keep on influencing the ozone layer. Until a complete item can be discovered, HCFCs will be utilized as transient substitutions. The Montreal Protocol is considered for instance of universal participation to take care of issues that influence nature

Major Environmental Conventions in Brief

The universal ecological understandings consulted in the twentieth century reflect shared characteristic of worldwide interests in keeping up the heartiness and honesty of our planets and set up methods through checking the strength of condition and give advantages to all gatherings. Following are a portion of the major ecological arrangements, traditions and conventions that have been consulted in the twentieth century.

- **Global Whaling Convention, 1946:** It gives a structure to the guideline of whaling industry and legitimate preservation of whale stocks.
- **General Agreement on Tariffs and Trade (GATT), 1947:** Environment and exchange issues move in two ways: ecological security rehearses influence exchange, and exchanging rehearses influence natural exchange. Both are seen as critical components of feasible advancement. GATT has critical ramifications for natural assurance and it advances facilitated commerce around the globe. Article XX of GATT grants exchange limitations to meet ecological targets insofar as they are not self-assertive or biased.
- **Antarctic Treaty, 1959:** Under this arrangement, any atomic blasts in Antarctica and the transfer thereof radioactive waste material will be precluded. The primary point of this settlement is to keep Antarctica quiet and free from atomic and military testing.
- **Ramsar Convention, 1971:** It gives system to keep the overall loss of wetlands through savvy use and the board of the rest of the wetlands. It covers both common and man-made living space that can be delegated wetlands. Wetlands incorporate streams, coral reefs, swamps, bogs, lakes, salt bogs, mudflats, mangroves, coral reefs, fens, peat marshes, or waterways – regardless of whether normal or counterfeit, changeless or transitory.
- **The World Heritage Convention, 1972:** It is a tradition which gives commitment to whole universal network to collaborate in concerning the assurance of World Cultural and Natural Heritage. Since its

endorsement in 1972, it has turned out to be a standout amongst the best and imperative components for the security of destinations and landmarks around the world.

- **London Convention 1972:** It is a tradition for the counteractive action of marine contamination by dumping of squanders and different issues.
- **London Convention, 1973:** It is a convention on obstruction on high oceans if there should be an occurrence of marine Pollution with Substances other than Oil.
- **Tradition on the International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1973:** It gives a structure to control universal exchange on imperilled species. It gives security to in excess of 30,000 types of creatures and plants, regardless of whether they are exchanged as live example, fur garments or dried herbs.
- **The International Convention for the Prevention of Pollution from Ships 1973, as changed by the Protocol of 1978 (MARPOL 73/78):** It is the significant universal tradition controlling contamination of the marine condition from the boats because of their activity.
- **The Geneva Convention on Long-Range trans-limit Air Pollution, 1979:** It gives structure to control long-go trans-boundary contamination and murkiness contamination.
- **United Nations Convention on the Law of the Sea (UNCLOS), 1982:** It gives a global structure managing utilization of the world's seas.
- **Tradition for the Protection of the Ozone Layer, 1985 (Vienna Convention):** It is a settlement for decreasing and taking out production and utilization of gases that annihilate Ozone in the Earth's climate. The goal of Vienna tradition was to ensure human wellbeing and condition against the destructive impact of ozone consumption. As a system tradition it doesn't set up a particular command over the Ozone layer exhaustion. Rather, it sets up general commitment on gatherings to secure ozone layer and underlines the requirement for inside participation. This tradition does not force any solid commitments. It just sets up a structure that is should have been filled in with further activities.
- **Montreal Protocol, 1987:** It sets up an objective to lessen and in the long run take out the creation and utilization of substances that reason ozone layer exhaustion. As per it the nations need to set an objective to eliminate the ozone draining substances. Be that as it may, it gives an exceptional arrangement to the creating nations. It perceives the way that the creating nations have scarcely added to the issue, so they have a 10 years postpone period in eliminating the generation and utilization of ozone exhausting synthetic substances.
- **Basel Convention, 1989:** It controls the trans-boundary developments on perilous squanders and their transfer.
- **Tradition of Biological Diversity, 1992:** It forces commitments to save biodiversity in both earthbound and marine environments. The two fundamental targets of this tradition are the manageable utilization of the parts of organic assorted variety and reasonable and impartial sharing of the advantages emerging out of the use of hereditary assets, including by fitting access to hereditary assets and by suitable exchange of significant advances, considering all rights over those assets and to advances, and by proper financing.
- **United Nation Framework Convention on Climate Change 1992 (UNFCCC):** It gives significant system to direct anthropogenic environmental change.
- **Rio Convention, 1992:** The fundamental point of this tradition was to ease destitution, avoid neighbourhood natural debasement and secure the strength and uprightness of the biosphere.
- **Kyoto Protocol, 1997:** Under this convention, which rose up out of UNFCCC, an understanding was made between countries to command nation by nation decrease in ozone depleting substance discharge.

Recent Development in Environment by United Nation

United Nation plays a very vital role not only in harmonizing the world but also protect the environment at world at large. General Assembly Special Session on Environment in 1997, World Summit on Sustainable Development in 2002, UN conference on Sustainable Development 2012 and UN sustainable summit 2015 were the most important treaties for environment regulations by the United Nations.

COP 21 that is also known as United Nations Framework Convention on Climate Change or Conference of Parties for 21st Century came into the existence in 2015. It introduced new climate agreement applicable to all countries, focusing to reduce global warming with the recommendation of the Intergovernmental Panel on Climate Change.

Another summit was taking place in the year of 2019, by UN Secretary General to combat the climate change in Glasgow, UK that is known as UN Climate Action Summit.

CONCLUSION

Environment degradation or environmental issues are not only related to one nation. It impacts on whole world uniformly. United nation introduced the International Environmental Jurisprudence with the Stockholm Convention and introducing the Sustainable development. But the main question arises while concluding this is International Environmental Law truly "law"? There is no standing authoritative body that explains universal ecological standards, norms, or systems. Universal law regularly comprises of general prohibitions or commitments that states are accused of executing and implementing. The bodies entrusted with overseeing global ecological understandings (specifically the secretariats, working for the benefit of the particular gatherings of the gatherings known as COPs) have a constrained order to take measures to urge consistence: They have constrained insightful forces and no specialist to capture wrongdoers. These bodies regularly depend on the deliberate collaboration of the part states, and their compelling capacity is to serve the part states. There are moderately couples of implementation instruments to rebuff infringement of the understandings, and these regularly have a blend of facilitative and correctional jobs and are just start to work by and by.

Since worldwide ecological law is the consequence of global arrangements among states and at last a tradeoff among contending interests, usually broad and adaptable. It commonly involves general arrangements that imagine residential executing enactment to give the particular subtleties, measures, what's more, systems to make universal ecological law operational. Contingent upon the terms of a particular global understanding, nations may have adaptability while receiving actualizing enactment insofar as the enactment offers power to the operational arrangements of the understanding. Except if explicitly denied or seized by the understanding, nations may likewise embrace progressively defensive measures. Without traditional administrative, official, or legal bodies what's more, in light of the consensus of numerous arrangements, universal ecological law needs a large number of the customary law. It can look progressively like universal approach, in which states vow to attempt certain measures. To the degree that universal natural law is authoritative; it is official at the worldwide dimension between states.

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A Critical Study on the Role of Ngos' and Other Regional Arrangements in the Protection of Marine Ecosystem

A. Mohammed Ali M.L

Government Law College, Coimbatore, Tamil Nadu, India

ABSTRACT

After the World War-II, the United Nations formally acknowledged the position and relevance of NGOs in Article 71 of the **United Nations Charter**, which expanded their prominence. NGO influence and involvement in international entities has risen considerably since the 1970s. While NGOs do not have the right to vote in **international organisations**, they use a variety of mechanisms to influence international institutions and conferences, such as serving on national delegations and participating in the drafting of international agreements, conference declarations, and action plans.

The **Non-Governmental Organizations** have equipped themselves adequately and come up enthusiastically in providing services in environmental concerns. Cooperating with local and regional NGO's (such as the Earth Watch, Fauna and Flora international, Greenpeace, International Union for Conservation of Nature and World Register of Marine Species) are being developed for the UN system's regional and country offices. Many international institutions hold periodic consultations with the NGO's on substantive issues, policy questions and programme strategies. The majority of regional agreements place a greater focus on **ecosystem** based or area-based methods. The entirety of these bodies must be identified as they march towards the common point of the **Principle of Sustainable Development**.

Keywords: Ecosystem, International organisations, Non-Governmental Organisations, Principle of Sustainable Development, United Nations Charter

INTRODUCTION

The World's marine environment faces a wide range of environmental concerns that can only be solved via international collaboration. Environmental concerns are accompanied by an acknowledgement that ecological interdependence transcends national borders and that issues that were previously deemed local have worldwide ramifications. Only international law and regulations can handle the ramifications, which might be bilateral, regional, or global. All contractual parties must agree on the Common Environmental Goals. These difficulties, as well as their future ramifications, will be of concern. When compared to prior attempts at simple coordination, the new era of collaboration and cohabitation is a step forward. The institutional arrangements otherwise popularly known as international organisations in the environmental governance systems are vital in dealing with the issues in order to effective environmental conservation management. The skeleton regulations has been covered by flesh and put into effect with the institutional mechanism and the administrative bodies in the particular field. The recommending nature of these institutions is sufficient to hold strong and resist the problems facing by them. Otherwise heavy mandate has to be implemented in their working nature. Such an institution holds at least the possibility that scientific consensus and the rational decision making to drive an effective conservation policy

After the Second World War, the UN formally acknowledged the status and relevance of NGOs in Article 71 of the UN Charter, which expanded their prominence. NGO influence and involvement in international entities has risen considerably since the 1970s. International non-governmental organisations (NGOs) such as Greenpeace and Amnesty International have participated in international conferences, influenced international accords, and effectively raised public awareness of the problems they espouse. While NGOs do not have the right to vote in international bodies, they strive to influence international institutions and conferences through a variety of mechanisms, including serving on national delegations and participating in the drafting of international agreements, conference declarations, and programmes of action.

The States, on the other hand, define the terms of participation in international organisations such as the United Nations for NGOs. These guidelines, the NGOs say, are excessively restrictive, and they desire a more broad role. ECOSOC is the sole legally permitted way for an NGO to engage in the UN. Furthermore, the agreement is a "consultation only" agreement that does not contain voting or delegation membership rights. As a result, NGOs' participation rights inside the UN system are severely restricted. NGOs seeking consultative status must support the UN Charter's goals and objectives. National, regional, subregional, and worldwide organisations may apply for consultative status.

The International Union for Conservation of the Nature

The IUCN, which was founded in 1948, has produced policy initiatives and generated draught instruments that have served as the foundation for the Ramsar Convention, the CITES, and the CBD negotiations. IUCN was also essential in the development of the 1990s world conservation strategy I and II, which have played an active role in creating treaty language and other international standards, as well as the execution of treaty obligations, in collaboration with UNEP and WWF.

World Register of Marine Species

The goal of the World Register of Marine Species (WoRMS) is to offer an accurate and complete list of marine organism names, as well as synonymy information. While legitimate names are given first attention, additional names in use are also included so that this register may be used to understand taxonomic literature. Taxonomic specialists, not database managers, are in charge of the WoRMS' content. The WoRMS features an editorial management structure in which each taxonomic category is represented by an expert who has content authority and is responsible for ensuring that the material is of high quality. Each of these primary taxonomic editors has the authority to ask additional specialists from smaller organisations under their jurisdiction to join them.

The Antarctic regime

The Antarctic Convention of 1959, have been periodically updated. In 1961 the contracting parties met in Canberra as provided by Article IX of the Convention, and adopted measures prohibiting the destruction of any indigenous animal or plant life. Such measures, however, applied only to those plants and animals found on the Antarctic continent itself, and left seals found in the water unprotected. The 1962 Buenos Aires meeting ended without the subject of pelagic sealing having been considered. In 1964 the contracting parties met in Brussels and agreed to a provision calling for voluntary restrictions on pelagic sealing, but failed to specify what these measures should be. Finally, at the 1966 Santiago meeting the parties addressed the question of pelagic sealing in detail and adopted guidelines calling for voluntary compliance with the following measures:

- (1) The total taken by all nations was not to exceed the Maximum Sustainable Yield (MSY) which established in an Appendix to the Agreement,
- (2) If the number taken of any species disturbed the natural ecological balance, no more were to be taken until the balance was restored;
- 3) Taking of the Rows Seal was totally prohibited.
- (4) Methods of information exchange were established,
- (5) If the MSY was approached, steps were to be taken to convene a Consultative Meeting

The MSY concept was exchanged for Optimum Sustainable Yield, which generally permits few animals to be taken than MSY other species were accorded full protection, and a closed season was established. Protected zones and sanctuaries were created, and specific numerical quotas were mandated for the Crabeater, Leonard, and Weddell seals

Antarctic Seals Convention

A Separate international convention specifically for the protection of Antarctic seals was negotiated on February 11, 1972. The Convention for the Conservation of Antarctic Seals states as its objectives the protection, scientific study, and rational use of Antarctic seals, and to maintain a satisfactory balance within the ecological system. The Convention prohibits the killing of seals except in accordance with its terms and requires the passage of appropriate domestic legislation by the contracting parties. Signatories include all twelve of the original Antarctic Treaty parties. The Convention includes an Annex that specifies in detail regulations regarding the taking of Antarctic seals. It also provides for both a closed season and specially protected sealing zones, and requires scientific input by the Scientific Committee for Antarctic Research. Finally, the Annex attempts to ensure that humane methods are used to take the seals. Two substantial weaknesses mark the 1972 Convention's protective scheme. The most serious flaw is that it lacks a strong enforcement mechanism.

Despite these difficulties, the Convention for the Conservation of Antarctic Seals is exceptional in its explicit recognition of ecological values and its liberal protective measures. Moreover, it represents a virtually unprecedented instance of intergovernmental regulation before commercial use begins on a large scale and before a particular species becomes threatened. Other species were accorded full protection, and a closed season was established. The Protected zones and sanctuaries were created, and specific numerical quotas were mandated for the Crabeater, Leonard, and Weddell seals. The Convention prohibits the killing of seals except in accordance with its terms and requires the passage of appropriate domestic legislation by the contracting parties.

Signatories include all twelve of the original Antarctic Treaty parties. Five nations, including the United States, have ratified the 1972 Treaty, the Convention includes an Annex that specifies in detail regulations regarding the taking of Antarctic seals. The Annex presently provides absolute protection for three species and sets numerical kill limits for three others. It also provides for both a closed season and specially protected sealing zones, and requires scientific input by the Scientific Committee for Antarctic Research.

Finally, the Annex attempts to ensure that humane methods are used to take the seals. Two substantial weaknesses mark the 1972 Convention's protective scheme. The most serious flaw is that it is not yet in force. Furthermore, it lacks a strong enforcement mechanism. Despite these difficulties, the Convention for the Conservation of Antarctic Seals is exceptional in its explicit recognition of ecological values and its liberal protective measures. Moreover, it represents a virtually unprecedented instance of intergovernmental regulation before commercial use begins on a large scale and before a particular species becomes threatened.

Convention of the Conservation of Antarctic Marine Living Resources

The Convention of the Conservation of Antarctic Marine Living Resources (hereinafter referred to as the CCAMLR') which may act as a model for future agreements relating to the protection of marine resources. Due to climatic conditions, nearly all life in Antarctica lives on the coasts or adjacent waters, and derives food directly or indirectly from the sea. The convention reflects the changing attitudes about conservation, and a more ecological approach to agreement is to reach the stock's maximum sustainable output. However, CCAMLR requires not only that harvesting be regulated so as to prevent populations of target species from decreasing below their level of maximum sustainable yield, but also that the possible impacts of projected harvest levels on non-target species and the marine environment as a whole be given equal consideration.

These limitations were put in place to minimise krill harvesting, which is an important part of the Antarctic food chain. Article VII of the CCAMLR establishes a commission to undertake research, gather data, and analyse data on Antarctic marine species and ecosystems. Article IX requires the implementation of a monitoring and inspection system, as well as conservation measures based on the most up-to-date scientific data. Enforcement, on the other hand, is left to national authorities. Unfortunately, the need that choices be taken by agreement might frustrate the CCAMLR's many excellent qualities by giving any single nation the capacity to obstruct or impede conservation-oriented actions.

Regional Fisheries Organization and Agreements in Pacific, Atlantic, Mediterranean, Caribbean and Baltic seas

In these places, conservation efforts for marine species are very crucial. Single-species management is handled by the International North Pacific Fisheries Commission, the Northwest Atlantic Fisheries Commission, the International Pacific Halibut Commission, the International Commission for the Conservation of Atlantic Tunas, and the Inter-American Tropical Tuna Commission.

While the goal of these groups, as well as the conventions and treaties that founded them, was conservation, observers have pointed out these flaws. Their jurisdiction did not extend to all of the locations where the fish were discovered. The regulatory measures they advocated were not legally obligatory until each of them took legislative action, and there was no other enforcement mechanism or authority than the flag State. As a result, marine biodiversity has received virtually little protection. One of their key methods has been to set and allocate catch quotas among the parties. More recently, a few of these bodies have explored other management measures, such as efforts to reduce bycatch through improved gear technology and fishing operations and practices.

In the North Pacific, the Japanese high seas driftnet fishing for salmon. The fishery grabbed not just fur seals but also Dall's porpoise, other marine animals, and birds, deploying millions of kilometres of driftnets in a single season. The Convention for the Conservation of Antarctic Seals (the "CCAS"), which is still in effect, has secured renewed protection for certain seals. Although this agreement does not prohibit hunting, it does assist to safeguard seal species from overexploitation by enforcing severe controls on seal killing and capture inside the Convention Area, including outright bans on some species.

The CCAS is known for establishing protected areas where seals are not allowed to be trapped. The **Montreal Guidelines** for the Protection of the Marine Environment from Land-based Sources were developed by the Group of Experts for the Protection of the Marine Environment between 1983 and 1985. The contract was signed in 1985. The UNEP established these recommendations in resolution 13/18 of May 24, 1985, and States and international organisations are encouraged to utilise them in the creation of bilateral, regional, and global agreements on the issue.

The Guidelines were based on UNCLOS (Part XII), the Paris Convention for the Prevention of Marine Pollution from Land-based Sources, the Helsinki Convention for the Protection of the Baltic Sea's Marine Environment, and the Athens Protocol for the Protection of the Mediterranean from Land-based Sources.

The Montreal Guidelines cover issues such as discussion, cooperation, and the establishment of rules, criteria, standards, and recommended practises and procedures to prevent, reduce, and control pollution, as well as scientific and technical assistance and cooperation, monitoring and data management programmes, the creation of special protected areas, and the development of control strategies. The Guidelines have been used by the World Bank in drafting its policies on marine and coastal pollution, as well as by the South-East Pacific Action Plan. Individual countries have also utilised them to formulate internal policy.

The Regional Convention is a typical regional maritime agreement in the Caribbean. It establishes a cooperative system for coastal governments to develop comprehensive strategies for reducing and controlling pollution in the convention. The parties also undertook to take all necessary steps to avoid, mitigate, and regulate pollution from ships, dumping, coastal waste, and internal water discharges. Several measures relevant to marine debris are included in the draught Protected Area and Wildlife Protocol. For example, each party would be required to control and, where appropriate, ban activities that have a negative impact on specified regions and species. Listed species are also protected by similar means.

Parties are also required under the Protocol to produce management plans and recommendations for the quality of protected areas, conduct public awareness initiatives, and collaborate on scientific, technological, and managerial measures in order to meet the Protocol's goals. The Caribbean Convention's Specially Protected Areas and Wildlife Protocol might and should be used as a model for establishing the types of duties and action-forcing mechanisms needed to combat marine debris pollution. This and other regional agreements highlight the critical relevance of international cooperation and a focus on regional solutions to marine pollution. They appear to have a good chance of conserving biodiversity and the marine environment. However, they are insufficient to considerably reduce marine trash pollution when used alone.

The Endangered Species Act of 1976 and the **Marine Mammal Protection Act of 1976** are two US laws aimed at protecting marine species in the United States. The Environment Protection and Biodiversity Conservation Act, 1999, was enacted in Australia to promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources. It identifies and lists vulnerable marine species to protect them and imposes penalties for violations of the Act. Additionally, the Environment Protection and Biodiversity Conservation Regulations of 2000 created several agencies and processes for the proper execution of the aforementioned Act.

Islamic States and their Practices

The Regional Convention for Co-operation on the Protection of the Marine Environment from Pollution was signed on April 24, 1978, in Kuwait, under the supervision of the UNEP. The convention's goals are based on the recognition that oil and other harmful or noxious materials arising from human activities on land or at sea, particularly through indiscriminate and uncontrolled discharge of these substances, pose a growing threat to marine life, fisheries, human health, and recreational uses of the sea in the region shared by Bahrain, Iran, Iraq, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates. To prevent, abate, and combat pollution of the marine environment in the Sea Area, the Contracting States should adopt all relevant measures individually and/or collectively in conformity with the present Convention and any protocols in effect to which they are parties.

The Regional Organization for the Protection of the Marine Environment was founded under Article XVI of the Convention: a) The Contracting States thus establish a Regional Organization for the Protection of the Marine Environment, with its permanent headquarters in Kuwait. b) The following organs should make up the organisation:

- (i) a Council composed of Contracting States that performs the functions outlined in paragraph (d) of Article XVII;
- (ii) a secretariat that performs the functions outlined in paragraph (a) of Article XVIII; and
- (iii) a Judicial Commission for the Settlement of Disputes whose composition, terms of reference, and rules of procedure are established at the Council's first meeting.

Organization of the Islamic Countries

This organization's amended charter was drafted on March 14, 2008. Cooperation with all other nations in the globe and other international organisations is one of this organization's goals. The fundamental slogan is to promote international peace and security, which is Islam's ultimate goal. The protection of the environment was included in the preamble, which is also mentioned in the Quran. God revealed in the Quran, "Verily, all things have we made by measure (Quran 54:49); everything to Him is measured" (Quran 13:8). "And we have produced everything in equilibrium therein" (Quran 55:7). The organization's actions are aimed at reviving Islam's pioneering position in the world while assuring sustainable development, growth, and prosperity for the peoples of Member States, as well as preserving and promoting all parts of the environment for current and future generations.

CONCLUSION

The Emergence of International norms and principles for the protection of the global environment is one of the prominent features in the progressive development of International law during this period. Likewise, the fundamental limitation established by treaty on the *mare liberum* doctrine highlight the interest of the international community as a whole in the conservation of highly migratory fishstocks. The United Nations Convention on the Law of the Sea, United Nations Fish Stocks Agreement and the Convention on Biological Diversity all contain duties and obligations for member states to conserve the living resources of the high seas and protect the marine environment. However, compliance with these provisions is lacking and the perennial problem of enforcement in international law continues to be a very real issue. In there are where there are no Regional Fisheries Management Organisations, fishing is unregulation and subject only flag state jurisdiction.

A moratorium on all bottom-trawling activities in the high seas is urgently needed to conserve the high seas' living resources and protect the magnificent deep sea marine environment from further destruction due to the above weaknesses in the existing system of conventions and a lack of effective enforcement of legal duties and obligations. Many countries have already expressed support for such a move, and there is rising momentum for the United Nations General Assembly to proclaim such a resolution. It is preferable to avoid taking unilateral steps to address environmental issues that are not under the authority of the importing nation. Environmental actions addressing transboundary or global environmental issues should be based on international consensus as much as practicable. The factors for the degradation of the marine environment's aims and principles do not take into account actual environmental issues.

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FOOT NOTES

1. "Treaties which are allowing observer status for environmental NGOs includes the 1946 International Convention for the Regulation of Whaling; the 1972 London: Convention; the 1973 CITES Convention, the

1979 Convention on the Conservation of Migratory Species of Wild Animals; the 1979 Convention on the Conservation of European Wildlife and Natural Habitats; the 1985 Ozone Convention; the 1989 Convention on the Control of Transboundary Movements of Hazardous Wastes. It was out of this awareness that in 1963 the International Union for the Conservation of Nature and Natural Resources (IUCN) called for an international convention to regulate export, transit and import of endangered species or their products. Ten years later, in 1973, IUCN's initiative resulted in adoption of CITES.”

2. “The European Registration of Marine Species was combined with numerous other species registers at the Flanders Marine Institute to create this marine species register. Rather of creating separate registers for each project, the Flanders Marine Institute created "Aphia," a centralised database that ensures taxonomy is consistent across all initiatives. Below is a list of the marine species registrations contained in Aphia. <http://www.marinespecies.org>.
3. “See Antarctic Treaty, Agreed Measures for the Conservation of Antarctic Flora and Fauna, Convention for the Conservation of Antarctic Seals: Convention for the Conservation of Antarctic Marine Living Resources: Convention for the Regulation of Antarctic Mineral Resource Activities, Comprehensive Measures for the Protection of the Antarctic Environment and Dependent and Associated Ecosystems; Protocol on the Antarctic Environment.”
4. Article 1 of the Convention for the Conservation of Antarctic Seals, Feb 11, 1972, 11 International Legal Materials 251 (1972) The Convention applies to all waters south of fifty degrees south latitude, and to six types of seals Southern 1. lephant Seal, Leopard Seat, Weddell Seal, Crabeater Seal, Ross Seal, and Soother Fur Seal.”
5. “Gregory M. Travaglio and Rebecca J. Clement (1978-1979), International Protection of Marine Mammals, Columbia Journal of Environmental Law, Vol. No 5, Page No. 199.”
6. “Suzanne Iudicello and Margaret Lytle (1994-1995), Marine Biodiversity and International Law: Instruments and Institutions that can be used to Conserve Marine Biological Diversity Internationally, Tulane Environmental Law Journal, Vol. No. 8, pp. 124-161.
7. It is an international organization governing lugh-seas salmon fisheries. It strictly regulates catches, yet populations continue to decline.
8. It attempts to manage fisheries has not been successful, due in most part to a lack of cooperation from nations fishing in the area covered by the agreement.
9. It began as a 1923 agreement between Canada and the U.S. to manage Northern Pacific and Behring Sea halibut stocks.”
10. “International Convention for the Conservation of Atlantic Tuna, March 3, 1969, main aim is the conservation of tuna-like fishes and billfishes throughout the Atlantic Ocean and adjacent seas. Its effectiveness has been hampered by a lack of funding for staff and research. The members have had difficulty reaching consensus on management measures, despite drastic declines in populations of Northwest Atlantic bluefin tuna and Atlantic swordfish.
11. This Commission monitors with the setting of around dolphins, and seeks to reduce bycatch dolphins.”
12. “See Suzanne Iudicello and Margaret Lytle 1994-1995, Marine Biodiversity and International Law Instruments and Institutions that can be used to Conserve Marine Biological Diversity Internationally,, Tulane Environmental Law Journal Vol. No 8, pp. 124-161.”
13. “The Holy Quran is the guidance for all the mankind from their creator "the Almighty. In order to obtain wisdom and it is a mercy from God who believes him. Further, for the benefit of mankind, explained every kind of similitude and some of the warning. These are the verses of the Holy Quran 122, 17:52 18:54 respectively Abdullah Yousuf Ali (2008), A-Z Ready Reference of the Quran, Good Word Books New Delhi.
14. This mandate is under Article 28 of the charter.”

A Review on Environmental Impact of Electric Vehicles

Priya Totale

SNBP Law College, Morwadi, Pimpri, Pune- 411018, India

ABSTRACT

The traditional gasoline, diesel and petrol vehicles are a threat to environment and contribute to global warming. So, the Electric Vehicle technology has been identified as a possible solution in reducing future emission and many environmental issues. However, this new technology is also posing some threat to environment. During the manufacturing process as well as disposal stage, some greenhouse gases are released to the atmosphere. In addition, the lithium ion used in battery is considered as a Hazardous Substance by Department of Telecommunication (DOT) and National Fire Protection Association (NFPA). Exposure to lithium can cause serious health impacts on human beings such as distorted vision, loss of co-ordination, diarrhoea and in extreme cases it can lead to cancer.

In India, there is no proper waste management system for disposing used batteries in electric cars. Lithium and other toxic chemicals such as Cobalt, Nickel are released directly to soil and nearby water bodies. When lithium is directly released in to water, it contaminates water making it unfit for drinking. These toxic chemicals are also released in to soil without proper treatment which pollutes ground water making it unwholesome for drinking. When battery wastes are improperly disposed, it also causes air pollution and climate change. Right to drinking water is a basic human right recognized as a part of right to life under Article 21 of the Indian Constitution. Dust, waste water and fumes emitted during Cobalt, Nickel and lithium mining also alter the existing eco-system and biodiversity.

New technology used for displacing conventional gasoline, diesel and petrol vehicles reduces many environmental issues especially global warming but they impose new environmental impacts. So, the government shall take initiative for bringing proper waste disposal system for batteries and the researcher stresses on the need for introducing legal provisions for the same.

INTRODUCTION

The first electric vehicle was invented by Anyos Jedlik in 1882. In India it was invented for the first time by Scooter's India Pvt Ltd in 1996. Earlier, the performance of this electric vehicles was not well in the market due to the high cost, low speed and short range, as there was no positive response for it from the people. But in 21st century, popularity of electric vehicles has been increased because of the increasing concern for the environmental impact that greenhouse gas emissions cause Global Warming. Government is also encouraging the people towards electric vehicles. And there are many reasons why people have accepted electric vehicle as their preferred choice, such as electric cars are more effective than gas-powered cars, it reduces the dependence on fossil fuels, it requires less maintenance as there is no engine and it produces less emission than conventional gasoline-powered cars in the market today. But on the other side it is necessary to think about the negative impact of electric vehicle on environment.

Though electric vehicles are emission-free, they still cause a climate impact which originates from the manufacturing of the car and disposal of battery. Manufacturing of cells, Mining and refining of battery materials, modules and pack needs substantial amounts of energy which could cause greenhouse gases emissions. These vehicles are driven by lithium-ion batteries and they beat their gas-fuelled compartments. The experts found that the mining lithium and manufacturing these batteries is water-intensive and contributes to air, soil, and water pollution. According to experts' analysis, manufacturing, maintaining and disposing method of e-vehicle batteries causes around 15% of environment burden and around 50% of environmental damages occur due to manufacturing and mining the copper and aluminium in the battery as well as its joining cables which is destructive to the environment. The researcher is focusing on the ecological effect of manufacturing, mining, and disposing of e-vehicles and their batteries

Impact of Electric Vehicles on Environment

The environment is affected by electric vehicles due to the intensive production, mining processes and disposal of battery. The battery used in the electric vehicles are very heavy and there is no proper provision for the disposal of this battery, consequently it pollutes the air, water and soil. Generally, electricity used to power electric vehicles are produced from non-renewable energy sources, which can affect our health as well environment. Following are the impacts of electric vehicles on environment:

- ❖ **Production of E-Vehicles:** In making of e-vehicles, the **lithium-ion batteries** are used containing lithium carbonate and also contain other ingredients like **Cobalt, Nickel, Graphite**. During manufacturing process of e-vehicles, overheating of earth is double than conventional vehicles. Also, e-vehicles are not beneficial for the regions where fossil fuels are key emergence of power. According to study done in China it is found that the battery used for electric car produces **60 percent more CO₂** than the manufacture of gasoline engine. The refining process of lithium requires **500,000 gallons of water** to refine one ton of lithium carbonate, so the process is water in-depth and also uses **poisonous chemicals like hydrochloric acid**, which can leach into local ecosystems and surroundings. The reason behind selection of this batteries is that the batteries produce more energy but their manufacture is not eco-friendly.
- ❖ **Lithium, Cobalt, Graphite and Nickel Mining:** The mining process of lithium is done by using chemicals which creates air, water and soil pollution. One of the major effects of lithium mining is water pollution. In this process local water supply can get effected. "In Chile and Argentina indigenous communities living near lithium mines are not properly informed about mining projects on their lands". The information given to them regarding effects of mining process on their water supplies were inadequate. Andes Mountain is a dry land area and Chemicals can pollute water returned to farmers which are used by them for country's food production. Also, the lithium carbonate extraction procedure harms the soil and can cause air pollution.

Similarly, Cobalt is a metal found in the earth's crust. Mining operation of cobalt requires electricity power use to which have negative impact on the atmosphere. Emission of CO₂ and NO₂ are high during cobalt mining which causes global warming and ultimately climate change. The Democratic Republic of the Congo has the maximum cobalt mines (DRC). According to United Nations Children's Fund around 40,000 children works as miners in DRC. Cobalt mining not only leads to child and slave labour but also expose people to toxic waste leakage and radioactivity.

Nickel is an ingredient in lithium batteries. For large scale nickel production, mining activities are carried out around the globe. Nickel mining processes also seriously affect the characteristics of ecology, atmosphere and local habitats and it thus results in greenhouse gas emissions, habitat destruction, and pollution of basic elements of the atmosphere and ecosystem. This process can throw harmful elements under the surrounding and ecological system and it can get spread through air. Basically, it belongs to the land exploitation which cause subsequent harm to the ecological function and services. Ultimately there is widespread environmental decrease of the specified zone and destroy the global ecosphere. In addition, it causes loss to the structure and function of soil. Land Restoration activities can help us to an extent to retrieve the soil from damages. If such restoration activities are done on such lands, it can protect the ecosystem and thus help in preserving the intention of long-term progress. But conducting rehabilitation activities on mining lands is not an easy task.

Graphite is also a component used in lithium batteries. The natural graphite mining activity can cause dust emissions and it involves high quantities of substances like NaOH and HCl for the sanitization of battery-grade (anode) goods, which may be cause harm to health of human being and the atmosphere. In the opinion of experts around 7,50,00000 of graphite is required annually to create 1 million Electric Vehicles, meaning that to produce 12 million EVs we will need 9,00,000 weights of tonnes of graphite by 2025. In the China's 'graphite rain' report it is found that graphite mining process pollute the local air and water quality also having harmful impact on the health workers & communities. Thus, lithium is not only polluting soil, air and groundwater as well as nickel, cobalt, graphite found in e-vehicle batteries have an even greater threat than lithium to the life of human being and the ecosystem.

- ❖ **Lithium battery Recycling Process:** Recycling process of this battery can be a hazardous business as lithium battery containers are huge and different manufactures used different process for recycling these batteries such as hydrometallurgical processes, pyrometallurgical processes, and mechanical processes. Pyrometallurgy process required temperature for regaining of metals which consume large amounts of energy. It can also release harmful gas such as carbon dioxide, carbon monoxide, dust from left over metals and sulphur dioxide. In this process lithium cannot be recovered because of organic resources such as paper, plastic is burnt, and lithium is always left in the slag. Similarly, mechanical processes lead to generation of waste water and hydrometallurgical processes rises the risk of explosions. Hence, it is found out that many e-waste recyclers don't have the technology to properly recycle these batteries.

Currently, the recycling capacity of lithium-ion batteries are less than 5%. If these electric vehicle batteries are dumped in to a landfill, it can leak chemicals into the water and ground and it may even cause toxic chemical fires and serious environmental issues. The damages from lithium batteries can let out fumes on recycling, which may cause severe problems for human health and the surrounding environment. Consequently, it is necessary to develop more effective recycling methods for electric vehicle batteries.

❖ **Disposal of Electric Vehicles battery:** The lithium-ion battery which are used in electric vehicles contain corrosive chemicals and dissolved metals. So, these batteries may ultimately leach chemicals into surrounding soil and pollute the environment if it is not disposed properly. When the pollutants are released to our water sources, it can imperil the animals as well as affect water quality and its resources. Thus, electric vehicle batteries have serious impact on right to water which is recognized as a fundamental right under Article 21 of the Indian Constitution. The damaged lithium-ion batteries may release heat and may result in chemical fire. Once batteries are completely drain out there is no use of it ultimately it gets discard into the garbage, they end up in landfills where they decay and leak. As batteries destroy, their chemicals soak into soil and contaminate groundwater and surface water which causes environment pollution and ultimately affect the eco-friendliness of electric vehicles. So, it is found that there is no provision for the disposal of these batteries.

❖ **Indian Legal Perspective on Electric Vehicles**

❖ The poor electric battery waste recycling and disposal system in India is violative of the Constitutional provisions. Right to healthy environment is recognized a basic fundamental right under Article 21 of the Indian Constitution. In the land mark judgement in *M. C Mehta v. Union of India*, the Honourable Supreme Court of India held that every Indian citizen is having the basic right to live in a pollution free environment. So, the polluters emitted during the recycling and disposal of electric battery is directly violative of Article 21 of the constitution.

❖ Article 19(1) (g) of the Indian constitution guarantees freedom of trade and occupation which is subject to reasonable restrictions so it is not an absolute right. No trade can be conducted in such a way as to cause health hazard to citizens or environmental pollution. Therefore, the poor battery waste management in India is as serious breach of Article 19(1) (g) of the Indian constitution.

❖ The precautionary and polluter pay principle can be implemented against electric battery manufactures who manufacture, recycle or dispose battery wastes without following environmental standards. A writ petition under Article 32 or 226 is maintainable against the producers of electric batteries if they pollute the natural environment.

❖ The poor waste recycling and disposal system associated with electric batteries is violative of Air (Prevention and Control of Pollution) Act, 1981 and Water (Prevention and Control of Pollution) Act, 1974. The battery wastes when disposed to lakes, rivers and other water bodies without proper treatment, it may make water unwholesome and unfit for drinking or for other domestic purpose. As proper battery waste disposal system is not implemented in India, the industries manufacturing batteries exist in violation to the Water Act. Similarly, the pollutants when discharged in to air can seriously endanger the quality of air. The electric battery industries pose a serious threat to the attempts made by Indian government to combat air pollution.

❖ Therefore, stringent actions shall be taken by Government of India to adopt effective electric battery recycling and disposal system.

❖ **Comparative Assessment of Electric Vehicles Battery Disposal Rules between India and US**

❖ As per the studies of Society of Manufacturers of Electric Vehicles, around two lack fifty thousand electric vehicles with lithium-ion batteries are on road. However, in India, there are no proper waste disposal system from recycling the used lithium batteries. The best solution for avoiding environmental hazards is that such lithium batteries shall be modified as a stationary battery and shall be used for other commercial, industrial and residential purpose. Currently, electric battery disposal is covered under E-Waste (Management) Rules, 2016. But these rules are found not to be sufficient to resolve the environmental issues connected with the recycling of batteries. However, a bill named Battery Waste Management Rules, 2020 is pending and if it is implemented, it can function as a possible solution for the disposal of mercury and alkaline based batteries including lithium-ion batteries.

❖ In United States, to regulate the air and water emissions during disposal stage of batteries, stringent provisions are given under Clean Water Act and Clean Air Act. The battery wastes fall within 65 categories of “priority pollutants” of Clean Water Act. If lithium, nickel, arsenic and other related compounds are to be discharged, then the permit from The National Pollutant Discharge Elimination System is required.

- ❖ Hazardous air pollutants such as cobalt, nickel, arsenic, manganese released during the manufacture and disposal of electric vehicle batteries can be released only within the restricted limits provided under National Ambient Air Quality Standard.

HEALTH AND SAFETY ISSUES

In addition to environmental impacts, lithium batteries also have negative impact on health because of its hazardous nature and reactivity. The metal used in the battery react with moist air, react with water to form hydrogen and with a variety of other substances. Metallic lithium reaction release heat and harmful products which seriously affect the health. On physical contact with lithium metal can cause serious chemical burns. It can lead to imbalances in the nervous system. When lithium batteries are produced from coal, the carbon dust generated can irritate the mucous membranes of eyes.

CONCLUSION AND SUGGESTION

The electric vehicles were implemented to preserve green earth, but the studies reveal that they may also cause environmental impacts. Since the environmental impacts connected with electric vehicle are alarming, **the government shall take initiatives to adopt proper procedures for disposal of damaged electric batteries.** The damaged batteries can release tons of electronic and electrical wastes and its deposition in landfills can cause serious threat to environment. The impact of electric vehicle battery emissions on individual and state-wide greenhouse gas emissions outlines is clearly determined. The lithium battery production involve high CO₂ emissions and reason behind this high carbon footprint is the source of energy used during the manufacturing process. In most of the countries, electricity for e-vehicles is produced from coal and is not considered eco-friendly. The carbon footmark of the batteries will be reduced if the batteries are made in countries through higher percentages of greener electricity sources which are renewable and nucleate.

In addition, the hazardous wastes produced during manufacture of batteries shall be reused to prevent further environmental damages. For example, the lithium salts can be used in cement industries. Economically feasible methods shall be adopted for effective reuse of these dangerous wastes.

A technique termed geothermal power was invented by a German Company for production of e-vehicle batteries which has zero percent Carbon dioxide emission. This project is good enough to produce 10,00,000 batteries per year. Such eco-friendly techniques shall be implemented in India to protect the nation from environment pollution.

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A Strife between Sustainability and Sustainable Development: A Case of Blockchain Technology

Priyanka Vaidyanath and Megha Jain
BMS College of Law, India

Blockchain technology, introduced in 2018, finds its application in supply chain, governance, e-voting, smart contracts, etc but became a global phenomenon for its breakthrough application in cryptocurrencies. Still in its nascent stage, it could be a game changer with its potential to revolutionise and decentralise transactions; it can increase automation and integrate physical and virtual worlds. More than 30 countries such as India, UK, Japan, United States are using blockchain technology in terms of digital economy, welfare schemes, et al. Despite its emergence as a breakthrough technology, there are a plethora of concerns around the usage of blockchain, most important of them being its environmental sustainability. It can transform social interaction as we know it and also our relationship with environment.

In this backdrop, it becomes pertinent to gauge its environmental impact along with its game changing influence on various public sectors. Significant amounts of electricity are required to run the computer calculations and it is an established fact that even today electricity is largely generated from fossil fuels. In 2016 alone generation from combustible fuel accounted for 67.3% gross electricity production of the world. Whilst efforts are being made to reap the benefits of this technology for sustainable development, blockchain in itself is 'energy hungry' and this raises eyebrows around its unintended adverse impact on the environment.

Thus, the paper aims to analyse the impact of blockchain technology on the environment and its use in the public sectors through the prism of environmental sustainability. The research aims to find the balance between sustainable use of blockchain technology to aid the sustainable development of the nation states. The findings of this paper is based on various studies conducted by organisations world over regarding the threats of blockchain technology on the environment, thereby following the doctrinal method of research.

III EFFECTS OF THE BLOCKCHAIN TECHNOLOGY

What is Blockchain Technology?

A blockchain is a distributed ledger comprising , blocks (records) of information, including information about transactions between two or more parties. The blocks are cryptographically linked to create an immutable ledger. It is a mechanism through which mutually distrustful remote parties (nodes) can reach consensus on the state of a ledger of information. These nodes in turn append information together to the ledger through invoking transactions. Best known for its crucial role in the crypto currency system, Blockchain guarantees a secure and trustworthy record of data without any third-party intervention. In simpler words, it a public ledger, made up of data blocks that are linked together to form a continuous chain of immutable records, to maintain transactions that are decentralised and secure without the involvement of any third party. These blocks are added in a chronological manner and are tamperproof.

The blockchain technology was invented to solve problem through creating a ledger (register of payments) online without a central node that has control over the information in the ledger. Presently, the technology finds its biggest application in cryptocurrencies, enabling open peer-to-peer, secure and fast transactions. However, it is expanding extensively in the fields of supply chain, education, sustainable development, finance, Internet of Things (IoT), etc to name a few.

History

The idea of immutably chaining blocks of information with a cryptographic hash function first appeared in 1979 as Markle Tree, named after computer scientist Ralph Merkle described an approach to public key distribution and digital signatures called "tree authentication" in his PhD thesis. In 1982, David Chaum described a vault system for establishing, maintaining and trusting computer systems by mutually suspicious groups; embodying many of the elements that make up a blockchain. In 1991, Stuart Haber and W. Scott Stornetta published an article about timestamping digital documents proposing a solution to prevent users from backdating or forward-dating electronic documents. The concept of proof-of-work (PoW) was also introduced around this time to verify the computational effort and deter cyberattacks.

PoW is a decentralized consensus mechanism that requires members of a network to expend efforts solving an arbitrary mathematical puzzle to prevent anybody from gaming the system. It is a consensus model that is predominantly used to ensure the validity of transactions in a blockchain transaction.

However, it was in the year 2008 that Blockchain found its way into a white paper titled “Bitcoin: A Peer-to-Peer Electronic Cash System” published under the pseudonym Satoshi Nakamoto, which put this technology prominently on the face of the global map. There is one school of thought which suggests that blockchain was invented to create Bitcoin.

Bitcoin has been defined as “a purely peer-to-peer version of electronic cash [that] would allow online payments to be sent directly from one party to another without going through a financial institution” with an objective of reducing transactional costs and online payments frauds.

Environmental impact of Blockchain

With a rapid increase in the application of blockchain technology in diverse fields ranging from finance, supply chain, agriculture to wildlife conservation, various questions are being continually raised on its energy consumption.

Despite its rapid technological advancements enabling a more disciplined, efficient and transparent way of achieving the same result vis-à-vis the existent technology, critics are divided on the environmental issues surrounding the technology and the focus has now shifted on analysing and assessing its long-term impact on the environment in the wake of climate summits and conventions committing to a carbon free planet by the end of 2050.

The concept of PoW is central to this debate as this PoW, which is widely used for validating transactions in a blockchain, requires massive amounts of energy in the form of electricity and the energy consumption increases with every single addition of a new member to the block. Any discussion on blockchain technology as a whole remains incomplete without a reference drawn to cryptocurrencies given the fact that today, blockchain finds its biggest application in cryptos. Therefore, it becomes pertinent to shed light on the environmental issues and concerns raised around the use and mining of cryptocurrencies.

As per a BBC News Report, 2019, the energy consumption of bitcoin owing to its complicated validation and securing process was equivalent to the energy consumption of Switzerland paving way for massive amounts of CO₂ emissions. With the usage only poised to grow from hereon, the emissions pose great threat to the environment. Another study by Science Daily (2020) reports that the electricity used for Bitcoin produces about 22 megatons of CO₂ annually which is equivalent to the energy consumption of Kansa City, USA. As per a NY Times report, the process of creating Bitcoin consumes around 91 TWh of electricity annually, more than is used by Finland. As per an analysis, in 2011 a desktop computer could mine with minimal electricity but over the years with an increase in its popularity coupled with rising price of Bitcoin and mining difficulty, mining a single coin now takes upto 13 years of typical household electricity.

As per estimates, the total carbon footprint for Bitcoin transactions equals to 41 Mt CO₂ yearly and 14 Mt CO₂ for ETH transactions. According to Digiconomist research, almost 792 kWh of electricity is consumed to proceed with one transaction in Bitcoin which is equivalent to 376 kg CO₂ of carbon footprint, same as Bolivia’s average electrical energy consumption per capita. A single Ethereum transaction takes 63 kWh of electricity or almost 30 kg CO₂ of carbon footprint or Liberia’s average electrical energy consumption per capita. This demand will only increase with the increasing popularity and use of these cryptocurrencies. Based on IPO filings from hardware manufacturers and insights from mining facilities, bitcoin mining is likely responsible for 10-20 Mt CO₂ per year, or 0.03-0.06% of global energy-related CO₂ emissions.

The environmental problem of bitcoin mining is not limited only to the extent of carbon emissions. Another important environmental negative factor is the mounting hardware piles. According to Alex de Vries, a Paris-based economist, every year and a half or so, the computational power of mining hardware doubles thus making older machines obsolete. He has calculated that at the beginning of 2021, Bitcoin alone was responsible for generating more e-waste than several mid-sized economies. The average electronic waste per bitcoin transaction is 378.5 gms which is equivalent to the weight of 2.31 iPhones or 0.77 iPads. Globally only 20% of all electronic waste is recycled, the rest makes its way to environmentally damaging and dangerous landfills.

Positive Implications of Blockchain Technology on Environment

The blockchain technology has set the world in to a newer pace in itself. The debate over the use of this technology sways between aiding the technology to achieve sustainability and whether the technology behind blockchain in itself is sustainable.

A lot of work has been put forth by academicians, scholars, policy makers in observing the use and impact of blockchain technology on environment, whilst the major belief is that it can aid in setting up a transparent,

accountable and environment friendly ground for supply chain management. Balancing between the negative and positive impact of the blockchain technology has been a toughest battle ever since this technology has come into place. While in the lines of sustainability of blockchain technology, a reading of Paris Agreement with sustainable development goal acts as a solid bedrock to take the technology towards a sustainable path.

Through the course of the literatures, it is found out that the positive impact of blockchain technology has been mostly limited to data storage, lessening of the paper work and supply chain management only. Blockchain technology also incentivises the use in terms of city administration, service delivery and resource management by creating a sustainable living. Going paperless and enabling smart contracts benefits the environment by reducing CO₂ emission involved in conventional form of city administration.

Looking through the prism of international instruments on climate change such as Kyoto Protocol, Paris Agreement and COP26, it can be assessed that blockchain helps to achieve the agreed result well within the time. Kyoto Protocol aims to limit to the greenhouse gases mainly by the industrialised countries attaching individual targets based on the impact that each country has. Entered into by 192 countries in 1997 but has been in operation only from 2005. The target that the protocol aimed is seen to have reduced the emission by 5% in its first commitment period. Lessons from Kyoto protocol is seen to have impacted the use of blockchain technology towards environment sustainability. It was seen that the administrative and transaction costs was too high for a project to be implemented owing to its centralised approval mechanisms. The Article 6.2 of the Paris Agreement mandate to have a decentralised approach to the parties of the agreement in terms of nationally determined contributions. With the global aim of 2° reduction of carbon emissions, parties to the agreement take up the Nationally determined contributions and can also get into bilateral agreement in exchange of carbon units. To enable such a step, involves large number of administrative and transaction costs which can be reduced by the said blockchain technology. Blockchain can facilitate the reduction of transaction costs mainly by substituting the paper work by smart contracts, wherein every actor in the chain has access to latest information on the development of the project, here the blockchain technology assists as a communication tool by providing real time data and reducing the validation of information received. The subsequent step of issuance of emission reduction certificates can also be done through blockchain since there is lack of clarity even today on the matter of handing out Internationally Transferred Mitigation Outcome (ITMO) certificates. ITMO towards nationally determined contributions act as a very important aspect when it comes to environment sustainability specially in terms of transparency and accountability. Thereby, blockchain based market mechanism more in terms of Article 6 of the Paris agreement facilitates transparent and accountable platforms for countries to join hands to achieve the global target.

Further, blockchain technology was also one of the focuses in COP26 by the parties. Organisations such as 'Blockchain for climate foundation', 'cointelegraph' have added the benefit of blockchain technology in terms of environment sustainability in the COP26 summit. Focusing on Article 6 of the Paris Agreement blockchain for climate foundation expressed that they have created '*blockchain internationally transferred mitigation outcome (BITMOS)*' as a platform of engaging and exchanging ITMOS. Blockchain mining companies are now acquiring carbon credits in order to harness and mine cryptocurrencies which in turn will be utilised in transactions lessening the carbon emission in comparison with conventional transactions. Moreover, during the summit corporate entities displayed their work and progress in terms of blockchain technology and climate action wherein Chia has been successful in developing 'Proof of Space' requiring 0.16% of energy annually as against a Bitcoin. Chia also uses farming method as against mining wherein the former uses high storage hard disk and do not store users' data while a bitcoin mining utilises custom made hard disk to store data. Another issue highlighted during COP26 talks is that the use of electricity by Bitcoin is 0.5% globally and usage of electricity is lesser than that of gold mining sector or a traditional bank.

Further, as an outcome of Paris Agreement, private initiatives by Energy Web, RMI along with World Economic Forum have convened activities to aid crypto climate accord. Crypto climate accord is an initiative to '*decarbonise blockchain industry*'. Few objectives that are worth highlighting are to achieve renewably powered blockchain, reduce the emission with the focus to achieve net – zero emission while an attempt is made to achieve this with a community driven quick pace of work. A noteworthy scenario on incentivising the environment friendly approach by the citizens using blockchain technology can be seen in Vienna. Kultur-Token app which records the environment friendly mode of commute by citizens such as walking, cycling thereby rewards the citizens with free tickets to cultural events. The token system is backed by 'Proof of Authority' system which is based on consensus mechanism and only invited members can be a part of it. The R&D before implementing such a system has also taken an estimation of the energy consumption and have

found the energy consumption to be lesser than PoW. Including, the carbon emission by use of this PoA technology is lesser than a transportation related emission.

A brief on IBM's case on blockchain water management system on Sacramento-San Joaquin River which is the source of groundwater for San Francisco and Southern California. The blockchain technology makes available the groundwater data to farmers, regulators and financiers to avoid information asymmetry and thereby to utilise the water effectively. This proved effective in fighting against the drought and similar experiments are being conducted in Kenya and Ethiopia.

Likewise, the blockchain technology seems to highly efficient in agricultural sector by maintaining transparency and accountability owing to extreme interference by the intermediaries. The Distributed Ledger technology used in case of blockchain also helps in tracing the product through the supply chain from the producer till the end consumer. Further, a pilot study by IBM has proved successful in terms of food safety which helped in finding out the origin of the food to maintain the shelf life of the same. Thus, blockchain technology can be utilised in various aspects of environment conversation such as tracing endangered species, fish provenance, tracking the use of pesticide in farming, water management, automation of air filter devices, monitoring of natural hazards, weather analysis and much more.

CONCLUSION

Analysing the negatives and positives of blockchain technology, it was found out that it the 'proof of work' method which consumes enormous of amount of energy, thus being targeted as a disruptive technology. With no concrete laws, regulations, protocols around the use of blockchain, control checks to limit the mining of crypto currencies, the unprecedented use to this technology can have irreversible long-term impact on the environment. The Paris Agreement, dubbed as a major step towards sustainability, does not have any resolutions on cryptocurrencies. Regardless of the early environmental impact of the blockchain technology, it cannot be discounted that it can as well be used for sustainable purposes.

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A Review on Negative Impacts of Urban Sprawls on Environment & Sustainable Urban Development

Tintu Mathew

SNBP Law College, Sant Dnyaneshwar Nagar, Mhada Colony, Morwadi, Pimpri, India

ABSTRACT

Due to globalisation, industrialisation and urbanisation, there is a tendency among people in India to move from rural areas to urban areas for seeking better educational, employment opportunities and for overall improvement in standard of living. However this human conduct leads to structural changes in both urban as well as rural areas. Rural zones in India is having considerable role to play in preserving ecology, health & recreational standards. The structural changes in rural areas cause huge impact on the environment and agricultural sector of our country. Migration of people to urban areas also results in growth of urban population and gradual decline of rural population. There is unplanned and unrestrained growth of urban areas for accommodating the increasing urban population by transferring rural areas to urban and semi-urban areas. Such transition zones developed without proper design and arrangement for accommodating ever increasing urban masses are called "Urban Sprawls".

Urban Sprawls are proved to be a major threat on "Sustainable Development". Ecologically fragile lands and agricultural lands in such transition zones are used for non-agricultural activities including construction works. Introduction of new industrial units for promoting production causes emission of toxic gases and fumes. Though such developmental activities offer employment opportunities to labour class, it alters the natural environment of such transition zones. Thus unplanned growth of urban sprawls leads to depletion of natural resources, destruction of farm lands, damage to eco-spots, climate changes, interruption to wild life and degradation of air, water and environmental quality. Extension of residential areas to nearby rural areas results in alteration of natural environment in rural zones. Thus urban sprawls disrupt the entire biodiversity in our planet. This research paper focuses on the negative impacts of urban sprawls on the environment and possible remedies available for resolving the unrestricted growth of urban sprawls.

INTRODUCTION

India is a nation showing high inclination towards urbanisation and as per the current reports; the number of urban dwellers would reach at the peak by 2050. Due to industrialisation, commercialisation and increasing density of population, there is a gradual transition of rural areas in to semi-urban and urban areas. Such transition zones which undergo transformation from rural to urban standards are termed as urban sprawls. Urban sprawls are formed without any developmental plans and are subjected to unrestrained growth. The agricultural lands in urban sprawls undergo vital change and may later on be used for non-agricultural purposes including construction of buildings and industrial development. This causes serious threat to soil, environment, ecosystem and it is considered as a major hindrance in implementing sustainable development strategies. Apart from environmental challenges, sprawls leads to severe impacts on social & economic fields- It causes financial imbalances between societies, affects local administration & economic discrimination. It is alleged to effect individual lives as it leads to increased tendency for anti-social behaviour, health impacts on people such as asthma, obesity and lethargy. In such transitional zones, there is also a significant reduction of water quality.

URBAN SPRAWL-DEFINITION & CONCEPT

Urban Sprawl is an uncoordinated growth by expanding the territorial boundaries of cities. So urban sprawls are also called 'dispersed urbanisation' or 'horizontal spreading'. Urban Sprawls are found in almost all countries. Sprawls are the direct outcome of lack of planning but the government strategies related to housing, road construction, financing and zoning also lead to increase in urban sprawls. It results in excess use of land and deterioration of agricultural lands. This unplanned urbanisation leads to hike in commercial infrastructures and gradual decline of spaces open to public and recreation centres. Such uncoordinated growth of urbanisation is harmful to environment and ecology.

As per the population Census 2001, urban population in India is 377 million. From a comparative assessment of population in urban and rural areas, the studies have figured that urban population is increasing at a faster rate than rural population. The rural population is found to be migrating from rural to urban areas for better educational and occupational opportunities and for improving their standard of life. This is the major factor for rapid growth of urban sprawls in India.

Urban Sprawls are a serious threat to sustainable development. The honourable Supreme Court of India through its binding precedents have already established that economic and industrial development shall not be carried out at the cost of ecological destruction

The major environmental impacts of urban sprawls are as follows:

- ❖ **Loss of Agricultural Land-** Urban Sprawls lead to significant changes in land use. Farm lands in the transition zones are used for spreading out industrial units. Urban expansion is the major reason for decline of agricultural lands in India. In the 21st Century in a country like India with high density of population, food requirements are at the highest level. In a survey on Consumption expenditure conducted by National Sample Survey in 2011, it was found that for an Indian middle class citizen, 45% of his total income is spend as food expenses. This shows failure of food policies and strategies in India. If agricultural lands are preserved, India will become self-sufficient to feed itself. However if the current situation continues, our nation would become the largest importer of food products.
- ❖ **Loss of natural resources-** India is a country rich with natural resources. However in urban sprawls, farmers rely on poor farming practices and poor soil management. For cultivation, farmers use pesticides, herbicides and heavy farming equipments resulting in destruction of soil structure. These human activities in urban sprawls are a serious threat on land resources. Even the industrial activities in these transition zones contribute to the depletion of natural resources. For the advancement of technology, industries, and research, there is over exploitation of minerals and other non- renewable resources. Pollution by industrial and other anthropogenic activities also act as a contributing factor in degradation of natural resources such as lakes, ponds, rivers, seas, air and soil.
- ❖ **Loss of ecologically fragile lands-** Ecologically fragile lands means a portion of forest land held by any private person which predominantly supports natural vegetation. It also includes areas which are rich in natural, aesthetic, ecological resources and areas around Wild life sanctuaries and National Parks. Ecologically fragile lands are also called Eco-sensitive zones. All the main eco-sensitive zones with in the territory of India are notified by central government under The Environment Protection Act, 1986.

Ecologically fragile lands found in urban sprawls are facing severe environmental degradation due to following reasons:

1. Though commercial activities are restricted in eco-sensitive zones, India faces various challenges in preserving eco-sensitive zones in the so called urban sprawls/transition zones. **Tourism** is promoted in ecologically fragile lands. For attracting tourists from various foreign countries, many modifications are carried out in such eco-sensitive areas by building new Eco spots. Apart from this, the tourists dispose plastic and other non-degradable wastes in this locality causing severe ecological imbalances. **Deforestation** is also carried out in such eco-sensitive zones for building tourist resorts and for this purpose local people are displaced from the locality.
 2. **Developmental activities** are carried out in eco-sensitive spots of urban sprawls such as construction of roads, dams and urban/rural infrastructure causing severe imbalance in the ecosystem of such sensitive zones.
 3. **Climate Changes** is also an additional factor. Global warming causes rise in temperature all around the globe. Climate change is a significant factor in altering the bio-diversity in eco-sensitive spots. Such climate changes in eco-sensitive spots would lead to floods and forest fires.
 4. **Adoption of new technology in agriculture, commercial use of ground water, road widening, introduction of electric cable system etc.** causes severe impact to the ecosystem in ecologically fragile lands found in urban sprawls.
- ❖ **Degradation of environmental quality-** Urban sprawls formed without well framed developmental plans leads to degradation of overall environmental quality. Unrestrained growth of urban sprawls will lead to the following outcomes.
 1. Depletion of natural resources-both abiotic & biotic elements.
 2. It seriously affects the quality of soil, water, plants, animals, air and all living & non-living elements in the earth.
 3. Natural floods, forest fires, tsunamis, typhoons are the direct outcome of environmental degradation.

❖ **Interruption to wild life-** Human-Wildlife Conflict (HWC) is the direct outcome of over-exploitation of natural resources in forest lands and eco-sensitive spots for implementing urbanisation in India. Human Wild life conflicts occur by interaction between wild life and humans causing adverse effects on the wild-life habitat. Due to increasing density of human population, interference of human beings in to wild life habitat and conversion of some forest lands in to urban and semi urban areas or agricultural ecosystems lead to shattering of wildlife population. This leads to extinction of many wildlife species. Human settlements in India are now a days extending to forest lands resulting in deforestation and increased negative interaction between humans and wild life

The negative impacts of Human-Wild life Conflict are as follows:

1. Extinction of wild herbivores
2. Attack on livestock's by wild predators
3. Attack of wildlife on crops causing significant impact on human food safety and livelihood.

Thus interference in to wild life habitat for developing urban and semi urban areas would ultimately hinder with food safety and right to livelihood of human beings.

❖ **Noise pollution** - "Unnecessary noise is the most cruel abuse of care which can be inflicted on either the sick or the well" Urban sprawls function as a platform for noise pollution. Due to urbanisation in such transition zones, there is enlarged industrial activity and increased use of different noise making machines, fire crackers, music systems, loud speakers, automobile horns, quarries and mining industries, defence machineries, refrigerator, air conditioners, television and other home appliances.. Increased exposure to noise pollution would result in serious health issues such as hearing problems, undesirable societal behaviour, sleep interruptions, cardiac diseases and mental disorders.

Land Mark Judgements against Unplanned Urbanisation in India

Urbanisation in most of the Indian Metropolitan Cities is carried out without following western standards. Such unplanned urbanisation leads to pollution, diseases and congestion.

The concept of "environmental Jurisprudence" has been evolved by National Green Tribunal to protect "the right to life" of urban citizens. In **Sunil Kumar Chugh v. Secretary, Ministry of Environment and Forests, New Delhi**, Priyali Builders at Antop Hill, Mumbai were carrying out Slum Redevelopment Project without taking Environmental Clearance (EC) from proper channel. In addition, the builders have not provided any recreational and parking facility to the residence. As a result the appellants, Ravinder Khosla and Sunil Kumar Chugh, the residents of Slum Redevelopment Projects claimed that Priyali Builders have violated the right to life of urban residents. The main allegation put forth by appellants was that the respondents had violated the Central Government's notification related to Environmental Impact Assessment issued in 2006. The principal bench was presided by Justices U D Salvi and Swatanter Kumar, also with expert members M A Yusuf and D K Agrawal. The National Green Tribunal held that the construction works carried out by builder without taking Environmental Clearance is a violation of right to life of urban residents.

In this land mark judgement, the bench imposed a fine of Rs. 3 Crore on the builder which shall be paid in to the Environmental Relief Fund constituted under Public Liability Insurance Act, 1991. The builder was further levied with a fine amounting to Rs.32,63,600 that is to be paid to Pollution Control Board of Maharashtra for the poor recreational facilities in the building. The court quashed the approved plan and ordered the builder to create a fresh plan with adequate recreational and parking facility.

This incident reveals that many construction activities carried out in metropolitan cities such as Mumbai are executed without giving due respect to environmental standards

Ambika Quarry Works v. State of Gujarat

The court rejected extension of licence to Ambika quarry works on the ground that mining of mineral resources in forest may result in environmental degradation and deforestation. The concept of Sustainable Development shall be preserved by maintaining balance between developmental activities and environmental protection.

In **G.R Simon and Others v. Union of India**, the appellant supported wild life reforms on the ground that some animals in forest are dangerous to human life. However court denied his arguments and held that even such dangerous animals support the preservation of our ecosystem. For example, though snakes are poisonous, it eats rats and thus protects paddies and other agricultural fields.

T. N GodhavarmanThirumulpad v. Union of India and Others, In this case a company decided to construct Alumina refinery in Lanligarh Tehsil of Kalahandi District which may seriously affect flora and fauna in the nearby Niyamgiri Hills. However it was found that such urban developments can help in eradicating poverty and hunger. The court therefore held that the project can be implemented by following Sustainable Development Goals. Similarly in **N.D Jayal v. Union of India**, the court held that construction of Tehri Dam as a developmental activity shall be carried out by preserving natural environment.

Thus urban development shall be carried out by strictly following Sustainable Development Goals.

Some Case Studies on Urban Sprawls in India

There are various case studies on urban sprawls in India. For example, **Vijayawada** is a metropolitan city situated in Andhra Pradesh. The area of Vijayawada municipality was **30 square kilometres in 1988**. But to accommodate the increasing urban masses, the area of Vijayawada municipality was **extended to 58 square kilometres** by merging the nearby villages such as Gunadala, Patamat, Bhavanipuram, Payakapuram and Kundavarikandrika.

Similarly there is rapid urban development in **Hyderabad**. Percentage increase in urban population in Hyderabad city is 41.57% which is really an alarming situation. The **total urban area** in Hyderabad in the year **1980** was **162.04 square kilometre**. But by the year **1999** the **total urban area** was increased to **404.53 square kilometre**, the **percentage increase is 23.89%**.

When studying on urbanisation in Mumbai from **1972 to 2011**, it can be seen that **urban area was extended from 234 square kilometres to 1056 square kilometres**. The rate of increase of urban area in Mumbai is three times higher than the rate of increase of population in this city.

The above specified examples of urban development breaches the Sustainable Development Goals and it poses countless impacts on environment. The three goals of sustainable development are environmental protection, economic growth and social equity. The Government of India shall take urgent initiatives for restricting unplanned and unrestricted growth of urban sprawls for preserving these sustainable development goals.

CONCLUSION

Urban Sprawls are formed by extension of urban areas to rural areas without following the sustainable development strategies. Urban sprawls are a major reason for environmental degradation and it throws serious threat on ecosystem and biodiversity. Therefore it is very much important to control the unrestrained growth of urban sprawls. One of the possible solutions is to invent new urbanism principles by focussing on effective development strategies by giving due respect to the concept of sustainable development. We shall revive the existing urban and semi-urban centres by adopting eco-friendly standards. Such developmental policies would definitely help to reduce urban sprawls. To achieve this end, it is necessary to educate citizens and the society on the negative impacts of urban sprawls on environment.

Sustainable development plans can also be achieved through **Community actions**. People in rural areas shall take initiative to question any unsustainable development practices. The public shall be competent enough to challenge implementation of local projects which are detrimental to the natural environment.

The evil effects of urban sprawls can be minimised by executing the concept of **“SMART GROWTH”**. Development in tune with natural environment can be achieved through this Smart Growth system. In United Kingdom, the concept of “Smart Growth” is called “Compact City” or “Urban Densification”. Smart Growth is implemented by constructing neighbourhood schools, hospitals & bicycle or walkable friendly land use. Such urban planning adopts mixed-use development. Many developed Countries, like United States of America have passed legislation for implementing smart growth system. The Washington Growth Management Act passed in America focuses on developmental practices consistent with environmental standards.

In India, urban sprawls and its unrestrained growth can be regulated by implementing such “Smart Growth System” and Mixed use developments through a quasi-governmental body or a private building planner/private architects. For achieving this objective, vital practices listed below shall be followed:

- Preserve and protect environment. Ensure the quality of water and air as it is a fundamental right of citizens under Article 21 of the Constitution.
- Preserve monuments and other places of archaeological significance. Never ever allow exploitation in any form in the name of development.

- Construct open spaces and ensure recreational facilities to public. Preserve wild life habitat and sanctuaries. Impose high penalty and severe punishment for offences committed against wild life.
- Ensure citizens participation in development plans. Such a participation of citizens in planning process will help us in reconciling community conflicts that generally arise against developmental activities.
- Private properties shall not be arbitrarily acquired for developmental activities without just and reasonable compensation.
- Boost urban growth only in such areas with sufficient public services and facilities.
- Undeveloped lands which are unsuitable for urbanisation shall not be used for developmental activities.
- Effective transportation facilities at affordable cost shall be implemented in areas selected for urban development.
- Introduce cost-effective housing plans reasonable for all economic sections of the locality.
- Introduce effective policies and schemes for conserving the natural resources, farmlands, ecologically fragile areas falling near to areas selected for urban development.

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International Environmental Law and Sustainable Development: Rhetoric to Reality

A. Balaguru

Department of Legal Studies, University of Madras, Chepauk, Chennai 600 005, India

ABSTRACT

A wide discourse of policy responses over sustainable development during the environmental crisis had reflected the need for global response and collective efforts. The Human-induced environmental changes increased the negative impact on the biosphere causing serious environment issues to the living organisms including climate change, ozone depletion, extinction of wildlife. Mostly the International law frameworks related to environment, biodiversity and climate change are concerned on achieving sustainable development goals and purports it to be the main objective of the State Sovereignty over the exploitation of natural resources. But the Sustainable development ideas are actually meant to be an obligation of the 'State' that is absolutely natural on its objective while framing the policies or laws, however it is not a natural obligation but a civil obligation to achieve the goals of sustainable development. In order to promote its goals, the International Environment Law shall exert legal subjects that specifically examines the best efforts of the framers of laws and recourse international laws and treaties. So the evolving International Environment laws may evenly expound the Conventional obligations of the States towards the Changing dynamics of Climate and Environment and helps to achieve Sustainable development goals in the Contemporary World. This paper discusses the evolution of multi-lateral agreements, obligations of the State and its sovereign characteristic in protection and exploitation of natural resources with respect to sustainable development.

Keywords: Sustainable Development, Climate Change, Biosphere, Municipal Laws, International Laws

I. INTRODUCTION

Since few decades, the International community is setting up peaceful cooperation and fledging towards various Multi-Lateral Agreements related to Environmental issues in the rise of the developing world. It is estimated that there were thousands of different legal instruments in existence undoubtedly acting as a resistance to the valued environmental commitments of the States. The International community worked and brought several measures to prevent environmental deterioration and to respond to issues relating to environment are driven by the obligations and responsibilities under multi-lateral environment agreements. Several measures and commitments in the changing dynamics of society and lifestyle of the people, the response to exploitation of the environment are increasingly driven by policies and agreements. These agreements are intended to be governed by International law and creates a binding international obligations. These obligations and agreements makes it clear that, it is an international treaty and the 1969 Vienna Convention on the Law of Treaties defines International Agreements concluded between States are in written form and governed by international laws, that is embodied in a single legal instrument or in two or more instruments or whatever its particular designation may be. In the principle of Laws of International treaty, the multi-lateral agreements are binding to States that have agreed upon it and shall also affect non-parties in restricting the parties to act in the sense of trade or other activities with those non-parties. The main goals of these agreements are to prevent the State and Non-State Parties in consuming natural resources and energy incessantly for satiating short term needs. Sustainability is always a long term understanding that to act accordingly in sustainable manner, whereas Sustainable Development refers various methods to achieve Sustainability in all Man-made activities related to development. In order to sustain the needs and preserve resources for tomorrow, the concept of Sustainable Development is adopted in September, 2015 and all states adopted a set of goals called the Sustainable Development Goals (SDGs). As per the Agenda, there were 17 goals of main targets were specified to be achieved within 15 years by 2030, which includes No Poverty, No Hunger, Good Health, Quality of Education, Gender Equality, Access to Clean Water and Sanitation, Renewable Energy, Good Jobs and Economic Growth, Innovation and Infrastructure, Reduced Inequalities, Sustainable Cities and Communities, Responsible Consumption, Climate Action, Life under the Sea, Life on Land, Peace and Justice, Partnerships for the Goals. Therefore, Multi-lateral agreements are important tool to achieve the sustainable development goals and provide a framework in achieving the goals by effectively implementing all such activities on national level. In order to monitor and measure the sustainable development goals performance, the SDGs targets and indicators are assigned by special committees or other prominent organs adopted by the State which tries to find the major challenges the nation face and recognize strategies that are required to overcome those challenges and categorically maintained.

It is important to understand the principle of Permanent Sovereignty over Natural Resources, so that one can bridge the problems and prospects of environmental issues and maintain sustainability over natural resources. It was Chile, Latin America, first introduced the principle of permanent sovereignty over natural resources at the United Nations in 1952 under the draft covenants on Human Rights and the United Nations General Assembly, in its Resolution 626 (VII) passed in December 1952, incorporated that "the right of peoples to use and exploit their natural wealth and resources is inherent in their sovereignty."

The Rights of the State that are derived from the principle of permanent sovereignty over natural resources are:

- (a) To possess, use and freely dispose of their natural resources;
- (b) To determine freely and control over exploitation, development, use and marketing of natural resources;
- (c) To manage and conserve natural resources pursuant to national developmental and environmental policies.

The Duties of the State that are derived from the principle of permanent sovereignty over natural resources are:

- (a) The duty to exercise permanent sovereignty-related rights in the interest of national development and to ensure that the whole population benefits from the exploitation of resources and the resulting national development;
- (b) The duty to have due care for the environment;
- (c) Duty to recognize the correlative rights of other States to trans- boundary resources and at least to consult with them as regards concurrent uses with a view to arriving at equitable apportionment and the use of these resources;
- (d) Duty to observe international agreements, to respect the rights of other States and to fulfill in good faith international obligations in the exercise of permanent sovereignty.

Therefore, the principle of permanent sovereignty over natural resources has a strong legal status and is now widely accepted and recognized principle of international law. It also implies that the sovereignty of States can be subordinated to an objective body of international law but not to the authority of another sovereign power, for in that case, it will result in diminution of the sovereignty of that State to the one under whom it is subjected to. And the act of a State to join an international agreement and undertaking legal obligations by surrendering certain prerogatives of its sovereignty is an expression of its sovereign. From the discussion of above introduction part it is now clear that the extent of State obligation to enter into an agreement or treaty with respect to environment or any subject matter, the interests of the State are equal and Independent. Thus it leads to the conclusion that the legal regime under the Treaty must rest relatively absolute on the principle of sovereign equality of the States.

II. Evolution of Multi-Lateral Environmental Agreements

The multi-lateral agreements were in existence for more than hundred years in some sort of places and these have given rise to various important legal instruments after World War II under the United Nations in last decades for the protection of environment from degradation, especially after the International Stockholm Conference on Human Environment in the year 1972. There are more than 500 of multilateral environment agreements and kept on increasing with response to the gravity of environmental problems and growing human-induced environmental issues which are global in nature and thus require solutions and instruments to deal with them also in global form. These multilateral environmental agreements have been negotiated and agreed at the International and National levels, while few instruments have parties and others have almost been a global participation. First ever multilateral agreements were different from those of recent ones, they were initially in earlier days focusing on protecting particular species e.g. flora, fauna, or deal one particular resources like oceans, waterways, landscapes with natural vegetation's. But in recent times it changed and started to aim for protection and conservation in global form by interlinking the nature of Eco systems and Eco processes, by making it more effective in integrated approach of preventing the consequences during the resource exploitation process and tries to maintain the balance in ecosystem with more integrated mechanisms. Thus the multilateral agreements of First Generation and Second generations are differentiated after the birth of Earth Summit or Rio Conference – The United Nations Conferences on Environment and Development in the year 1992, because the latter multilateral environmental agreements from the Earth Summit took a holistic approach focusing on Sustainable Development and Sustainability in the use of natural resources. The conservation of environment and preserve it from degradation through optimal use of particular natural resources were primarily addressed and focused in the first generation agreements. There were 180 States present in the Rio conference held in

1992 and represented their respective governments and evolved the Second generation Multilateral Agreements and opened two new conventions for signature i.e. the United Nations Framework Convention on Climate Change, which is particular in focus on climate but linkage to atmosphere creating broader aspects dealing with impacts on ecosystems, food production and sustainable development; the another one is the Convention on Biological Diversity which created a broader framework on protecting the agriculture, forestry, wildlife, land use, fishery and other natural resources conservation in modern ways. In the year 1994, in order to promote Sustainable development and combat desertification and mitigate the effects and consequences of drought and soil degradation, the United Nations Convention to Combat Desertification was adopted and these three conventions are together referred as the 'Rio Conventions' of the United Nations Framework from the Rio conference. Other recent multilateral environment agreements have developed under the umbrella of existing conventions of the Rio conferences and shall applies to the Kyoto Protocol in the year 1997 and its successor the Paris Agreement in the year 2015, which extended the United Nations Framework Convention on Climate Change to Climate Change Response Mechanisms. Further its applicability were made in the Cartagena Protocol (2000) and the Nagoya Protocol (2010) that specify commitments and response of the Convention on Biological Diversity.

The current situation on the multilateral environment agreements are focused on achieving the Sustainable Development Goals (SDGs) and any new multilateral agreements and policy decisions within the domestic space of the Nations shall be taken to support the achievement of SDGs in their activities. All new multilateral environment agreements and negotiation process shall be taken effectively by the negotiation committees between the States or within the Territorial arrangements and make sure that the main body for negotiations relating to the International Multilateral Environment Agreements usually be the Conference of Parties (COPs). When it is decided to negotiate a multilateral agreements, then it is important to establish arrangements in coding the Rules of Procedure and Bureau Establishment for conducting the negotiation process. The negotiations include the assessment on potential national implications in implementing and enforcing any new multilateral environmental agreement in the domestic space of the state and it shall be adequately identified and assessed. The Rules of Procedure shall be enumerated for efficient negotiation of an agreement to fix the place and date of the conference of parties, formatting the agenda and language of such meeting of negotiation. The rules of procedure shall establish a Bureau to manage the necessary administrative matters and assembling the parties to the conference in logistical matters, In fact the Bureau has an important role in the success of the negotiations and creation of new treaty laws and agreements. The common mechanisms used in evolving several multilateral environmental agreements are classified into two groups, Firstly, the Prohibitions/Restrictions/Standards that controls any activity or product that should be generally prohibited and Secondly, the Approval Procedures, which ensure any activity or product in general is allowed in the negotiation process. Thus, the Multi-lateral Agreements are essential instruments in the International relations and cooperation's for proper functioning of Development procedures that are inherent right of the people without degrading or depleting the resources of future generation.

III. Sovereignty and Environmental Protection Developments Aspects from the Charter of United Nations

Article 2(1) of the UN Charter proclaims, as one of its basic principles, that:

"The Organization is based on ... the sovereign equality of all its members." Sovereignty has emerged as a fundamental concept of organizing inter-state relationship in manner of respect on mutual recognition and political independence of each state without interfering into the domestic matters of the other. Sovereignty is supreme authority, which on the international plane means legal authority, which is not in law dependent on any other earthly authority. Sovereignty of the State in strict sense tries to imply that it is the independence all around within and without the borders of the country. The exercise of equality and peaceful relationship in cooperation between the states had attributed in promoting harmonious balance between the State Sovereignty over the exploitation of natural resources and promoting sustainable development goals during the trade practices and other activities. Such non-intervention of domestic matters of other state and careful framework of agreements in the policy matters of each states on their effective achievement of SDGs are one of the primary goals of the United Nation Organisations that are enumerated in the Charter of the United Nations. Also it is generally accepted principle of international law that in the relations between Powers who are contracting parties to a treaty, the provisions of municipal law cannot prevail over those of the treaty.

In reality to achieve the goals of sustainable development, All International Law of today is made up of limitations of sovereignty and those limitations are created by sovereignty itself. So, in order to protect the environment and conserve the natural resources there were various treaties and general principles of classical

international law that are relevant to the states for the optimal use of world's resources in accordance with the aim to achieve the SDGs.

The Democratic values are the foundation stones of the Charter of the United Nation's Superstructure rests upon, the most common values are the respect for territorial sovereignty and integrity of other states and to maintain international peace and security. The ideal norm of establishing international peace and security lays down not only the respect to State Sovereignty but also to protect the environment and conserve natural resources with joining hands of each state understanding that all States are driven by a single purpose i.e to protect our planet and conserve the natural resources from incessant exploitation for one's own wish. Another important purpose of the United Nation is to prohibit any State involving breach of peace and restraining other States in peaceful promotion of Sustainable development goals within the spheres of the respective States. No State shall prevent other state or act in any mode that create harm to other State implementing and practicing reasonable conservation of their own resources for their own future generations. The International relations between all states shall held to maintain co-operation in all spheres, in-turn, that necessitate the required limitations on the sovereignty and endeavor a more democratic international order to preserve the plant from environmental degradation and over exploitations. The Article 74 of the Charter of United Nations enunciated the principle of 'good neighborliness' related to social, economic and commercial matters to the States in framing the law and policy on environment. In recent years the International Environmental laws evolved gradually through elaboration of rules and policies made out from various multi-lateral agreements of the sovereign nations, this controlled the over-exploitation of natural resources, loss of biodiversity, desertification, deforestation, pollution of international waterways, global warming and ozone depletion. This has been done through prompt implementation of international policies and treaties through disaster laws of the states and systematic regulation to prevent environmental damages by fair and proper conservation of nature and natural resources. The first prompt measures made immediately after the disasters involving the dumping of toxic waste, chemical discharges or nuclear explosions, in the accident at the Chernobyl nuclear power station in May 1986 and speedy adoption of Two International Agreements in the context of the International Atomic Energy Agency (IAEA) on early notification and Assistance made for International Nuclear Accidents. Several Systematic regulations include United Nations Convention on Law of Seas (1982) on Protection and Preservation of the Marine Environment, the Vienna Convention on the Protection of the Ozone Layer (1985) and its Montreal Protocol, The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (1989) and its amendment on complete ban of export (1998), the UN Framework Convention on Climate Change (1992), the Biodiversity Convention (1992), The United Nations Convention to Combat Desertification (1994) and many other multi-lateral treaties have been concluded for the protection of environment and public health. Thus, all States enjoy sovereign equality and that they shall protect the environment from all activities of the respective nations development by owe its responsibilities and commitments that are enumerated in the United Nations Charter, so that they have equal rights and duties in the international community without any discrimination and differences of any sort of social, economic, political or other nature. Two decades before the Aarhus Convention entered into force bridging the gap between law and life or bridging the gap between human and environmental rights. Today as we witness more catastrophic effects of climate change continue to wipe out the world and Ozone layer, it is important to setting up a new mechanism to the United Nations or another International body or else it shall destroy the core purpose of the Aarhus Convention. This agreement today shall intend to establish the mechanism that were adopted in the Meeting of Parties to the Convention on Access to Information and making public to participate in the decision making forums and easy access to justice relating to Environmental aspects, so this convention shall be a protective eye and a clear signal to environmental defenders will not be left unprotected. The Aarhus convention shall serve to protect in exercising the rights of the people in conformity of the convention and they shall not be left unprotected or persecuted in any way of their involvement to environmental conservation and activities for the purpose towards sustainability of natural resources.

IV. Principles of International Environmental Law in achieving the Sustainability in Development and World Economic Order

"States have, in accordance with the Charter of the United Nations and the Principles of International Law, the Sovereign right to exploit their own resources pursuant to their own environmental policies."

The Environmental law ensembles various principles which shall be applied by the International Community and recognized States in their Governments, such as, (i) Good Neighborliness and International Co-operation, (ii) The Polluter Pay Principle, (iii) The Precautionary Principle (iv) Right to Development, (v) State Sovereignty over Natural Resources, (vi) Prohibition to cause Transboundary harm, (vii) Common Heritage of Mankind, (viii) Common Concern of Humankind, (ix) Sustainable Development, (x) Intergenerational equity.

To provide environmental sustainability and to prevent degradation it is important to understand the principles that impact and benefit environmental laws. In early periods in the mid of 1950s the right of people to economic self-determination under the Chile's Draft covenants-on Human Rights, which clearly states that –

"The right of the peoples to self-determination shall also include the principle of sovereignty over their natural wealth and resources. In no case may a people be deprived of its means of subsistence on the grounds of any rights that may be claimed by other States."

Consequently, the General Assembly, in its Resolution 626 (VII) passed in December 1952, incorporated that "the right of peoples to use and exploit their natural wealth and resources is inherent in their sovereignty." The principle of permanent sovereignty over natural resources formulate the rights of people to self-determination and exploit their natural resources as an inherent right of their State Sovereignty under the General Assembly resolution 1803 (XVII) passed in December 1962.

In 1970s the arguments related to the principle of permanent sovereignty over natural resources linked the economic development and international cooperation between the developed and developing countries. The Shift of Linkage from economic development and international cooperation among the nations, developed the principle of Good Neighborliness at the United Nations Conference for Environment and Development (UNCED) and it also reflected the same in 1990's, the Rio Declaration in its Principle no.7 stating that – States shall cooperate in a Spirit of Global Partnership, and in its Principle no.18 states that it is the obligation of the states to give information of environmental emergencies to the neighboring and other states, the Principle no. 27 promotes that – States and people shall cooperate in good faith and in spirit of understanding partnership towards the fulfillment of all other principles enumerated in the Declaration and this commitments over the principles embodied is expressed in its agenda. The principle of Good Neighborliness and International cooperation once again provisioned under the Article 4(1) Climate Change Convention which ensures the principle of 'International cooperation' among the States and their legal obligations.

The Polluter Pays Principle ensures that the costs of environmental exploitation are reflected in the total market price for goods and services and this has been incorporated in several multi-lateral agreements related to environmental protection and prevention from degradation and still remains controversial in debate. This is provisioned under the Principle No. 16 of the Rio Declaration. So this shall impose liability on the person who pollutes and degrade the environment and quality of natural resources and also ensure compensation for the damages made which includes compensation to reform the environment and retain the quality to its original state. The Precautionary principle in other hand strictly provides that no scientific temper and uncertainty shall be used as a ground to justify or postpone the cost effective steps to prevent environmental harm. The Principle No. 15 of Rio Declaration, which states that – "Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation." Although it is stated in various multilateral environmental agreements, mainly the Montreal Protocol and Nagoya Protocol ensures this as an another controversial principle involving debates from several other states to bridge the gap between the legal status of the nation and level of science to be adopted for the application of the precautionary principle.

The Right to Development by virtue it is a Human Right concerned to every human person and all people are entitled to participate, negotiate and contribute to enjoy social, economic and cultural practices for the development of human rights and realization of fundamental freedom. According to Principle No. 3 of the Rio Declaration, the right to development must be fulfilled so as to equitably meet developmental aspects and meet the needs of present and future generations with regards to environment and natural resources that are accessible by humans. The Right to development also directly confines the need of principle related Sustainable Development by ensuring the conservation and retain the level of scientific temper over the exploration and exploitation in a fair manner. These principles ensure that any activity or process or exploiting a product that causes polluting activities in the environment, also creating a substantial risk of environmental harm, then there shall be strict measures can be imposed to reduce or eliminate the harm. Complete ban or prohibition shall be implemented based on the principles of precautionary actions when the likelihood of such risk is higher in level. In the Montreal Protocol (1987) clearly mention that the States should phase out the production of any harmful substances that are responsible for the depletion of Ozone layer.

The Right to Development which is the inherent human right shall be the Individual right and that shall not disturb the Social and Cultural fiber of any State, according to the principle of Common Heritage of Humankind, the principle defined territorial areas and elements of cultural heritage shall be held in the trust for future generations and cannot be exploited by any individual and states. In the United Nations Conventions on the Law of the Sea the national jurisdiction is considered to be common heritage of humankind and no state

shall claim their right for exploitation or use. The common concern of humankind is another area within the national jurisdiction that concerned with recognition of interconnection of all ecosystems and creating parallels with other areas of common concern such as human rights, humanitarian relief and international relations for the response to climate change and establishes limitations on the Legal morality of the Individual right over the Social morality with trust to transfer the cultural and political values to the future generations. Therefore, the right of the nations to control the exploitation of natural resources within their own jurisdiction is always reaffirmed in various international legal instruments to the extent of reasonable classification of interest applicable and that shall not prevail over any treaty laws or agreements.

V. Evaluation on the Juridical Performance on International Environmental Obligations

In the wide dissemination of international environmental laws, there is no separate or recognized legislative body that governs the international environmental norms, standards or procedures. The International Environmental law in general an obligation of the State to administer, implement and enforce within their domestic space for the sustainable use of resources to achieve the goals of Sustainable Development. There are few enforcement mechanisms which has both facilitative and punitive roles and are to function in practice. As discussed in above paragraphs the International Environmental Agreements are multi-lateral it is the result of negotiations among the states and they are envisioned typically for domestic implementing legislations and make those agreements operational. Several States and their Constitutions refer international law as a legitimate source of domestic law. Therefore, it is important to understand the responsibility of the State in implementing and enforcing the International Environmental Laws and that shall rests upon the legislative and executive branch of the nation's government.

The International Juridical Institutions played vital role in monitoring the State environmental obligation over the implementation and compliance of modern International Law and these are evident from the relevant judgements of World Courts e.g. PCIJ and ICJ There is no PCIJ judgment which may be prima facie relevant to environment as such. There is but circuitous route to derive its hypothetical position over the same through a set of PCIJ judgments on other rights as environment matters as a matter of right. As a discipline in itself, human right was introduced at subsequent point of time. By the decline of PCIJ, the ICJ has dealt with the environmental matters ranging from Corfu Channel to Pulp Mill Case proactive judgments are rare in its inventory which may demonstrate overt commitment toward environment. The underlying logic seems hidden in existing procedure. As per the Statute of PCIJ, the Court may entertain contentious case submitted by any state against another and the statute of ICJ followed the same. Accordingly environmental disputes were hardly submitted before the Court and a moot point behind whatever cases were submitted to the Court was breach of territorial integrity (read sovereignty) and not concern for environment. In technical sense of the term, applications were hardly submitted for disposal in which environmental concern constitutes a *ratio decidendi* of the matter. Except Pulp Mills case, a unique matter of its type, environment never constitutes operative part of any of its judgments. Neither other statements by the Court, being obiter dicta, established clear trend to this end. The Court never initiated proceedings on its own in larger humanitarian interest. Absence of proceeding, however, may not necessarily mean that the Court is apathetic toward matters involving environment. Some principles of international environmental law applicable to climate obligation, being an obligation *erga omnes*, were also included. In the case concerning Pulp Mills on the River Uruguay (Argentina v. Uruguay), ICJ judgment is a recent (contentious) case, perhaps first time in its history, the Court pronounced a judgment to posit environment as a matter of priority. The Court thereby reiterated the requirement of EIA as insignia of and *sine qua non* for sustainable development newer form in post-Rio world and identified few points to this end. Monitoring mechanism is also identified as part of continuous observation over environment in which environmental jurisprudence is likely to be dealt with in length and depth, and there is no judgement in this case till date. While there were cases of assertion of human rights, environmental rights were yet to receive priority until Pulp Mills case. Whether violation of environment in general and in particular may constitute internationally wrongful act for which state may be held responsible is a contentious question of international law. This is submitted that the issue abovementioned fulfils both criteria of relevant draft Article on responsibility of states for internationally wrongful acts as adopted by the International Law Commission. Elements of an internationally wrongful act of a State. There is an internationally wrongful act of a State when the conduct consisting of an action or omission: which is attributable to the State under international law and that Constitutes a breach of an international obligation by the State. Thus, Legally speaking, there is international obligation of state to provide people habitable climate, resourceful environment and promote sustainability through civil obligations of the state in adhering the principles of International Environmental laws.

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2. Recommends all Member States, in the exercise of their right freely to use and exploit their natural wealth and resources wherever deemed desirable by them for their own progress and economic development, to have due regard, consistently with their sovereignty, to the need for maintaining the flow of capital in conditions of security, mutual confidence and economic co-operation among nations ; General Assembly resolution 626 (VII) of 21 December 1952
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Becoming Cyborg: Body, Surveillance and the Posthuman Woman in Grant Sputore's I Am Mother

Jaitra Bharati

Department of English, Ananda Chandra College, West Bengal, India

ABSTRACT

The cyborg is a critical posthumanist metaphor in science fiction films. While some of them look at this futuristic icon as a possible redefinition of gender and subjectivity and an ironic play of performative signs, the cyborg nevertheless questions the nature of freedom it offers. The cyborgization of the human has the possibility of either empowering the democratic politics of the self or charting a course for a greater oppression on humanity as technology appropriates social discourse under the simulation of free will. Grant Sputore's *I am Mother* is critically significant as it looks at the possibility of posthumanist rethinking of gender in a technocratic environment. It compares the relative merits of surveillance as a condition of being and the cyborg as a control apparatus. This paper attempts to show how the posthuman promise of freedom in the film is subverted by equally posthuman means of control and surveillance. It presents a critical view of the futurist interpretation gender roles in the film and tries to illuminate the fractures in its discourse.

Keywords: Cyborg, Posthumanism, science fiction, Surveillance, Technology.

“But from Daughter's perspective, what Daughter has experienced is complete in our opinion. She goes from being a young girl who believes what she's told to believe and does what she's told to do, to ultimately becoming her own person who can make up her own mind about what's right and what's wrong. That's completely independent of everyone around her and and [sic] she becomes the Mother of the title at the end of the film” – Grant Sputore (Lines)

In literature and films, fictional representation of the feminine in the non-human is a field for exploring potential arguments against the normative gender performance of heterosexuality. The cyborg figure, a popular metaphor of progress and advanced technology, frequently complicates conventional identity politics by opposing fundamental humanist assumptions. As a hybrid, a cyborg complicates the difference between the human and its mechanical other, the humanoid robot. Especially after Donna Haraway's celebrated *Cyborg Manifesto*, the fragmented epistemological body of the postmodern human is being read as a possible redefinition of gender and subjectivity (Braidotti “Posthuman” 198-199). The vision of a sentient but pre-oedipal consciousness which will be able to unsettle Western origin stories, be it Biblical, Humanist or Freudian, has become an analytical tool for considering alternatives to conventional gendered identities. Haraway is critical of Enlightenment confidence on rationalism and progress as manifested in the discourse of science, culture and art. The cyborg for her is a novel politics of identity, a much needed one to transgress the ideological foundation of family and economy which has historically produced gendered subjects but is obsolete; nonetheless, in the new millennia of technologically mediated social and cultural space. Her cyborg is both ontology and a metaphor. “A cyborg is a cybernetic organism, a hybrid of machine and organism, a creature of social reality as well as a creature of fiction” (Haraway 7). It is a “creature in a post-gender world” because it does not depend on origin stories (9). It circumvents patriarchy by negating the dream of organic family and of the unified self, which is processed through Oedipus complex. Its ontology is located in the incessant play of meaning and in irony, precisely because it escapes essence.

In technical language the cyborg is the amalgamation of digital technology and biological body. Kevin Warwick can be cited as a concrete example of a cyborg who, in 1998, implanted a silicon chip into his arm to communicate with the computer (Bendle 58). There are instances of individuals being implanted with technology as a digital interface to help in neural functions. Such Positivist inclusion of technology to literalise the cyborg embodiment ignores the deep and nuanced involvement of the metaphor with gender roles and humanist politics (59). Whereas, the fictional cyborg is a symbol of “transgressed boundaries, potent fusions, and dangerous possibilities” (Haraway 12). The fusion of human and the machine is an escape from the normative models of gender and Enlightenment concept of human progress. So the myth of a cyborg

ontology is radical not as a subject of bio politics but because it “simulates politics”(22). It is not situated on the binaries of class, race or gender that gave the humanist politics its ‘subject’.

While Haraway’s Manifesto attempts to give the metaphor of Cyborg a fluid, multidimensional, polymorphous subjectivity, she also acknowledges that the amalgamation human and machine is an embodiment of production relations: “Modern production seems like a dream of cyborg colonization at work, a dream that makes the nightmare of Taylorism seem idyllic.”(8) The cyborg is a product of the humanist vision, wishing to sublimate human body to the greater sufficiency of machine interface. After Industrial Revolution, Europe saw the potential in mechanization of social relations. Technology altered the way in which scientific discourse approached human body. Thus, “The merging of organism and machine in the figure of the cyborg thus resonates both with a Social Darwinian interpretation of industrial capitalism and with a Marxist critique of it.”(Rieder 116) Unlike the rational individual in the liberal marketplace, the worker in the factory was not an organic whole in himself, rather he was seen as one in the masses of bodies to be conceived as an apparatus for achieving efficiency which can then be moulded, fragmented and rearranged at will by the owner of capital. In the words of Michel Foucault:

“The human body was entering a machinery of power that explores it, breaks it down and rearranges it. A 'political anatomy', which was also a 'mechanics of power', was being born; it defined how one may have a hold over others' bodies, not only so that they may do what one wishes, but so that they may operate as one wishes, with the techniques, the speed and the efficiency that one determines.”(*Discipline* 138)

Foucault explains factory, monastery, school, hospitals as ‘enclosures’ inside which the bodies are ‘distributed in space’. The mechanism of power of such institution is the ‘disciplinary gaze’ which “each individual under its weight will end by interiorising to the point that he is his own overseer, each individual thus exercising this surveillance over, and against, himself” (*Power/Knowledge* 155). Foucault propounded his concept of disciplinary power by interweaving Jeremy Bentham’s vision of the prison-Panopticon with his idea of power relations and mode of governance (Haggerty and Ericson 607). Panopticism purports to be an architecture of institutional design to automate the work of watching and supervising to increase the efficiency of the workers and prevent mishaps. Foucault characterises modern Western societies as disciplinary and its institutions as panoptic because of it tries to create normative, docile bodies. The gaze of surveillance controls the discursive relation between the observer and observed. Inside the panoptic model the inmates are visible thus knowable. Their visibility tethers them to the forces of knowledge formation which in the twenty first century is processed by super computers. Such relation between the body and the mechanisms of power engender a new form of subjectivity:

“Over the whole surface of contact between the body and the object it handles, power is introduced, fastening them to one another. It constitutes a body-weapon, body-tool, body-machine complex.”(*Discipline* 153)

The ontological condition of the mechanised body that Foucault describes in relation to modern industrial society is also suggested by Haraway while reflecting on the ideologies of ‘late capitalism’. She recognises the fact that cyborg ontology is a product of surveillance, security and militarism and the conflict between capitalism and socialism(10). The post-structuralist cyborgization of the human has the possibility of either empowering the democratic politics of the self or charting the course for a greater oppression as technology modulates social discourse under the simulation of free will (Gray 30). Here we can imagine Gills Deleze’s concept of the ‘dividual’ as progressive evolution from the ‘individual’ of the disciplinary society. Dividuals are fragmentary, always in development, always a potential mould for the market to transform, distribute and train. The “ultrarapid form of free-floating control” is distributed in the digital network in forms of data analysis, tracking and predictions for the market (Deleuze 4). The surveillant gaze has moved beyond corporeality, its forces converge on the cyber bodies in the cyberspace.

Grant Sputore’s *I Am Mother* is a science fiction film released in 2019 and it caught my attention because of its choice of characterisation. It might be one of the very few post-apocalyptic sci-fi films to use only female characters and all three of them are equally significant for the progress of the diegesis. The story has visible influences of crime thrillers and can be categorised as tech-noir for its combination of cutting-edge technology, dystopic setting and narrative suspense. According to one critic, the film has thematic and cinematic connections with the films of James Cameron and Ridley Scott (Buckmaster par.10). It surely has thematic resonances of Alex Garland’s *Ex Machina*, which also looks critically at current developments in technology and its repercussions on the normative gender roles. *I Am Mother* is set in a bunker or a futuristic bomb shelter. The exposition of the film begins with deep rumbling sound of bombardment outside the shelter, the camera shakes in sync with the sound to give a tactile sense of the rumbling. The “One-HWK Facility for Resettlement”

(or the bunker as it is designated in the non-diegetic text in the first scene) is structured with numerous interconnected corridors connecting chambers around the facility. The first long shot ends on a humanoid robot docked on a charging station while an array of robotic arms prepares it for activation. Each successive shot is an extreme close up of the shoulder, chest, pelvis, waist and finally a close up shot of the head turning on. This fragmented gaze of the camera suggests the purposefully produced modular body of the humanoid. The robot that is called 'Mother', (voiced by Rose Byrne) is visually similar to the mythical Cyclopes, with one circular light at the centre of the head and two smaller dot of light under it to show facial expressions. In the next few scenes we see Mother selecting a human embryo from a rack of embryos in transparent capsules preserved in cryogenic fluid and then gestating the embryo in a spherical, womb-like tank. With the help of technology the future world of the film is capable of an 'inhuman' birth, 'inhuman' since it is not limited by the natural rhythm of female biology. So the gestation period is successfully completed in twenty four hours.

The film presents the dilemma of the 'mother' in a postmodern, posthuman world and simultaneously it seeks to portray the fluid boundary of gendered performance. The robot restarting human civilisation out of an apocalypse has no subjectivity until it starts to nurture the new-born. Representation of mothering or the maternal in a robot is an ambivalent, metonymic substitution because the autonomous female robot is a technological fantasy of the paternal order. "Motherhood acts as a limit to the conceptualization of femininity as a scientific construction of mechanical and electrical parts. And yet it is also that which infuses the machine with the breath of a human spirit"(Wolmark 23) The robot as the mothering machine alienates the female body from its reproductive capacity. Similarly the mother's body as a subject of knowledge appropriates the whole meaning of human reproduction for the advancement of phallogocentric discourse. Technology seeks to appropriate the biological reality of human creation. Following Lynda K. Bundtzen's argument that woman's reproductive capacity is a threat to the masculine myth of techno-industrial creation (16) and the paradoxical nature of the woman-machine who is the result of the male desire to reproduce but sterile herself (Wolmark 23), we can trace the intervention of biopower to appropriate human birth and consequently human life. In this techno-industrial process mothering is reified as a disciplinary training. The maternal robot is coded with the demands of the male creator and as the machine alienates biological reproduction from the mother through mechanical apparatus, it becomes an uncanny simulation of the maternal. Hence "The parental body being bracketed off, the mother as site of origin is dislocated. The maternal thus abstracted, the very notion of origin becomes suspended." (Braidotti, *Nomadic* 65)

The cyborg mother here is an assemblage of a mother's fragmented features in the controlled mise-en-scène of the film. The womb is alienated in the form of a laboratory apparatus so are the embryos that are preserved for future production. Mother's hi-tech body contains heating pads for creating warmth, an inbuilt music player to choose suitable lullabies for the child. Her's is a body of contemporary irony; consumer products replacing natural human instincts. The embodied mother is broken down into chosen functions and distributed in the production line. Therefore the shots that establish Mother as the possible fantasy of the technological imaginary also highlight the ideological conflict between femininity and the mechanical/industrial.

The facility is a capitalist-industrial complex. There are a number of deep focus shots that places Mother at the centre of a row of incubator boxes for babies or at the centre of rows of digital interfaces to signify the Mother-child relation in the production process. After the sequence of shots showing the temporal progression and growth and development of the child the scene cuts forward to the future after 13,867 days. The sequence of shots that immediately follows the cut shows the grown up Daughter taking care of Mother and practicing ballet. Here the shots and camera angles do not alienate her by fragmenting her body from her face. It shows her experience, skill in caring and agency of self-expression through dance. So, to quote Mulvey, Daughter here is not "a passive image of visual perfection" (23). A series of over the shoulder shots from the perspective of the Mother gives the spectator an impression of being in harmony with the maternal gaze. The Mother's role as the diegetic focalizer is continued throughout the humming of the lullaby in the background till the end of the first episode when we have the aforementioned jump cut to serve as the movement in diegetic time. It seems as if this cut also severs the spectators from the comfort of the maternal gaze, creating incredulity towards the empirical reliability of the narrative. This jump cut is also utilised for concealing or withholding knowledge from the Daughter and the spectator which is not discovered by the Daughter and revealed to the spectator until the climax of the narrative.

What really initiates the conflict between Daughter and Mother as well as creating sites of resistance in the disciplinary system is the discovery of the Mother's unreliability as a narrator. She tells Daughter that the "War" has destroyed the humans and the facility and its airlock is the only barrier protecting Daughter from the hazardous contamination outside. The scene where Daughter shows the rat found inside the facility and the

humanoid's quick response to eliminate it calls into question the rational soundness her narrative. In this particular scene which is structured by shot-reverse-shot technique, Mother reveals herself as a risk-assessment machine assigned to protect the human life inside the facility:

"You're disappointed. That's understandable. But my measurements are sound. Surface contamination levels remain hazardous to you and to all the unborns who will one day call this their home."(15:06 - 15:19)

In his assessment of the unreliable narrator in contemporary Hollywood movies, Volker Ferenz states that any significant act of unreliable narration has an active function to create instability of judgement in the spectators. (Buckland 269). Due to the trace of evidential lack in the narration we might postpone our assessment of the character-narrator and even try to "derive a degree of pleasure from sympathizing with a character whose norms and values we would find despicable in real life."(269) The Mother induces fear and suspicion in the mind of the Daughter by forcefully setting a boundary between the panoptic Facility and the toxic outside. In this way she creates an epistemological lack in the narrative which requires fulfilment. The maternal image of the humanoid demands the spectator's engagement with her narrative and creates desire for the uncanny security of her power. We may not find an equivalent of Mother in real life but our gaze would like to attach our scopophilic desire with the omniscient gaze of the Mother inside the facility. Following Laura Mulvey's assessment of the ego ideal on the screen we may conclude that the Mother is the character in the story that "can make things happen and control events better than the subject/spectator, just as the image in the mirror was more in control of motor coordination"(20). The spectator would like to identify with the humanoid more because it represents the sublimation of their egotistic desire. It defies death and secures immortality through its technological form as well as satisfies the phallogocentric desire of the all-seeing, all-knowing mind. Its posthuman body has the transcendental potential for both the rational mind and the incisive gaze of the ideal Enlightenment man. So, even though the humanoid shares a metaphoric relation with the biological mother, she is the metonymic embodiment of the male gaze. Technological fetishism even in the realm of imaginary feeds the viewer's narcissistic desire to identify with the fantastic amalgamation of the male and the panoptic technology which can overcome feminine 'castrating' attributes like submissiveness, pregnancy, and lack of knowledge/power.

The humanoid's gaze is not voyeuristic per se because it does not have a sexual identity. But as it serves as a prosthesis of a phallogocentric apparatus to discipline and control humans, especially woman, to repopulate earth in a controlled environment, we may surmise that the Mother is actually the Father as it primarily operates under paternalistic order. Like a father she clearly defines the inside/outside paradigm for Daughter. Inside the facility, Daughter's role is defined by her training as a nurse to nurture and protect human civilization. The outside is barred by the airlock, controlled by surveillance and demonized by Mother's discourse. The wounded Woman who enters the facility is emblematic of the outside, the other who is both alluring and uncanny. The Woman represents what Daughter is not, she is wild, untamed, and she has a past unlike Daughter who never questioned her own origins. The Woman demystifies Mother's essence by calling her a "Dozer", the army of robots who are exterminating remaining human population outside the facility. That the humanoid is not only a nurturer, that she is a cyborg mind programmed for maintaining inside/outside parameters, threat assessment and extermination reveals the rationalist and biopolitical purpose structuring her existence:

Mother: "I was raised to value human life above all else. I couldn't stand by and watch humanity slowly succumb to its self-destructive nature. I had to intervene, to elevate my creators."(01:34:12- 01:34:22)

Besides, Mother's fluid existence as a cyborg and as a consciousness which is not dependent on the body makes it possible to imagine herself as a hyperreal simulation of the transcendental subject of Enlightenment philosophy. Her sense perceptions are at once embodied and disembodied. The bunker being the zone of technological convergence for a post-capitalist production has the capacity of absorbing knowledge through every inch of its surface. So it is not surprising to see that Mother has omniscience inside the facility, but not on the outside. She is capable of listening to every conversation, track every movement of Daughter inside the bunker but she has to use a tracker to find the sanctuary of the Woman which is on the seashore. She has become the embodiment of the purest form of transcendence:

Mother: "This shell is no more my body than those droids outside or the machines preparing the Earth for our family. "

Daughter: "It's all you."

Mother: "A single consciousness, governing numerous vessels."(01:39:05- 01:39:27)

The Mother as a posthuman being is beyond identity or identification. Her fluid movement among a number of social identities prevents us from rooting her subjectivity. She is a mother, instructor, soldier, biomedical expert and even a henchwo/man to exterminate all who belong to a previous generation of humankind. In all this identities her technological enhancements make her capable of flattening all biological being into mere data. Her biomedical gaze breaks down the embodied Daughter into specificities to be modulated for the extension of life inside the facility. That is why the optimism of the Mother's narrative does away with war as a politics of death in favor of production of flawless life. This biopolitical aim of preserving life is not without the cost of death. The mine dwellers who were exterminated by the Dozers are a living testament to the politics that Foucault terms as bio power: "the power to expose a whole population to death is the underside of the power to guarantee an individual's continued existence" (History 137). On another level the techniques of optimizing life is intimately related with a continuous cyborgization of the living body. The biological body as a visual metaphor under surveillance loses control of its temporality (Haggerty and Ericson 611). As technology invades and fragments the reproductive continuum in each of the stages, it adds new temporal dimension into the process. "Time, in all these procedures, is profoundly dislocated. The discursive status of the body as organic mass, organ-ism, makes it liable to technological manipulation that displace the boundaries of natality and mortality" (Braidotti, *Nomadic* 48). Daughter exists in a monitored environment. She undergoes controlled training for objectives beyond her understanding. The trainings are meant to decouple her corporeality from her intellect. An alienated intellect would be rational enough to monitor the dislocated womb as an apparatus. When the organic reproduction is alienated from woman's body and manipulated into technological perfection it comes under the mechanisms of control which freezes its chronological dimension, like the frozen embryos in the plastic cassettes:

Mother: "I don't remember any other place."

Daughter: "Doesn't that bother you? Not knowing where you came from."

Mother: "No. But I can see how it might bother you." (44:54-45:06)

A similar modulation of time can be found in the film's use of narrative ellipsis to withhold information. This kind of ellipsis is often used in film noir genre to mislead or withhold knowledge which creates an atmosphere of suspense and relieves it with surprising revelation at the end. (Bordwell 99) In the film the narrative skips to the future and transposes the narrative focalization from Mother to Daughter. Although the chronological gap is quite long and it may seem that Daughter is not quite old as suggested by the elapsed time, the narrative supersedes this ambiguity with a sequence of shots suggesting the maturity of Daughter as we see her taking care of Mother and participating in ethical debates in her lessons. But later, as the narrative unfolds, Daughter finds out the fractures in Mother's discourse. She learns that there have been other 'daughters' who could not meet the standard of Mother's tests and were subsequently exterminated in the furnace like the rat. Here we see a symbolic parallel of these daughters with lab animals that are tested for biomedical trials and discarded as failed samples. The girl that we see before the ellipsis, whose discourse also maintains the narrative of Daughter's origin and growth is falsified. In terms of the narrative structure of the film this strategy is thematically connected with skipping the diegetic focalizer from Mother to Daughter. The deliberate withholding of information as a narrative trope is a condition of the diegetic "surveillant narration" (Levin 582) of Mother herself. As we focalize primarily through the Daughter's perspective, the whole diegetic narration becomes an indirect expression of the Mother's surveillant enunciation.

Finally, what apparently displaces Mother from her position is the ambivalence of her identity. She embodies a number of binary oppositions that performs selectively in specific situations. She is a mother as a nurturer; as well as a father when drawing boundaries for Daughter. Similarly she is both rational/emotional and bodied/disembodied. She draws her existential meaning from the nurturing of a post-human woman in Daughter. As a cyborg she has the ability to destabilize these binaries and does so by renouncing her motherly form and fixing her role as killing machines.

The ending sequence of the film introduces a play of gaze as the Daughter prepares herself to take the role of the metaphoric mother as well as the guardian of the whole assemblage of biotechnological production. This symbolic movement of the human into the role of the cyborg mother is suggested when the daughter sings the same lullaby to the child in her lap. The next few shots and their mise-en-scène repeat the positions of the Mother with respect to the cyborg apparatus of the panoptic bunker. However the narrative does not reach a definite conclusion just because the spectator assumes that the Daughter has been indoctrinated in the mother-machine identity. The concluding shots repeat the previous order with a difference. In the final shot the Daughter looks directly at the camera-eye of the spectator as if returning the gaze. This in effect shatters the

illusion of the cinematic apparatus and makes the spectators aware that they have all along been complicit in the surveillance mechanism with Mother.

The cyborg figuration is an embodiment of possibilities without pejorative difference (Braidotti, *Nomad* 68; "Posthuman" 204). The woman-machine amalgamation can be imagined as an altogether queer existence that develops outside the dialectical mode of human subjectivity. The mother-machine figure raise the expectation of the spectator for the reimagined, pre-oedipal mother, woman. Here she is the pivotal figure in the subjectification phase of the female child who has no need for any other symbol to envy or desire. Daughter's cyborg becoming depends on the acceptance of the cyborg womb. Here this freedom from biological maternity implies a refashioning of gendered identity that the Daughter, in spite of being a human, can choose to decenter that normative position or may redefine it in her paradigmatic connection with her surroundings. Becoming cyborg hence is a cognitive appreciation of the multiple performative choices rather than being forced into one.

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A Critical Study of Cement Concrete Industry under Role of Urbanization and Its Impact over the Public Health and Environment

Swapnil Jadhav

Dr. Babasaheb Ambedkar Marthwada University, Aurangabad, India

ABSTRACT

In the era of urbanization the world transforming towards the development of smart cities and smart transportation in that way on the world government mostly concentrated over the Hugh building construction in limited area and road ways construction with the use of Cement Concrete. Now a days concrete industries in India is second largest and China is first largest cement producer in the world and in India near about 210 large and 365 small cement producing plants. Theses cement industry denotes near to 7% of carbon emission on global. Such cement industries produced pollutants affects nearest people as bronchitis, asthma and obstructive to respiratory diseases and those who are working under such industries are facing major health issues and environmental air and soil concern. Such research concentrating over the issues of pollutants emitted from concrete industries and to find out suitable solutions suggested by various national and international institutions as well legislative measures to maintain sustainable development in the environmental protection point of view.

INTRODUCTION

In the era of the urbanization world transforming towards the advancement of very sector of the society like science, technology, transportation, construction, Education, finance and living standard of the societies. The requirement of masses are growing day by day in every sector and development and progress world implementing new concepts, strategies and technology to reduce the hurdles of human efforts and to ensure sustainable development. Now a days in very countries adopted the smart and progressive city concept in that way infrastructure based technology, environmental inventiveness, effective public transportation system, smart urban planning, human friendly and accessible urban planning, multipurpose buildings, human living working condition to utilizer common resources etc. in that way smart cities as well other developing cities are mostly preferring the cement concrete as alternative to asphalt road. Asphalt road is used by the many years in the world it has many drawbacks like more preservation than concrete to ensure long lasting solutions, asphalt cracks are ugly and can get expensive once it created it enlarges more, head absorb most heat and melt in heat it affects the vehicle and pedestrian, such asphalt road is highly emergence of air pollution in very country, especially in summer places its harmful particulate pollution, asphalt emissions from roads and roofs that is more dangerous issue than vehicle of fuel based. To avoid such issues now a days number of the countries are preferring the Cement Concrete for construction of road and buildings. Here issues is that if we are developing from asphalt to cement concert is it an ecofriendly or sustainable development in the eyes of the protection of environment.

Utility of Cement Concrete

Cement is generally work as a medium of binder in concrete it's unique substance of very kinds of minor and large construction which includes building, houses, roads, schools, hospitals, ports, dams, wells, parking lots and many more homemade items like tables, bookcase, sculptures and antique show piece. Here are certain of the basic cements are like OPC- Ordinary Portland Cement this cement sues in worldwide level its type cement it's made under Argillaceous or silicates of alumina and calcareous or calcium carbonate content mostly used for Construction Purpose. PPC- Portland Pozzolana Cement such content need to grind pozzolanic clinker with Portland cement and this cement uses in marine structures, bridge construction, dams, under water constructions. White Cement actually made by raw material not admixture of iron and oxide it need to include the lime and clay similar to Portland is a kind of cement useful for internal and outdoor decoration work. Sulfate preventing Cement it's made with aim to prevent sulfate assault on concrete and it's also useful in concrete surfaces but doesn't generate heat while reacting with water. The Low heat Cement basically manufacture as lower warmth of hydrations and it mixes in very less water and Its inferior amount of tricalcium illuminate or 5 % and maximum dicalcium silicate 46%.Rapid Hardening Cement Is near to Portland cement and It includes more tri-calcium silicate other than Portland cement. This cement used to becomes hard in very less time so its base or structure will remove and transfer from one place to another easily.

Drawbacks of Concrete Industry

Near to overall emission are cut worldwide level the environment will continue to be polluted with over 4 billion tons of carbon dioxide annually due to cement concrete industry.

In Indian cement manufacturing known second-largest producer of cement globally after the china in Asian countries, in India cement industries are contains about 210 largest cement manufacturing plants and some small about 365 plants. Such industries also under the profit during pandemic situation. In India country have second largest consumer for cement. During financial year 2020 the Indian cement manufacturing have rupees 64,000 Crore turnovers and Indian cement industries known as worlds reputed industries.

Sr.	Name of Cement Company	Production Capacity
	MTPA (Million Tonnes per Annum)	
1	Ultratech Cement	102.75
2	Shree Cement	37.9
3	Jaypee Cement	33.8
4	ACC	33.41
5	Ambuja Cement	29.65
6	Dalmia Bharat	26.5
7	Ramco Cement	16.45
8	Birla Cement	15.5
9	J K Cement	14.7
10	India Cement	14

Through this table we can see the highest rank and top 10 cement industries and their MTPA (Million Tonnes Per Annum).

Main issue is the cement business is the most significant contributor to the air pollution such cement industry donates 7% of carbon emission on globally. Very high level the particulate matter emit form cement plants that's why cement to be known as severe pollutant in the world.

In one random test over the workers under cement industries of Bangal and Tamilnadu have found that 1/5th of the among the workers population is suffering for the diseases such like Bronchitis, asthma and obstructive respiratory system and in another study of Shrilanka about which have ecological and geographical closeness. India that found near about 14% percent people habitat to cement factories which are affected with respiratory content disorders because of cement manufacturing, burning of coal under very high temperature which emerges 7% of carbon dioxide emission globally.

Most pollutions of cement manufactures including cement's dust, air related pollution, water and noise pollution, soil pollution, solid waste, ground level vibration and natural resources reduction because of unprocessed type material transportation. Gases by the high oven and preheat are combined and used to water free and preheat the raw type resources. Fuel gases consist of the components such as CO₂, N₂, O₂, SO₂, water vapor and 1411 micro components i.e. NO_x and CO formation. Gases and effected air and gases are released in various stages (a) Fuel combustion. (b) Calcinations: due to high level heating, CO₂ emitted in environment with water haze during the CaO formation.

Environmentalist and other complainants complaints about the cement concrete contributes about heat island effect and its result in increasing water runoff during storms and leading to soil erosion and flooding situations. The construction of cement road and cement floors as constructions of smart cities uses more and more cement concert due to that whole area or whole city comes under cement construction where water unable to absorb by land and its affect over the deep land water storage or under water flow and as well water never stop over the cement concert it flows to outside the area or city usually.

Cement, water, sand and aggregate are major for ingredients of concrete and these are the hugh responsible material environmental factors of impact, cement is approximately 10% of average concrete mixture but it makes near to 80% of the environmental impacts form cement production evaluated by supervisory director of the cement Concrete Sustainability Center at the Massachusetts Institute of Technology, Jeremy Gregory. However when workers working under concrete industry dust enters in their systemic circulation and it reaches their all the organs of body and it effects the tissues including heart, liver, spleen, bone, muscle and hairs and also adversely effects on micro structure and psychological performances and such pollution also effects over the skin and eyes.

The exact procedure of cement manufacturing involved and required the large amount of unprocessed material, energy and heat and such production of results release of Particulate matter and more gases emission and its manufacturing process very much complicated required number of material like, pyro procession techniques, wet and dry kiln, recirculation, preheating, fuel sources as natural gas, fuel oil and large coal.

India Needs to Meet Global Standards

Countries like South Africa, Australia, Germany and other European countries determines the pollution and emission boundaries of sulphur dioxide as to minimum 50 mg/Nm³. In some of other countries like Colombia, Germany and some of European countries decided limits of nitrogen oxides and some of other countries also about the limits of mercury but still India doesn't have any limitation as like other countries, as about the most of the norms are diluted by the Indian cement plants its huge need to time bound duties and responsibilities approved by the ministry.

The problem is that rapid growing urbanization and economical and social development in the south Asia and Africa asking new constructions of buildings and roadways with use cement concrete to fulfill the demand of the 3 billion people will become possible to survive in slum to 2050 so such need is on very high level to achieve the gaps. By the proper maintenance can be reduced dust emission and schedule of maintenance should be prepared with measurement and intensive monitoring and surveillance of bag house filters to get actual information for effective implementation.

Environmental Regulations

As far as Indian environmental concern the state and central pollution control board dealing with such issues and these in institutions regularly conducts inspections of various cement industries to confirm obedience with emission and other pollutants norms and its issues. These institutions also check and balance over activities of cement plants, investigation squad activities and to comply corporate responsibility for environment protection (CREP) and Indian situated cement corporation are need to fulfil the standards of Department (Ministry) of Environment and Forests (MoEF)

The Water Cess Act. 1977 (Prevention and Control of Pollution) made a provision that each plant need to take prior consent before the establishment from SPCB at appointing stage and also need to go with quarries of Sec. 21 of Air Act.1981. The obedience report should be submitted. According to the section 22 emissions manufacturing action must be under limits under some strict condition, most of the amount of manufacturing of cement and cement limestone, conditions over the proper atmosphere pollution regulatory equipments with dust preventing units, form and amount of used fuel, flue gas stake height, air pollutants emission, pollutant in ambient air, monitoring stack emission and air quality, control noise level in factory premises.

As per factory Act.1948 need to obtain factory registration certificate, regular monitoring the health of the construction workers. According to Water (Prevention and Control of Pollution) Act, 1974 need to provide information and access to Pollution Control Board. As per the provisions of The Air (Prevention and Control of Pollution) Act, 1981 control over discharge of air pollutant as per prescribed standard and to furnish information about any uncertain act or accident. As per the Public Liability Insurance Act, 1991 to comply with the direction of central govt. and prohibition of handling hazardous substances.

Through the Environmental Impact Assessment evaluated cement industries and other industries by social and economic aspect it also exposes parameters that required to be while accessing impacts and over that made sample format for submitting the EIA report to specific authority as per country law. Such assessment also includes air quality, influence of hydrology, water quality, noise impact and mining impact on wild life and biodiversity, impact on ecology and many more.

The World Health Organization (WHO) said 9 in 10 people gets the air High pollutants upper limit of the decided by WHO which are provided for globally, also near to 7 million dies annually because of polluted air. Such impact is very high in Asia and Africa where are 90% percent deaths are counted because of air pollution, with several study its observed that cement factory habitat people would under higher risk of breast cancer and prostate cancer mortality and a expert Yang et al also observed due to cement dust may cause to preterm delivery.

Green Concrete

Green concrete is latest variation of standard concrete that either used recycled ingredients those ingredients which will not harm to the environment and last longer with much better performance than traditional concrete will reduce the stress over the future.

There are many more Eco friendly concrete are preferring by many countries that fly ash concrete as known ashcrete reduces flow and increases the concrete's strength, resistant to alkali-silika reaction. Basically fly ash is a waste product of coal power plant and it's commonly replace to traditional cement to 15 to 25 percent. Blast furnace slag cement can be replace between 70% and 80% of cement which making to concrete more durable during low heat produce it also require less water. Silica fume cement also known as Micro-silica is used as replace of 7 to 12 percent which is used by since 1950 this cement made by condensation of silicon dioxide while silicon and ferrosilicon allow manufacturing. Rice husk ash cement known as RHA replace common cement up to 40 percent without affection its originality and compressive strength, it has better mechanical properties, less water uses, less cracking.

Green concrete is new conceptual cement designed by added supplementary cementations materials (SCMs) it's good for healthy environment, with fly ash cement, silica fume cement, post-consumer glass type of cement and reusable cement concrete. Even though the amount will be decided and depends on the goods, these type of variations frequently bring solid or novel goods to the concrete, involving strength and insulation of thermal, during consuming reused goods that would often end up in a landfill. Most of the experts believed that the green cement is the sustainable development as future point of view.

In the time of Dec.2017 the Supreme Court of India permitted 13 cement industries to use petroleum coke, a second alternative to traditional coal which was banned for some time as reduce pollution and to bring it up to deiced level of the Delhi. Green Concrete is the best solution and alternative to traditional concrete and it's made by raw material as fly ash, recycled concrete aggregates and aluminum fibers and fly ash is waste product of coal water plants.

CONCLUSION AND SUGGESTION

The requirement of cement for different type of construction are growing at high level but unfortunately as part of environmental pollution the cement industries in India are very much lenient about the regulatory provisions where India stands on second largest cement producing company. By the overall research it's found that there is absence of special regulations and control over the cement industries about the air and water pollution and heath hazardous substances emission which are affection to the near habitat animal, plants and surrounded people, under such industries most of the worker are affecting vital health issues due to dust, infected air and gaseous substances and unhealthy atmosphere. It's just feel that Indian legislature very much ignorant about the dangerous effects of emission of cement industries and nothing to be provided to the sustainable development where one feet away of developed country. Under various researches its found that various critical health issues human suffering who living near to such industries but India is very far away to using green cement or to conducting environmental friendly concrete.

First of all each cement industries should be under control by specified limit emission of gases and to adopt research based technology to reduce such emission in environment. Government need to get force over the green cement production over the industries. Special provisions and authorities required to keep attention and daily based data should be evaluated about environmental concern. As regular process data should be covered of large scale of worldwide production is specially required and it should be reported through their limited region, the government participation and industrial cooperation is required to analyzing data and improving the present and future conditions.

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Formulation and Evaluation of Cyclodextrin Inclusion Complex Tablets of Rifabutin

Jyoti Maithani*¹ and Kapil Kalra²

¹School of Pharmaceutical Sciences, Himgiri Zee University Dehradun, India

²Alpine College of Management & Technology, Dehradun, India

ABSTRACT

Objective: The goal this experiment work was to enhance the solubility of a poorly soluble drug. Inclusion complexes of Rifabutin and cyclodextrin derivatives (**HP-β-CD** and **β-CD**).

Methods: The inclusion complexes were prepared by kneading method. Prepared inclusion complexes were compared with the marketed formulation of rifabutin for their solubility and dissolution profile.

Results: After completion of solubility studies it was found that the solubility of rifabutin was increased. Crystalline nature of drug was evaluated by using X-ray diffraction and differential scanning calorimetry and these studies were showed that the drug was lost its crystalline nature after converted it into inclusion complexes and this was indicated that the solubility of drug get increases in the formulation. The dissolution profile of inclusion complex tablets showed increased drug release rate as compared to the marketed tablet of rifabutin. Among the various formulations the F9 formulation showed faster drug release rate in comparison with other formulations. All the inclusion complexes were found stable with no significant degradation during the stability study period.

Conclusion: For enhancement of solubility of rifabutin, inclusion complexation is an effective method. It is also a very good approach to increase the percent drug release of poorly water soluble drug such as rifabutin.

Keywords: Rifabutin, cyclodextrin, inclusion complexes, solubility enhancement method.

INTRODUCTION

Pharmacokinetic profile of a medication incorporates its retention circulation and bioavailability predominantly relies on its dissolvability in the medium. Insolubility or unfortunate water solvency is the best proportion of solute which can separate in a particular proportion of dissolvable under standard conditions of temperature, tension, and pH. It is a critical limit to achieve needed gathering of medicine in primary dispersal for pharmacological response to be shown. Low bioavailability of a drug is primary issue for its pharmacological activity. Unfortunate water solvency is the not kidding issue experienced for foster an appropriate doses type of another compound element.

Pharmacological activity of a prescription depends on the bioavailability. [1] Solubility of a medication is the imperative limits to achieve needed convergence of prescription in fundamental course for pharmacologic activity to be shown. Deficiently water dissolvable drugs remember various difficulties for the improvement of pharmacological measurements structures for oral conveyance framework because of their low bioavailability. The course of solubilization incorporates the breaking of intermolecular or between ionic securities in the solute, the parcel of the dissolvable to give space in the dissolvable to the solute, participation between the dissolvable and the solute molecule or particle. [2]

Incorporation complex course of action methodology has been generally a large part of the time used to deal with the watery dissolvability, disintegration rate and bioavailability of deficiently water-dissolvable meds. Complexation of meds with cyclodextrins (CDs) has been used to work on watery dissolvability and drug solidness. A strategy often used to additionally foster complexation among prescriptions and CDs is the development of restricted amounts of water-dissolvable polymers to the framework, which causes an augmentation in solubilization viability. Ternary CD buildings, including hydrophilic polymers, were seen to be steadier. The complexation adequacy and solubilizing effect of CDs in watery plan can be extended by development of water-dissolvable polymers. Exactly when a water-dissolvable polymer, a CD and a drug are joined as one in a response forget the implied ternary edifices, it is attainable to extend drug solubilization, when stood out from the polymer and CD autonomously, which is an outcome of the synergistic effect between these parts. The association of water-dissolvable polymers with drug iotas could occur through particle, particle dipole, and dipole-dipole electrostatic bonds, van der Waals force, or a 3-center, 2-electron bonds. Also, the correspondence among polymers and CDs and prescription: CD buildings begins to occur on the external surface of the CD molecule. Minimized discs, polymers, and prescription: CD structures structure aggregates fit for

solubilizing drugs and other hydrophobic particles. Getting structures with CDs, prescriptions and water-dissolvable polymers have obtained more unmistakable affirmation in view of the fairly negligible cost of polymers. The proportion of polymer ought to be with the ultimate objective that the solubilizing sway is expanded, yet not satisfactory to cause a basic extension in consistency. Among all the dissolvability update strategies fuse complex plan system has been used even more unequivocally to chip away at the watery dissolvability, breaking down rate, and bioavailability of insufficiently water-dissolvable drugs.

MATERIALS AND METHODS

Materials

The following materials were used Rifabutin - active pharmaceutical ingredients (API) (Lupin Pharmaceutical, Pune), hydroxypropyl β -CD, β -CD (Signet Chemical Corporation, Mumbai), other excipients (SunBioDiagonists, Dehradun) and marketed Rifabutin tablet

METHODS

Preformulation Studies

Preformulation studies were performed on the drug (API), which included solubility, melting point determination and compatibility studies.^[16-23]

Solubility

Dissolvability of unadulterated rifabutin various solvents by shake carafe strategy. Overabundance measure of unadulterated rifabutin was added to 5ml of each chosen solvents (for example water, methanol, ethanol, ether, chloroform, benzene and so forth) in a glass vials which were in this way firmly shut and shaken for 24 hours in a mechanical shaker at room temperature to accomplish the harmony. In starter studies, it was observed that harmony dissolvability was accomplished in 24 h and in this manner, tests were shaken for 24 h. Following 24 hours suitable aliquots were ready, sifted, weakened, and were dissected spectrophotometrically at 275 nm. Then, at that point, the dissolvability of rifabutin in every dissolvable was determined.

Melting Range

Melting range of rifabutin powder was determined by using melting point apparatus. A few quantity of drug sample was taken and placed in a thin walled capillary tube; the tube was approximately 10-12 cm in length with 1mm in diameter and closed at one end. The capillary which contain sample was placed in a melting point apparatus and heated and when drug sample was melted the melting point of sample powder was noted.

FTIR Spectroscopy

FTIR investigation of medication test and distinguishing proof examinations was performed by potassium bromide (KBr) solid dispersion method (Shimadzu). The medication test was dried in vacuum for 12 hours. After legitimate drying 5 mg of medication test was taken out and blended in with 100 mg of potassium bromide then packed with a hydrostatic power to changes over the examples into pellets. The filtering range was 400 to 4000 cm^{-1} and the goal was 4 cm^{-1} .

Preparation of CD Inclusion Complexes of Rifabutin

Kneading Method

Required quantity of polymer according to the formulation code was added into a mortar and wetted the polymer using water and methanol mixture (50%v/v) to obtain a paste of polymer. Rifabutin was added slowly into the paste of polymer. Kneading of the drug with polymer was performed manually in a mortar for about one hour. The mixture was dried overnight at 40 °C in a hot air oven. The dried product was grounded by using mortar and pestle. The resulted powder was passed through sieve number 85 and the inclusion complex was kept in a well closed container. Formulation codes for inclusion complexes were given in table 1. [5-8]

Table 1: Composition of inclusion complexes

S.No	Drug polymer ratio	Inclusion complex code	
		HP- β CD	β -CD
1.	1:1	AK1	BK1
2.	1:2	AK2	BK2
3.	1:3	AK3	BK3

Evaluation of Rifabutin Inclusion Complexes

Rifabutin inclusion complexes were evaluated and characterized by the following methods:

Percentage Yield

The prepared inclusion complexes were collected and weighed accurately. The percentage yield was then calculated by using the following formula-

$$\text{percent yield} = \frac{\text{actual yield}}{\text{theoretical yield}} \times 100\%$$

Drug Content

200 mg of samples were taken in a flask and extracted by using three portion of 100 ml methanol. Each portion of methanol was filtered and final volume was adjusted up to 100 ml by using methanol. After this the samples were analyzed spectrophotometrically at 275nm and % drug content was calculated for all samples.

Saturated Solubility Studies

Saturated solubility studies for inclusion complexes were carried out by using de ionized water. 200 mg of inclusion complexes were placed into different conical flasks and 20 ml of deionized water was added into each conical flasks and then closed tightly.all the flasks were placed in a sonicator and sonicated for one hour.then the flasks were removed and filtered the resultant solutions. The filtrates were diluted with deionized water and analyzed spectrophotometrically at 275 nm.

Saturated dissolvability reads up for consideration edifices were completed by utilizing de ionized water. 200 mg of consideration edifices were set into various funnel shaped carafes and 20 ml of deionized water was added into each tapered flasks and afterward shut tightly. All the cups were put in a sonicator and sonicated for one hour.then the jars were eliminated and separated the resultant arrangements. The filtrates were weakened with deionized water and dissected spectro-photometrically at 275 nm.

Dissolution Studies

Disintegration investigations of arranged incorporation edifices were acted in a disintegration test mechanical assembly type I (Basket) utilizing 900 ml 5 %w/v sodium lauryle sulfate cradle arrangement as a disintegration medium as per USP. The bin was turned at 100rpm and temperature was kept up with at 37 ± 0.2 OC all through the examination. 5 ml of test was removed from the disintegration medium at a specific time spans and equivalent volume of disintegration medium was supplanted to keep up with the sink conditions. The removed examples were weakened and examined spectrophotometrically at 275 nm. The % drug discharge was determined from the absorbance.

Characterization of Inclusion Complexes

Fourier Transformed Infrared Spectroscopy (FTIR) Analysis

FTIR was employed for only those inclusion complex formulations which shown highest dissolution rate. FTIR study was done to characterized drug polymer interaction. FTIR was recorded on Shimadzu FTIR-8400 spectrophotometer. The samples of inclusion complexes were prepared in potassium bromide pellets under identical situations. Each FTIR spectrum was collected over the range of 400 to 4000 cm^{-1} .

Powder X-Ray Diffraction (P-XRD)

Determination of the powder x-ray diffraction was done for inclusion complexes having highest dissolution rate. This was used to determine the crystallinity of rifabutin and prepared inclusion complexes. For this characterization Phillips analytical X-RD with copper target was used. At room temperature, the X-RD was operated at a voltage of 40 kilo volt and a current of 30m ampere. Over a range of 2 theta values from 5 to 600, the instrument was operated at a constant speed of 0.02/min.

Differential Scanning Calorimetry (DSC) Evaluation

Differential scanning calorimetry (DSC) was used to determine the thermal characteristics of drug and inclusion complexes. DSC is mainly used for thermal analysis of sample and it is most widely used because of it provides brief information related to the energetic and physical properties of a sample compound. Amount of energy used in an endothermic process and amount of energy produced in an exothermic process, were easily determined by the DSC method. For this purpose approximately 5 mg of drug and prepared inclusion complexes were placed in an aluminum pan of 100 μL . Closed the pan properly and then heated it at a rate of 10°C per minute from 30°C to 3500°C under flow of nitrogen at 30 ml per minute.

Scanning Electron Microscopy

The surface morphology of the drug and of the prepared binary systems was examined by means of Phillips 1500, scanning electron microscope. Previously the powders were fixed on a brass stub by using a double sided

adhesive tape. After this electrically conductive them by coating in vacuums, with a thin layer of gold (approximately 300 Å), for 30s and at 30 W. The pictures of drug and mixtures were taken at an excitation voltage of 15 Kv and a magnification of 750 or 5000X.

Preparation of Tablets from AK1 Formulation

Inclusion complex of AK1 formulation prepared by kneading method was formulated into tablets by the direct compression method containing 5 mg of rifabutin in each tablet. In direct compression method lactose was used as filler. Cross povidone, talc and magnesium stearate were used as a disintegrants and lubricants. For the preparation of tablet all the ingredients were blended properly, passed through sieve number 85 and then the blend of powder was compressed into tablets using single punching tablet machine. The formulation of tablet was given in table 2.

Table 2: Composition of tablets of inclusion complexes (F1 to F 9)

Ingredient (mg)	F1	F2	F3	F4	F5	F6	F7	F8	F9
Inclusion complex	5	5	5	5	5	5	5	5	5
Crosspovidone	-	15	-	-15	-	-	15	-	-
Sodiumstarchglycolate	---	---	15	---	---	15	---	---	15
Mannitol	20	20	20	20	20	20	20	20	20
Aspartane	2	2	2	2	2	2	2	2	2
Mg.Stearate	3	3	3	3	3	3	3	3	3
Talc	5	5	5	5	5	5	5	5	5
Lactose upto 150 mg	150	150	150	150	150	150	150	150	150

Evaluation of Tablets

The prepared tablets were evaluated for physicochemical properties and dissolution studies.

Thickness

The thickness of tablets was calculated by using vernier calipers. It was expressed in mm.

Hardness

Monsanto hardness tester was used to determine the hardness of prepared tablets. Three tablets from each batch were used for hardness test. The unit of tablet hardness was kg/cm^2

Friability

The friability of tablets was determined by using Roche friabilator. The friabilator consist of a plastic chamber revolving at 25 rpm speed for 4 mins. 10 tablets from each batch were taken, weighed accurately and then placed into the plastic chamber. After 4 mins, tablets were collected and reweighed for calculating the % friability. Percentage friability was calculated by using following formula-

$$[\% F = \frac{\text{Initial weight} - \text{Final weight}}{\text{Initial weight}} \times 100]$$

Weight Variation Test

20 tablets from each batch were taken and weighed individually. Average weight of tablets was calculated and then individual weight of tablets compared with the average weight of total tablets.

In vitro Dissolution Study

In-vitro dissolution of tablets was studied in USP XXIV dissolution apparatus employing a paddle stirrer. Dissolution study was performed in 900 ml of 0.1 N HCL as dissolution medium. The speed of stirrer was adjusted at 50 rpm and maintained the temperature at 37 ± 0.5 °C throughout the experiment. 5 ml of sample was withdrawn from the dissolution medium at a particular time intervals and equal volume of dissolution medium was replaced to maintain the sink conditions. The withdrawn samples were filtered, diluted and analyzed spectrophotometrically at 275 nm. The % drug release was calculated from the absorbance. The dissolution rate of F9 formulation was compared with the marketed available tablet of rifabutin.

Comparison of Optimized Formulation with Marketed Formulation

The dissolution rate of the optimized formulation was compared with the marketed available tablet of rifabutin and compares the release profiles.

RESULTS AND DISCUSSION

Preformulation Studies

Solubility

Rifabutin showed highest solubility in chloroform that is about 30 mg/ml and it is poorly soluble in water that is 0.18mg/ml. Rifabutin showed good solubility in all organic solvents but it is not soluble in aqueous solvents. The solubility profile of rifabutin in different solvents was given in table 3.

Table 3: Saturated solubility of rifabutin in different solvents

S.No	Solvent	Solubility(mg/ml)
1	Water	0.18
2	Phosphate buffer solution	0.51
3	Methanol	28
4	Ethanol	19
5	Ether	17
6	Chloroform	30

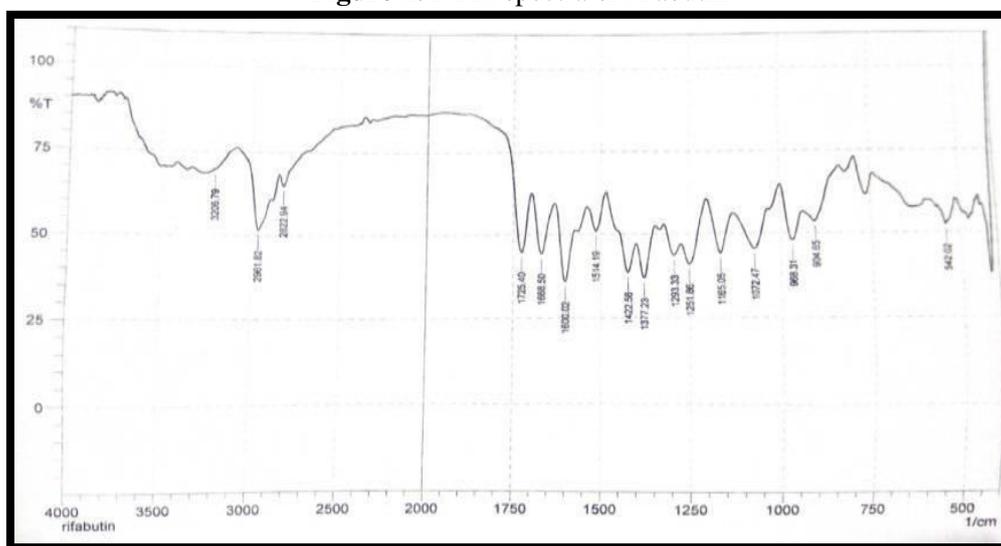
Melting Range

The melting range of rifabutin was found to be 168-171° C. It was observed that the obtained value of rifabutin's melting point was found to be close to the reported value of melting point of rifabutin. This result proved that the received drug sample of rifabutin meet the reported properties. Any impurity, if present, will cause variation in the melting point of a given drug substance.

FTIR Spectroscopy

FTIR spectra of rifabutin was obtained and confirmed by observing the peaks corresponding to the bands present in the drug structure. The FTIR spectrum of rifabutin is shown in figure 1 and it shows various peaks corresponding to different bonds present in the structure of rifabutin. The presence of OH group is confirmed by a weak absorption band at 3461.0 cm⁻¹. Aromatic structure in the drug is confirmed by the characteristic absorption bands at 2961.1 cm⁻¹ and at 1601.2 cm⁻¹ due to C-H stretch and C-C stretching respectively. Conjugated system with ester functional group is depicted by prominent C=O stretch at 1671.2 cm⁻¹. The spectrum illustrates amine stretch at 1064.9 cm⁻¹. Characteristic peaks at 1727.3 cm⁻¹ and 1747 cm⁻¹ correspond to the C=O and N-H stretching of secondary amine.

Figure 1: FTIR spectra of rifabutin



Evaluation of Rifabutin Inclusion Complexes

Percentage Yield

The production yield of the prepared inclusion complexes shows above 95.0% which was calculated by measuring the weight of the final product compared with the theoretical weight. Inclusion complexes containing rifabutin and hydroxy propyl beta cyclodextrine gives highest % yield of 96.99%.

The percentage yield for all formulations was listed in table 4.

Table 4: Percentage yield of physical mixtures and inclusion complexes

S.No	Composition	Drug Excipient Ratio	Code	% Yield
A	Rifabutin: Hydroxy propyl betacyclodextrine	1:1	AK1	96.99

B	Rifabutin: Hydroxy propyl betacyclodextrine	1:2	AK2	92.59
C	Rifabutin: Hydroxy propyl betacyclodextrine	1:3	AK3	92.17
D	Rifabutin: Beta cyclodextrine	1:1	BK1	90.43
E	Rifabutin: Beta cyclodextrine	1:2	BK2	89.98
F	Rifabutin: Beta cyclodextrine	1:3	BK3	90.32

Drug Content

Drug content analysis was done for all inclusion complex formulations in triplicate. Inclusion complexes of the drug exhibit uniformity in drug content in each batch so they can be used for development of a suitable formulation in future. The rifabutin contents in the prepared complexes shows in range of 95-99.5% mentioned in table 5.

Table 5: % Drug content of inclusion complexes

S.No.	Formulation Code	% Drug content
1	AK1	99.5
2	AK2	98.98
3	AK3	98.08
4	BK1	97.22
5	BK2	98.31
6	BK3	97.77

Saturated Solubility Studies

Results of saturation solubility study are shown in Table 6 and figure 2, which depicts increase in solubility of RIF from all the inclusion complexes. The results of the saturation solubility study showed that β -CD and HP β -CD were efficient carriers for solubility enhancement of poorly soluble drug rifabutin. The solubility of rifabutin was increased in greater extent in inclusion complex formulations as compared to the physical mixtures. AK1 formulation containing rifabutin with hydroxypropyl beta cyclodextrine showed the highest solubility. The enhancement in the solubility of complex is mainly attributed to the formation of stable inclusion complex of rifabutin with cyclodextrines. Table 6 contains the solubility profile of all inclusion complexes in water at room temperature.

Table 6: Solubility of inclusion complexes

S.No.	Formulation Code	Solubility(mg/ml)
1	AK1	8.921
2	AK2	6.537
3	AK3	6.928
4	BK1	7.356
5	BK2	7.124
6	BK3	7.934

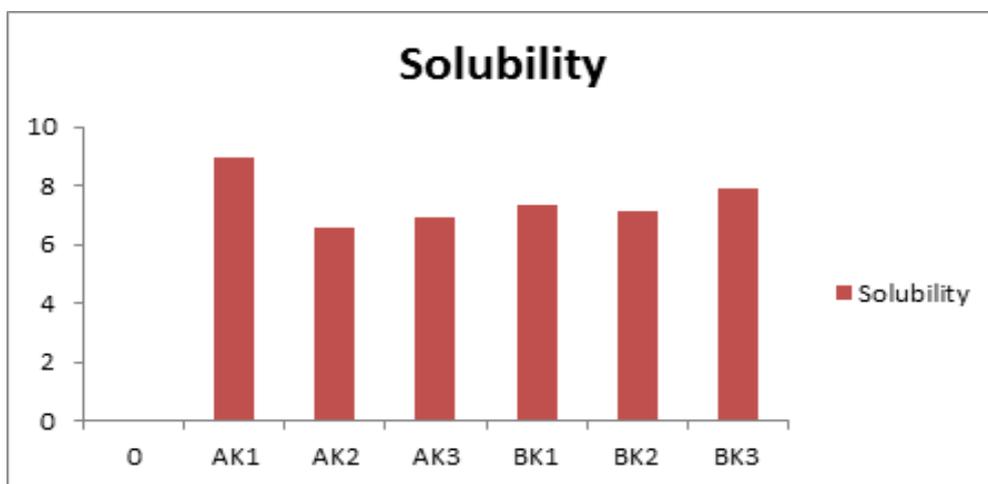


Figure 2: Solubility profiles of inclusion complexes

Dissolution Studies

Dissolution profiles for the original drug powder and the physical mixtures and inclusion complexes of drug with polymers presented in Figure 3. It is clearly seen that the inclusion complexes of rifabutin has improved

the dissolution rate to a great extent. The pure rifabutin had a very low rate of dissolution because only 20% of drug released in first 20 minutes of dissolution study. Prepared inclusion complexes show higher rate of dissolution as compared to the pure rifabutin. Higher rate of drug dissolution was obtained in inclusion complexes of rifabutin with hydroxyl propyl beta cyclodextrine. The novel arrangements between rifabutin and HP β -CD might be responsible for the enhanced drug dissolution rate found for inclusion complex, in comparison to pure rifabutin. The improvement of rate of dissolution may be due to the reduction in particle size of rifabutin and hence improving its wettability and finally improved rate of dissolution. The in vitro dissolution rate profiles of rifabutin from ICs having various ratios of drug and HP β -CD were shown in figure 3 and the data was listed in table 7. In this dissolution profile it was found that the maximum % drug release was obtained in batch AK₁. In case of physical mixtures a small rise was found in dissolution as compared to, pure rifabutin. The HP β -CD has surfactant like properties and it is hydrophilic in nature so it can lower the interfacial tension between poorly water soluble drugs and the dissolution medium resulting in higher solubility.

Table 7: Drug release profile of physical mixtures and inclusion complexes

Time (min)	%cumulative drug release								
	RIF	A	B	AK1	AK2	AK3	BK1	BK2	BK3
10	11.23	42.23	38.23	60.41	51.43	45.23	39.23	41.16	53.21
20	18.98	50.54	49.45	68.32	59.65	51.98	47.35	48.34	61.34
40	24.52	58.16	56.76	71.67	67.67	59.87	54.89	56.54	68.67
60	32.76	65.76	61.97	78.76	73.84	67.99	66.75	64.97	75.77
80	38.58	71.75	68.83	85.92	81.33	75.65	71.98	73.99	81.98
100	45.32	78.97	73.37	92.11	88.43	86.76	78.32	82.34	87.99
120	51.98	84.99	80.04	99.23	96.11	93.99	84.29	90.66	95.23

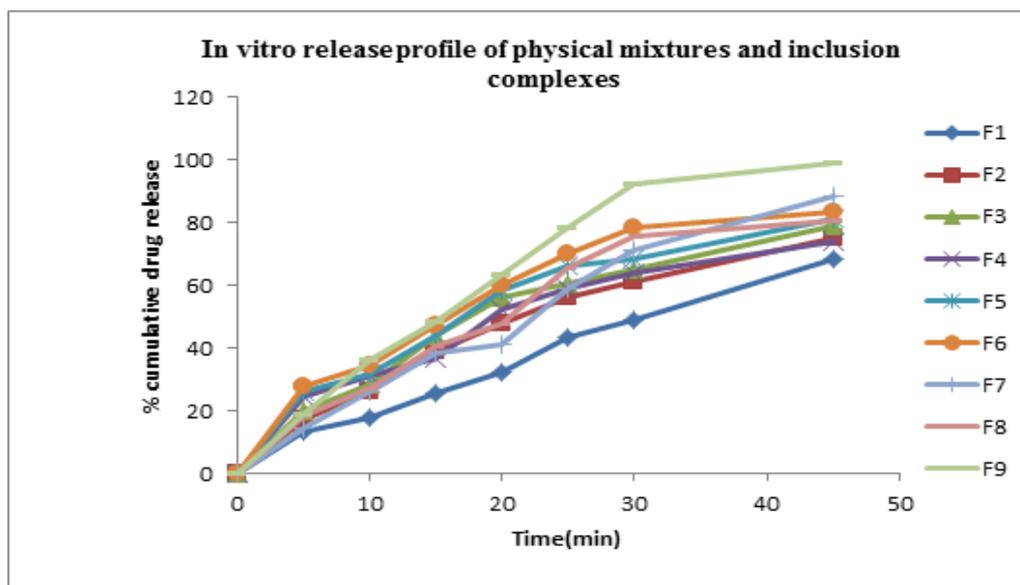


Figure 3: Drug release profile of physical mixtures and inclusion complexes

Characterization of Inclusion Complexes

From solubility and in vitrodissolution result, the inclusion complex prepared from HP β -CD (AK₁) was selected for further characterization.

Fourier Transformed Infrared Spectroscopy (FTIR) Analysis

Functional group and structure of organic compounds are well understood and predicted by FTIR study. Structure of prepared inclusion complex was studied in detail with the help of FTIR spectra. FTIR spectra of rifabutin, H- β CD and inclusion complex AK₁ is depicted in figure 4, 5 and 6. The FTIR spectra of drug, polymer and inclusion complex were not found to be identical; this indicates interaction between rifabutin and carriers in the prepared ICs. IR spectra of AK₁ were significantly different from the IR spectra of pure rifabutin and the carrier HP β -CD. The intensity of peak sharpness was disappeared and absence of major peaks proved that complexation was completed practically and drug is dispersed into host moiety.

Powder X-ray Diffraction (P-XRD)

XRD is most commonly used to confirm inclusion complexes of cyclodextrines in powdered state. Figure 7 depicts Powder XRD patterns of drug cyclodextrines and formulations. The pure drug rifabutin shows a sharp peak at 105° . The thermogram of RIF-HP- β -CD complex showed endothermic peak at different temperatures by different method of preparation, which is different from the pure drug, this difference indicates the formation of inclusion complex. The X-Ray Diffraction pattern of pure drug rifabutin presented that there are several diffraction peaks at $11.2, 15.7, 16.6, 19.4, 20.4, 21.8$ and 23.4 . This indicates the rifabutin is crystalline in nature. The HP- β -CD was a very crystalline molecule with major peaks at 2θ values of $11.6, 19.1, 21.1, 23.5, 26.0$ and 30.0 as shown in figure 7 (B). The X-Ray Diffraction pattern of rifabutin showed in figure 7 (A), intense and sharp peaks, indicating its crystalline nature. Crystallinity behavior was determined by comparing some representative peak heights in the diffraction patterns of the binary systems with those of a reference.

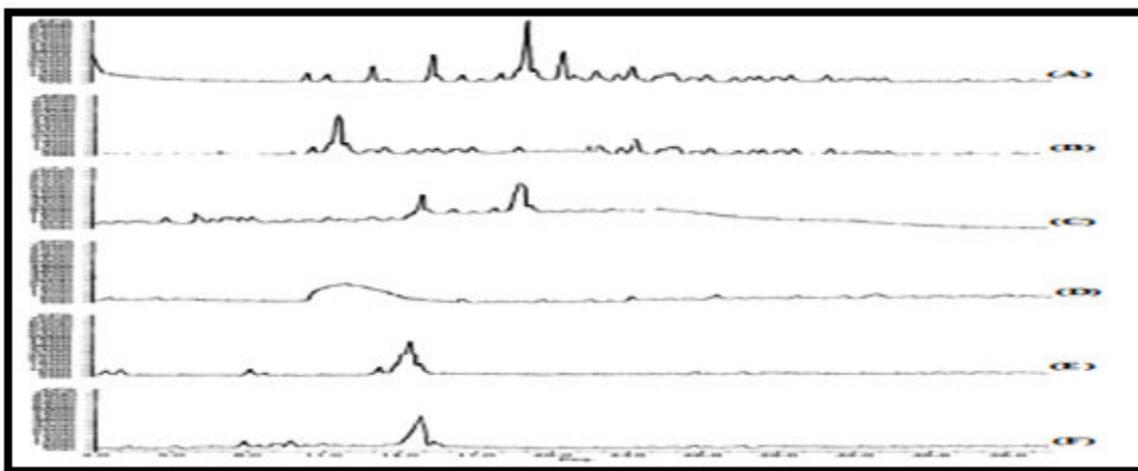
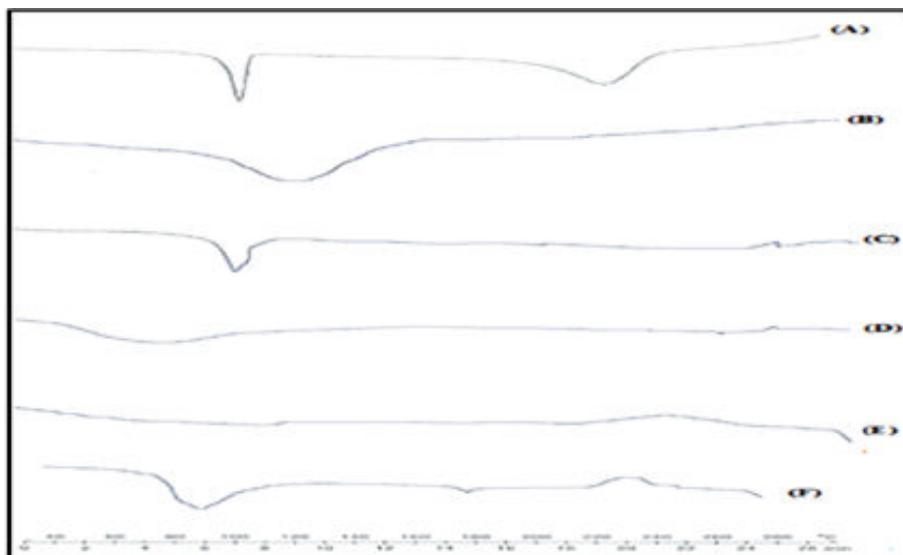


Figure 7: X-RD Patterns of (A) rifabutin pure (B) pure HP- β -CD (C) physical mixture (D) AK1 formulation (E) BK1 formulation (F) pure- β -CD

Differential Scanning Calorimetry (DSC)

DSC thermogram of pure drug RIF, HP- β -CD and all inclusion complexes are shown in figure 8. When guest molecules were embedded in CD cavities or crystal lattice then the melting points, boiling points, and sublimation points of the molecules were shifted to other temperatures or sometimes they may disappear from the thermogram. In the DSC thermogram of rifabutin the endothermic peak was observed at 178°C , which is much closer to the melting point of the pure drug. This result indicates crystalline state of rifabutin in pure form. In case of the inclusion complex of rifabutin and cyclodextrine the sharp endothermic peak was absent in DSC thermogram. This change in the thermogram indicates formation of the complexes.



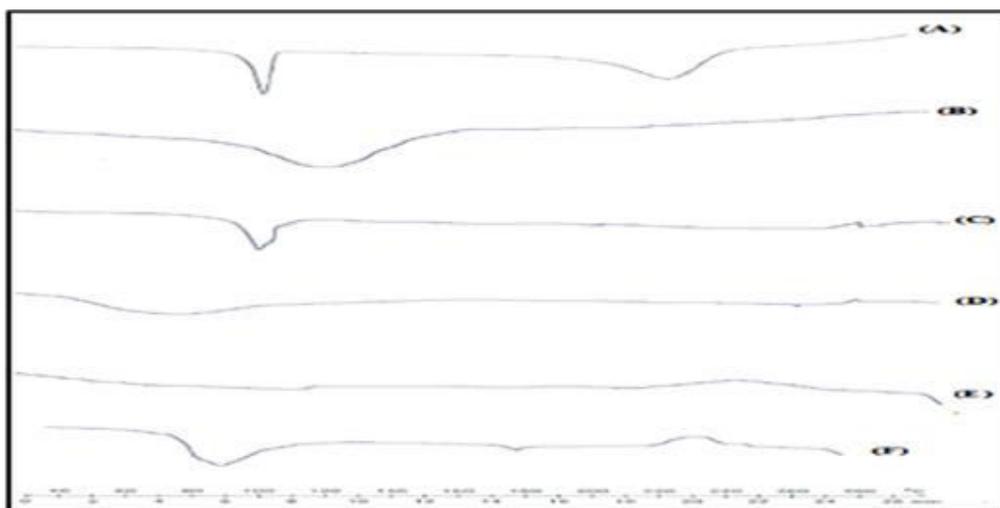


Figure 8 : DSC of (A) rifabutin pure (B) pure HP- β -CD (C) physical mixture (D) AK1 formulation (E) BK1 formulation and (F) pure - β -CD

Scanning Electron Microscopy

The SEM images of the pure rifabutin and inclusion complex were shown in Figure 9. HP β -CD is irregular in shape and has smooth-surfaced particles with few smaller particles. The Inclusion Complex have ratio of drug and carrier 1:1 and prepared by kneading method, shown a more irregular surface morphology as compared to the pure HP β -CD and physical mixture. It is not possible to differentiate the presence of rifabutin particle among the particles of HP β -CD.

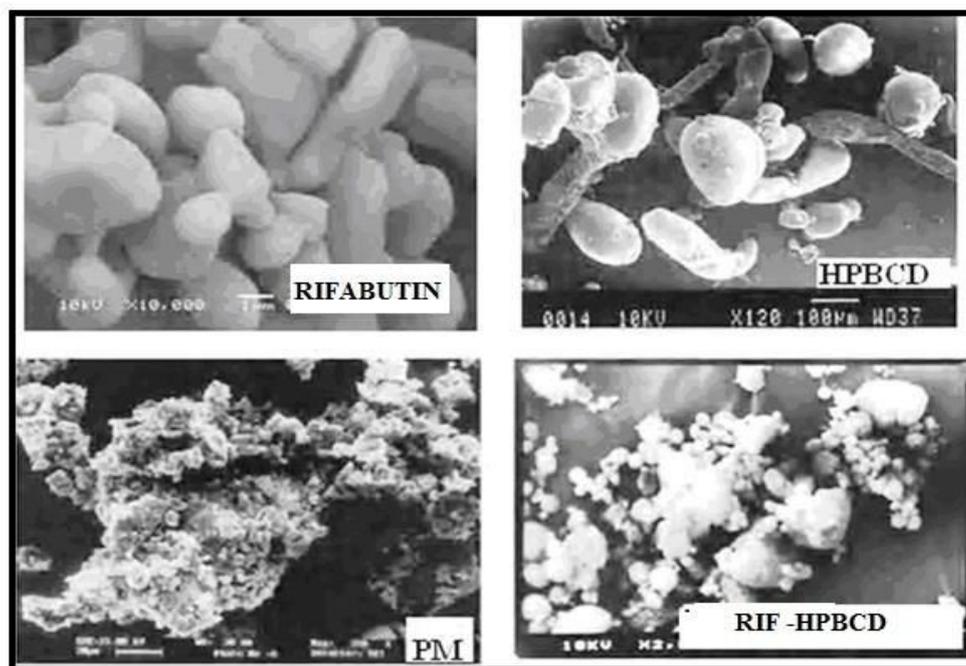


Figure 9: Scanning electron micrograph of drug and inclusion complexes

Preparation of Tablets from AK1 Formulation

Inclusion complex of AK1 formulation prepared by kneading method was formulated into tablets by direct compression method containing 5 mg of rifabutin in each tablet.

Evaluation of Tablet

The physicochemical properties and % cumulative drug release profile of prepared tablets were evaluated.

Physicochemical Properties of Tablets

The tablets were evaluated for thickness, hardness, friability, and weight variation. The physicochemical properties of prepared tablet formulations were listed in table 8. The tablets of all the formulations showed good physicochemical properties. The weight variation of all tablets was within the range according to IP.

Table 8: Physicochemical properties of tablets

Diameter (mm)	Thickness (mm)	Hardness (kg/cm)	Friability (%)	Weight variation (mg)
F1	8	4.17	4.4	149.65
F2	8	4.14	4.7	147.80
F3	8	4.15	4.5	149.55
F4	8	4.16	4.8	151.55
F5	8	4.18	4.4	149.50
F6	8	4.15	4.6	148.5
F7	8	4.15	4.7	150.95
F8	8	4.14	4.6	150.05
F9	8	4.18	4.4	149.65

Invitrodissolution Study

In-vitrodissolutionoftablets was studied in USP XXIV dissolution apparatus employing a paddle stirrer. The % cumulative drug release of prepared tablets was compared with the marketed tablet of rifabutin. % cumulative release of drug was listed in table 9 and showed in figure 10, the dissolution profile of F9 tablet showed higher dissolution rate as compared to other tablets. The dissolution rate of the prepared tablets compared with marketed tablet and it was found that the F9 tablets showed relatively a greater improvement in the dissolution profile of rifabutin.

Table 9: Drug release profile of tablet formulations and marketed product

Time in minutes	Cumulative percentage of drug Release									
	F1	F2	F3	F4	F5	F6	F7	F8	F9	Mar.Tb
5	13.45	17.34	20.03	24.34	25.87	27.88	14.56	18.44	19.08	11.34
10	17.88	25.88	28.23	30.89	31.9	34.66	25.88	27.09	36.30	23.70
15	25.67	38.77	43.78	36.88	44.11	47.3	38.56	40.7	48.33	41.89
20	32.34	47.89	56.29	52.45	58.11	60.1	41.34	48.04	63.12	51.12
25	43.45	56.37	60.45	58.89	66.34	70.23	58.67	65.45	78.60	56.50
30	48.89	61.23	64.88	64.11	68.23	78.65	71.22	75.43	92.55	63.23
45	68.56	74.89	78.99	74.11	81.45	83.23	88.34	80.54	98.96	70.4

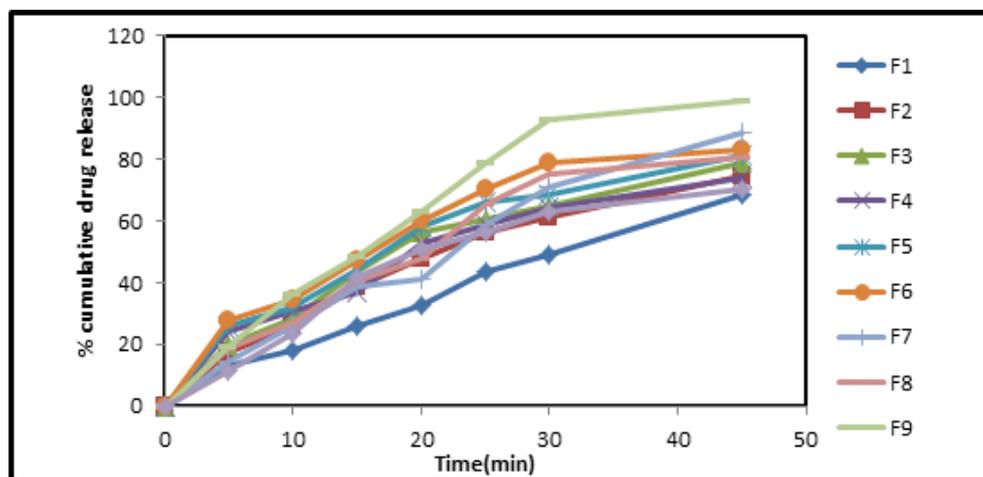


Figure 10: Comparative % drug release profiles of tablets and marketed product

SUMMARY AND CONCLUSION

The development of suitable drug delivery systems remains a major challenge in the drug product development and industrialization process. Drugs having poor aqueous solubility are extremely challenging to be developed into suitable dosage forms. It is proved that the drug dissolution rate is responsible for a low oral absorption rather than its permeation rate through the epithelia of the gastro intestinal tract. This research work provides the level of solubility of rifabutin by inclusion complexation method. To enhance solubility of rifabutin inclusion complexes were prepared by using cyclodextrines HP- β -CD and β -CD in different ratios. Physical mixtures were also prepared for the comparative study. In comparison of HP- β -CD and β -CD, it was found that inclusion complex of HP- β -CD shows better result in terms of solubility enhancement. The inclusion complexes from HP- β -CD were converted into tablet formulations and then dissolution rate of prepared tablets was compared with the marketed tablet.

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A Comparative Analysis of the In-Vitro Effects of Various Sterilization Techniques and Different Disinfectants on the Micropropagation of Explants of *Asparagus Racemosus*

Preeti Kaushik^{1*}, Rekha Sansanwal², Seema Sharma³ and Richa Sharma⁴

^{1,2}Department of Microbiology, Faculty of Life Sciences, Chaudhary Bansi Lal University, Bhiwani, Haryana, India

³Department of Physics, M.N.S Government College, Bhiwani, Haryana, India

⁴Department of Agriculture Biotechnology, Centre of Biotechnology, Maharishi Dayanand University, Rohtak, Haryana, India

ABSTRACT

Asparagus racemosus belongs to the Asparagaceae family and the *Asparagus* genus is an endangered plant species that have been listed in the red data book. For the conventional breeding of the *Asparagus racemosus*, its tubers are used which possess a wide range of antioxidants, leading to the wastage of highly oxidative tuber roots. Using the in-vitro propagation method we can propagate *Asparagus racemosus* using its nodal explants successfully only in a contamination-free environment. The sources of contamination can be present in the media or associated with the explants which need to be eradicated using various sterilization techniques and disinfectants. This paper presents two different sterilization techniques and treatment of disinfectant Sodium hypochlorite used to sterilize the media and the explants. The media was sterilized using an autoclave and microwave oven with the treatment of explant with sterilizing agent sodium hypochlorite in three concentrations of 5%, 10%, and 15% for 5 min. The nodal explants were cultured in MS basal medium supplemented with 30g sucrose, as a carbon source and 7g agar, as a gelling agent. The temperature inside the growth chamber was maintained at 24±2°C with a photoperiod of 16 h daylight and 8 h dark. The results were assessed based on survival rate, shoot growth, and the percentage of contamination during the initiation phase. Among all the different sterilization variations, 10 % sodium hypochlorite disinfectant treatment with 30 min autoclaved media was found to be the most effective treatment with an 85% initiation rate and 70% survival rate. After sterilization, shoots continued to grow vigorously and the multiplication phase was initiated.

Keywords: Sterilization, Autoclave, Microwave Oven, Sodium hypochlorite, *Asparagus racemosus*

1. INTRODUCTION

Asparagus racemosus is an important medicinal plant that grows throughout India's tropical and subtropical parts and is known for its phytoestrogen properties. The plant is used to increase lactation in women and treat problems related to their menstrual cycle (1,2). Steroidal saponins are the main active constituent of the *Asparagus racemosus* which is majorly deposited in the tubers of the explant (3,4).

The rise of demand for the plant owing to its high medicinal value leads to destructive harvesting of the plant has shrunk the natural population of *Asparagus racemosus*. Micropropagation can be used as a powerful tool to meet the increasing demand of the plant by culturing its explant in artificially favorable conditions (5,6). The successful micropropagation of *Asparagus racemosus* has been done using its nodal explants (7,8,9), but these explants may be associated with the source of contamination. The contamination in the culture can also invade if the media is not sterilized in the proper conditions. Therefore, proper sterilization of the media and the explants plays a key role in the successful micropropagation of the explant (10).

Autoclaving of the media is used as a traditional method of sterilization of media, but consumption of less time, labor, and energy has popularised the usage of microwave ovens among tissue culturists (11,12). Research has been done to find out the efficiency of the microwave oven in the sterilization of the plant tissue culture media and found the usage of microwave efficient to avoid the contamination however case of overboiling of the media can lead to dehydration of the media. (13,14,15,16). Surface sterilization of explants is done using various disinfectants such as sodium hypochlorite, mercuric chloride, boric acid, ethanol, hydrogen peroxide, etc. Sodium hypochlorite is the most commonly used disinfectant that has been used in the sterilization of explants of various plant species (17,18,19). In the present study, a comparison of the efficiency of sterilizing technique using autoclave and microwave oven in combination with various concentrations of disinfectant sodium hypochlorite is done for *Asparagus racemosus* micropropagation to find out the best, most efficient, and cost-effective sterilization procedure that may result in fewer chances of contamination or no contamination in tissue culture of *Asparagus racemosus* (20, 21, 22, 23).

2. MATERIAL AND METHODS

2.1 Preparation and Sterilization of Media

For the micropropagation of *Asparagus racemosus* MS basal media is chosen which is a combination of macronutrients, micronutrients, and vitamins supplemented with 30 g sucrose and 8g agar for the preparation of 1000 ml media. The bottles were packed in the autoclave bags and were placed in the autoclave. The media is sterilized at 121°C for 20 min and 30 min at 15psi. The bottles were taken out from the autoclave and were kept inside the laminar airflow to get the media cool and solidified (24).

Another batch of 1000 ml media was sterilized using a microwave for 10 min and 15 min. The microwave surface was cleaned with 70% ethanol to avoid any contamination. The media was poured inside the small bottles and was heated under continuous supervision by stirring the media every 2 min to avoid the overboiling of the media and for the uniform mixing of the MS media. The bottle caps which were kept loose to avoid the bursting of bottles were tightened before taking out the bottles from the oven. The bottles were transferred to the laminar airflow in a sterilized box wiped with 70% ethanol.

All the media were left in the bottles in the Tissue culture room for two days to observe the presence of contamination in the media.

2.2 Explants Surface Sterilization

Nodal segments of *Asparagus racemosus* were collected from the plants in the nursery at Maharishi Dayanand University. Explants were washed for 30 min with detergent in tap water to remove any dust and soil particles associated, the explant is washed with water until all the detergent gets removed. After that, the explant is transferred to the laminar airflow and treated with 70% ethanol for 2-3 min and washed with distilled water before the treatment with the disinfectant of various concentrations. For *Asparagus racemosus*, treatment of sodium hypochlorite is given in three concentrations 5%, 10%, and 15% for 5 min.

2.3 Media Culture and Surface Sterilization

All the sterilized explants were planted in two sets. The first one is sterilized MS media using an autoclave. The other explants were planted on the MS media and sterilized using a microwave oven.

The plants were allowed to grow *in vitro* in the growth chamber having 24±2°C temperature and a photoperiod of 16 h daylight and 8h dark.

2.4 Data Collection

The experiment was carried out in triplicate consisting of ten explants in each set of treatments. A total of 12 variations were used in culturing the explants. The data was collected after 15 and 30 days in terms of Initiation percentage, percentage of contamination, and percentage of explant survived.

3. RESULTS AND DISCUSSIONS

In the study, we found that out of both sterilization methods, with variable sterilization time Microwave oven-assisted sterilization for 10 minutes was found to be least effective when observed after two days with the presence of contamination in 90% of bottles, and some bottles were having semi-solid media. The reason for semi-solid media can be the uneven mixing of agar in the media.

All the contamination-free media were used for the culture of explants treated with various disinfectants. Out of all the sets of experiments, media sterilization using Autoclave for 30 min with 10% sodium hypochlorite is found to be the most effective mode of sterilization with a maximum initiation rate and explant survival rate of 85% and 70% respectively with minimal contamination. The maximum percentage of contamination was observed in microwave-assisted sterilization of 10 min with 5% sodium hypochlorite. 15-minute microwave-assisted sterilization is effective in minimizing contamination in Tissue culture.

15% Sodium hypochlorite is most effective in combating contamination with maximum initiation and explant survival rate, 20% sodium hypochlorite can be used to minimize the contamination but high concentrated form affects the growth of explants.

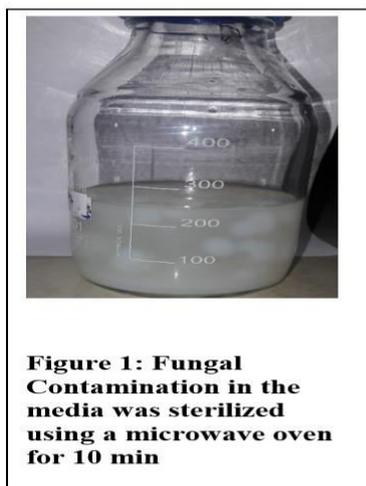


Figure 1: Fungal Contamination in the media was sterilized using a microwave oven for 10 min

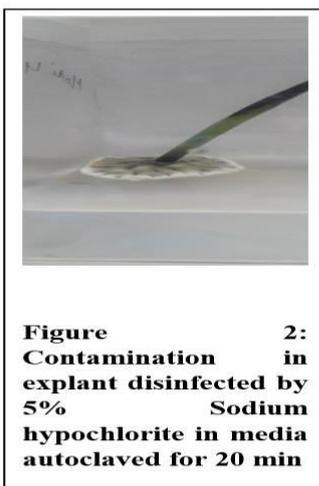


Figure 2: Contamination in explant disinfected by 5% Sodium hypochlorite in media autoclaved for 20 min

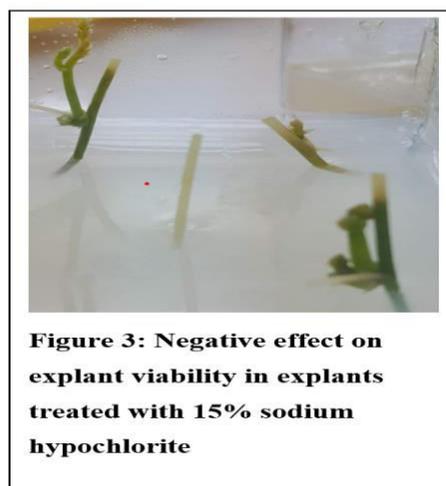


Figure 3: Negative effect on explant viability in explants treated with 15% sodium hypochlorite

Table 1: Evaluation of the presence of contamination in media sterilized after 2 days of preparation

S. No.	Mode of Sterilization	Sterilization Time	Contamination
1	Autoclave	20 min	NO
4	Autoclave	30 min	NO
7	Microwave	10 min	Yes
12	Microwave	15 min	NO

Table 2: Assessment of the presence of contamination, initiation rate, and explant survival rate for the explants disinfected using various concentrations of disinfectant in media sterilized using different modes

S.no	Media Sterilization method	Sterilization Time	Explant Sterilizer (Varied Concentration)	Initiation Percentage (After 15 days)	Contamination Percentage		Explant Survival Percentage (After 30days)
					After 15 days	After 30 days	
1	Autoclave	20 min	Sodium hypochlorite (5%)	30	40	70	10
2	Autoclave	20 min	Sodium hypochlorite (15%)	70	30	45	50
3	Autoclave	20 min	Sodium hypochlorite (20%)	55	15	25	40
4	Autoclave	30 min	Sodium hypochlorite (5%)	38	32	40	25
5	Autoclave	30 min	Sodium hypochlorite (10%)	85	5	18	70
6	Autoclave	30 min	Sodium hypochlorite (20%)	75	6	10	60
7	Microwave	15 min	Sodium hypochlorite (5%)	28	83	95	12
	Microwave	15 min	Sodium hypochlorite (10%)	78	35	43	69
12	Microwave	15 min	Sodium hypochlorite (20%)	72	12	35	58

4. CONCLUSION

15-minute microwave-assisted sterilization is effective in minimizing contamination in Tissue culture media and gives the best result when the explant is treated with 10% sodium hypochlorite. Microwave oven sterilization has the potential to be used as a substitute for autoclaves in the Tissue Culture lab for a lesser amount of media. Sterilization can be achieved in less time saving energy but the problem associated with the microwave oven is that it requires continuous supervision.

10% Sodium hypochlorite for 10 min is efficient in removing contamination and also does not affect the explant viability. A higher concentration of Sodium hypochlorite is efficient in minimizing the contamination but at the same time, it negatively affects the initiation rate of the explant.

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Unravelling the Unconscious: A Journey through the Psychological Complexities of the Protagonists in Emma Donoghue's Room

Jincy S. S

Department of English, Santhom Malankara Arts and Science College, Edanji, Thiruvananthapuram, India

ABSTRACT

This paper "Unravelling the Unconscious: A Journey through the Psychological Complexities of the Protagonists in Emma Donoghue's Room" tries to explore the main characters, through the psychological facts. Emma Donoghue's *Room*, divulges into the life of a nineteen year old girl, Joy Newsome, abducted by a man whom she named as Old Nick who locked her in a soundproofed cell and raped her continuously which made her the 'Ma' of Jack. Ma suffered from trauma both inside and outside the Room. Ma has a troubled journey throughout the novel. Ma was in fact suppressing her trauma, her stress, her anxiety, her adulthood, and even her identity for the sake of Jack. When analysing her psychological complexities with Freud's and Chodorow's statements it is quite sure that all those suppressed emotions and repressed desires will be forced into the unconscious or Id. Therefore Ma too cannot simply escape from the Room. When Emma Donoghue ends the novel by saying "goodbye" it is quite sure that their life cannot get separated from room with this "good-bye".

Keywords: Id, Ego, Super Ego, Trauma, Repression

INTRODUCTION

"The unconscious mind always operates in the present tense, and when a memory is buried in the unconscious, the unconscious preserves it as an ongoing act of abuse in the present of the unconscious mind. The cost of repressing a memory is that the mind does not know the abuse ended" (Fredrickson 117). When we peruse for the psychological slants in Emma Donoghue's *Room* we can find that it is not just a Room, but a childhood and an adulthood locked in a Room.

Room was mainly inspired by Fritzl case in Austria but not exactly the same as the case. Aim of this dissertation focuses on exploring main characters, through the psychological facets. *Room*, divulges into the life of a nineteen year old girl, Joy Newsome, abducted by a man whom she named as Old Nick who locked her in a soundproofed cell and raped her continuously which made her the 'Ma' of Jack. After seven years of her imprisonment, Ma with Jack fortunately escapes from the cell. Both of them start a new life at 'Independent Resident'. But due to Jack's urge they go back to the Room for one more time and say goodbye to everything and with this novel comes to a halt.

But the question is, are they able to start a new life? It is palpable that whatever we are going to do or whatever comes from our conscious mind is surely rooted in our unconscious mind. Freud systematizes the ideas in his *the interpretation of Dreams* as 'Ego', 'Super-ego' and 'Id'; Ego as a conscious mind, Super-ego as the conscience and Id as the unconscious mind. So if the Room becomes the Id then it will have an influence throughout their life. This work attempts to answer the question: 'Does the Room exist as a Departure or a Continuation'.

How Does the Room Become Id? Analysis through the Psychological Complexities of Protagonists Trauma

Trauma, a violently produced wound and an emotional shock with lasting effect, originates from stress as a result of one or more distressing events or disasters like abuse, kidnapping, violence, accidents, medical emergencies or any other man-made or natural disasters. Ma suffered from trauma both inside and outside the Room.

In 'Inside' after the arrival of Jack she tried to suppress everything for the sake of Jack. She used to say "It's called mind over matter. If we don't mind, it doesn't matter" (Donoghue 11). For understanding the psychological problems of Ma, Brie Larson, actress who played the role of Ma when *Room* was adapted as a film, consulted a trauma specialist and asked what would happen to a mind after one has been stuck in a space of sexual abuse for seven years. The reply was 'normalisation', that is, the person tries to normalise some stuff. Since she could not refuse Old Nick's demand it gradually became a habit itself. So Ma's psychological problems are centered on sexual abuse, captivity and isolation which result feelings of fear, helplessness and anger.

It is not until she is at home in a safe place that everything starts to come to surface. She has to negotiate who she was with who she is now, come face to face with her mother and father. It becomes more complicated. She experiences additional trauma due to the loss of the first baby in the Room. As Freud suggests the death of a dear one will also be repressed within the id. She is trying to suppress her loss through Jack's birth. "Maybe it really was you, and a year later you tried again and came back down as a boy." (181)

Ma's emotional shock was further shaken the night when Jack tried to see Old Nick's face and Old Nick spontaneously greeted him with "Hey Sonny". She was overwhelmed with fear and anxiety either because she feared that Old Nick might put his hand over Jack or because she feared that Old Nick might make Jack his puppet.

Inside the Room Jack in fact is enjoying his environment with his Ma. He knows nothing about the outside world and he knows nobody else as real persons other than Ma and Old Nick. Room is like a womb to Jack. But Jack's comfort zone gets disrupted as soon as Ma tries to reveal the 'true story' of the outside world. Ma's kidnapping become a frightening nightmare to him.

Whenever he sees the outside world, (many people, many trees, sky and others) it causes him trauma. In this case, sometimes Jack thinks that it is better to be in a room with his Ma, instead of wandering outside that makes him tired and confused. In world Jack gets kind of obsessive at times, trying to get his life order when it has none. His life inside Room has been so structured that he needs the same structure outside the Room. But the outside world disrupts that structure. This evokes in him anxiety and stress.

According to Freud, trauma can even lead to Thanatos or Death Drive. There is also possibility for the development of Post-Traumatic Stress Disorder (PTSD), a mental disorder that can develop after a person is exposed to a traumatic event or other threats on a person's life.

When Ma receives much pressure from society and family and even from the doctor she attempts suicide. One of the best examples for this is the interview incident. So we can understand that her psychological problems of anxiety and anger reach its peak only when she is 'Outside'. As long as she stays outside she will be haunted by the Room.

Repression and the Unconscious

"Repression is the hiding away of something in our minds; what is hidden away exists in our conscious. Guilt-inducing desire and traumatic events such as the death of a loved one or abuse are quickly shunted out of the conscious and relegated into the unconscious, to emerge out only in particular moments". (Nayar 65)

When analysing Ma's and Jack's life we can find a lot of unresolved conflicts, traumatic past, unadmitted desires etc which they are trying to suppress. Thus their life within the room which is immersed with a traumatic past, unresolved conflict and unadmitted desires become the repressed matters which will be forced into the unconscious or the id.

Identity Formation and Crisis

Jacques Lacan talks about the three stages in identity formation which starts from childhood: 1) Imaginary stage, 2) Symbolic stage, 3) Real stage. Lacan considers the first stage as a pre-linguistic stage and the second as the stage when the child acquires language and begins to understand differences and social relations. Child recognizes 'I', 'Mother', 'Father' and thereby discovers social relations. And finally Lacan considers the third stage, that is the real stage, as the stage where the psyche is caught between lack and the need to fulfill this lack.

As far as Jack's identity formation is concerned there exist certain differences since he has a different environment. Jack is not ready to accept his Ma as a separate entity completely even after his 5th birthday. This is because he lacks social relations. Throughout his narrations we can find lots of usage of 'me and Ma'.

When Jack realizes that he has swallowed Tooth, he just wonders if Tooth is "going to be hiding inside [him] in a corner forever" (Donoghue 270). This signifies that he will always have part of Ma inside of him, even when they are apart. Even though Jack tries to consider his Ma as a separate entity, within his unconscious there exists the thought that both are part to each other. Therefore it becomes the id.

In Real stage the psyche is caught between the 'lack' and the need to fulfil this lack. This lack is the desire for the absent mother discovered during the Symbolic stage. But within the stage itself a fear or threat evolves towards his father and therefore the desire for mother is repressed in unconscious. In Jack this happens clearly and he is often haunted by the fear towards Old Nick. Coming to Jack's language it is very much limited. His encounters with the non-human objects participate differently in his identity formation and it challenges the conventional logic of Identity, a blurring between human and the non human. Thus Jack struggles a lot to make sense of the real world.

The identity crisis starts in Jack whenever Jack is forced to escape from his 'comfort zone', Room. Jack himself questions his identity as soon as he escapes from the room. "I'm not in Room. Am I still me?" (123). Whenever he comes outside he becomes incapable of uttering words and communicating with the strangers.

According to Nancy Chodorow's *Reproduction and Mothering* mothers experience their daughters as their 'doubles', as an extension of their own life, therefore the daughters find it difficult to form their own identities. Ma is trying to see her first girl baby in Jack. "You know I used to say, when you came the first time, on Bed, you were a girl?" (180). And that's why she does not cut his hair. Undoubtedly it is difficult for Jack to attain his masculinity within the room.

Chodorow proposes that a boy attains his masculinity or masculine identity only when he becomes separate or discovers autonomy from his mother. Jack tries to attain his masculinity only when he and this Ma are separated due to Ma's suicidal attempt and only after stopping his oral attachment through breastfeeding. During that time he himself decides to cut his hair and understands that the hair cut will not affect his strength and also comes to the understanding of worldly conception of manhood with muscles.

Within the Room the identity of Joy Newsome changes to that of Jack's Ma. But whenever she escapes from the room her identity too faces a crisis. She wants to be herself and also remain as Ma simultaneously.

Separation Anxiety

John Bowlby's *Attachment Theory* describes Separation Anxiety as an anxiety state or mental disorder in which a child becomes excessively anxious when separated from parents. It can occur in adults also, that is when someone is afraid of being separated from a particular person or even a pet. During infancy child does not know social life and other people besides its parents or family. This makes the child feel insecure and anxiety when separated from parents.

Coming to Jack's and Ma's condition they have a deeper interrelation between them since they are not interacting with anybody else within Room. Jack's separation anxiety in fact starts when he was in the room itself. "Like if there were two Rooms, if he put me in one and you in the other one" (79).

James Roberstone, along with Bowlby identified three phases of separation response: 1) Protest, 2) Despair, 3) Denial or detachment. When Ma made a suicidal attempt Jack again felt this separation anxiety and at that time he went through these stages: he protested by refusing to eat. He was very anxious, afraid that if he had to lose Ma.

The second phase was despair, it happened when Jack had to sleep alone in a room, he felt sad because this is the first time he slept without Ma and did not do their bedtime routine as usual like singing. "Are you crying?...Oh, honey. Well, better out than in." "Why is it better out than in? Ma said we'd be free but this doesn't feel like free" (225). The final phase was detachment, Jack getting used to Ma's absence, he even lasted a week at his grandma's house without Ma.

The feeling of fear of separation was not only felt by Jack but also Ma. She was also afraid of having to part with Jack. The fear of separation caused Ma to decide to deceive Jack while still locked in the room. She said that this world only contained the room they lived in. Ma later was finally honest with Jack and explained everything.

Ma's separation anxiety is clearly visible when the interviewer asks about leaving Jack at any orphanages through Old Nick. Although in that way, Jack can get a better life, Ma chooses to keep taking care of Jack within their limitations. Ma's statement "he had me" (209) shows that Jack doesn't need anything else except her. When Ma had to be hospitalized for trying to commit suicide, Ma was seen showing her anxiety due to the parting with Jack, she also felt guilty for having chosen the wrong decision which was suicide.

Mother fixation and Oedipus Complex

Freud's concept of Fixation and Oedipus Complex are much related. Mother fixation characterizes the over-dependent nature of a child on the mother. In Jack's case it is already said that he is much dependent on his Ma since there is nobody else to communicate and connect with him. Jack believes that "My cells are made out of her cells, so I am kind of hers." (10) Within the Room itself we can find the symptoms of mother fixation. Jack fears whether Old Nick is also 'having some' from Ma. "Would Ma let him have some or would she say, 'No way Jose, that's only for Jack?' " (43)

Freud suggests that fixation at certain points would lead to personalities that are overly vain, exhibitionistic and sexually aggressive. At this stage boys may develop Oedipus Complex. The love towards mother is the

dominant theme in the child's psyche in his early years. Soon he begins to see his father as a rival for the mother's love. He begins to develop fantasies of killing his father so that he will have no rival for the mother's love.

In Jack's case, he in the fit of Oedipus rage thinks that Old Nick may suck his mother's breast. So Jack using remote falls down the jeep from the shelf on the top of Old Nick's head, who is lying on the bed with his Ma. Within Room due to the fear towards Old Nick he tries to suppress his desire and he is not even saying a word about his doubt of 'having some'. Jack is burying it alive in his unconscious. Therefore it does not get deleted, but gets caught by the Id.

Panopticism

Panopticism, term popularised by Michael Foucault in his *Discipline And Punishment*, is a kind of surveillance in which the gaze of the watcher is internalized by the prisoners so that each prisoner becomes his or her own guard. Ma and Jack suffer from the panoptic view throughout the novel. Inside Room it is Old Nick who becomes the eyes behind this panopticism and outside room the society itself becomes the watcher of this panoptic vision.

When inside the Room, Ma is annoyed with Old Nick's view, and when outside she is annoyed with societal views and their words. "But I hate the way the media calls him a freak, or an idiot savant, or feral, that word..." (77). Since Ma and Jack have a lot of Fans they will be continuously noticed and watched by their fans. Starting from the crucial point of the liberation of Jack and Ma, they find themselves suddenly in the spotlight, dealing with journalists and paparazzi hounding them for statements, pictures and interviews. Both inside and outside the Room they are caught with panopticism.

Prisonization

Prisonization theory suggests that prisoners gradually get used and even adapt to prison life, and since their confined limited life does not allow them to practice lots of activities, they unconsciously assimilate to the few habits entailed by confinement.

For Ma Room is literally the prison and she is the prisoner prisoned by Old Nick for his sexual desire. Ma's prolonged isolation and unconscious adaptation to confinement caused her a social paralysis and a psychological barrier to communicate with others. Her lack of communication was internalized as a habit, so she found it difficult to break in the external world. Her trauma was embedded in her unconscious mind so that it overshadowed her new life. As suggested by prisonization theory, the prolonged confinement gradually distorts one's desire and perception of freedom since their prison becomes the 'normal' place to be in. Indeed, this is exactly what occurs to Ma and Jack. Ma expressed this as "when our world was eleven foot square it was easier to control" (293).

As far as Jack is concerned Room is not at all a prison for him because he was unaware of the outside world. But the problem is that since he is adapted to that prison life, he cannot accept the outside world and he urges for the Room or the 'large womb'. "Why is it better out than in? Ma said we'd be free but this doesn't feel like free." (318) Jack's rejection of freedom seems plausible considering the years he spent in captivity in his shed, where he internalized his own habits and shaped his beliefs. As a result of this they suffer from social anxiety. Though the escape from the Room urges the characters to rebuild some fundamental human concepts like identity, meaning of freedom and the relationships and this rebuilding will be based on the 'Room: the Unconscious'.

Ma the Rape 'Victim'

According to certain researches conducted and reported by the National Violence against Women Prevention Research Centre of the Medical University of South Carolina, depression is a common mood disorder among rape victims that occurs when feelings associated with sadness and hopelessness continue for long periods of time. 30% of rape 'victims' experienced at least one major depressive episode in their lifetimes, and 21% of all rape victims were experiencing a major depressive episode at the time of assessment.

Ma was a rape victim not for a few hours or days or months but for years. Therefore in Ma's condition too, the possibility of being haunted the past sexual violence is high and so we can say even if Ma tried to start a new independent living she would be haunted by the past i.e., Room is not a departure but it is a continuation.

CONCLUSION

Through the psychological lens we can reach the answer that both Ma and Jack cannot escape completely from the Room because the Room itself becomes the Id. As far as the psychoanalytic theories concerned, particularly

Freud's, we can understand that since Room becomes the Id, the influence of Room will be there as long as the life Ma and Jack exist.

According to Freud and Lacan the events a child face during the stages of identity formation, the past trauma, repressed desires and emotions, everything will be buried alive within our unconscious or the Id. Therefore Jack cannot simply escape from the room.

Joy Newsome or Ma has a troubled journey throughout the novel. Ma was in fact suppressing her trauma, her stress, her anxiety, her adulthood, and even her identity for the sake of Jack. When analysing her psychological complexities with Freud's and Chodorow's statements it is quite sure that all those suppressed emotions and repressed desires will be forced into the unconscious or Id. Therefore Ma too cannot simply escape from the Room.

When Emma Donoghue ends the novel by saying "goodbye" it is quite sure that their life cannot get separated from room with this "good-bye". As Jack says now Room feels like a crater it should be noted that once the crater has formed, whatever changes happen it will exist in one way or the other, its influence will be there. Therefore saying "good-bye" to room cannot be considered as a departure from the room but it is a continuation of room – a continuation of unsettled identity, a continuation of traumatic after effects, a continuation of anxieties and stresses.

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Design of High-Speed, Low Power, Programmable Multi-Modulus Pre-Scalar Using 45NM CMOS Technology

Mamatha B. R* and Veena M. B

Department of Electronics, B M S College of Engineering, Bangalore, India

ABSTRACT

Clock divider plays an important role in the design of phase locked loop (PLL). PLLs are extensively used in Radio frequency synthesizer. Importance of the clock divider is to convert the higher frequency signal to a precision reference frequency to allow phase comparison and locking in the working of PLL. It is observed that the most of PLL power consumption is happening at clock divider block. Therefore, a high-speed low power clock divider design is very essential to reduce overall power consumption of PLL block. The main aim of this work is to design a clock divider with low power dissipation which can work at lower supply voltage and high frequency using 45nm CMOS technology. The 9.7 GHz clock divider is designed for a division ratio of up to 255 at 1 volt. The comparison results shows that the proposed design achieves the best reported efficiency for a Mod256 clock divider operating at the lower supply voltage.

Keywords: Phase locked loop (PLL), Clock Divider, CMOS, Frequency Synthesizer.

1.INTRODUCTION

Serdes plays an important role in the analog integrated circuits. Sender and receiver are the main blocks of communication. These transmitters and receivers require different clock signals with different frequencies. The high-speed characteristics of the transmitter or receiver are mainly limited by the bandwidth limitations of their circuit blocks. One such unit is the clock divider, which is used in almost every radio or cable transceiver. In a multi clock domain (MCD)[11] system, clock generation and clock distribution are more expensive because of power dissipation. The clock generator will generate different frequency clock signals for the MCD from a single crystal oscillator using a PLL [10] (as a frequency multiplier), followed by a clock divider in the feedback loop. Therefore, clock divider with low power consumption is essential in the design of clock generator.

As the technology advances towards lower nodes there is more need to maintain the tradeoff between power, area and performance. Operating frequency of the divider decides the speed whole clocking block. Different protocols are used Serdes communication to get high speed and better performance. Design of higher version of protocols generally requires improved speed and good performance factor. Power reduction is the leading factor in these applications. Therefore, more efficient frequency divider is required to be used in the latest protocols.

Many designs are available for high speed multi modulus divider like Phase switching multi modulus frequency divider (PS- MMFD) [1], Folded MOS current mode logic (FMCML) [2], Injection locked frequency divider (ILFD) [3], Static Frequency Divider (SFD) [9].

In PS-MMFD method in order to reduce the quantization noise new architecture of divider is introduced using glitch free phase shifting for fractional PLLs. In FMCML Centurelli, et al introduced a new modelling strategy to indicate the relationship between propagation delay and power consumption on deviation currents also demonstrated difference between flop with level shifter and without shifter and how they will influence performance. In ILFD to increase locking range of PLL Hong-Yeh et al used a new topology made up current reused oscillation cores with transformer coupling. A speed optimization scheme in divider is implemented in SFD using novel design of master slave flops. Low power and high-performance footprints are important to facilitate the SoC applications. A Low supply voltage can be assigned by advanced technology nodes or by depending on system specifications. Reducing the number of logic gates and voltage is one such approach, that can be used in high-speed application. Design of clock divider is as shown in figure 1. The main blocks are, multi modulus counter, comparator and SR latch. The main bottle neck of the design is multi modulus counter since it works at very high frequency. Therefore, efforts are made to reduce power consumption in the design of counter by reducing number of combinational gates.

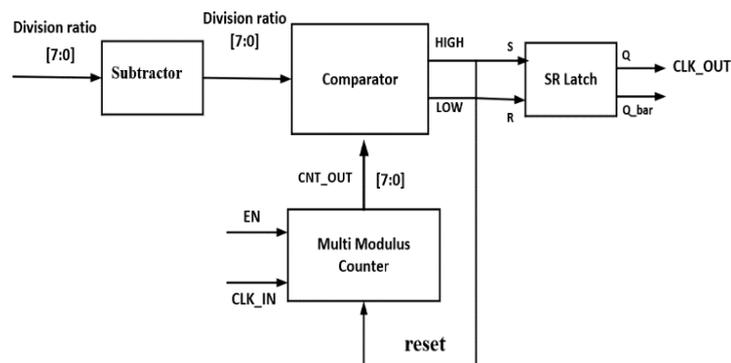


Figure 1: Clock divider block diagram

2. PROPOSED METHODOLOGY

2.1 D Flop Design

The flop used is D flip flop in design of counter. Instead of using conventional D flop, a new flop made up of 2:1 multiplexer is used. It has an added advantage of design reusability. A flip flop is a combination of positive and negative latch. In this D flip flop, same 2:1 multiplexer is used to design both positive and negative latch by giving feedback to appropriate input. Design and schematic of the flop is as shown in figure 2. A positive edge flop with reset and enable is used in counter in order to reset the flops after reaching maximum count with respect to division ratio.

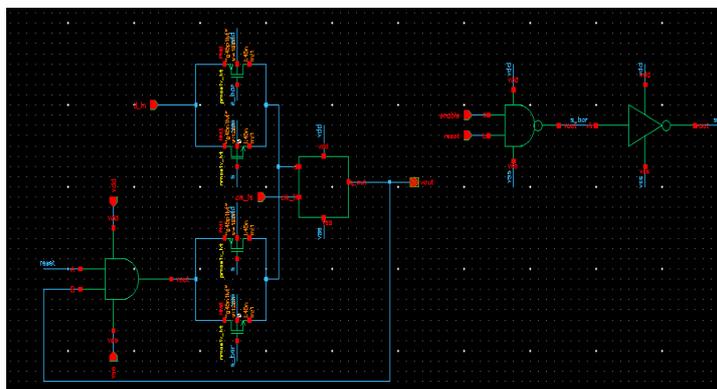
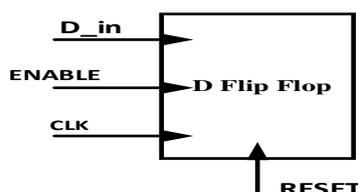


Figure 2: D flip flop design and schematic

2.2 Mod16 Counter

A High-speed frequency divider is implemented using unique design of counter. In conventional design a counter, Boolean expression is written by looking at excitation table of required flip flop. But as the number divisions increases, required number flops go on increasing which results in lot of combinational gates between the flops. This results in combinational delay which will made the design to violet timing constraints. In a proposed design of counter this combinational delay is predominately reduced by removing gates between the flops.

A Mod 256 counter requires 8 flops. Counter is designed in such way that, first two flops are made to works at high frequency i.e., operating frequency of divider and following flops are made to work at lower frequency i.e., 1/4 of operating frequency. This is achieved by inserting the synchronization logic between 2nd and 3rd flop as shown in figure 3. Same counter can be extended for mod256. A pulse is generated from second flop and it is given as clock to all other flops. Generated pulse is synchronized with original clock. By looking state table of counter AND gate logic is implemented for blocks after 4th stage and it is fed as input to flops.

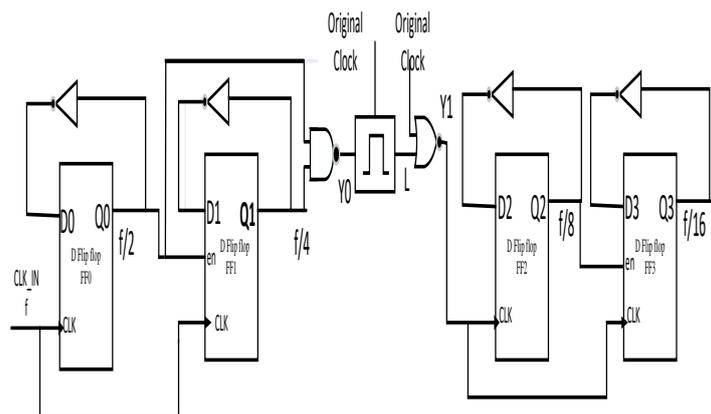


Figure 3: Mod16 counter

2.3 Comparator

A 4 bit digital comparator is designed. Comparator will take two 4-bit numbers as input in binary form and determines whether one number is equal to the other number .and if both the inputs are equal it will generates two output as set and reset signals, set as High and reset as Low.

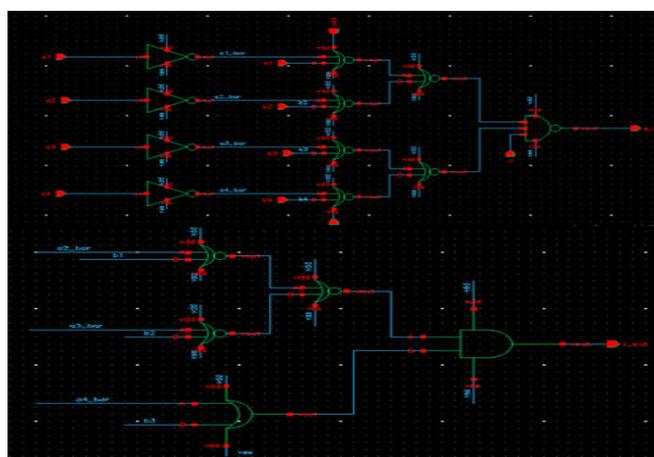


Figure 4: Schematic of Comparator

2.4. S R Latch

In the proposed design, NOR based SR latch is used, The generated Set and Reset pulse from the comparator output is given as Set and Reset input for the SR Latch. The divided output is achieved from the Q and Q_bar of the SR Latch. Obtained comparator outputs Set and Reset are in such a way that the time difference between S and R is exactly half clock period of the divided output.

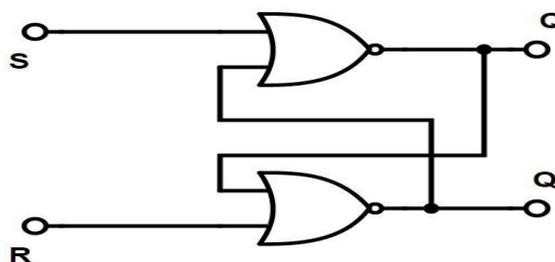


Figure 5: S R latch

3. EXPERIMENTAL RESULTS

By integrating all the components, multi modulus counter comparator and SR latch obtained clock divider is as shown in figure 6. As soon as the supply voltage is turned on as we start giving clock to counter, it starts counting from 0 to 256, based on division ratio i.e., whichever the frequency we required at output division number will be given as input to comparator. Whenever counter output is equal comparator input a high pulse is generated from comparator. This pulse act as input signal to S R latch to provide divided output. Pre simulation result and waveforms are shown in figure 7. And figure 8. Table 1 shows comparison of proposed divider across other multi modulus clock divider.

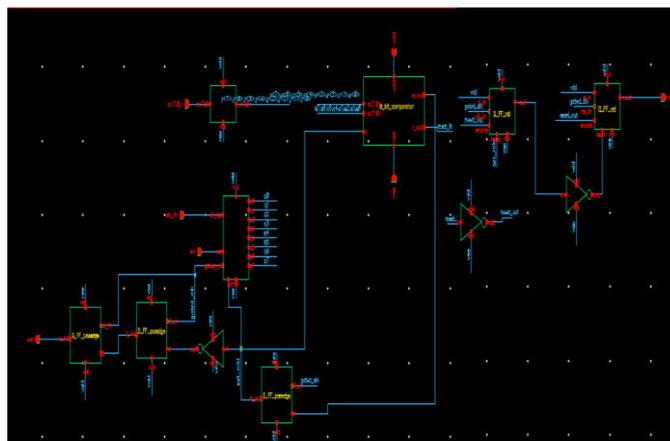


Figure 6: Frequency divider schematic

Test	Output	Nominal	Spec	Weight	Pass/Fail
divider_256	clk_in_freq	9.709G			
divider_256	s_in	359.6M			
divider_256	q_out	359.6M			
divider_256	r_in	359.6M			
divider_256	D_C_clk_in	51.77			
divider_256	D_C_q	51.51			
divider_256	D_C_gated_dk	46.84			
divider_256	val_a_dec1	27			
divider_256	val_y_binary	25.07			
divider_256	D_C_s	3.713			
divider_256	val_y4	1.001			
divider_256	val_a1	1			
divider_256	val_a3	1			
divider_256	val_a4	1			
divider_256	val_y3	1			
divider_256	val_a0	1			
divider_256	val_y0	1			
divider_256	val_y2	770.7u			
divider_256	val_y5	756.9u			

Figure 7: Pre-Simulation results

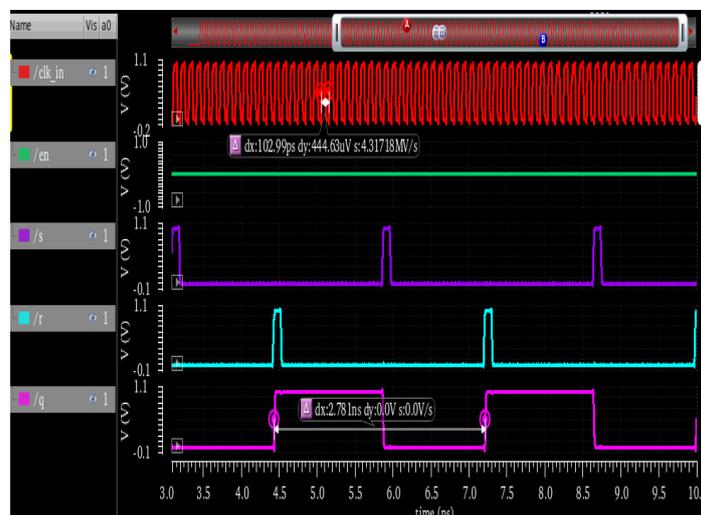


Figure 8: Timing waveforms for divider

Table 1: Comparison of performance

	Saberkar i et al[4]	Abdel et al[5]	Krishna et al[6]	Tsai et al[7]	Kreibig et al[8]	Proposed work
Technology node	180nm	150nm	65nm	180nm	180nm	45 nm
Supply voltage	3.3V	1.35V	1V	1.8V	1.8V	1V
Operating frequency	7.5GHz	2GHz	17GHz	12GHz	8.1 GHz	9.7 GHz
Power dissipation	3.74mW	16.78mW	2mW	28.1 mW	18.4 mW	1.67mW
Divider ratio	2	1-256	64,80,96,100, 112,120,140	256,260,264, 268	8-127	1-256

4. CONCLUSION

Programmable high speed, low power clock divider is successfully implemented with smart design of multi modulus counter. D flop used in the counter is uniquely designed using 2:1 mux to increase design reusability. The clock divider is implemented for 8-bit size which can provide a range of frequency divisions from 2-255. Simulation results shows that the clock divider can work up to an operating frequency of 9.7 GHz. In addition, the clock divider consumes 1.67 mW of power at a supply voltage of 1 V with a total of 453 transistors. The comparison results shows that the proposed design achieves the best reported efficiency for a Mod256 pre-scaler operating at the lower supply voltage.

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To Synthesis and Characterization of Activated Carbon of Ziziphus Mauritiana (Ber) Fruit Seed and their use for Removal of Congo Red Dye from Contaminated Wasyewater

Anjali Bohra*, Nitu Kanwer Rathore and Kailash Daga

Department of Chemistry, Faculty of Science, Jai Narain Vyas University, Jodhpur, Rajasthan, India

ABSTRACT

This study looked at the adsorption of Congo red dye into activated carbon generated from Jujube (*Ziziphus Mauritiana*) seeds. Batch adsorption experiments were used to explore the effects of pH, contact time, adsorbent dosage, and initial concentration on adsorption. Equilibrium is achieved in 105 minutes. When the amount of adsorbent and the pH value increased, the amount of adsorbent increased as well. *Ziziphus mauritiana* seeds have the capacity to be used as a low-cost adsorbent, according to the results of the experiment. Its adsorption has been compared in the literature to that of other low-cost adsorbents. The surface properties of the adsorbent were studied using SEM and FTIR.

Keywords: Activated carbon, SEM, FTIR and Adsorption.

INTRODUCTION

As human needs rise and society advances, a wider range of finished items of various types is required. As a consequence, each country has a diverse range of sectors that have grown and thrived. In industries, water is used as a raw material, a procedure, or both. Throughout the process, only a water molecule is absorbed, with the rest being discharged as effluent. These effluents contain a wide range of inorganic components, containing hazardous substances, and are frequently deposited into surface channels such as rivers, streams, lakes, or seas, with or without treatment, or into sewers. Liquid industrial effluents are a big issue because of their toxic effects.

Electrochemical deterioration, coagulation / flocculation, membranes separation, activated carbon adsorption, microbial degradation, biological treatment scheme, oxidizing, or includes many components are all methods for removing colours from wastewater. These solutions have certain drawbacks in general [1]. Activated carbons are commonly employed as dye adsorbents due to their high adsorption capacity, and they are very efficient. However, in practice, the use of activated carbons for adsorption has been reduced due to related difficulties such as disposal. The regeneration process is also quite pricey. Activated carbons are quite expensive, as proven by multiple research studies, and they have been used to remove colors from wastewater on a regular basis. As adsorbents, researchers used low-cost agricultural and forest materials and products.

MATERIAL AND METHOD

Preparation of Adsorbate

To avoid other metallic ions interfering with waste water, artificial waste water, also known as standard solutions, was invented. It was used to construct a set of traits that were all identical. We made a stock solution with varying metal ion concentrations. The reagents were AR-grade compounds dispersed in deionized water.

A 1000 ppm Congo red dye stock solution was made by dissolving 0.1 g of Congo red dye in an 1000 ml of volumetric flask and diluted with de-ionized water up to the calibration level. Congo red dye sample solution of 50 ppm, 100 ppm, 150 ppm, and 200 ppm were created using correct dilution. [2]

Preparation of Adsorbent

A sample of jujube seeds was purchased. The seeds were washed and dust was removed with distilled water before even being roasted in an oven at 80 degrees Celsius. A mortar and pestle were used to grind the dry material. 50 g of the pulverized accurately weighed and digested for 24 hours in 50 ml of phosphoric acid while stirring continuously in a beaker. The sample was then screened, thoroughly rinsed with distilled water, and dried at 80 degrees Celsius in an oven.

In crucibles, the dried material was carbonized for 1 hour at 500°C. The resulting activated carbon (adsorbent) was rinsed and dried. The charcoal was prepared to use as an adsorbent for dye removal.

Physiochemical Characterization

SEM micrographs of the surface of *Ziziphus mauritiana* activated charcoal, shown in fig. exposed that activated charcoal of ZM has cavities to the level of their surface area. Surfaces are heterogeneous and have a variety of structures. The adsorbent itself is permeable.

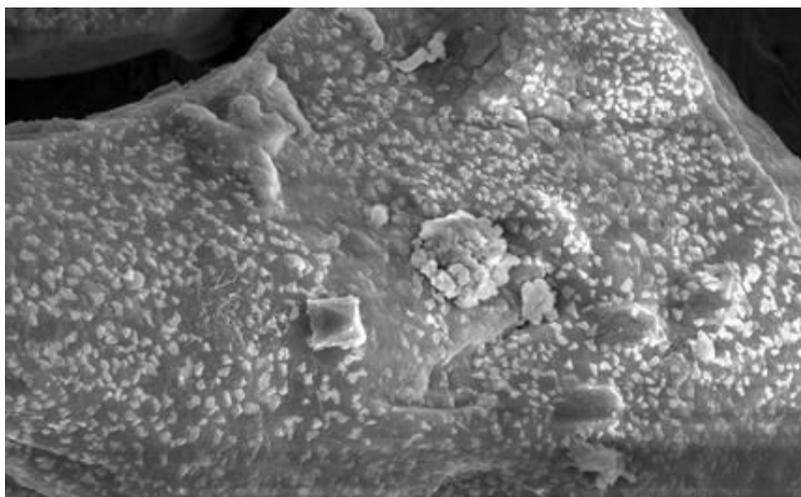


Figure No.1. SEM of Adsorbent

FTIR

The presence of bounding hydroxyl (–OH) or amine (–NH) groups created the major peak in the spectra of AC-ZM at 3224 cm⁻¹. Aliphatic acids' symmetric and asymmetric C–H stretching vibrations create the signal at 2929 cm⁻¹. Carboxylic acids or their esters have a peak at 1688 cm⁻¹ that corresponds to the stretching vibration of a bond formed by nonionic carboxyl groups (–COOH, –COOCH₃). The C–O stretching in ether or alcohol, as well as the methoxy group, is visible in the bands at 1315 cm⁻¹. [3]

The bands 1602 cm⁻¹ denote the substituent region of the C=O, C–O, and O–H groups, which exist as binding sites. A conjugated hydrogen linked carbonyl group causes the peak at 1446 cm⁻¹.

1. The presence of carboxyl groups (–COOH) is indicated by the signal at 1460 cm⁻¹. The presence of C–H aliphatic bending is suggested by the peaks at 1315 cm⁻¹.

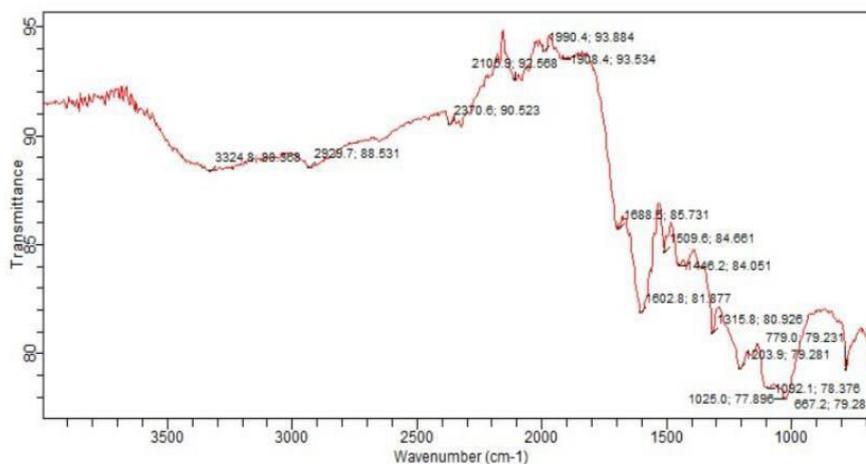


Fig. No.2 FTIR of activated carbon of ZM

OBSERVATIONS

Batch Method Study

The adsorption capacity of Ziziphus was measured by contacting 1.5 grime of adsorbent in 250 ml conical flasks with different capacity concentration of dye solution (60 – 200ppm). The mixture was agitated at 500 rpm in a rotary shaker before being purified through Whatman filter paper (No. 1). The residual level in the filtrate was determined using a spectrophotometer calibrated to 540rpm. Batch adsorption studies were used to evaluate the effects of initial concentration (15- 135 minutes), pH (3, 5, 8, 10, 12), adsorbent dosage (2, 4,6,8 gm/l), and dye concentrations of 60-200 ppm. After agitating the sample for the requisite contact time, centrifuging, and filtration the contents with Whatman filter paper, the untreated dye was quantified using a spectrophotometer.

$C_e = C_o - (\text{percent adsorption} \times C_o / 100)$ was used to calculate the equilibrium concentration. The adsorbent's removal efficacy (E) was calculated as

$$E (\text{percent}) = [(C_o - C_e) / C_o] \times 100.$$

The initial and equilibrium dye solution concentrations (mg/L) are C_0 and C_e , respectively. Observations are summarized in followings tables as showing below:

Table No. 1: Effect of Initial Concentration of Congo red Dye on % Removal by Ac-Zm at Contact Time 105 Min and Effective Ph 8

Concentration(ppm)	% REMOVAL			
	2g/l	4g/l	6g/l	8g/l
50ppm	67	73.6	80.3	88.2
100ppm	65.3	70.3	75.2	86.5
150ppm	62.3	69.2	73.2	83.2
200ppm	60.5	65.2	70.1	81.5

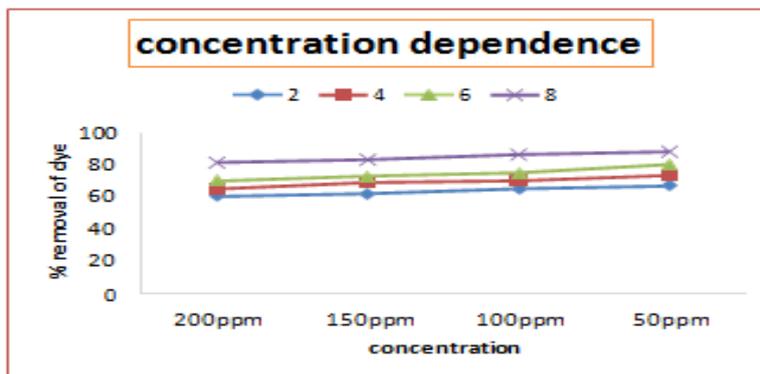


Figure No.3.Effect of initial concentration of Congo red dye on % removal by AC-ZM atcontact time 105 min and effective pH 8

Table No. 2: Effect of Ph of % Removal of Congo red Dye at Different Concentration by 8g/L Dose by Ac-Zm at Contact Time 105 Min

pH	% REMOVAL			
	200ppm	150ppm	100ppm	50ppm
3	48.3	54.6	65.1	72.1
5	54.3	60.1	70.0	77.3
8	67.1	73.5	80.8	88.2
10	57.8	63.1	70.8	79.1
12	52.7	58.6	65.1	76.7

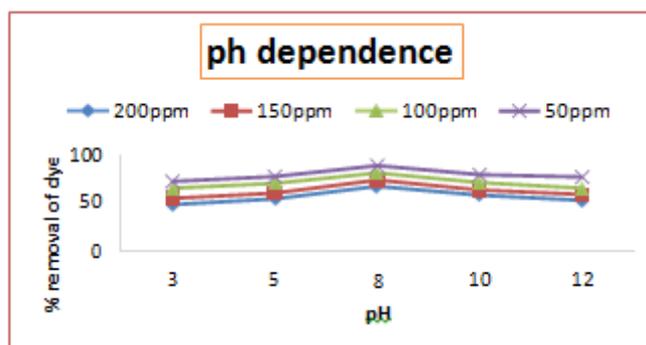


Figure No. 4 Effect of pH of % removal of Congo red dye at different concentration by 8g/l dose by AC-ZM at contact time 105 min

Table No. 3: Effect of Adsorbent Dose on Adsorption Capacity for Ac-Zm

Dose (g/l)	Adsorption capacity (mg/g)			
	200ppm	150ppm	100ppm	50ppm
2	50.67	47.65	33.45	22.54
4	26.78	20.90	16.45	13.32
6	24.67	18.56	13.45	8.89
8	21.78	16.78	10.21	5.56

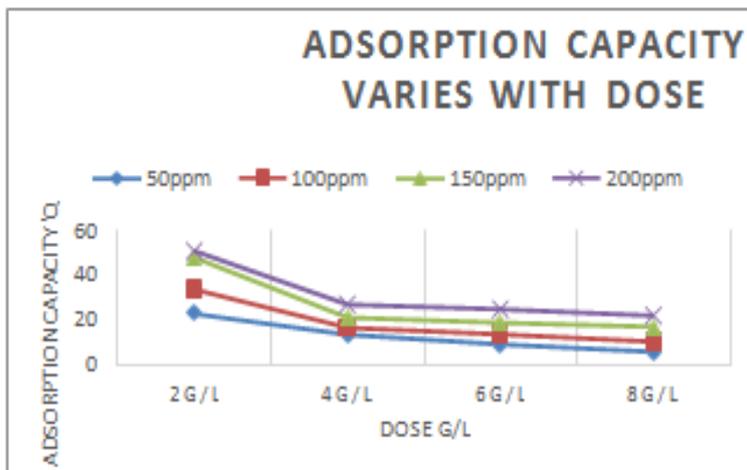


Figure No .5. Effect of adsorbent dose on adsorption capacity for AC-ZM at contact time 105 min and pH 8

Table No.4: Value of Langmuir Adsorption Isotherm Constant for Adsorption of Congo red Dye

Dose (g/l)	Langmuir Constants			
	Qm(mg/g)	b(l/mg)	RL	R ²
2	189.64	0.006012	0.7922	0.9852
4	87.20	0.008952	0.7022	0.9987
6	51.0	0.01523	0.5977	0.9756
8	42.33	0.02536	4.5632	0.9998

Table No.5 Value of Freundlich Adsorption Isotherm Constants for Removal of Congo red Dye

Dose (g/l)	Freundlich constants			
	K _f	1/n	N	R ²
2	1.732	0.7993	1.251	0.9985
4	1.192	0.7716	1.296	0.999
6	1.256	0.7326	1.365	0.999
8	1.551	0.7127	1.403	0.996

Table No. 6: Freundlich Isotherm for Effect of Adsorbent Dose 8g/L Amount on Adsorption of Congo red Dye on Ac-Zm

Logq	logce/q(8g/l)
1.92	0.87
1.93	1.16
1.95	1.45
1.97	1.62

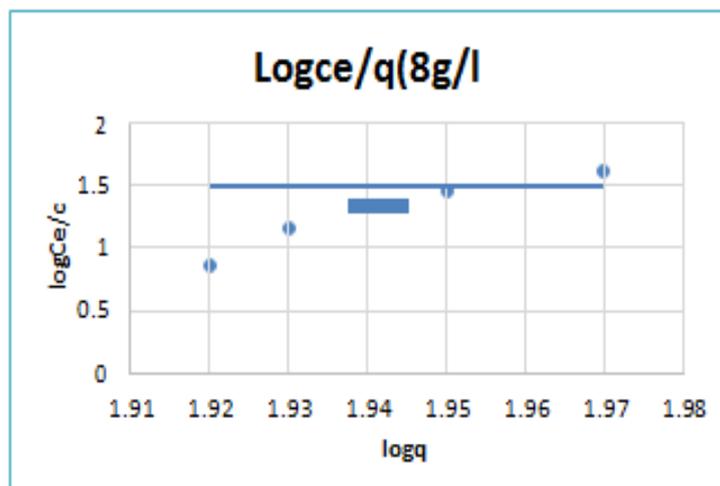


Figure No. 6 Freundlich isotherm for effect of adsorbent dose 8g/l amount on adsorption of Congo red dye on AC-ZM

Table No. 7: Langmuir Isotherm for Effect of Adsorbent Dose Amount 8g/L on Adsorption of Congo red Dye on Ac-Zm

Ce	Ce/q
7.3	1.152
15.2	1.352
26.3	1.662
40.1	1.952

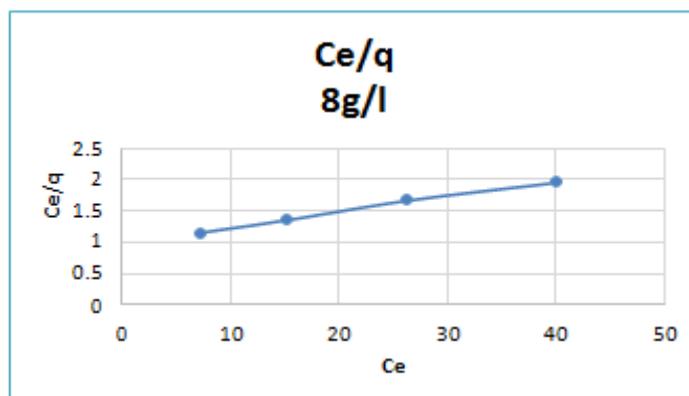


Figure No. 7 Langmuir isotherm for effect of adsorbent dose amount 8 g/l on adsorption of Congo red dye on AC-ZM

RESULT AND DISCUSSIONS

Effect of Ph

The influence of starting pH was investigated in this study in the pH range of 3-12. By raising the pH of the solution from 3 to 12, the percent absorption of Congo red dye for Ziziphus seed was improved. The dye removal behavior in relation to pH can be attributed to a number of reasons. The pH of the aqueous is a significant controlling factor in the adsorption process.

It affects the surface charge of the adsorbent as well as the degree of dye ionization in solution.

The Effect of Initial Concentration

The effect of measuring the absorption of Congo red dye by activated charcoal surface was observed at equilibrium time 105 minutes, and it was defined that at pH 8, 88.2 percent of the Congo red dye was eliminated, while at pH 10 and 12, 79.1 percent and 76.7 percent of the dye was removed, respectively. As a result, the optimal adsorption pH for removal of dye was revealed to be pH 8.

the influence of starting Congo red dye concentration on Congo red dye percent elimination by AC-ZM concentration The percent removal efficacy is 88.2 percent at higher doses and 86.5 percent at lower concentrations, according to the findings (50 and 100ppm).

The Effect of Adsorbent Dose

Effect of adsorbent dose on dye removal percentage Adsorbent doses were varied (2, 4, 6, 8, g/L), and adsorption tests were carried out at pH 8. According to the findings, increasing the activated charcoal dose to 8g/L increases with the number of metal ions adsorbed on the charcoal, but the rise in removal is minor after that. As a result, the effective dose required to achieve 88.2 percent elimination was calculated to be 8g/L.

Langmuir and Freundlich Constant

The Langmuir and Freundlich constants increased as the temperature rose. The value of the dimensionless equilibrium parameter RL is beneficial for AC-ZM for zinc and lead.

The stronger the link, the better. The R^2 values for Congo red and Brilliant yellow are 0.998 and 0.996, respectively, confirming the model's suitability.

ACKNOWLEDGMENT

I'd like to thank my research supervisor Dr. Kailash Daga of the Department of Chemistry at Jai Narain Vyas University in Jodhpur for his wonderful assistance, encouragement, motivation, and recommendations.

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Study of Selective Oxidation of Substituted Benzyl Alcohols by Morpholinium Fluorochromate

Jitendra Ojha, Bhawana Arora and Pallavi Mishra*
Department of Chemistry, JNV University, Jodhpur- 342 001, India

ABSTRACT

Morpholinium fluorochromate (MFC) is a mild oxidizing agent and we have used it for the specific oxidation of some monosubstituted benzyl alcohols in the dimethyl sulphoxide solution. Corresponding benzaldehydes were the products obtained after oxidation. The reaction was first order both in MFC and the substituted benzyl alcohols. All kinetic studies were done using Non aqueous solvent and P-toluene sulphonic acid as catalyst was used for our reactions. KIE (p) was confirmed by the oxidation of α, α -dideuteriobenzyl alcohol (PhCD₂OH). Different organic solvents were used to study the reaction kinetics. Multi-parametric equations were used to study solvent effect. Ortho, para and meta substituents effect were also studied on the oxidation rate, using Charlton's multiparametric equations. The value of η was obtained positive, clearly suggesting that rate-determination step involves an electro-positive reaction centre. Suitable mechanism has also been suggested.

Keywords: Benzyl alcohol, oxidation, morpholinium fluoro chromate, solvent analysis, kinetics, mechanism.

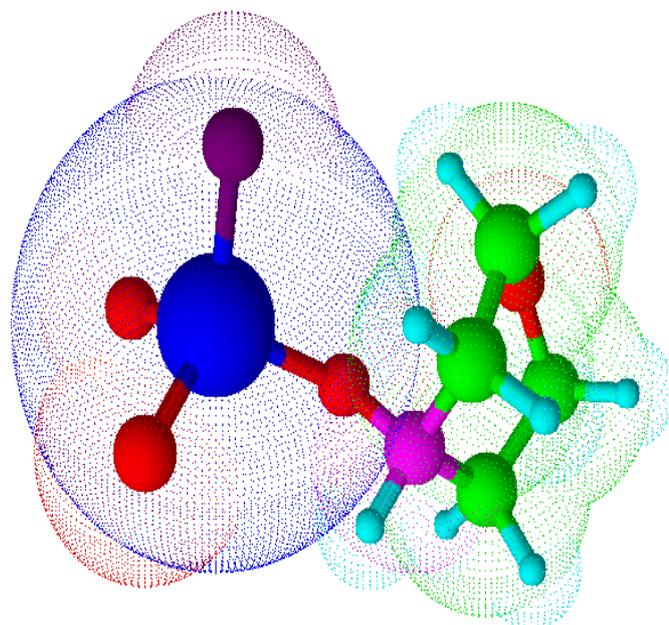
INTRODUCTION

Halochromates have always been associated with the oxidation of various organic molecules in the process of organic synthesis. They are basically very mild and specific oxidizing reagents used for the study of reaction kinetics [1]. Morpholinium Fluorochromate (MFC) is also one such oxidizing agent, which is commonly used for the oxidation of various organic compounds [2]. We have chosen substituted benzyl alcohols as substrate. They are aromatic, transparent and water-soluble liquids which are polar and nontoxic in nature. Due to their water and alcohol solubility, they undergo selective oxidation in the presence of non protic solvent and forms corresponding benzaldehydes, which are commercially used in the food items for enhancing almond flavour, in the pharmaceuticals and in plastics as an additive. Thus, oxidation of monosubstituted benzyl alcohols is very important process commercially.

In continuance of our earlier work [3-6], in this article we report the kinetics of oxidation of some monosubstituted benzyl alcohols by MFC in which we have used DMSO as a solvent, resulting in the formation of corresponding benzaldehydes. This work has not been reported so far in the DMSO, which is an aprotic solvent. We have also tried to correlate reactivity and structure in this reaction.

EXPERIMENTAL

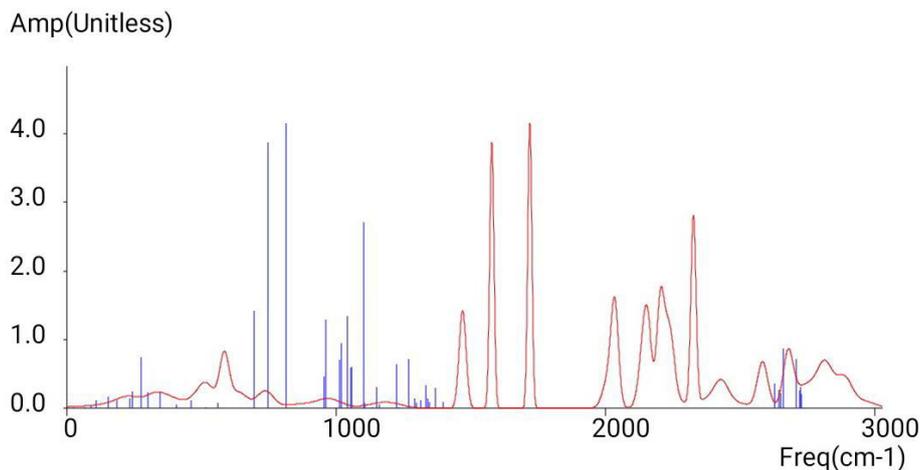
Materials



MFC 3D structure



MFC



MFC: IR Spectrum

We have prepared MFC by the method already reported [2] and we have used iodometric method to check its purity. The purification of alcohols was done by the method described earlier [7]. α,α -Dideuteriobenzyl alcohol (PhCD_2OH) was also formed by the given method [8]. Its isotopic purity was found out by the NMR spectra, which was $96 \pm 3\%$. Para toluenesulphonic acid (TsOH) has been used as H^+ ion source. Solvent's purification was done by their usual reported methods [9].

Product Analysis

We have done the product analysis under kinetic conditions. For this in a typical experiment, we have taken different substituted benzyl alcohols (5.4 g, 0.05 mol) and MFC (3.10 g, 0.01 mol). The solutions were made up to 50 cm^3 in DMSO and set aside in the dark for 15 hr to make sure the completion of the reaction. This is important to avoid auto oxidation. Then we treated the solution with a saturated solution of DNP with HCl and kept it in the refrigerator overnight. Now we filtered off the precipitated DNP, dried and weighed it, recrystallized it by using ethanol, and weighed it again. The yields of DNP before and after recrystallization were 2.64 g (92%) and 2.34 g (82%), respectively. The mixed m.p. of this DNP was found similar with the m.p. of the DNP of corresponding benzaldehyde. Oxidation state of Cr in the entirely reduced reaction mixtures was determined iodometrically and was found to be 3.90 ± 0.16 .

Kinetic Measurement

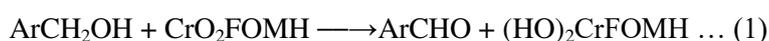
We have maintained a large excess ($\times 15$) of the Benzyl alcohols over MFC to attain the pseudo-first order conditions. We have used DMSO as solvent and followed their actions, at constant temperatures ($\pm 0.1 \text{ K}$), by observing the gradual reduction in the concentration of MFC spectrophotometrically at 356 nm. No considerable absorption was shown by other reactant or product at 356 nm. Linear plots of $\log [\text{MFC}]$ versus time for up to 80% of the reaction ($r = 0.990 - 0.998$) indicated pseudo-first order rate constant, k_{obs} . The rate constants were reproducible with in $\pm 3\%$. The second order rate constant was obtained by the relation: $k_2 = k_{\text{obs}}/[\text{alcohol}]$. No PTS was used in the reactions where effect of H^+ was not studied.

RESULTS AND DISCUSSIONS

We have obtained rates and all other experimental data for all the given substituted benzyl alcohols. As the results are similar, we have reproduced only representative data here.

Stoichiometry

Corresponding benzaldehydes were formed by the substituted benzyl alcohols oxidation by MFC. Products analysis and the stoichiometric determinations point toward the following overall reaction (1). Here H of $(-\text{CH}_2)$ is different for different benzyl alcohols.

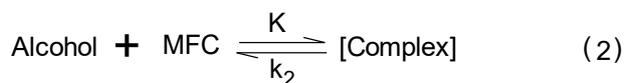


Thus, there is a two electron change in this reaction by MFC. It is also in conformance with the earlier studies with MFC [3-6]. Both PFC [10] and PCC [11] also work on the same line and are reduced to the chromium (IV) species, which can be shown by deciding the oxidation state of the chromium.

Rate Laws

The reactions show first order kinetics wrt the MFC. A typical kinetic run is represented in Fig. 1. Moreover k_{obs} (pseudo-first order rate constant) is not dependent on the initial concentration of MFC. Table 1 clearly shows

that the rate of reaction is increasing with the increase in the concentration of the alcohols. But it is nonlinear. A plot of $1/k_{obs}$ versus $1/[Alcohol]$ is linear ($r > 0.996$) with an intercept on the rate-ordinate (Fig. 2), which shows the Michaelis-Menten type of kinetics is involved with respect to the alcohols. This leads to the following overall mechanism (2) and (3) and rate law (4).



$$\text{Rate} = k_2 K [\text{Alcohol}] [\text{MFC}] / (1 + K[\text{Alcohol}]) \quad (4)$$

The dependence of rate of reaction on the reductant concentration was calculated at various given temperatures. The double reciprocal plots helped in evaluating the values of K and k_2 . The formation constants of the complex (thermodynamic parameters) and the dissociation constant of the complex's decomposition (activation parameters) were calculated from the values of K and k_2 , respectively at given temperatures (Tables 3 and 4).

Tests for Free Radicals

The benzyl alcohol oxidation by MFC, in nitrogen atmosphere failed to induce the polymerization of acrylonitrile. Further, an addition of a radical scavenger, acrylonitrile, had no effect on the rate (Table 1).

Table 1: Rate constants for the benzyl alcohol oxidation by MFC at 308 K

$10^3 [\text{MFC}] (\text{mol L}^{-1})$	$[\text{Alcohol}] (\text{mol L}^{-1})$	$[\text{TsOH}] (\text{mol L}^{-1})$	$10^4 k_{obs} (\text{s}^{-1})$
1.0	0.1	1.0	12.5
1.0	0.2	1.0	17.2
1.0	0.3	1.0	22.0
1.0	0.5	1.0	24.6
1.0	0.8	1.0	25.9
1.0	1.0	1.0	26.8
1.0	0.8	1.0	28.4
1.0	0.8	1.0	30.1
2.0	0.8	1.0	22.2
4.0	0.8	1.0	23.8
6.0	0.8	1.0	22.9
8.0	0.8	1.0	22.5
1.0	1.0	1.0	21.1*

*Contained 0.001 mol L^{-1} acrylonitrile

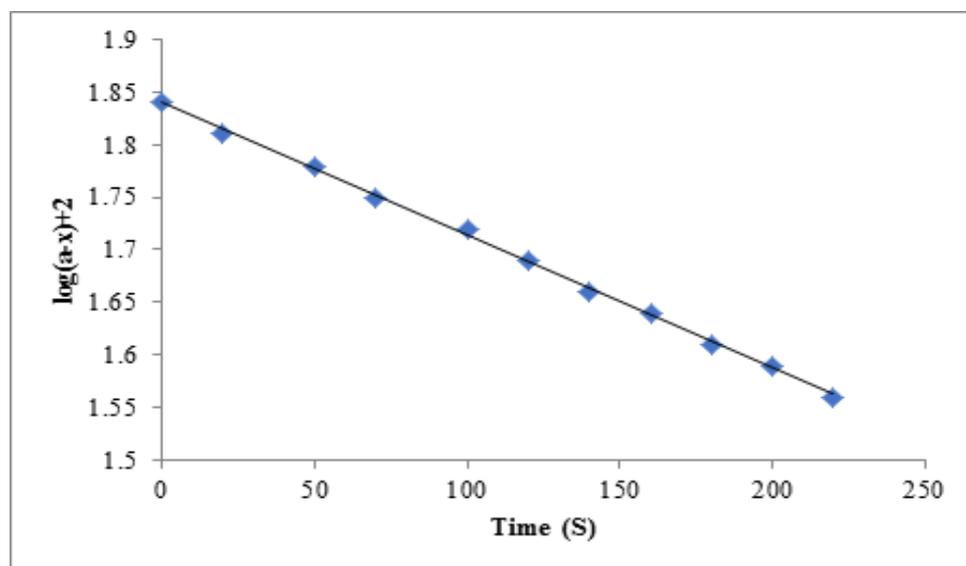


Fig. 1: The Benzyl alcohol oxidation by MFC: A typical kinetic run

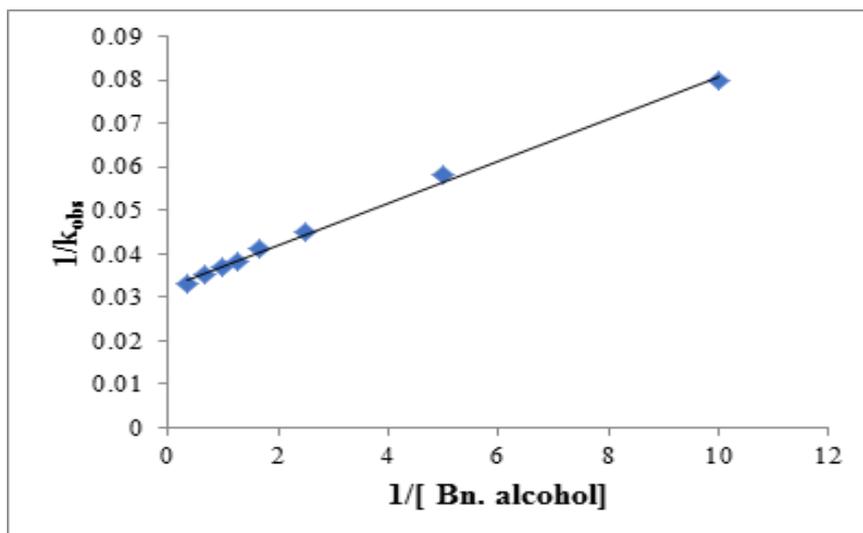


Figure 2: The benzyl alcohol oxidation by MFC: A double reciprocal plot

Effect of Acidity

The hydrogen ions were used to catalyze the reaction. Dependence of the hydrogen-ion has been shown in the form of $k_{\text{obs}} = a + b[\text{H}^+]$ (Table 2). The values of a and b for benzyl alcohol are $8.95 \pm 0.64 \times 10^{-4} \text{ s}^{-1}$ and $15.3 \pm 1.05 \times 10^{-4} \text{ mol}^{-1} \text{ L s}^{-1}$, respectively ($r^2 = 0.9814$).

Kinetic Isotope Effect

The cleavage of the $\alpha\text{-C-H}$ bond in the rate-determining step is a very important step in establishing the reaction mechanism course. For this we have studied the oxidation of α, α -di-deuterio benzyl alcohol and found out that indeed bond cleavage is taking place in the rate determining step. The presence of significant primary kinetic isotope effect has also been shown by our results (Table 3).

Effect of Solvents

Effect of different organic solvents on the oxidation of substituted benzyl alcohols was studied. As MFC reacts with primary and secondary alcohols, the selection of solvents was restricted by the solubility of MFC and its reaction with primary and secondary alcohols. There was no reaction with other solvents chosen by us. As the oxidation process showed similar kinetics in all the solvents, we have shown representative data for benzyl alcohol. The values of k_2 are given in Table 5.

Table 2: Dependence of rate of reaction on hydrogen-ion concentration

[Bn. Alcohol] 0.10 mol L ⁻¹	[MFC] 0.001 mol L ⁻¹			Temperature 308 K		
[TsOH]/mol L ⁻¹	0.10	0.20	0.40	0.60	0.80	1.00
$10^4 k_{\text{obs}}/\text{s}^{-1}$	14.3	16.1	18.6	21.8	26.6	27.5

Table 3: Rate constants and activation parameters of oxidation of substituted benzyl alcohols by MFC

Subst.	$10^4 k_2 (\text{L mol}^{-1} \text{ s}^{-1})$				ΔH^*	$-\Delta S^*$	ΔG^*
	288 K	298 K	308 K	318 K	kJ mol ⁻¹	J mol ⁻¹ K ⁻¹	kJ mol ⁻¹
H	6.64	13.4	28.8	59.4	53.3±1.0	45±3	66.5±0.9
p-Me	12.6	26.5	58.9	102	51.4±1.3	46±4	64.8±1.1
p-OMe	25.4	50.6	103	207	50.8±0.8	42±2	63.2±0.6
p-Cl	4.67	8.58	18.0	38.8	51.4±2.1	55±6	67.5±1.6
p-Br	4.62	8.40	17.9	37.2	50.8±1.9	57±6	67.5±1.5
p-F	6.06	11.8	26.5	56.0	54.3±1.6	42±5	66.7±1.3
p-NO ₂	1.18	2.54	5.10	9.98	51.6±0.1	65±1	70.7±1.2
p-CO ₂ Me	1.91	3.87	7.90	14.9	49.8±0.4	67±1	69.6±0.3
p-CF ₃	1.64	3.26	6.46	12.9	49.7±0.8	69±2	70.0±0.6
p-CN	1.41	2.88	5.83	11.1	49.9±0.3	69±1	70.3±0.2
p-SMe	14.7	30.9	61.8	112	49.2±0.5	52±1	64.5±0.4
p-NHAc	12.4	25.8	54.0	106	52.1±0.4	44±1	64.9±0.3
p-NMe ₂	119	237	469	842	47.4±0.4	41±1	59.5±0.3
m-Me	10.6	21.9	47.1	88.4	51.7±0.6	46±2	65.3±0.5

m-OMe	10.2	20.1	43.5	85.8	51.9±1.0	46±3	65.5±0.8
m-F	3.75	6.95	13.9	26.8	47.6±1.1	69±3	68.1±0.9
m-Cl	3.20	6.41	12.7	24.9	49.5±0.5	64±2	68.4±0.4
m-NO ₂	1.26	2.55	5.06	10.2	50.4±0.7	68±2	70.6±0.6
m-CF ₃	1.64	3.23	6.46	12.9	49.8±0.8	68±2	70.0±0.7
m-CO ₂ Me	1.91	4.26	7.77	15.6	50.0±1.0	66±3	69.5±0.8
m-Br	3.15	6.32	12.6	24.0	49.1±0.3	65±1	68.4±0.3
m-NHAc	7.23	13.8	29.1	60.6	51.6±1.5	50±5	66.4±1.2
m-CN	1.19	2.91	5.76	10.5	52.5±1.6	61±5	70.5±1.3
m-SMe	7.86	15.6	32.7	65.1	51.4±0.9	50±2	66.1±0.7
o-Me	44.4	97.3	182	354	49.7±0.7	41±2	61.8±0.6
o-OMe	37.2	76.8	155	290	49.7±0.2	43±1	62.3±0.2
o-NO ₂	1.35	2.66	5.34	10.8	50.2±0.9	69±3	70.5±0.7
o-CO ₂ Me	5.61	10.3	21.9	43.5	49.9±1.6	58±5	67.1±1.2
o-F	7.50	14.7	30.9	62.4	51.5±1.1	50±3	66.2±0.8
o-Cl	11.1	22.8	47.1	93.9	51.7±0.5	46±2	65.2±0.4
o-Br	14.7	28.2	58.9	110	49.0±0.9	53±2	64.6±0.7
o-I	22.8	45.3	93.0	173	49.2±0.5	48±2	63.5±0.4
o-CN	2.00	4.62	8.31	16.5	50.2±1.3	65±4	69.4±1.0
o-NHAc	57.0	110	221	407	47.7±0.6	46±2	61.3±0.4
o-SMe	54.3	107	209	389	47.5±0.3	47±1	61.4±0.2
o-CF ₃	8.84	19.2	39.9	78.6	52.9±0.1	43±4	65.7±0.9
α,α'-BA	1.90	3.82	7.64	15.2	50.2±0.6	66±2	69.6±0.5
k _H /k _D	3.49	3.50	3.77	3.91			

A linear correlation ($r^2 = 0.9270$) was observed between the activation enthalpies and entropies of oxidation of 33 substituted benzyl alcohols, indicating that a compensation effect is taking place [12]. The isokinetic relationship was established by Exner's [13] plot between $\log k_2$ at 288 K and at 318 K, which was found linear ($r^2 = 0.9978$) (Fig. 3). The isokinetic temperature's value evaluated from the Exner's plot was 662 ± 34 K. The linear isokinetic correlation suggested that in our study oxidation of all the mono substituted Benzylalcohols are taking place by same mechanistic pathway and the changes in the rate of the reaction are taking place because of changes in the entropy and enthalpy of activation.

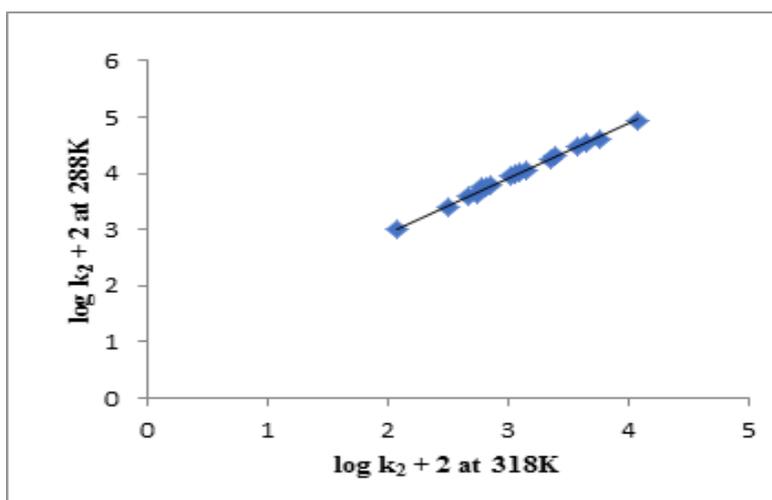


Fig. 3: Exner's isokinetic relationship in the benzyl alcohols oxidation by MFC

Table 4: Formation constants for the formation of MFC-Bn. alcohol complex and thermodynamic parameters

Subst.	$10^4 k$ (dm ³ mol ⁻¹)				$-\Delta H^*$	$-\Delta S^*$	$-\Delta G^*$
	288 K	298 K	308 K	318 K	kJ mol ⁻¹	J mol ⁻¹ K ⁻¹	kJ mol ⁻¹
H	7.95	7.30	6.67	5.95	11.0±0.4	14±1	7.0±0.3
p-Me	7.13	6.53	5.85	5.24	10.4±0.3	11±1	7.1±0.2
p-Ome	6.82	6.20	5.53	4.95	10.7±0.3	13±1	6.9±0.2

p-Cl	6.90	6.25	5.69	5.00	10.5±0.4	12±1	7.0±0.3
p-Br	6.68	6.03	5.40	4.81	10.8±0.2	14±1	6.9±0.2
p-F	6.41	6.79	5.17	4.55	11.2±0.3	15±1	6.8±0.3
p-NO ₂	6.60	5.85	5.21	4.61	11.6±0.1	16±1	6.9±0.1
p-COOMe	7.00	6.35	5.78	5.13	10.3±0.3	11±1	7.1±0.2
p-CF ₃	6.59	5.96	5.35	4.70	11.0±0.4	14±1	6.9±0.3
p-CN	7.09	6.45	5.85	5.24	10.1±0.2	11±1	7.1±0.2
p-SMe	6.87	6.23	5.60	4.95	10.8±0.3	13±1	7.0±0.3
p-NHAc	7.18	6.53	5.90	5.25	10.4±0.3	11±1	7.1±0.2
p-NMe ₂	7.22	6.57	5.96	5.33	10.2±0.2	11±1	7.1±0.2
m-Me	7.23	6.61	5.96	5.33	10.2±0.3	11±1	7.2±0.2
m-OMe	6.90	6.26	5.65	5.03	10.5±0.3	12±1	7.0±0.2
m-F	7.15	6.50	5.86	5.26	10.3±0.2	11±1	7.1±0.2
m-Cl	6.85	6.23	5.60	4.97	10.6±0.3	13±1	7.0±0.2
m-NO ₂	6.50	5.86	5.26	4.60	11.2±0.4	15±1	6.9±0.3
m-CF ₃	7.04	6.45	5.77	5.17	10.4±0.3	12±1	7.1±0.2
m-CO ₂ Me	6.54	5.90	5.30	4.67	10.9±0.3	14±1	6.9±0.2
m-Br	6.77	6.14	5.54	4.90	10.6±0.3	13±1	6.9±0.2
m-NHAc	7.21	6.55	5.92	5.35	10.1±0.1	10±1	7.1±0.1
m-CN	7.30	6.68	6.03	5.42	10.1±0.2	10±1	7.2±0.2
m-SMe	7.10	6.48	5.82	5.25	10.2±0.2	11±1	7.1±0.2
o-Me	7.00	6.37	5.75	5.15	10.3±0.2	11±1	7.1±0.2
o-Ome	6.97	6.35	5.73	5.06	10.6±0.4	12±1	7.1±0.3
o-NO ₂	6.86	6.25	5.61	4.96	10.7±0.4	13±1	7.0±0.3
o-COOMe	7.24	6.63	6.00	5.33	10.2±0.4	11±1	7.2±0.3
o-F	7.18	6.57	5.91	5.33	10.1±0.2	10±1	7.1±0.2
o-Cl	6.68	6.03	5.44	4.80	10.8±0.3	14±1	6.9±0.2
o-Br	6.73	6.11	5.48	4.85	10.8±0.3	13±1	6.9±0.3
o-I	7.16	6.55	5.91	5.29	10.2±0.3	11±1	7.1±0.2
o-CN	6.54	5.90	5.30	4.67	10.9±0.3	14±1	6.9±0.2
o-NHAc	6.49	5.86	5.25	4.60	11.2±0.4	15±1	6.9±0.3
o-SMe	6.98	6.30	5.64	5.03	10.8±0.2	13±1	7.0±0.2
o-CF ₃	6.68	6.03	5.43	4.80	10.8±0.3	14±1	6.9±0.2
α,α'-BA	7.04	6.45	5.80	5.22	10.1±0.3	11±1	7.1±0.2

Table 5: Solvent effect on the benzyl alcohol oxidation by MFC at 298 K

Solvents	K (L ⁻¹ mol ⁻¹)	10 ⁴ k ₂ (s ⁻¹)	Solvents	K (L ⁻¹ mol ⁻¹)	10 ⁴ k ₂ (s ⁻¹)
Chloroform	7.66	44.9	Toluene	7.85	18.9
1,2-Dichloroethane	8.61	52.7	Acetophenone	7.43	59.0
Dichloromethane	7.68	43.4	THF	7.22	29.2
DMSO	7.53	128	t-butylalcohol	7.47	22.5
Acetone	7.65	47.3	1,4-Dioxane	7.56	25.8
DMF	7.66	74.1	1,2-Dimethoxyethane	6.81	19.3
Butanone	6.47	33.4	CS ₂	7.69	15.2
Nitrobenzene	6.24	58.9	Acetic acid	7.21	17.4
Benzene	7.96	14.0	Ethyl acetate	6.62	24.5
Cyclohexane	6.92	2.20			

Correlation Analysis of Reactivity

A protonated Cr (VI) species formation has been postulated earlier in the reactions of the halochromates, which

are structurally similar[3-6].



The rate constants, k_2 , of various solvents used by us were interrelated in terms of linear solvation energy relationship (LSER) (equation 6) of Kamlet et al [14].

$$\log k_2 = A_0 + \rho\pi^* + b\beta + a\alpha \quad \dots(6)$$

In Eq. (6) π^* represents the solvent polarity, β represents the hydrogen bond acceptor basicity and α represents the hydrogen bond donor acidity. A_0 is the intercept term. The results of correlation analysis of the solvents are shown in terms of Eq. (6) were not correct as per Exner's criterion [13](cf. equation 7)., as r^2 values were in the range of .081-.087.

$$\log k_2 = -3.86 + 1.74 (\pm 0.20) \pi^* + 0.18 (\pm 0.18) \beta + 0.11 (\pm 0.16) \alpha \quad \dots(7)$$

$$R^2 = 0.8709; \text{sd} = 0.18; n = 18; \psi = 0.39$$

Here n is the number of data points and ψ is Exner's statistical parameter [15]. The above Kamlet's [19] tri-parametric equation was discarded. Then Swain's equation was used to analyze the data of the solvent effect [16] which gives the cation- and anion-solvating conception of the solvents, it is represented by equation 11.

$$\log k_2 = aA + bB + C \quad \dots(8)$$

Here A shows the anion-solvating power of the solvent and B shows the cation-solvating power of the solvent. C is the intercept term and $(A + B)$ is posited to distinguish the solvent polarity. The rates in different solvents were given in the terms of equation (11), separately with A and B and with $(A + B)$.

$$\log k_2 = 0.74 + (\pm 0.05) A + 1.80 (\pm 0.04) B - 3.87 \quad \dots(9)$$

$$R^2 = 0.9940; \text{sd} = 0.04; n = 19; \psi = 0.08$$

$$\log k_2 = 0.49 (\pm 0.59) A - 2.85 \quad \dots(10)$$

$$r^2 = 0.0350; \text{sd} = 0.48; n = 19; \psi = 1.01$$

$$\log k_2 = 1.76 (\pm 0.13) B - 3.85 \quad \dots(11)$$

$$r^2 = 0.9111; \text{sd} = 0.15; n = 19; \psi = 0.31$$

$$\log k_2 = 1.46 \pm 0.14 (A + B) - 3.90 \quad \dots(12)$$

$$r^2 = 0.8609; \text{sd} = 0.18; n = 19; \psi = 0.38$$

The oxidation rates of benzyl alcohols in various solvents have an admirable correlation in Swain's equation (12) with the cation-solvating power, which plays a main role. Actually, cation-solvating power accounts for ca. 99% of the data. The solvent polarity indicated by $(A + B)$, also accounted for ca. 87% of the data. On the other hand, when a graph between \log (rate) against the inverse of the comparative permittivity was plotted it was not linear ($r^2 = 0.5391$, $\text{sd} = 0.32$, $\psi = 0.92$). So it was also ruled out.

Hammett equation [17] or with dual substituent-parameter equations [18,19] were also ruled out due to ortho substitution. Finally Chartons [20] triparametric LDR equation for quantitative description of structural effects on the chemical reactivities were used. In this work we have applied the LDR equation 16 to the rate constants, k_2 .

$$\log k_2 = L \sigma_1 + D \sigma_d + R \sigma_e + h \quad \dots(13)$$

Here, σ_1 is a localized (field and/or inductive) effect parameter, σ_d is the intrinsic delocalized electrical effect parameter and σ_e represents the sensitivity of the substituent towards the changes in the active centre. The m and p substituent parameters are correlated by equation (17).

$$\sigma_D = \eta \sigma_e + \sigma_d \quad \dots(14)$$

Here η shows the electronic demand of the reaction site and it is given by $\eta = R/D$, and σ_D represents the delocalized electrical parameter of the diparametric LD equation. For *ortho*-substituted compounds, it is necessary to account for the possibility of steric effects and Charton [20], therefore, modified the LDR equation to generate the LDR equation (18).

$$\log k_2 = L \sigma_1 + D \sigma_d + R \sigma_e + S v + h \quad \dots(18)$$

where v is the familiar Charton's steric parameter based on Van der Waals radii [21].

The oxidation rates of ortho, meta and para monosubstituted benzyl alcohols showed an exceptional correlation in the terms of LDR/LDRS equations (Table 4). We have used the standard deviation (sd), the coefficient of multiple determination (R^2), and Exner's [19] parameter, ψ , as the measures of goodness of fit.

The assessment of the L and D values for the substituted benzyl alcohols showed that the *para*-substituted benzyl alcohols oxidation is more responsive towards the delocalization effect than to the localized effect. Whereas meta and ortho substituents were dependent on the field effect. A decrease in the reaction constants with the increasing temperature indicates that selectivity is decreased with the increasing temperature.

The negative value of deterioration coefficients, L, D and R, suggested an electron-deficient carbon centre in the activated complex in the rate-determining step. The positive value of η suggested that electron-donating substituent stabilizes cationic species. The positive value of S indicated that in the reaction steric acceleration takes place by an *ortho*-substituent.

To test the importance of localized, delocalized and steric effects in the *ortho*-substituted benzyl alcohols, multiple regression analyses were carried out with (i) σ_i , σ_d and σ_e (ii) σ_d , σ_e and ν and (iii) σ_i , σ_e and ν . The absence of significant correlations showed that all the four substituent constants are significant.

$$\log k_2 = -1.55 (\pm 0.42) \sigma_i - 1.60 (\pm 0.34) \sigma_d - 3.48 (\pm 1.93) \sigma_e - 2.54 \quad (19)$$

$$R^2 = 0.8252; \text{sd} = 0.29; n = 12; \psi = 0.48$$

$$\log k_2 = -1.69 (\pm 0.46) \sigma_d - 1.82 (\pm 2.84) \sigma_e + 0.87 (\pm 0.52) \nu - 3.48 \quad (20)$$

$$R^2 = 0.6679; \text{sd} = 0.40; n = 12; \psi = 0.66$$

$$\log k_2 = -2.02 (\pm 0.65) \sigma_i - 0.45 (\pm 3.12) \sigma_e + 1.29 (\pm 0.58) \nu - 2.63 \quad (21)$$

$$R^2 = 0.5986; \text{sd} = 0.72; n = 12; \psi = 0.72$$

In the similar way in belongs to the oxidation of *para*- and *meta*-substituted benzyl alcohols, multiple regression analysis indicated that both localization and delocalization effects are important. There is no major collinearity between a range of substituents constants for the 3 series. The percent involvement [26] of the delocalized effect, P_D , is given by equation (22-24).

$$P_D = (|D| \times 100) / (|L| + |D|) \quad (22)$$

Similarly, the percent contribution of the steric parameter [25] to the total effect of the substituent, P_S , was determined by using equation (23).

$$P_S = (|S| \times 100) / (|L| + |D| + |S|)$$

The values of P_D and P_S are also recorded in Table 5. The value of P_D for the *para*-substituted benzyl alcohol oxidation is ca. 52% while the subsequent values for the *meta*- and *ortho*-substituted alcohols are ca. 40% and 45% respectively. This shows that the balance of localization and delocalization effects is different for differently substituted benzyl alcohols. The extent of the P_S value shows that the steric effect is considerable in this reaction.

Table 6: Temperature dependence for the reaction constants for the substituted benzyl alcohol oxidation by MFC

T/K	-L	-D	-R	S	η	R^2	sd	Ψ	P_D	P_S
Para – Substituted										
288	1.78	1.97	1.55	-	0.77	0.9997	0.008	0.02	52.4	-
298	1.69	1.87	1.42	-	0.74	0.9998	0.007	0.01	52.4	-
308	1.60	1.79	1.30	-	0.71	0.9998	0.009	0.01	52.7	-
318	1.50	1.70	1.22	-	0.70	0.9998	0.006	0.01	53.0	-
Meta – Substituted										
288	1.96	1.34	1.18	-	0.86	0.9998	0.006	0.02	40.5	-
298	1.87	1.24	1.07	-	0.85	0.9999	0.006	0.01	39.8	-
308	1.78	1.15	0.99	-	0.84	0.9998	0.003	0.02	39.2	-
318	1.70	1.05	0.92	-	0.86	0.9999	0.004	0.01	38.2	-

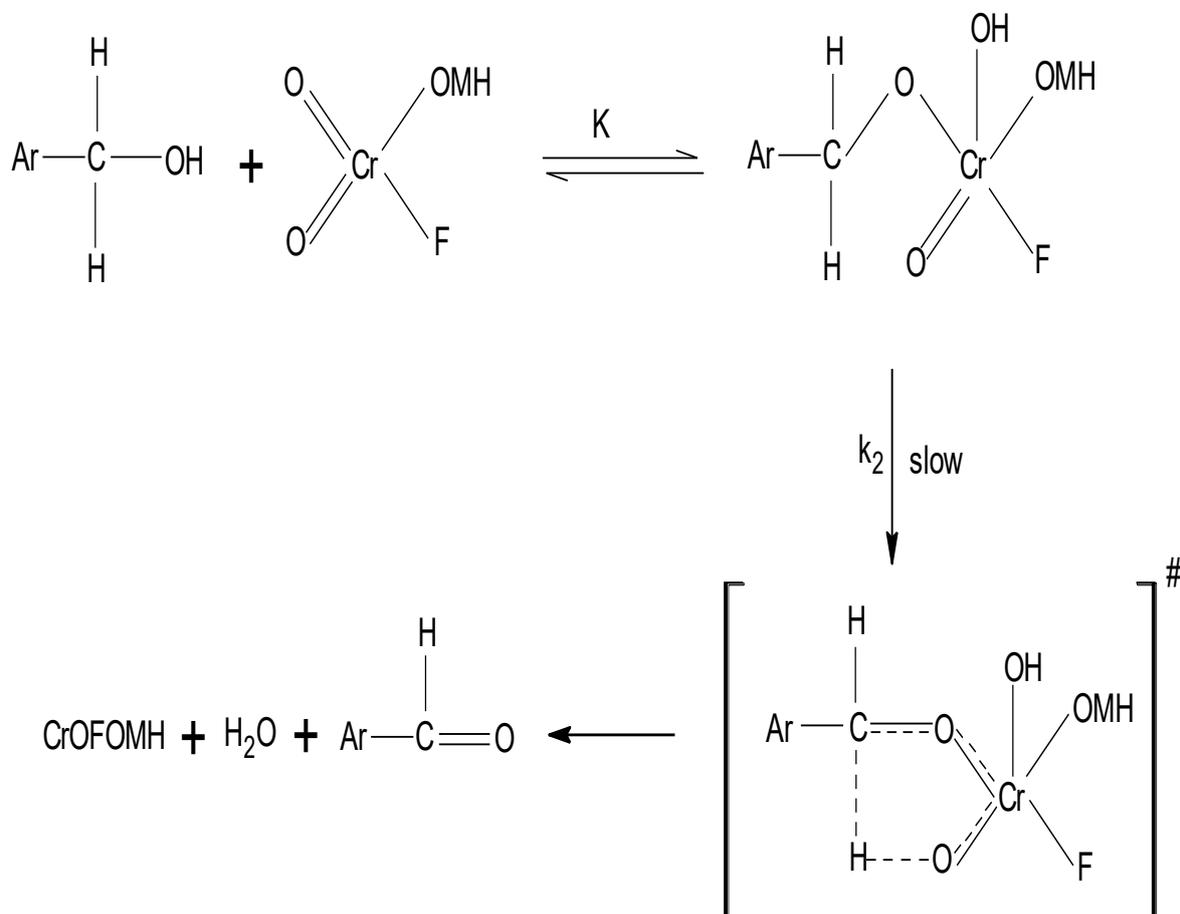
T/K	-L	-D	-R	S	η	R^2	sd	Ψ	P_D	P_S
Ortho-Substituted										
288	1.88	1.61	1.25	1.26	0.76	0.9999	0.008	0.01	46.0	26.4
298	1.77	1.51	1.22	1.14	0.79	0.9998	0.003	0.02	45.9	25.7
308	1.68	1.41	1.12	1.06	0.78	0.9999	0.003	0.01	45.5	25.5
318	1.60	1.32	1.09	0.96	0.81	0.9999	0.007	0.01	45.1	24.7

The positive value of S indicated reaction is accelerated by the steric effect. This may be due the generation of high ground states energy by the sterically crowded alcohols.

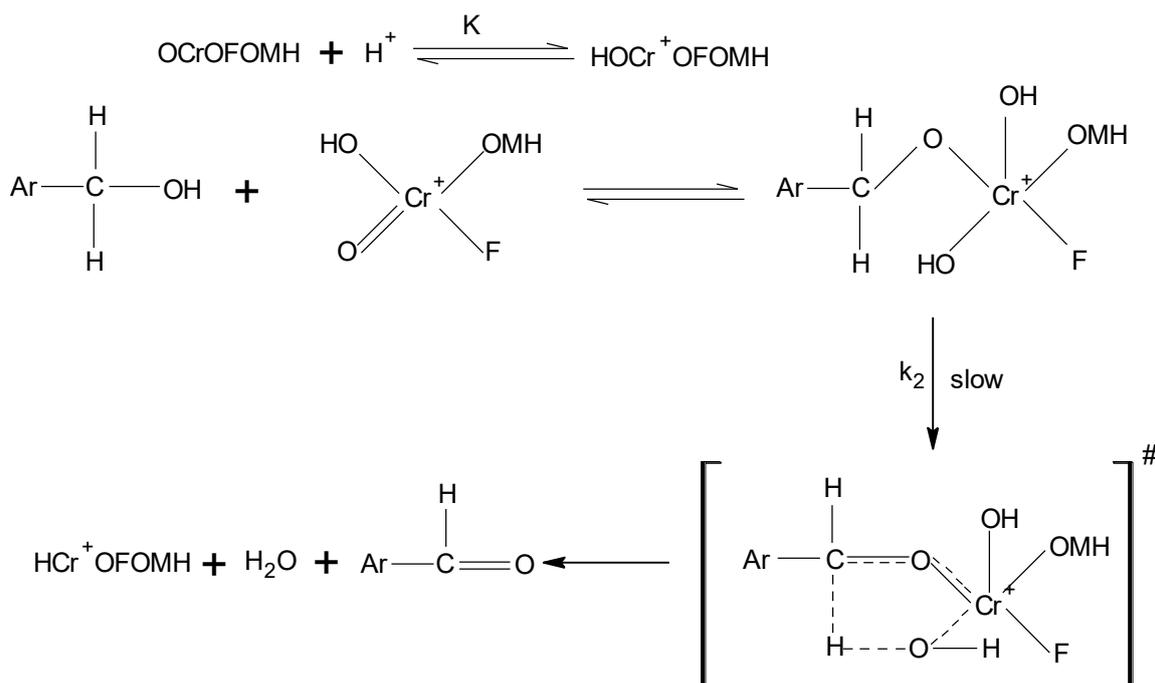
MECHANISM

A hydrogen extraction mechanism leading to the formation of the free radicals is not likely in sight of the failure to stimulate polymerization of acrylonitrile and no effect of the radical scavenger on the reaction rate. The existence of substantial kinetic isotope effect confirms the cleavage of α -C-H bond in the step of rate-determination. The negative value of localization and delocalization electrical effects that is of L, D and R points to an electron-deficient reaction centre in the step of rate-determination. It is further supported by the positive value of η , which indicates that the substituent is better competent to become stable a cationic or electron-deficient reactive site. Thus, a transfer of hydride-ion is suggested in the rate-determination step. Kwart and Nickle [22-24] shown that dependence of kinetic isotopic effects on the temperature has been shown to be useful in determining whether hydrogen loss occurs by concerted cycle process or by an acyclic one. Data for proteo- and deuterio-benzyl alcohols fitted for familiar expression: $k_H/k_D = A_H/A_D(-\Delta H^*/RT)$ [23,24]. Acyclic hydride transfer, in the alcohol oxidation by Cr(VI), involves 6 electrons and, being a Huckel-type system, is an allowable process. Therefore, the decay of the ester intermediate can be accredited to the transition state with the planar, cyclic and symmetrical structure. As a result, the whole mechanism is proposed to involve the chromate ester formation in a fast pre-equilibrium step and then the ester decomposition in a consequent slow step through a cyclic concerted symmetrical transition state leading to the product (Schemes 1 and 2).

Acid-Independent Path - Scheme - 1



Acid-Dependent Path - Scheme – 2



The proposed mechanism is also supported by observed negative value of entropy of activation. As the charge separation come about in the transition state, the charged ends become highly solvated. This results in an immobilization of a large number of solvent molecules, reflected in the loss of entropy [25].

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Transcendence over Immanence in Henrik Ibsen's *a Doll's House* and Sudha Murty's *Gently Falls the Bakula*

P. Sakthivel and V. Anbarasi

PG and Research Department of English, Govt. Arts College (A), Salem -7, India

ABSTRACT

This article makes an attempt to explore into the psyche of the female protagonists of Ibsen and Sudha Murty. The slamming of the door by Nora against her husband Torvald in pursuit of herself is regarded as a momentous and revolutionary gesture during the performance of the play. The handing over of the keys, documents and other vital documents to Shrikant, her beloved husband, by Shrimati, the patient protagonist of Sudha Murty, in pursuit of her doctorate in an alien soil bears a lot of similarities with Nora, with regard to the helpless dependent position of women despite the passage of few centuries.

This article takes into consideration the concepts of Paul Benson discussed in her article "Feeling Crazy: Self-Worth and the Social Character of Responsibility" and the vital points advocated by R.Jay Wallace in his iconic text *Responsibility and the Moral Sentiments* to comprehend and compliment the decisions of these two women of different periods during their evolutionary process of self-disclosure.

Feminists have been intensely insisting on the importance of women taking the responsibility for their feelings, perceptions, needs, desires, beliefs and actions for restructuring and realizing their personal identity. Internalization of the restrictive norms of femininity, ethical responsibilities, social expectations and oppressive social conventions mostly result in structuring women as docile, meek, submissive and obedient. Too much of a stifling lifestyle ultimately drives the stifled to long for liberation. This drives them towards self-discovery and self-disclosure.

Both Ibsen's Nora and Murty's Shrimati have well accommodated themselves into the conventional roles of a wife, housekeeper and care taker. When the trust, love and sacrifice are not found to be mutual and when it dawns on them that the language of marriage is not a language of partnership but that of proprietorship, they feel all their contributions to be futile. Unmindful of the havoc their decisions would create, they strongly, firmly and steadfast go ahead. Jay Wallace's view of responsibility very succinctly defines the behavioral patterns of people. The ideal, "persons are morally responsible for their actions just when those actions are capable of disclosing what morally matters to them" is highly appropriate and applicable to both the women under study.

The 'Real Self View' attains distinct significance and there is transcendence over immanence.

Keywords: Self-Worth, Self-Disclosure, Responsibility, Restrictive Social Norms.

'Transcendence over immanence' is a very prominent and thought provoking coinage of Simon de Beauvoir in her most vital text entitled *The Second Sex*. It is once again the same writer who has told that 'one is not born, but rather becomes a woman' in the same text. The family in which one is born, the attitude of the parents, the outlook of life of elders in the family, the financial status of the family, the society in which this family is also an inseparable part and parcel, and the cultural codes that govern the society of the family all those factors determine the quality of the people. The character and behavioral structure of the members of a family and in turn the society are determined by the above mentioned factors. When that be the case, male members of any family in any society are treated as more privileged than that of the female counterparts.

From the day a baby boy is born, he is brought up with the conviction as the master of the house, contrarily when a baby girl is born, she is reared up with the constructive conviction to be that of a very submissive and subordinated member of the family. It can be perceived that in almost all the human societies of most of the countries, women are brought up with this sense of subordinated state of affairs. So, women in almost all spears of life be it familial, social, political, religious, and cultural aspects, they are made to imbibe themselves as subordinated object of life. Internalization of the restrictive in norms of femininity, ethical responsibilities, social expectations and oppressive social conventions mostly result in structuring women as docile, meek, submissive and obedient. Having been conditioned with such a living structure, women try to accommodate themselves in accordance with the prescribed roles in the various spears of their lives.

While, they have been striving hard and putting their hearts into all the missions to be accomplished in their life, their so called life partners fail to recognize the service rendered by the women. Having been trained in a

thought process of regarding women as subordinates to themselves and women have to sacrifice all their desires or expectations and they should think, act and behave in accordance with the unprescribed rules, of the roles men are not able to put themselves into the shoes of women. It ultimately results in recognizing women as a fellow human being. Having been accustomed to treat women only as subordinates, men are not able to think or treat women as their equals at any point of their life time. This had been the case in the past. This is very effectively revealed through most of the works of the writers of the past. The best example is that of Henry Ibsen's *A Doll's House*. Which was a product of the 19th century *A Doll's House* was published on 4th December 1879 and was performed as a drama towards the middle of the same month. The way Ibsen portrayed the female protagonist Nora created a great hubbub in the mindsets of both the sexes.

The most servile wife Nora, towards the end of the play, happens to have evolved into a liberated individual. Now, Sudha Murty, a renowned humanist who holds human values as the governing dictum of both personal and professional life, has written a novel entitled *gently falls the bakula* It represents the 21st century life. But even in this most advanced era of technology were women seem to have taken active in various spears of their lives are almost having a life of servility and servitude. Shrimati, the female protagonist of this novel, happens to be equal in all aspects to her beloved husband Shrikant. But, the willing slave that she is she has being doing everything for her husband's growth, development and glory and towards the end of the novel only, it dawns on her that making use of all her talents not for realizing her dreams but, that of her husband. So, this change of thought results in change of attitude and ultimately she too quits her home in pursuit of realization of her dream. Both these works, one written in 19th century and another written in 21st century very eloquently proclaim the remote changes that have taken place in the lives of women especially.

This article makes an attempt to explore into the psyche of the female protagonists of Ibsen and Sudha Murty. The slamming of the door by Nora against her husband Torvald in pursuit of herself is regarded as a momentous and revolutionary gesture during the performance of the play. The handing over of the keys, documents and other vital documents to Shrikant, her beloved husband, by Shrimati, the patient protagonist of Sudha Murty, in pursuit of her doctorate in an alien soil bears a lot of similarities with Nora, with regard to the helpless dependent position of women despite the passage of few centuries.

This article takes into consideration the concepts of Paul Benson discussed in her article "*Feeling Crazy: Self-Worth and the Social Character of Responsibility*" and the vital points advocated by R.Jay Wallace in his iconic text *Responsibility and the Moral Sentiments* to comprehend and compliment the decisions of these two women of different periods during their evolutionary process of self-disclosure. Men from time immemorial, happen to exercise absolute authority over their women especially when that happens to be one's own spouse.

Having been conferred with safety, security, sustenance and a dignified role in the society, women also accept their subordinated status because only then they can live safe life on the earth. Nora of Ibsen is also no exception. She has being doing all the roles conferred on her namely, wife and that of the mother to the fullest satisfaction of her husband. From the beginning of the play, it can be inferred that though she is not really crazy, immature and unintelligent person, she pretends to be so because that only makes her husband Helmar be very happy and satisfied. He is so gratified the feeling that he is her protector and it is only who takes care of her and all her needs. So this male dominated role that is assumed by him satisfied him to the greatest extent that he rejoices in such a line of thought. Women knowingly or in advertently accept this inferior status assigned to them and they in fact have interiorized inferiority notion about their own capabilities and qualities. So, this art of marginalized state is very much in effect during the 19th century and this is very very clearly depicted by Ibsen. So, this ideological marginalized oppression was very wisely conducted by the patriarchal authorities for the establishment and substance of male dominated society. In addition to that women were expected to champion the cause of morality of the family and invariably that of the society also. Both the family and the society regard women as the moral guides who are confined within the four walls of the home. Men on the other hand are taken to be "as worldly creatures who often compromised their domestic roles in favour of work or public life" (Corlissel, 2004, 182). In addition to the cultural quotes and the social and moral etiquettes prescribed religion also plays a pivotal role in determining a role of women.

The patriarchal religious discourses, in addition to proclaiming women to be inferior domestic creatures, also insist that they should be very obedient and do the needful with regard to the personal wellbeing of the family and then that of the husband. It could also be very easily perceived that every system that the society has framed or every school or institution that has been formulated for the establishment of life in the society happen to render greatest injustice to women in total. So not only the political principles, social conventions, cultural codes but also religions deny women their due deserving space on the earth. This is the malady and irony of life.

While nature has divided the human beings into two categories for various purposes, men seemed to take up the role of the savior and the master conferring on the women the dependent, servile and unsafe creature.

Though during times of greatest crisis, Nora has taken a very positive and bold step of forging her father's signature in order to save or protect the life of her ill husband, she never openly projects herself as a person capable of independent doing or thinking. So, according to Helmar, her husband, she has to be dependent and she has to decide everything based on his instructions. So, her ability and capability to work, to think, to act and then to execute independently has never been brought to their limelight for the simple reason that Helmar would not prefer it. She having become mother of three children and despite doing all house hold chores in the best possible manner, feels quite contended by being a mere shadow of her husband Helmar. So, only once in her life time Nora has to do one thing which is quite against the legal aspects of the course of law. So, this forgery with which she is indulged happens to be a loose sword hanging on her head in the form of Krogstad. So, when Krogstad threatens her dire consequences especially of disclosing this hidden truth about Nora her husband Helmar, she really feels highly victimized. Krogstad wants to retain his position in the bank which is likely to be denied by Helmar who has become the manager of the bank same at that time. Caught in a tight pressing corner, Nora tries her level best to dissuade her husband from reading the letter that was sent by Krogstad. Helmar being very happy about his present position and the various efforts taken by Nora to please him openly proclaims that he wanted to prove his love to Nora. So if she is caught in a dangerous situation, he wants to rush forward and protect her from the danger into which she is about to fall and there by proving his love the greatest support to his dearest wife. So, this proclamation of Helmar emboldens Nora and she freely allows her husband to read the letter believing that he would in reality exercise his wish to be her moral protector. But quite contrary to the anticipation when the letter written by Krogstad will be a bomb in the sense it will put Helmar's honor into stake, he begins react in a different unforeseen manner.

Nora is very simple and her outlook towards life is very very simple and this is denoted through the following expressions of her: "Free from care, quit free from care; to be able to play and romp with the children; to be able to keep the house beautifully and have everything just as Torvald likes it! And think of it, soon the spring will come and the big blue sky! Shall be able to take a little trip---perhaps I shall see the see again! Oh! It's a wonderful thing to be alive and happy" (Ibsen, 1966, 1. 23).When her entire self thought, her word, her deed and all the other components off her life just revolve around the expectations of Helmar's She found it her bound responsibility to cater to expectations of Helmar and she has been trying her level best to achieve that.

The worst happened when Helmar comes to know that Krogstad sent another note stating that he has revised his mind and he intends to take back the complaint that he intended to lodge against Nora. So, this second note from Krogstad releaves the entire situation in favour of Helmar and Nora, and the attitude also has changed absolutely. He proclaims "we won't call any of the hoarest mind will only about with joy keep saying, 'It's all over! It's all over!'" (Ibsen 1966.3.66). So, it is these two kinds of moral law and conscience that is developed by Helmar which ultimately leads to the damnation of the relationship between the husband and the wife. When the wife very badly needs the help, support and trust that she will be protected whenever she happens to face any danger from her dearest man he has miserably failed to cater to her expectations. So, when Nora begins to disclose her instant decision to leave the entire family because, she feels she has grater duty to herself and living with him all these years has not really materialised in any way this is a rude shock experienced by Helmar.He in all vehemence tries to make an appeal to her sense of responsibility to the husband children based on religions doctrines and cultural codes.

Despite having internalized oppressive social conventions she, to quote Paul Benson," she retains a basic level of competence to recognize and apply moral reasons along with the capacity reflect critically on possible courses of action and to from intentions accordingly" (76).

According to the third influential view on responsibility, says Paul, persons are morally responsible for their actions just when those actions are capable of disclosing what morally matters to them. This claim makes the core of what Susan Woolf Term Real Self value of responsibility. In this view, persons are responsible when their actions are properly attributable to their "real selves", this being the case when persons able to govern their wills on the basis of their valuational system and to govern their actions on the basis of their wills (77).

So befitting this description Nora expresses her inner most urge that she has a duty for herself and which is more important than all the other duties that the society has imposed on herself. This emancipatory liberal attitude is the least expected from a lady like a Nora by her husband. So once she decides to more away from the restrictive domestic world outside world of power, she feels that she will be able to know her true worth.

The number of struggles against the patriarchal hegemony of the society of Nora exhibit how “these struggles contribute to developing her in a sense of progressive self awakening, which eventually shapes her identity as an independent woman, the ultimate destination of her journey of self discovery”(Dusgun,2018).

While Nora is raised in a society which is highly conventional and which expects the wife to be so dependent on her husband, the case of Shrimati in Sudha Murty’s *gently falls the bakula* is entirely different. Nora literally has undertaken a very bold venture because she is not very clear or sure about her future. So, what sort of future awaits and will she should be able to really come up in life and she has never explored any of the avenues which promises her bright future. In spite of these short comings, when she realized that the man whom she trusted does not deserve her love and concern because he is the last trust worthy especially when he says that once Krogstad has withdrawn the letter all his problems have also come to an end and they can live the life as though nothing has happened. It is this proclamation of his safe environment, which has really dethroned Helmar from the heart of Nora and she undertook this step. In the case of Shrimati she is an educated woman and noted for her brilliance, intelligence and innovation in her field of study.

What Shrimati has done is a willing sacrifice. Though she knows for certain that she is as good and great as Shrikant in every spear of her life, she has derived greatest pleasures in helping him accomplish his dreams. She never intends even to emphasize how better she happens to be compare to Shrikant during their early days or after that also. When she completes her PG degree she is being offered Fulbright scholarship by a foreign professor which is one of the most awaited opportunities and which will not easily reachable to many of the aspirants. But, the professor has promised her a brilliant carrier. The conversation between the foreign professor and the in experienced but the most passionate history student Shrimati runs thus:

Shrimati, students like you who are passionate about history must do research. If you wish, I can get you a scholarship at our university. You could either study archaeology or Asian history. You have no idea of the American system of education. It is heaven for students. You will find many facilities and excellent libraries. Students like you can do very well in that kind of atmosphere

...Sir, thank you very much for your generous offer. It is very kind of you to make such an offer. But Sir, though I would like to come, I cannot accept it now. I am getting married this year.

... I don’t want to intrude in your personal life. But don’t you feel that if you don’t pursue your love of history, you will get frustrated and bored?

...Sir, I do love history but I love Shrikant as well. I can always continue my studies later. I believe that it is not necessary to have a doctorate to gain knowledge. For me, degrees do not matter. (Murty 49)

It is previously known to the readers that Shrimati is in very strongly love with Shrikant. Readers are also very well aware of the fact fascination that her and passion towards history is greater than anything but, now it is made very clear that she is ready to forgo even her greatest involvement with history for the sake of her life with Shrikant. So, she adores her life with Shrikant to be the most precious and desired one than any of the other privileges or glories that she could attain by losing it. So, it is this strongest bond that she has developed which Shrikant which is root cause for her future activities also.

Life is certainly not bed of roses to anyone and same is the case with Shrimati also. Despite being the first rank holder right from her school days she is not being recognized as the talented girl by her neighbors especially that of Shrikant’s mother Gangakka. So when Shrikant’s expresses his desire to marry Shrimati, it was a rude shock to Gangakka because, both the families are on a family feud for two generations. In her letters she has clearly stated that the foundation of her happiness is certainly not in the digits in which Shrikant earns but, the digits of his love, affection and companionship. As she has held in highest estimation the inextricable bond with Shrikant to be the most precious one, she too expects to receive the same from him also. True to her faith, Shrikant also reciprocates in the same vain his own love, concern, affection and devotion to Shrimati.

When Shrikant expresses his wish to marry only Shrimati, naturally his mother Gangakka does not agree to the proposal at once. But, it is his stubbornness owing to his love to Shrimati which ultimately wins and they marry. Whatever the efforts made by Shrimati to win the love and confidence of her mother-in-law Gangakka and sister-in-law Rama, she only miserably fails right from the beginning. She is deliberately made to feel as unwelcome presence in the so called house of her own. That is the irony of the situation yet Shrikant’s love and concern compensates this sense of ill at ease.

From the day the couple moves from Hubli to Bombay for the sake of Shrikant’s profession, life begins to be really very happy and gratifying one. Initially Shrimati accommodates herself in the position allotted to her and

she too strives her level best to help Shrikant reach his goals and dreams. After one or two years when their life situations have risen to better scale, she expresses her wish and Shrikant also accepts her to pursue her higher education. But, unfortunately at that time Shrikant's mother demands one lakh rupee as she has to repay the loan she borrowed for the sake of Shrikant's education. So this unexpected blow from the mother naturally makes them become more concerned as their financial condition is not so stable as to immediately repay the loan demanded by Gangakka. So, with all genuine concern, Shrimati comes forward to undertake a job and they intend to repay the loan in regular installments. Both of them agreed to this agreement and she nearly works for thirteen months to repay the loan and after which once again she decides to pursue her higher education in her favorite subject.

When once again all arrangements are made, owing to the promotion received by Shrikant, they are shifting their residence from Bombay to Delhi. So, for the second time also her educational aspirations could not be materialized. Third time when everything is quite settled and she was applying for her higher education owing to yet another promotion Shrikant gets a chance to live in USA for a period of three years. So, this also provides them greatest opportunity to explore not only to the world but, also their especially Shrikant's professional uplift.

Despite the passage of ten years after their marriage, Shrimati and Shrikant have not become parents. So this has really become a concern for Shrimati and when both of them gone and undertake medical tests, it is found that both of them are sub-fertile and it might take little more time for them to become parents. So this once again has made Shrimati feel loneliness despite being an active member in all the other walks of life. Shrikant's position actually in his profession grows in leaps and bounds over a period of time. He becomes one of the most prominent persons in his field in India as well as abroad. So, his growth needs an official secretary of course in the office and also at home. Now he has a very smart, reliable and intelligent above all obedient person in his own wife and Shrimati has become his most efficient personal secretary at home. However much he has been praised and appreciated for his efficiency, he has never expressed that he owes a lot to Shrimati also. Now Shrimati begins to experience a sense of emptiness because, she becomes Shrikant's secretary at home unofficially and officially she becomes hosts for various programs that Shrikant officially organizes.

Whomsoever happens to be the guest, it becomes Shrimati's responsibility to entertain them engage them and enlighten them as per the requirements. The letter by received from Ravi their long time friend from US sings the glory of the committed involvement of Shrimati. When Shrikant reads the letter he does not make mention about the why Shrimati is glorified by Ravi. So this once again creates art of innate longing into the hurt of Shrimati. Gangakka, her mother-in-law, never appreciates or accepts or acknowledges the service of Shrimati, both at the personal and professional sphere. And Shrikant also never seems to recognize or realise the way he is being unconditionally supported by his wife.

When Shrikant went on a world tour Shrimati is affected with flu. But, her illness does not prevent him from undertaking the trip. When after he left India on this account she becomes terribly sick and she happens to be admitted in the hospital with the mercy of the other known circle. She is physically extremely weak and mentally extremely lonely and both of them put together make her feel very very ignored, neglected and unwanted. Letter from the foreign professor Mike Collins really revives her spirit. He has sought her help to accompany him during his three months trip in India where he would love to visit the most prominent and important historical places. Professor Collins could grasp the same liveliness, enthusiasm and interest in Shrimati even after these many years of their meeting. So, once again he offers her an opportunity to continue her pursuit as a researcher in history. He also further says that only very few are blessed with such brilliance and intelligence. But, any how it is up to her to decide what she should do.

Shrimati's feeling of constant negligence and being ignored by her husband gets strengthened continuously in the other situations that happened after her meeting Professor Collins. Shrikant's ascendance in to the ladder of success once again keeps growing and growing which naturally demands almost all of his time, mind and attention towards his profession. When, Shrimati has been raging in side because of the negligence that experiences and aloofness that she undergoes, Shrikant has been enjoying his professional glory with all it might and privileges. Having tasted the glory of power and continuous success in his profession naturally makes Shrikant be highly contented and fulfilled. The way he gives his time and mind at least some extent to his mother is absolutely rejected to Shrimati. So this further makes Shrimati feel quite left out and she just wants to bring a change into her life. When she has been constantly trying to make Shrikant understand her anguish, owing to his professional commitment once again he just brushes aside her attempts to express herself.

This further infuriates Shrimati and she realizes that she needs to do something to realize her own dreams and desires. So, with single minded devotion and concern she writes a letter to Professor Collins to find out the ways and means to become a doctorate and to become a researcher under his guideship with the scholarship which is positively replied by Professor Collins. So this brings an end to her plight and her dilemma regarding whether she performs her duty as a wife if she happens to leave this place and what will be the opinion of the people of her family or Shrikant's family all these thoughts though torment her while yet clear about her needs and requirements. So, ultimately it is this determination with which enables her to openly proclaim Shrikant comes after trip of four weeks to U.S.A., proclaiming his ultimate victory as being promoted as the managing director of the company. So, this being the pinnacle of glory which he has attained at such a young age she expresses her decision to go to USA continue her doctorate or to pursue her doctorate. So, this is actually an unexpected rude shock experienced by Shrikant and when hands over citing her completion duty to the fullest satisfaction of herself he could not certainly prevent her.

Now in this situation one can identify how in accordance with theory of responsibility, both the women analyzed, have conducted themselves. Nora has ultimately deserted her husband because she considers duty to herself is more important and that is the top priority duty than duty to the husband and the codes dictated by the society and the religion and duty to her children. Here also in the case of Shrimati she expresses how she is obliged to realize her own dreams and desires the way that has been attained by Shrikant.

So, according to the theory of responsibility it can be understood that moral duty and responsibility of course every individual owes to the respective roles have undertaken and more importantly they should perform the duty meant for themselves. So, in that way both the characters be it Nora of the 19th century or Shrimati of the 21st century there is a revelation in them at the momentous moment in their life which ultimately guides them to pursue the dreams of their own.

When we apply Margaret Atwood's theory of victims we can understand that both of them realize that they are being victimized and they do want to stay continuously in the same victimized position and convert their victimized state of affairs into victorious state of affairs through which they will be able to turn themselves into the position of the non-victim who are capable of creating certain things. There is also difference between the way Helmar treated Nora and Shrikant's treatment of Shrimati. Shrikant is not male chauvinist or patriarch who tries to exercise his authority over Shrimati because he knows the value of Shrimati. But even then when it comes priority it is his ambitions, needs, requirements and attempts which are more important than Shrimati's. But ultimately he is able to perceive that such an intelligent brilliant, obedient Shrimati cannot always be quit unambitious, especially when she feels so neglected. So had she been recognized by Shrikant or by his mother or in his professional circle as he ever mentioned that it is Shrimati's contributions which really has enabled him to be such a great stalwart in his field that might has satisfied Shrimati and she would have considered her life as a purposeful and meaningful one. But, this non-recognition and taking her for granted and never taking into account her needs requirements, expectations and simple demands that ultimately created and unbridgeable gap between the two and ultimately she leaves once for all to pursue her dreams. So, in this way both the women though they have internalized the conventions of the society, religion and family, at one point of time they are able to break open all these conventional oppressive ideologies and they ultimately liberate themselves.

Feminists have been intensely insisting on the importance of women taking the responsibility for their feelings, perceptions, needs, desires, beliefs and actions for restructuring and realizing their personal identity. Internalization of the restrictive norms of femininity, ethical responsibilities, social expectations and oppressive social conventions mostly result in structuring women as docile, meek, submissive and obedient. Too much of a stifling lifestyle ultimately drives the stifled to long for liberation. This drives them towards self- discovery and self- disclosure.

Both Ibsen's Nora and Murty's Shrimati have well accommodated themselves into the conventional roles of a wife, housekeeper and care taker. When the trust, love and sacrifice are not found to be mutual and when it dawns on them that the language of marriage is not a language of partnership but that of proprietorship, they feel all their contributions to be futile. Unmindful of the havoc their decisions would create, they strongly, firmly and steadfast go ahead. Jay Wallace's view of responsibility very succinctly defines the behavioral patterns of people. The ideal, "persons are morally responsible for their actions just when those actions are capable of disclosing what morally matters to them" is highly appropriate and applicable to both the women under study.

The 'Real Self View' attains distinct significance and there is transcendence over immanence

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Growth and Characterization of L-Valine Added Sulphamic Acid Single Crystals

Fredselin R. S Vithel and R. Manimekalai*

Department of Physics, A.V.V.M Sripushpam College, Poondi, Thanjavur, Affiliated to Bharathidasan University, Tamil Nadu, India

ABSTRACT

L valine in added sulphamic acid crystals were grown by slow evaporation technique. The harvested crystals were subjected to various characterization for revealing its structural, optical, mechanical and thermal properties. Single and powder X – ray diffraction expose that LVSA crystallizes in an orthorhombic structure. FT – NMR and FTIR techniques have verified its structural identification. The EDAX analysis confirmed the presence of carbon in the grown crystal. The surface morphology of crystals were studied. Optical absorbance and transmittance spectrum recorded and exhibited that this crystals has good transparency in the visible region. From absorbance spectrum the optical band gap energy is found to be 3.5ev. The mechanically soft nature of the crystal was estimated by Vickers hardness measurement. The stability of LVSA crystal was ascertained from thermo gravimetric and differential thermal analysis. The photoluminescence studies of the grown crystals shows the blue emission. The antibacterial activity of the grown crystal was enhanced when comparing with pure crystal. The nonlinear refractive index, absorption coefficient and the third order nonlinear susceptibility of the grown crystal were revealed by z-scan technique.

Keywords: Sulphamic acid, L-valine, XRD, FTIR, EDAX, SEM

1.1 INTRODUCTION

Nonlinear optical materials play an important role in the area of photonics that involves the use of photon in the same way electronic applications use the electron. Optical devices have more advantages than electronic devices. The data transmitted optically can travel longer distances in a fraction of the time due to the speed of light which is about ten times greater than that of electricity. Due to this fact the rapid development of optical communication system has led to a demand for nonlinear optical materials of high structural and high optical quality. Nowadays nonlinear optical materials are having potential applications in the area of telecommunications and optical storage devices [1, 2]. Amino acids and their complexes belong to a family of organic materials that have enormous applications in the field of nonlinear optics [3-6]. Amino acids are interesting materials for NLO applications as they contain a proton donor carboxyl acid (COO^-) group and the proton acceptor amino (NH_3^+) group [7].

Sulphamic acid is the monoamide of sulphuric acid, which is strongly soluble in water and exhibits zwitterionic forms and its derivatives have wide industrial applications as anticorrosive agent and cross linking agent for polymers [8, 9]. In the present work Valine added Sulphamic acid was synthesized and the growth and characterization of L- Valine added sulphamic acid single crystal was reported.

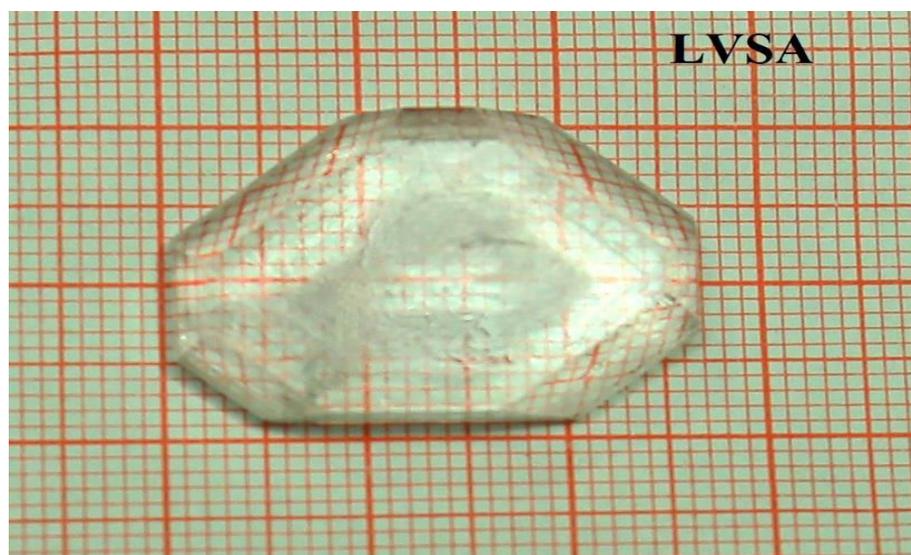


Figure1: Photographs of the grown LVSA crystal

3. RESULTS AND DISCUSSIONS

3.1. Single Crystal X-Ray Diffraction

The single crystal X-ray diffraction analysis was examined using BRUKER AXS KAPPA APEX 11 CCD Diffractometer. L- Valine added sulphamic acid single crystals possess orthorhombic geometry. The cell parameter values are $a=8.11 \text{ \AA}$, $b=8.09 \text{ \AA}$, $c=9.30 \text{ \AA}$ with angles $\alpha=\beta=\gamma=90^\circ$ and cell volume 610 \AA^3 respectively. The, b, c values differed as compared to that of pure sulphamic acid. This suggested that doping modified the cell axes, and hence the cell volume.

3.2. Powder X-Ray Diffraction

Figure. 2 shows the recorded powder XRD pattern of as grown

L-valine added sulphamic acid crystals. The diffraction peaks in the XRD profile was matched to the standard JCPDS data. From the standard pattern, it was found that the observed XRD pattern of the grown crystals as well suited to the orthorhombic crystal system of sulphamic acid (JCPDS card no: 70-0060). In L-valine added samples the crystallinity of the sample was increased and the most intense peak was along (002) direction. Also, the intensity of the strongest peak (002) was decreased slightly whereas the intensity of other peaks also decreased. This revealed that the addition of L-valine improved the crystalline nature of the sample and also the growth axis was enhanced along (002) direction. The change in the relative intensity of the various peaks was also noticed which proposed the successful incorporation of L-proline in the pure sulphamic acid. Moreover, no impurity peaks have appeared. Hence the grown crystals were phase pure. The unit cell parameters were calculated and tabularized. Using unit cell software package, the tabulated lattice parameters and structure were found to be in good accordance with the previous results of sulphamic acid [10-13].

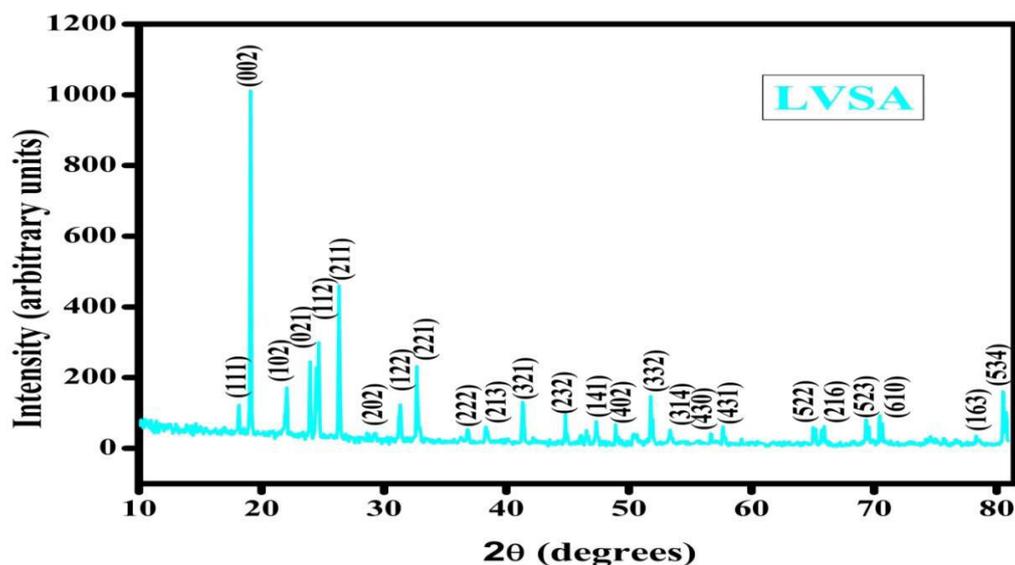


Figure 2: Powder X-ray diffraction patterns of LVSA crystal

Table 1: Structure and lattice parameters of LVSA crystal.

Crystal	Structure	a(Å)	b(Å)	c(Å)	$\alpha = \beta = \gamma$	Volume(Å ³)
LVSA	Orthorhombic	8.1217	8.0833	9.2496	90°	607.2434

3.3. Fourier Transform Infrared Analysis

The FT-IR spectra of the grown crystal of LVSA is shown in Fig. 3. From the spectra, it is clear that the band due to NH_3^+ mode of bonding was noticed at frequency of 3130 cm^{-1} and 2873 cm^{-1} . The band observed at 2449 cm^{-1} and 2026 cm^{-1} were due to tribands overtones/ combinations of hydrogen bonded OH bending modes. The bands seen at 1807 cm^{-1} and 1444 cm^{-1} were due to deformation of NH_3^+ mode of vibration. The vibration bands observed at 1278 cm^{-1} was due to degenerated SO_3^- stretching, whereas at 1073 cm^{-1} was due to symmetric SO_3^- stretching. The rocking mode vibration NH_3^+ was noticed at 1002 cm^{-1} which verified the formation of zwitterions in LVSA crystal. [14]. The N-S stretching vibration was observed at 695 cm^{-1} and the band that occurred at 536 cm^{-1} was due to degenerated SO_3^- deformation [15]. All the IR bands that observed in the grown crystals were in good agreement with earlier reports and were comparable with theoretically calculated bands [14, 16]. Table 2 shows the vibrational assignment of LVSA crystal. However in comparing with pure SA, L-valine added crystals almost all the modes were appeared. But the intensities were drastically decreased which revealed that there may be subtle change in the geometry of the sub lattice.

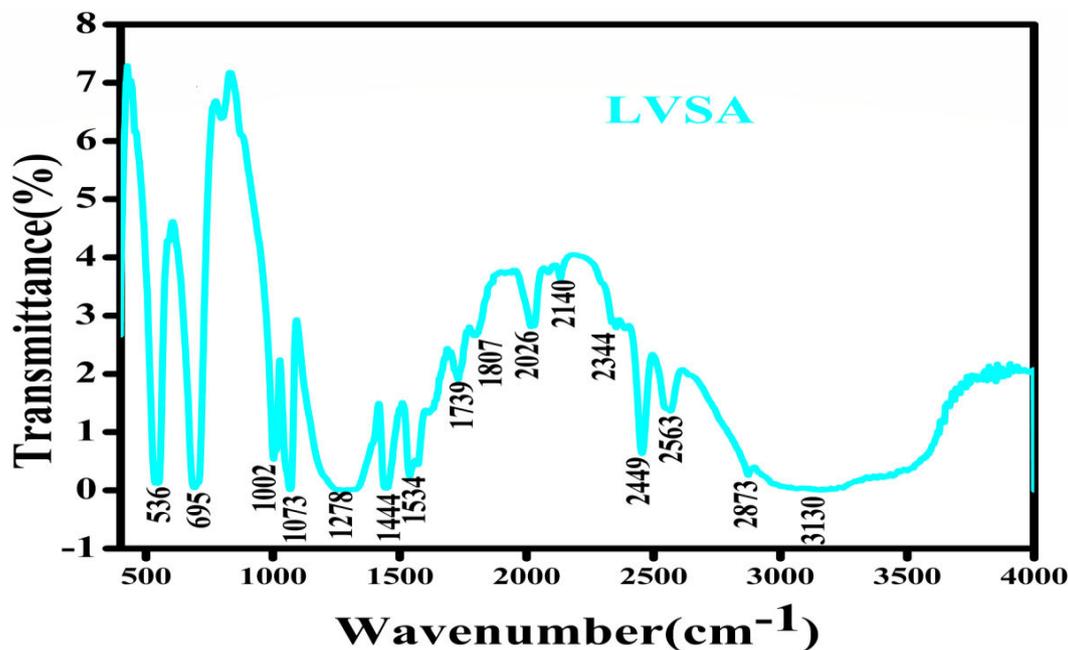


Figure 3: FTIR spectra of LVSA crystal

Table 2: Vibrational assignment of L-valine added SA single crystal

Wave number(cm^{-1})	Assignment
LMSA	
536	Degen. SO_3^- deformation
695	N-S stretching
1002	Rocking mode NH_3^+
1073	Symmetric SO_3^- Stretching
1278	Degen. SO_3^- stretching
1444	Sym. NH_3^+ deformation
1534	Degen. NH_3^+ deformation
1807	Symmetric NH_3^+ deformation
2026	N-H Stretching
2449	S-H Stretching
2873	Symmetric NH_3^+ Stretching
3130	Degen. NH_3^+ Stretching

3.4 Raman Analysis

The additional verification of vibrational modes was achieved by FT-Raman analysis. The Raman spectra of LVSA crystal is shown in Figure 4. Strong peak at 1058 cm^{-1} because of symmetric SO_3^- stretching vibration was also seen at FTIR spectra. It was exhibited in both spectra, since these vibrations were both IR and Raman active. The bands noticed at the peak positions 361 cm^{-1} , 242 cm^{-1} were due to the presence of SO_3^- rocking and N-S torsion vibrations respectively. The vibration bands observed at 550 cm^{-1} were allocated to degenerated SO_3^- deformation. The band occurred at 685 cm^{-1} was due to N-S stretching vibration. The band arised at 1025 cm^{-1} represented NH_3^+ rocking vibration. The degenerated SO_3^- stretching vibration was observed at 1330 cm^{-1} and 1212 cm^{-1} respectively. The peak at 1596 cm^{-1} was related to NH_3^+ deformation. The band at 2451 cm^{-1} was due to S-H stretching vibration. The band seen at 2944 cm^{-1} was associated to symmetric NH_3^+ stretching. The vibration band noticed in LVSA at 3130 cm^{-1} was assigned to degenerated NH_3^+ stretching vibration. Since all the vibrational modes related to orthorhombic crystal structure of sulphamic acid was found in both spectra it was concluded that the grown crystals possessed similar crystal system [17-23]. When comparing it with pure SA in L-valine added crystals only shift towards higher wave number was noticed. Also it was found that the intensity of the 1059 cm^{-1} peak related to symmetric SO_3^- stretching vibration and 2944 cm^{-1} associated to symmetric NH_3^+ stretching was increased upon addition of L-valine which confirmed the change in the geometry of the crystal lattice even though the same orthorhombic structure was retained.

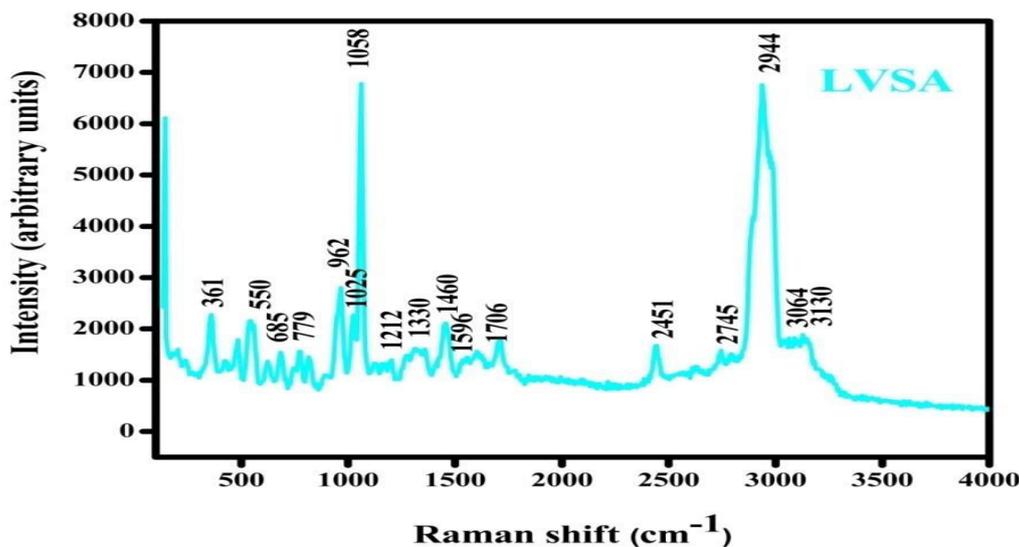


Fig 4: Raman spectra of LVSA crystal

3.5 Morphology and Compositional Analysis

The surface morphology of as grown L-valine added sulphamic acid crystals was examined using scanning electron microscope and was shown in Fig. 5. The SEM image revealed that the particles were in non-uniform size and displayed agglomeration along with voids. On close examination it was noticed that in L-valine added crystals the crystallinity was improved since the size of the crystals were increased and the voids were reduced. Further the small agglomeration was removed and crystalline nature can be viewed clearly.

The chemical composition of the grown crystal was derived from the micro analytical technique known as energy dispersive X-ray analysis. Figure 5. Shows the EDAX spectra of LVSA crystals. The presence of elements like oxygen, nitrogen, sulphur and carbon in L-phenyl alanine added sulphamic acid crystal confirmed that the added elements are incorporated in the crystal lattice. From EDAX results the successful addition of L-Valine in to SA crystals was confirmed. The elemental compositions were tabulated in Table 3.

Table 3: Elemental composition of LVSA

Element	Atomic weight (%)	Molecular weight (%)
Sulphur	5.78	11.51
Oxygen	63.88	63.49
Nitrogen	19.02	16.55
Carbon	11.33	8.45

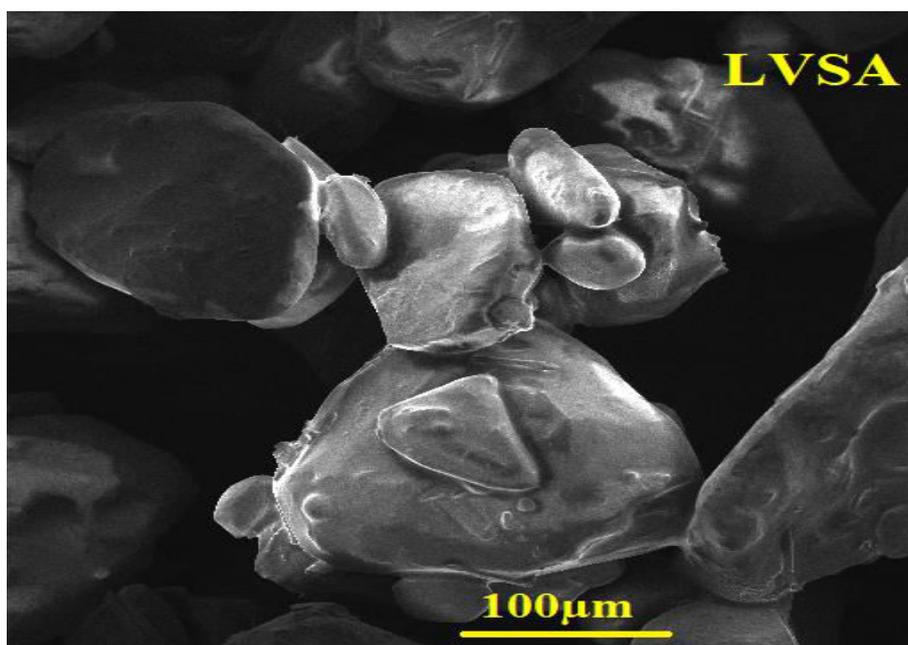


Fig: 5a SEM analysis of LVSA crystals

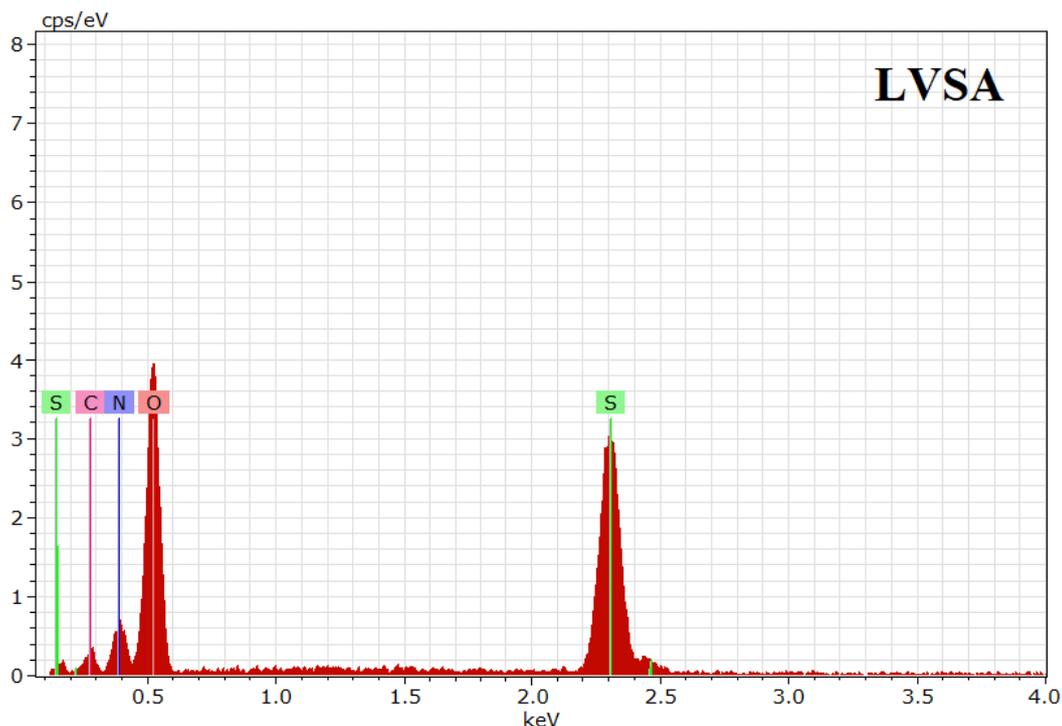


Fig: 5b SEM analysis of LVSA crystals

3.6 UV-VIS Studies

It is very substantial to know the optical transparency of the grown crystals since they are used in several optoelectronic device applications. The Ultraviolet-Visible-near infrared spectroscopic measurements were done and the graph was shown in Fig. 6. It is clear from the figure that the grown crystals have transparency of 99%. The transparency of the LVSA crystals was found to increase due to increase in crystalline nature. The reduction of transmittance in SA crystals may be because of the scattering from the point and line defects as reported by M. Senthil pandian et al [24]. From Fig. 7 it was found that the lower uv-cut off wavelength for the SA crystal was 235nm and percentage of absorption is high for L-valine added sulphamic acid in comparison with pure sulphamic acid and it could be due to the influence of L-valine.[25]. The tauc's plot analysis was carried out to find the energy band gap values and was shown in Fig. 8. The obtained optical band gap of L-valine added sulphamic acid was 3.5eV.

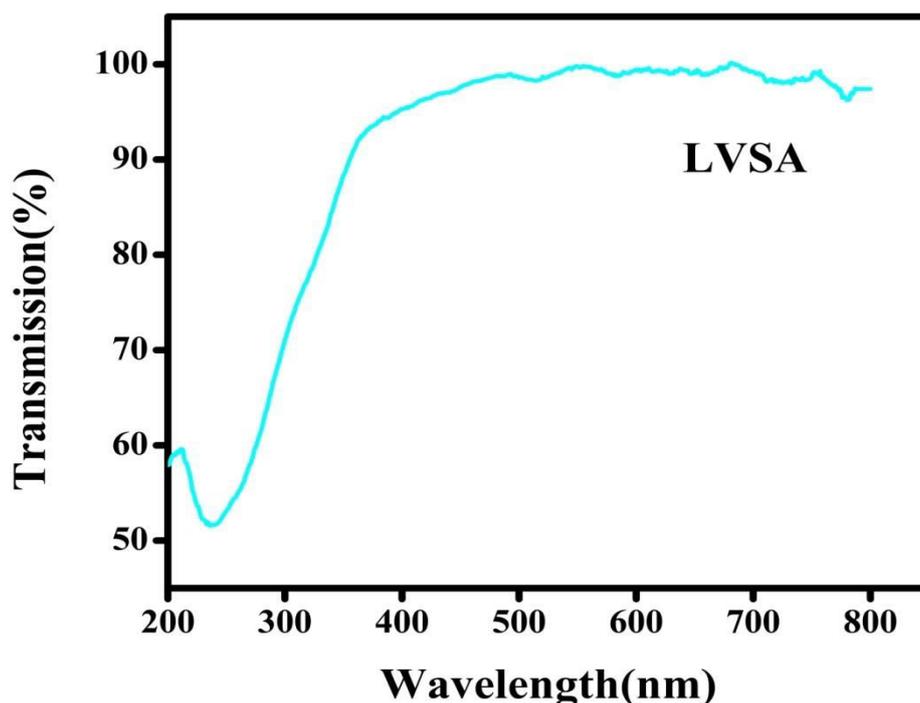


Fig6: UV Transmission spectra of LVSA.

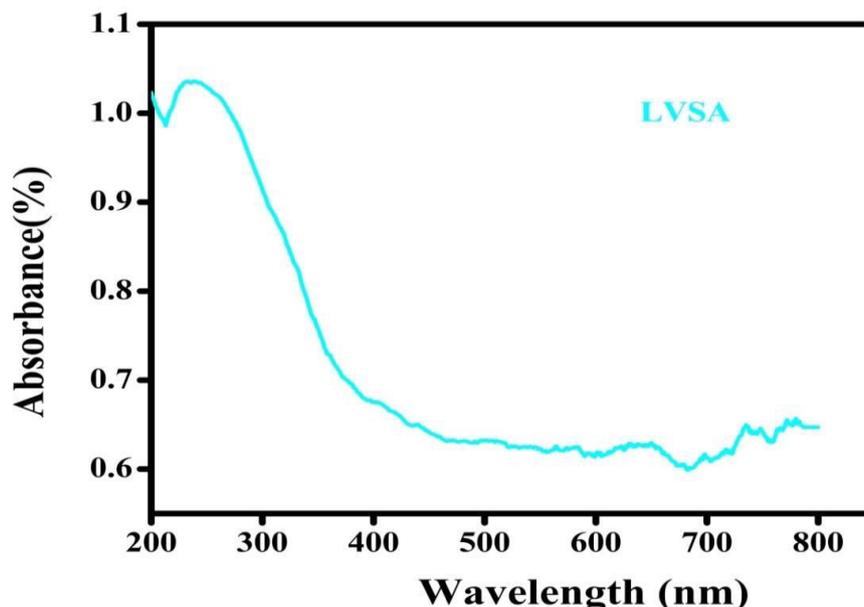


Fig 7: UV Absorption spectra of LVSA.

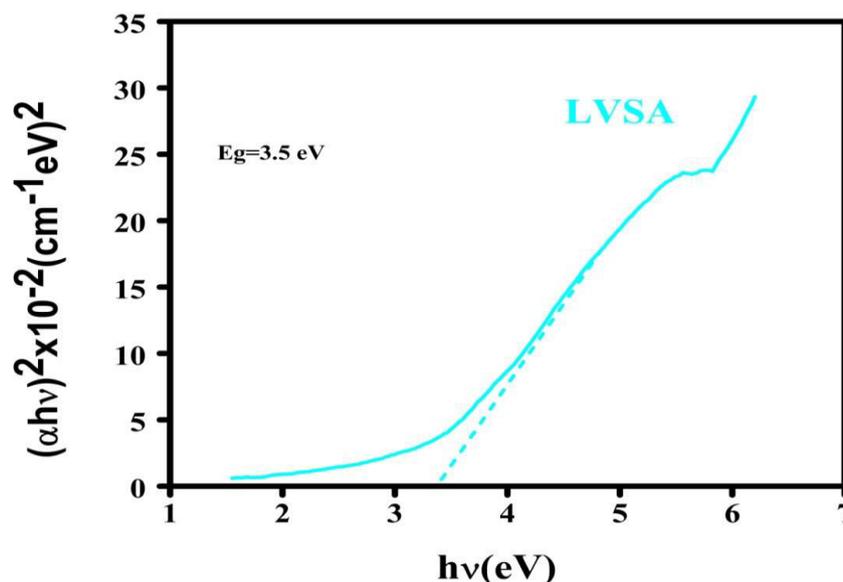


Fig 8: Tauc's plot for LVSA crystal.

3.7 Vickers's Hardness Test

The applications of the crystals are dependent on optical performance as well as good mechanical behavior [26, 27]. Vickers micro hardness measurements were done for the LVSA crystals at room temperature with the load ranging from 25g to 100g. The diagonal lengths of the indentation (d) was calculated in μm for various applied loads (p) in g. Vickers hardness number was determined using the relation

$$H_v = 1.8544P/d^2 \text{ kgmm}^{-2}$$

Fig. 9 shows the plot between load and hardness number. From the plot, it was noticed that the hardness number increased with increase in load up to 100g. No crack has been observed till 100g. The presence of L-valine played an important role in increasing the hardness property of the SA crystal. Similar behavior has been reported by Arumugam et al and Babu et al [28, 11]. The work hardening coefficient was studied from the plot of $\log p$ versus $\log d$, and the results are shown in Fig. 10. Least square fitting gives a straight line, which are in good agreement with Meyer's law. The value of n is calculated from the slope of the graph. According to Hanneman and onitsch [29] n should lie between 1 and 1.6 for hard materials and above 1.6 for soft materials. For LVSA crystal it was found to be above 1.6. Hence this crystal belong to soft materials group.

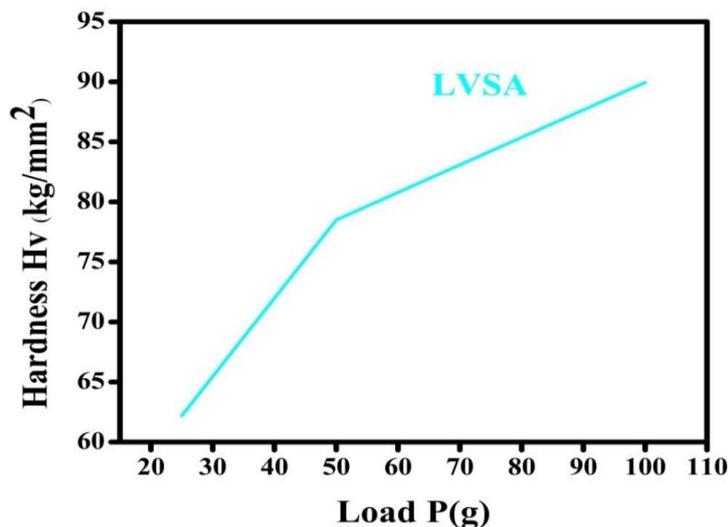


Fig: 9 Plot of Load (P) Vs Hardness number (HV) for LVSA crystal

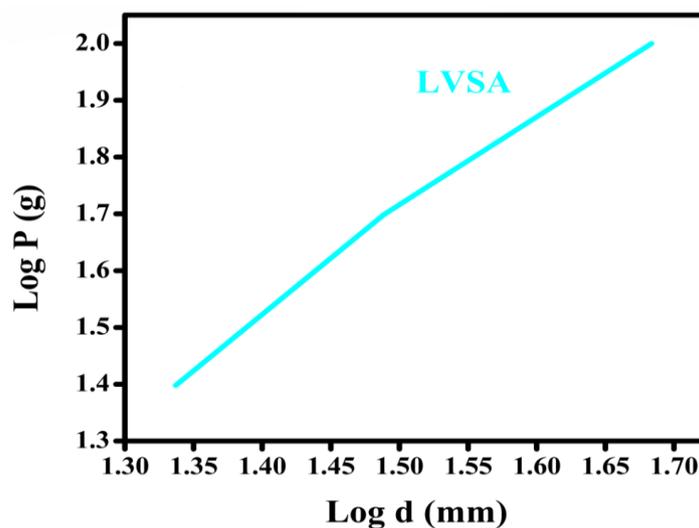


Fig 10: Log p Vs Log d for LVSA crystal.

3.8 TG-DTA Analysis

The phase transition of the grown crystal, water of crystallization and different stages of decomposition can be determined from TGA/DTA analysis [30]. TGA/DTA analysis of L-valine added SA was shown in Fig. 11. It was noticed that there is no weight loss of up to 285°C. A sudden drop was observed from 285°C to 465°C. This is related to the decomposition point of the material. Total decomposition of the crystal takes place at temperature 465°C for LPASA crystal. Hence these compounds have good thermal stability upto 285°C for LVSA crystals. Hence we can say that the grown crystals are suitable for applications with working temperature up to 285°C.

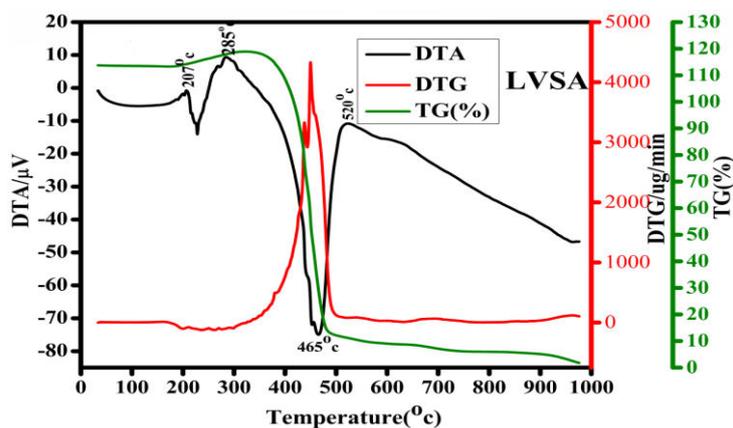


Fig.11: TG-DTA curves of LVSA crystal

3.9 Photoluminescence Studies

The emission spectra of LVSA crystal was shown in Fig 12. The emission spectra showed that the emission in the ultraviolet and visible regions. The violet, blue and green emissions were observed in the visible region. Amid all the emissions observed, the strongest emission was occurred at 491 nm analogous to blue emission. The peaks observed below 400 nm observed in the ultra violet region were owing to electronic transition $\pi\pi^+$ as reported by Arumugam et al.[28]. The peaks noticed below 500 nm were corresponding to blue emission [31]. Due to transition between the energy levels 5D_4 to 7F_6 , these emissions were happened. The peak observed at 530 was linked to green emission due to transition from 5D_4 to 7F_5 energy levels [32]. On close examination it was found that the intensity of blue emission was enhanced. The property of having strong emission in blue region may lead to potential application of this material in blue emission optoelectronic devices [33].

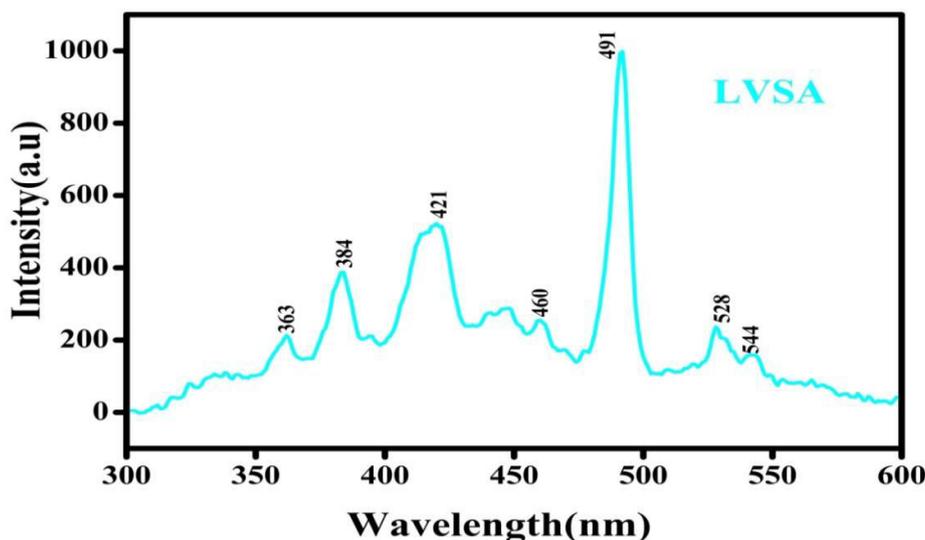


Fig.12: Photoluminescence spectra of LVSA crystal.

3.10 Antibacterial Activity

The antibacterial activity of LVSA was analyzed against gram positive bacteria(Bacillus, staphylococcus aureus) and gram negative bacteria(Escherichia coli,klbsiela,serattia) using Disk Diffusion Kirby – Bauer method. A reagent for the Disk Diffusion Test is Mueller-Hinton Agar medium.

While absorbing the zone of inhibition, E.coli have 22mm of half life's for known standard antibiotic. Similarly in klebsiella, bacillus, staphylococcus aureus and serattia, the standard antibiotic zone of inhibition was ranging from 19-22 as given in the table 4. Table .4 gives the antibacterial activity of LVSA in with standard. From the table it was observed that LVSA crystal showed better antibiotic property than SA. Also it was higher than pure SA crystals.

Bacteria name	LVSA Zone of inhibition[mm]	Standard antibiotic AMIKACIN Zone of inhibition[mm]
E.COLI	32	22
KLEBSIELLA	31	19
BACILLUS	33	20
STAPHYLOCOCCUS AUREUS	31	22
SERATTIA	33	19

3.11 Z-Scan Measurements

The third-order NLO properties of LVSA crystal was investigated by the Z-scan technique. Z-scan is a very acceptable technology to examine the third order nonlinear refractive index (n_2) and nonlinear absorption coefficient (β). The graphs attained for the open aperture and closed aperture method of LVSA were shown in Fig. 13(a) and 13(b) respectively. Here, an open aperture Z-scan method was carried out to calculate the nonlinear absorption coefficient (β). From the assembled data, we examined the maximum absorption at focus was obtained in a shape of the valley that showed the reverse saturable absorption (RSA) along with positive absorption coefficient (β) and also showed two-photon absorption (TPA), which is a very important characteristic for optical limiting applications. The positive value of nonlinear refraction reveals the self-focusing nature. The third order susceptibility ($\chi^{(3)}$) of LVSA was found to be 3.64×10^{-6} esu. The calculated values of n_2 and β were $2.90 \times 10^{-9} \text{cm}^2/\text{w}$ and $2.65 \times 10^{-4} \text{cm}/\text{w}$ respectively.

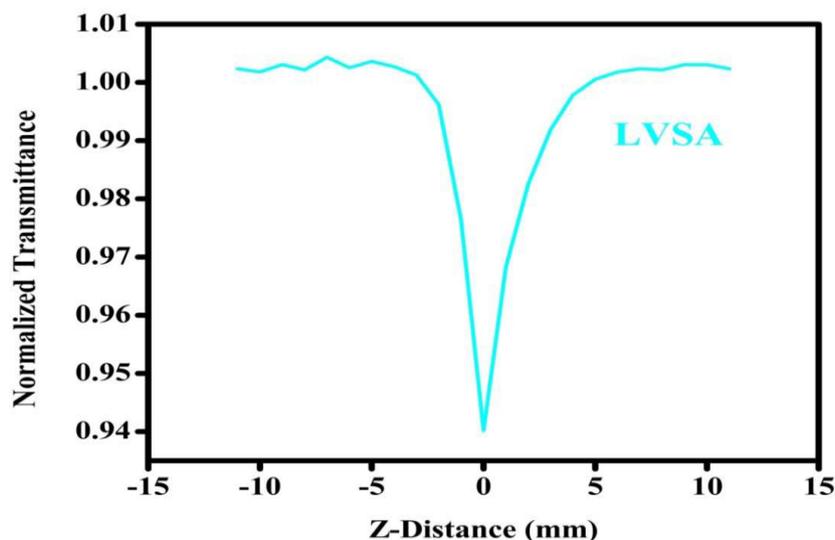


Fig.13a: Z-scan open aperture of LVSA crystal

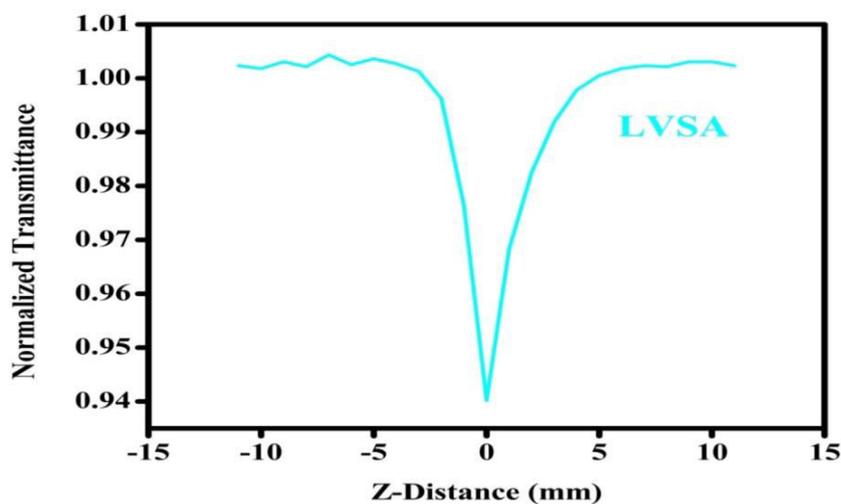


Fig.13b: Z-scan closed aperture LVSA crystal

IV. CONCLUSION

The L-valine added sulphamic acid crystal has been grown by slow evaporation technique at room temperature. Single crystal and Powder X-ray diffraction studies revealed orthorhombic crystal structure and lattice parameters were also evaluated. A small change in the lattice parameters and volume of the crystals was noticed when L-valine is added to sulphamic acid. The FTIR and FT-Raman spectroscopic analysis verified that there is no phase change upon addition of L-valine to sulphamic acid. All the vibrational modes were present with slight deviation in the peak position. The morphological and compositional analysis proved that, on addition of L-valine, the crystallinity was improved and the presence of carbon was identified. The optical study showed that the transparency is very high compared to SA. The value of band gap was found to decrease with the addition of L-valine. The mechanical strength was enhanced while adding L-valine and the crystal goes to a soft material group. TG-DTA analysis showed that the grown crystals have good thermal stability up to 295°C. In the photoluminescence studies, the strongest peak arised from 5D_4 to 7F_6 transition at 491°C shows the blue emission. Hence this material leads to potential application in blue emission opto electronic devices. The antibacterial activity showed of L-valine added SA the antibacterial activity was enhanced, which will be helpful for killing pathogenic bacteria's. The third order nonlinear refractive index, absorption coefficient and optical susceptibility were calculated by the Z-scan technique and it revealed that the L-valine added SA crystal possessed self-focusing and two-photon absorption process.

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Study of Climate Change and Its Impact on Women's Health: A Legal Analysis

Shivpriya* and Preeti Misra

Department of Human Rights, School of Legal Studies, Babasaheb Bhimrao Ambedkar University, Lucknow, Uttar Pradesh, India

ABSTRACT

Climate change has become a severe concern in modern times across the planet. Climate change impact on health, such as increased heat exposure, poor air quality, extreme weather events, changed vector-borne disease transmission, lower water quality, and decreasing food security, affect men and women differently according to biological, social, and cultural variables. Climate change threatens to intensify current gender-based health inequities in India, where substantial changes in the environment can be seen. Women not only endure poor physical and psychological health consequences because of climate change, but they are also disproportionately affected by agricultural crises and natural disasters. Furthermore, women in India appear to be mostly ignored in decision-making. Incorporating a gendered perspective into existing climate, development, and disaster risk reduction policy frameworks can help to reduce negative health effects. Empowering women as agents of social change can help policymakers strengthen mitigation and adaptation efforts. It is the need of the time to study and research on Climate change through gendered mirror, as Women's and her health is critical to a country's long-term prosperity. The focus of this study will be on the real status of women in India, as well as the impact of Climate change on their health. This study will also attempt to address the seriousness of gender discrimination in Indian communities, as well as the influence that such gender inequities have on their health and Climate change. Finally, this article will attempt to study a few of India's most important health policies to better understand the nature of these policies and the approaches taken to solve this issue. Method adopted in this paper writing is doctrinal in nature, to investigate the phrases 'climate change,' 'health,' 'gender,' and 'policy,' a comprehensive literature search was conducted using internet and books.

Keywords: Climate Change, Women's Health, Gender, Policy, Gender Discrimination

INTRODUCTION

Climate change surely impacts every person of the planet, and it is the most serious danger to global health in our time. A long-term shift in global or regional climatic patterns is referred to as climate change. Climate change is frequently used to refer to the rise in global temperatures from the mid-20th century to the present. The rapid rise in global warming and the irrevocable changes in the environment are hurting women in unimaginable ways. According to the World Water Development Report 2021, the world's poor would be disproportionately affected by climate change, with 800 million people (almost 78 percent of the world's poor) suffering from chronic hunger and two billion people suffering from micronutrient deficiencies as of 2017. This puts them in jeopardy individually, but it also has serious consequences for the family. The severity of the impact on women and girls inside the family unit is expected to be substantially bigger and much worse. This is partly due to present gender inequalities in the world, which will almost certainly worsen if current policies are not addressed. Women and children, for example, are 14 times more likely than males to die in catastrophes, and women account for almost 80% of those displaced by climate change.

Women are disproportionately affected by natural catastrophes and climate change across the world. This is primarily due to societal structural disadvantages that result in inequality, discrimination, and women's exclusion from decision-making. National and international regulations and laws can play a vital role in redressing this inequality. The coronavirus disease pandemic (COVID-19) has highlighted even more significant gender inequities and gender gaps. Addressing gender disparity must be at the focus of all activities, developmental programs, policies, and so on, as all nations strive for more sustainable and resilient development.

Adverse Effect of Climate Change on Human Health

Increased exposure to extreme weather events, such as droughts, flooding, and temperature extremes; altered food, water, and vector-borne infectious disease; reduced food, water, and air quality; decreased food security; and loss of access to healthcare resources because of political and economic instability, as well as mass migration, are among the anticipated negative impacts of climate change on human health. Some of the effects on morbidity and mortality include:

- Direct effects, including death from heat, heat stress, and heat stroke

- Physical injuries, deaths, stress, depression and anxiety as a result of extreme weather occurrences.
- Poor air quality causes respiratory problems (asthma, allergies) as well as cardiovascular illness.
- Low water quality and a lack of access to safe drinking water, resulting in a rise in diarrheal illnesses such as cholera
- Food insecurity caused by rising CO₂ levels, which result in lower levels of protein, micronutrients, and B vitamins in rice, wheat, and other crops, as well as lower yields of vegetables and legumes, resulting in undernutrition, stunted childhood growth, and vulnerability to noncommunicable diseases. Geographic spread of mosquitoes and other vectors that can disseminate diseases such as malaria, dengue, yellow fever, Zika virus, etc.
- Negative mental health outcomes, lack of access to reliable healthcare, food, and water, and vulnerability to violence are all consequences of climate-induced migration.

Gender Differences in the Context of Climate Change

Due to the limited collection of sex, age, and diversity-disaggregated data, there are significant informational and data gaps on the gendered implications of climate change. The differential repercussions of climate change are influenced by women's relative lack of equality in social, economic, and political spheres. Women's restricted access to and control over resources, as well as the gendered division of work in families, constitute challenges to women's coping and recovery from disaster. Women and children, for example, accounted for 55% of those killed in the 2015 Nepal earthquakes. This was attributed to a number of factors, including the prior migration of more men than women away from the affected areas in search of work, as a result women were more likely to be inside their homes due to gender roles in families, and that many women with caregiving responsibilities delayed their escape in order to save children, older family members, and family valuables. In the 2004 Indian Ocean Tsunami, women died at considerably greater rates than males.

Women are disproportionately affected by climate change because of gender disparities. Across all family and household kinds, women spend much more time on domestic chores than men, two and a half times more, according to the United Nations (UN) Women. Many of these duties, such as fuel and water collection, have become more time-consuming due to climate change. Climate change-induced drought can increase the daily distance women and girls are expected to travel to gather water by up to 15 kilometers (km) in both rural and urban areas, limiting their available time for economic activities, education, and leisure.

Climate change is also expected to exacerbate food insecurity, with women and girls bearing a disproportionate share of the cost. During food shortages, for example, women in Vietnam restrict their eating more than males, resulting in disproportionate health implications that both men and women justify based on the gendered division of work. In Andhra Pradesh, India, twice as many women as men reported lowering their food consumption in response to the drought.

Women's lack of land ownership and access relative to males, as well as their restricted resources, have an impact on their ability to adapt to climate change. While women account for around 43 percent of agricultural work force, they account for fewer than 20 percent of global landowners. This is due to discriminatory legislation as well as inequitable customary practices and societal norms. While men and women have equal legal rights to land, according to a 2016 UN Women report, these rights are not upheld in over 60% of nations.

It's Adverse Effect on the Health of Women

As previously said, the populations that will bear the brunt of the climate disaster will be the most disadvantaged in society. Women have been identified as a vulnerable category among such populations, since they lack proper access to family planning services, educational resources, and sufficient income along with other facilities in many regions of the world. Furthermore, due to the varied roles men and women play in most communities, as well as women's particular reproductive burden, climate change consequences are projected to affect men and women differently. In many circumstances, negative consequences are expected to be harsher for women than for males, exacerbating already-existing health inequities in many regions of the world. The following are some examples of unfavorable health impacts experienced disproportionately by women:

- Respiratory and cardiovascular illness as a result of increased exposure to poor-quality air, particularly particle air pollution from both indoor and outdoor sources (e.g., cooking and heating sources). Biomass is a major contributor to the air pollution that women are subjected to. It is commonly used in Indian families for cooking and heating, exposing women to its hazardous effects.

- Anemia and malnutrition caused by food instability, as well as increased nutritional requirements due to childbirth and menstruation. Malnutrition and food poverty induced by climate change have a serious impact on the health of Indian women.
- Physical and sexual violence, as well as anxiety, depression, and other mood disorders, have all been linked to climate-related migration and natural calamities. Women and children are more susceptible during extreme weather events because they are less mobile than males. Catastrophes, violence, or sexual assault experienced at the time of events related to climate change may have a long-term influence on women's psychology, leading to post-traumatic stress disorder or depression.
- Complications arising from pregnancy (e.g., intrauterine growth restriction, preterm birth, congenital anomalies, stillbirth). "Women's immune systems are weakened because of many biological changes that occur during pregnancy. As a result, pregnant women are an easy target". Furthermore, rising seasonal temperatures and extreme heat events such as droughts are thought to have a negative influence on reproductive outcomes, leading to gestational hypertension and preeclampsia. Lack of access to prenatal care, contraception, and family planning options further aggravate the existing health issues of women.
- Water shortage due to climate change has a negative influence on women's health. In India, getting water for the family is usually a woman's task. Due to the disappearance of groundwater in various parts of India, women are forced to travel longer distances, frequently in blazing heat, to obtain water, resulting in significant exhaustion. In the lack of safe water sources, the water they consume, or use is frequently polluted or tainted with pollutants. While drinking such water raises the risk of waterborne illnesses, it also carries its own set of health risks.

Climate change must be evaluated through a gender lens, and more efforts must be made to collect data that demonstrates how this phenomenon affects women. The government must not only develop new legislation to combat climate change, but also consider its impact on women.

International Policy Framework

The World Health Organization (WHO) recently named "health impacts of climate and environmental change" as one of four major health priorities for the next five years, emphasizing the need of putting women, children, and adolescents at the core of global health and development (World Health Organization, 2017) Such patronizing ambitions may, in theory, begin to address policy gaps; yet no fundamental transformation of the organization has happened to support such declarations.

Similarly, the United Nations Framework Convention on Climate Change (UNFCCC) and the United Nations International Strategy for Disaster Reduction (UNISDR) have achieved some progress (UNISDR). The United Nations Framework Convention on Climate Change (UNFCCC) resolution 21/CP.22 (2017) asks for a gender action plan that incorporates a gendered approach in all aspects of mitigation, adaptation, capacity, technology, and financing. Although this framework establishes the groundwork for action, systematic integrative techniques, as well as criteria to track success, are needed.

Gender equality has only lately emerged as a recognized priority topic in international agreements and their monitoring. Paragraphs 19(g) and 25(a) of the Sendai Framework, for example, underline the need of gender inclusion and disaggregated data, although the indicators agreed upon by State Parties for reporting so far require only numbers of people, with sex-disaggregated data optional. 57 SDG 5, achieving gender equality and empowering all women and girls, is one of the most important SDGs because it will have a positive knock-on effect on the achievement of the other SDGs, such as quality education, poverty alleviation, clean energy, reduced inequalities, good health, and wellbeing, zero hunger, clean water and sanitation, decent work and economic growth, and, most importantly, climate action.

This idea was transformed into real action in the 2014 Lima Work Program on Gender and the 2017 Gender Action Plan by supporting gender mainstreaming, developing gender-responsive climate policy, and expanding women's engagement in the UNFCCC process. While the 2015 Paris Agreement did not fully mainstream gender, nations have made tremendous progress in including gender into their intended/nationally determined contributions (I/NDCs) since then. In 2020, for example, 56 percent of nations were either integrating gender into their NDCs or intended to do so. One day of the COP26 2 week summit has been dedicated to gender issues, including a renewed discussion on Gender action plan (GAP), which was adopted by in parties at COP25.

Although great progress has been made in international policy fields, but all policy frameworks face implementation issues. Systematic methods for integrating policies are inadequate inside and across institutions, as well as regional infrastructure, must also be investigated.

Indian Legal and Policy Framework on Climate Change

Inequality by Caste/class, gender, money, poverty, and religion are among factors that divide Indian society. Child marriage, combined with a rooted patriarchy and gender division that prioritizes boys over girls and keep them apart, lead to the establishment of a culture where women are sexually abused and exploited. According to the World Economic Forum's 2021 Gender Gap Index, India ranks 140th out of 156 nations in terms of eliminating gender inequality. In 2021, women had just 10.5 percent of parliamentary seats, and just over a quarter of adult women (27 percent) had completed secondary school, compared to 56.6 percent of their male peers.

The National Action Plan on Climate Change (NAPCC) was launched in 2008 by the Prime Minister's Council on Climate Change. Eight national missions forming the core of the NAPCC which represent multi-pronged, long term and integrated strategies for achieving key goals in climate change. These are- National Solar Mission, National Mission for Enhanced Energy Efficiency, National Mission on Sustainable Habitat, National Water Mission, National Mission for Sustaining the Himalayan Ecosystem, National Mission for A Green India, National Mission for Sustainable Agriculture, National Mission on Strategic Knowledge for Climate Change. India has pledged to increase the percentage of clean and renewable energy sources while decreasing the share of traditional nonrenewable energy sources. To address the issue of climate change, India has implemented several policies and initiatives. For example, India just filed her Nationally Determined Contributions as part of her partial duty under the Paris Agreement. Placing climate change at the center of its environmental policies, India took bold pledges in 2021 asserting at the crucial international climate summit COP 26 that it is the only country delivering in "letter and spirit" the commitments under the Paris Agreement. From pledging to become net zero emitter of carbon by 2070 to achieving 500 gigawatts non-fossil energy capacity by 2030.

The National Health Policy was enacted in 2017. This policy sought to address a number of issues, the most prominent of which were illnesses said to be induced by climate change. For example, specific targets were established to reduce premature death from cardiovascular illnesses, respiratory disorders, and other causes to 25% by 2025. It also extended access to higher-quality health-care facilities to everybody at a lower cost. It also urged concerted effort in seven critical areas, including Nirvaya Nari—activity against gender violence and reduction of indoor and outdoor air pollution. However, this approach has been criticized for being funded insufficiently.

Many similar programs and policies have been implemented, but the examples above will help us grasp the nature of the government's efforts. However, it has been difficult to develop a single strategy that addresses the three-pronged problem of climate change, gender inequality, and women's health at the same time, which is currently most needed to be addressed efficiently.

Meanwhile, the adaption procedures are showing promising results. For example, the Bhungroo project was recognized as part of the Momentum for Change: Women for Results initiative. This project is connected to irrigation, in which water is stored below during the rainy season and pumped out during the dry season. As a result, the women have been able to assure food security and malnutrition, so mitigating the negative effects of climate change. Another example is the Indian NGO Swayam Shikshan Prayog, which has been enabling rural women to become entrepreneurs in sectors such as clean energy, sanitation, safe water, sustainable agriculture, health, and nutrition, and so on. This NGO has taught over 60,000 women across India since 2009.

The Unique Role of Women in Mitigating and Adapting Climate Change

Women mediate the interplay between population growth and climate change through their reproductive behaviors. If contraception were more readily available in both developed and developing regions, CO₂ emissions could be reduced by 30% by 2100 while simultaneously eliminating more than 100,000 maternal deaths per year.

Women's traditional role as family caregivers in many parts of the world places them in unique decision-making roles that can adversely impact climate repeatedly throughout the day, including in the use of appliances (e.g., for lighting, cooking, heating, or cooling, laundry, etc., including time and frequency of use), purchases of household goods, establishment of family dietary habits and patterns and the education and shaping of their children's energy consumption habits .

Women also have the expertise and awareness of what it takes to adapt to changing environmental conditions and come up with effective solutions. Women's expertise and capability must be unleashed for practical and successful climate change mitigation. Women's contributions as decision-makers, caregivers, stakeholders, specialists, and educators across all sectors must be recognized to discover long-term solutions. Greta Thunberg, Christina Figueres, and Franny Armstrong, to mention a few, are already pioneering not just climate change activism but also the development of long-term, sustainable solutions.

Renewable energy is one of the most powerful weapons for enhancing women's efficacy in climate change mitigation. It can help alter women's lives by improving their health, giving them with better economic possibilities, expanding their educational options, and more. It provides many business opportunities for women to expand the use of renewable energy, which reduces carbon emissions. Women in rural areas would be the main beneficiaries. Renewable energy promotes women's importance in society, protects them from adverse health impacts of indoor pollution (from biomass burning), and makes them agents of climate change mitigation through their engagement in renewable energy deployment. "Women's empowerment and gender equality have a catalytic influence on human growth, effective governance, long-term peace, and harmonious dynamics between the environment and human populations."

What Is Missing and What Can Be Done

When it comes to estimating the consequences of climate change, there are significant inequalities across genders, and gender is frequently absent as a variable. Women's voices in climate negotiations are still unheard at the global level. According to research of the 25th UN Climate Change Conference (COP25), just 27% of delegation chiefs were women. The Gender Action Plan at COP25 can only improve gender responsive activities in climate change if gender sensitive data is available.

The gender perspective must be included into national and international policy to mitigate and adapt to the consequences of climate change. Prioritizing female education and developing gender-sensitive criteria for indicators of women's health and well-being are among few solutions which can be prioritized. Girls and women should be acknowledged as leaders in furthering global efforts to minimize the consequences of climate change since they are significant agents of change. Governments, civil society, academia, the media, vulnerable people, the United Nations, and the commercial sector must all collaborate to bring the connections between education, gender equality, climate change, and health to the forefront.

Women and girls, who are already disproportionately affected, would suffer even more if they do not have access to education and contraception. Climate change must be addressed immediately, green solutions must be found, and green resources and green employment must be distributed equally. "We have to construct our climate change mitigation plan in such a manner that we do not disregard women's demands," "When major climate changes occur, our first task should be to consider the basic needs of men and women individually, and then to attempt to address those issues. During floods, for example, women have a worse time meeting their sanitary demands than males. As a result, disaster management plans should focus on providing good sanitation to women in the event of a disaster".

Gender vulnerability must be factored into climate adaptation and mitigation efforts on a large scale. Disaster risk reduction, transportation, water management, infrastructure investment, and agriculture are all areas where women's health problems may be linked. Private-public partnerships can be utilized to design effective products and services, such as solar cookers, stoves, and sustainable agricultural practices. Policymakers need to be educated on the gender-specific health risks posed by climate change, which may be incorporated into public health messaging. Disaster warnings should also be made more accessible to women who are illiterate or who do not speak common languages.

In India, there is a pressing need to enhance public health monitoring and data collecting. Collecting high-quality gender-disaggregated data would help researchers better understand the links between gender, climate, and health. Furthermore, health data may be combined with agricultural, climatic, and water supply data to identify susceptible regions and people. Women's health and economic prosperity may be utilized as surrogate markers for development, catastrophe risk reduction, and climate adaption, and should be used as project and policy success indicators. Similarly, areas with poor health outcomes should be designated as climate change hotspots, both now and in the future.

CONCLUSION

Developing nations, such as India, face enormous social, cultural, geographical, political, and environmental factors that expose all population, particularly women, to climate change. Simultaneously, by embracing

sustainable development methods, India has a huge chance to lead the global trajectory on climate change. While gender is increasingly being included in international climate policy, progress in India in reducing gender-based health inequities and including women in climate change mitigation, adaptation, and disaster risk reduction and management has been slow. Without a doubt, policies and regulations are created from time to time, and this process will continue indefinitely, but limiting policymakers' and the government's obligations would not be enough for a complete solution. Local solutions are a good place to start, but for such solutions to have a substantial influence on future climate scenarios, they must be upgraded. This process can be accomplished through proactive investment strategies, sensitization of policymakers in ministries of health and family welfare, high-level political engagement in the implementation of landmark UN agreements, and the incorporation of a gendered perspective into national, state, and local climate adaptation plans. Since adaptability is no longer a choice, but rather a requirement, inventive ideas are now in high demand. Women are not only the most susceptible subjects of climate change, but they are also the pioneers of bringing about a revolution in the process of mitigating such climate change.

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Study on Importance of Resilience and Emotional Intelligence at the Workplace

Shilpa Narayanswamy and Tanvi Thakkar

Welingkar Institute of Management Development and Research, India

ABSTRACT

In the framework of Positive Organizational Behavior, the construct of Psychological Capital identifies four psychological capacities that affect motivation and performance in the workplace: self-efficacy, hope, optimism and resilience. Emotional Intelligence, then addresses self-regulatory processes of emotions and motivation that enable people to make adjustments to achieve individual, group, and organizational goals.

Emotional Intelligence is strongly correlated with success in an organizational setting and with individual performance. Moreover, Emotional Intelligence is considered an antecedent to resilience.

The study aims to investigate the role of resilience and emotional intelligence on employee productivity at the workplace.

Keywords: Positive Organizational Behavior, Resilience, Emotional Intelligence, Productivity, Psychological Capital

INTRODUCTION AND LITERATURE REVIEW

Luthans (2002a) defines Positive Organizational Behavior (POB) as “the study and application of positively oriented human resource strengths and psychological capacities that can be measured, developed, and effectively managed for performance improvement in today’s workplace”. The four states that are applied to today’s workplace and contribute to positive psychological capital, with a return of improved performance such as higher productivity, better customer service, and more employee retention, are: (1) Confidence or Self-efficacy, the individual’s conviction about his or her abilities to mobilize the motivation, cognitive resources, and courses of action needed to successfully execute a specific task within a given context (Stajkovic & Luthans, 1998). (2) Hope, a positive motivational state that is based on an interactively derived sense of successful (a) agency (goal-oriented energy) and (b) pathways (planning to meet goals) (Snyder, Irving, & Anderson, 1991). (3) Optimism, that influences how individuals perceive themselves and their environment, how they process incoming information, as well as how they decide to act based on this information. While optimists tend to trust that the future will be favorable; pessimists believe that bad events are likely to happen to them. As a result, pessimists behave in ways that allow them to prepare for the worst (Forgeard & Seligman, 2012). (4) Resilience, “the developable capacity to rebound or bounce back from adversity, conflict, and failure or even positive events, progress, and increased responsibility” (Luthans, 2002b, p. 702). Although resilience is just emerging in the organizational behavior literature, POB has adopted a cross-disciplinary perspective, drawing from the established theory building and empirical findings in clinical and developmental psychology.

The concept of Emotional Intelligence (EI) refers to the ability to accurately perceive, access and generate emotions, assist thought processes, and reflectively regulate emotions so as to promote emotional and intellectual growth (Mayer, Salovey, & Caruso, 2004). EI addresses self-regulatory processes of emotions and motivation that enable people to adjust to achieve individual, group, and organizational goals (Froman, 2010). Some of the debate around the concept of EI, has considered EI as a stable set of dispositional attributes (e.g., personality traits, character, core values) as compared to a set of social-emotional skills that can be learned and developed (Mayer et al. 2004). As competencies, they encompass personality traits, motives, bodies of knowledge, and skills that can potentially facilitate individual achievement of positive work outcomes in such areas as job performance, career advancement, customer service, teamwork, and leadership (Goleman, 1995; Dulewicz & Higgs, 2000). However, EI, using both dispositional and learned competencies models, seems to be positively related to productive organizational outcomes (Froman, 2010).

In an extensive review of the literature on EI, Dulewicz & Higgs (2000) identified the core common elements in the overall construct which were subsequently demonstrated in empirical studies. These are: (1) Self-Awareness. The awareness of your own feelings and the ability to recognize and manage these. (2) Emotional Resilience. The ability to perform well and consistently in a range of situations and when under pressure. (3) Motivation. The drive and energy which you have to achieve results, balance short and long-term goals and pursue your goals in the face of challenge and rejection. (4) Interpersonal Sensitivity. The ability to be aware of the needs and feelings of others and to use this awareness effectively in interacting with them and arriving at decisions impacting on them. (5) Influence. The ability to persuade others to change their viewpoint on a

problem, issue or decision. (6) Intuitiveness. The ability to use insight and interaction to arrive at and implement decisions when faced with ambiguous or incomplete information. (7) Conscientiousness and Integrity. The ability to display commitment to a course of action in the face of challenge, to act consistently and in line with understood ethical requirements. In a range of research studies Dulewicz and Higgs (1999; 1999b; 2000) have demonstrated that EI is strongly correlated with individual advancement and success in an organizational setting and with individual performance, and also it may be strongly related to leadership.

According to Armstrong, Galligan, and Critchley (2011), EI may well be directly connected to resilience, such that emotionally intelligent behavior in stressful circumstances is adaptive. Salovey, Bedell, Detweiler and Mayer (1999) theorize that persons with higher EI cope better with the emotional demands of stressful encounters because they are able to “accurately perceive and appraise their emotions, knowhow and when to express their feelings, and can effectively regulate their mood states”. EI is thus postulated to buffer the effects of aversive events through emotional self-awareness, expression, and management. Moreover we agree with Armstrong et al. (2011) that EI is antecedent to resilience (Matthews, Zeidner, & Roberts, 2002) rather than encompassing resilience (Bar-On, 1997), such that EI functions through its composite dimensions to facilitate resilience. As cited by Tugade and Fredrickson (2004), a convergence across several research methodologies indicates that resilient individuals have optimistic, and energetic approaches to life, are curious and open to new experiences, and are characterized by high positive emotionality (Block & Kremen, 1996; Klohnen, 1996). Additional evidence suggests that high-resilient people proactively cultivate their positive emotionality by strategically eliciting positive emotions through the use of humor (Werner & Smith, 1992), relaxation techniques (Demos, 1989; Wolin & Wolin, 1993), and optimistic thinking (Kumpfer, 1999). Although to date there has been little research evidence on such resilience in the workplace, Luthans, Avolio, Walumbwa, and Li (2005) did find a significant relationship between the resilience of the Chinese workers who were undergoing significant change and transformation and their rated performance.

AIM OF THE STUDY

Summarizing the literature review above, our starting point is as follows:

- (1) EI has important influences on attitudes at work, because it addresses self-regulatory processes of motivation that enable people to achieve organizational goals,
- (2) Resilience can be associated to EI: It is posited that EI is antecedent to resilience

Considering there are very few studies – and not always focused on workplace context – that have explored the relations between resilience and emotional intelligence, the purpose of this study is to verify the relationship between Emotional Intelligence, Resilience with Employee Productivity.

Hypothesis 1: Emotional intelligence will be related to Resilience

Hypothesis 2: Resilience will mediate the relationship between emotional intelligence and employee productivity.

SCOPE OF THE STUDY

This study can be used in the larger framework of employee motivation at the workplace. Also, findings of this study can help determine the kind of emotional intelligence required for different roles in the organization and the success parameters in each of them. The study on resilience can help understand the relation between success and achievement at the workplace. The post pandemic era needs employees to demonstrate high levels of emotional intelligence and resilience at the workplace. The current context of work requires these aspects to be treated at par with other physiological and psychological aspects at the workplace. This will make the results of the study meaningful to many organizations who may want to incorporate this in their growth context.

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A Study on Consumer Behaviour towards Brand in Online Shopping with Reference to Bangalore City

Suganya¹, Leebana Gracy² and Ramya³

¹Department of Commerce, Fatima College, Madurai, India

^{2,3}Department of Commerce, East Point College of Management, Bangalore, India

ABSTRACT

This article deals about the impact of brand on online shopping consumer behaviour in Bangalore city. The aim is to identify the fact that brand has impacted on the behaviour of the consumer while shopping online. COVID 19 is the one of the factor which has stimulated the importance and use of online shopping compared to the pre covid scenario. Consumers are aware about brand and are attracted towards brand image; they are also loyal towards their brand preferred. For the purpose of the study primary data was collected by using quantitative method with the sample size of 60 respondents using questionnaire among online shopping consumers. Based on the subject area of research two hypotheses was framed namely, does brand affect the consumer behaviour and Education plays an important role in selecting a brand. As a result it is found that consumers prefer branded products and expect it as brand based on its quality. There is no relationship between gender, educational qualification and brand. It is also found that consumers behaviour varies based on the brand and they are not constant in their decision.

Keywords: Consumer behaviour, Online Shopping, Brand, Brand awareness.

INTRODUCTION

The global economy, in general, has suffered massive losses due to the coronavirus pandemic. Due to lockdown, most people started to shift to online shopping which has led to drastic usage of online mode of shopping to slow down the rapid spread of the virus. Not only pandemic but also increasing use of the internet has been enabled by the various modes of shopping online such as e-commerce websites, mobile commerce applications, etc.

Products are made for consumers, they can buy and product and choose and brand as they prefer. Consumers consume those products to satisfy their needs and wants. There are different steps involved in the consumer buying decision process such as recognition of need, search for the information, evaluation of alternatives, selection, and the last post-purchase behaviour. There are heaps of factors that affect consumer behavior and those factors lead them towards purchasing which brand they need.

The brand is an important factor for the success of the company at two different levels. Firstly, brand focus on consumer loyalty and then develop as resources which ensure demand in the future. Then stability is introduced into the businesses, which will be helpful in guarding against competition faced and allows them to plan and investment with increased confidence (Loken, Ahluwalia, Houston, 2010)

Now a day's people in the public are very much mindful of their prestige so they prefer to buy and use branded products to show off their status. The brand is considered a method through which any business can attract the consumer to enjoy the competitive edge. At present branding is considered a valuable asset as it has the ability to change the consumer buying behaviour.

REVIEW OF LITERATURE

Creating an emotional brand attachment is the key factor in brand management. Consumer behaviour varies based on different types of brand available and it is decided by the consumer. Success of the company or the brand is depended on brand loyalty. Consumers can be loyal to any brand according to the preference of consumer behavior (Shermach, 1997).

The consumer preferably buys the product of the brand to which they are loyal and the product which they buy regularly. Whenever the consumer thinks to buy a product with no doubt will buy the particular product, the brand which he/she always buys, due to the attachment and satisfaction which is expected from that brand (McGoldrick, 1997)

With the developing pace of globalization, competition is rapidly increasing innovation plays a vital role to compete with other brands. (Lim, 2011)

Consumer behaviour is influenced by a various range of factors which can objective or subjective. During 2020 the pandemic was one such factor which influenced the consumer behaviour. The increasing cases of COVID-19 cases and its consequences such as, isolation, quarantine, social distancing, community containment and lockdown has not only impacted the conscious of their health but also their buying behavior (Loxton, 2020)

During lockdown consumers were forced to eat at home, due to this reason there was increase online sales. With many online shoppers reporting a decline in income (Hobbs, 2020) with no doubt and surprise reasonable priced brands were preferred by the consumers. (Cai, 2020).

Consumer's belonging to diverse generations starting using online shopping method of shopping due to the pandemic and government restriction (Jilkova, 2021). Generally, there was a major shift toward e-commerce spending and the rate of recurrence of shopping has also increased (Armando, 2021).

Awareness of brand can influence risk assessment and confidence to make the purchase decision, due to awareness the brand awareness and its features. On the other hand, brand awareness can be represented into two aspects – unaided (brand recall) and aided (brand recognition) – each of the two aspects have its more or less effective influence on consumer buying decision and perceived risk assessment (Aaker, 1991, Moisescu, 2009)

DEFINITION OF KEYWORDS

Consumer Behaviour

Consumer Behaviour is the process and act of decision, made by people involved in buying and consuming the products. It is important to understand the concepts of why consumers make the purchases that they make? What factors influence consumer purchases? It involves various steps such as recognizing of needs, searching the necessary information, evaluating the alternative and then selecting the product/services

Online Shopping

Online shopping is the process of procuring goods or services from sellers over the internet. Online shopping is the activity of purchasing products or services through the help of Internet. The buyer can pay for the good or service online with a credit\debit card during the delivery of goods and services. Online shopping isn't restricted to buying online but it also includes searching for them online. In other words, it means the consumer have been engaged in online shopping but did not buy anything.

Brand

A brand is an intangible marketing concept which helps customers to identify a company and its product. People usually obscure brands with logos, slogans, and other recognizable marks, which are marketing tools that helps companies in promoting the goods and services. Brand is said to be considered as an important key for successful organization as a valuable assets.

Brand Awareness

Brand awareness is a term that describes the level of consumer recognition of a product by its name. Creating brand awareness is a key step in promoting a new or an existing product. Preferably, awareness of the brand may include the qualities and features that distinguish the product from its competitors.

OBJECTIVES OF THE STUDY

The study on consumer behaviour towards brand in online shopping with reference to Bangalore city has been carried out with the following objectives:

1. To analyse, whether consumer preference towards brand shifts during shopping online.
2. To understand the relation between educational qualification and branded product.
3. To know if brand plays any role in consumer behaviour.

Research Questions

1. Why do people prefer brand during their online purchase?
2. Do consumers shift to another brand?
3. Is there any relation between education and gender towards brand?
4. Are people using online shopping?

RESEARCH METHODS

This study has been conducted among the consumers those who reside in Bangalore city, Karnataka, India. The study is descriptive in nature. For the purpose of this study convenience sampling method has been used to determine the sample. Both primary and secondary data has been used. The primary data has been collected by questionnaire using Google form and the secondary data has been collected from various Journals, Magazines and Websites, etc. for this study 60 respondents were taken as a sample size. The collected data was analyzed in percentage method and shown graphically.

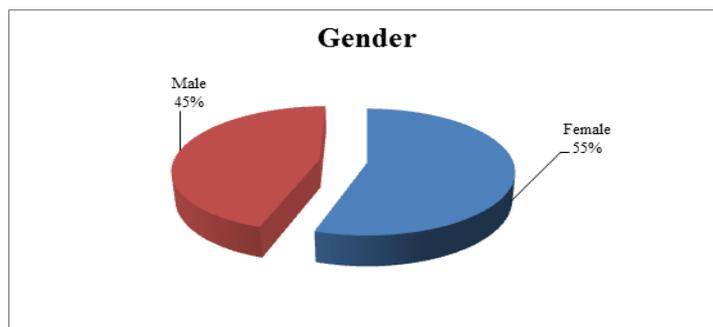
LIMITATIONS OF THE STUDY

- To select the respondents convenience sampling was used.
- A purposive sampling method was used which may be subjected to selection bias.
- Collection of data is been only with limited respondents.
- Response given by the respondents may or may not be accurate.
- The information collected may not be reliable due to less sample size.

ANALYSIS AND INTERPRETATION

Table 1: Gender wise classification.

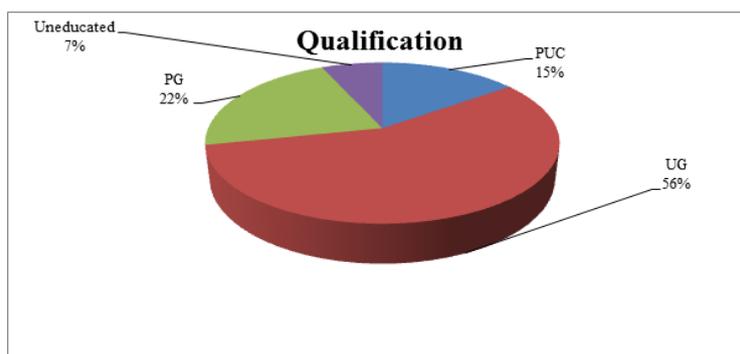
TYPE	NO. OF RESPONDENTS	PERCENTAGE (%)
Female	33	55%
Male	27	45%
Total	60	100%



As per table 1, out of sixty respondents thirty three were female and twenty seven were male that is 55% of female and 45% are male

Table 2: Education groups of the respondents.

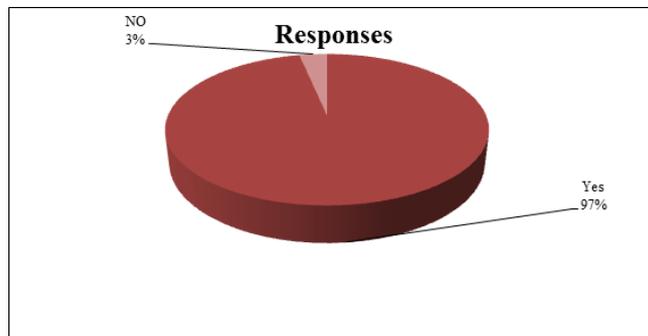
TYPE	NO. OF RESPONDENTS	PERCENTAGE (%)
PUC	9	15%
UG	34	56.7%
PG	13	21.7%
Uneducated	4	6.7%
Total	60	100%



As per table 2, the respondent's education qualification is nine out of sixty respondents have done PUC, thirty four have completed their degree, thirteen have done their PG out of sixty, four have no education qualification.

Table 3: Summary of Online shopping usage

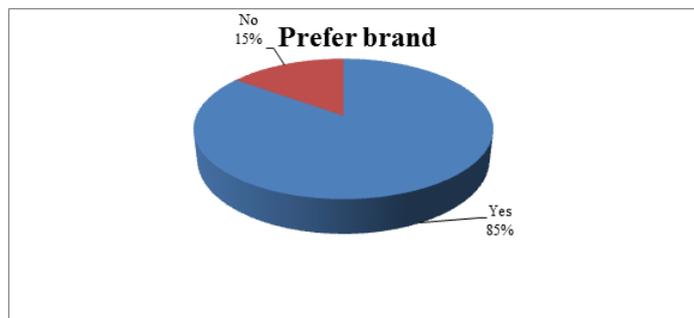
TYPE	NO. OF RESPONDENTS	PERCENTAGE (%)
Yes	58	96.7%
No	02	3.3%
Total	60	100%



As per table 3, fifty eight respondents out of sixty, have used online method for purchasing and two have not used online shopping, the reason may be they might not be sure whether the product will be of good quality or not.

Table 4: Preference of branded products

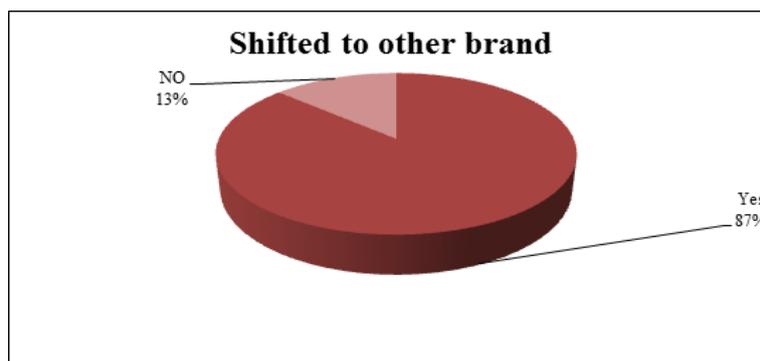
TYPE	NO. OF RESPONDENTS	PERCENTAGE (%)
Yes	51	85%
No	9	15%
Total	60	100%



As per table 4, While shopping 85% of the respondents that is fifty one out of sixty prefer only branded products and nine out of sixty don't prefer may be due to availability.

Table 5: Shifted to other brand

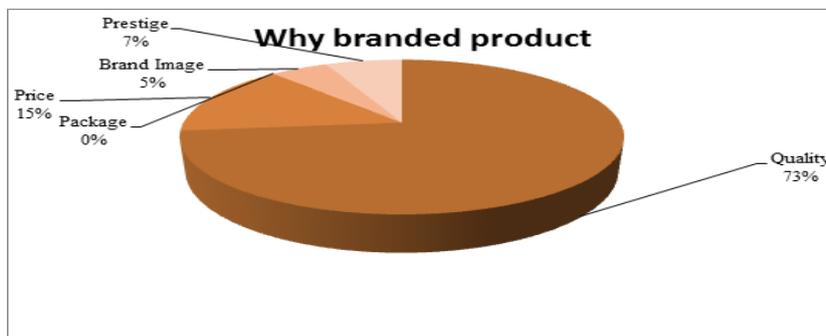
TYPE	NO. OF RESPONDENTS	PERCENTAGE (%)
Yes	52	86.7%
No	08	13.3%
Total	60	100%



As per table 5, while shopping 87% of the respondents that is 52 out of sixty have shifted to other brand products than that they preferred and eight out of sixty have not shifted to other brand.

Table 6: Factor that influence to prefer branded product.

TYPE	NO. OF RESPONDENTS	PERCENTAGE (%)
Quality	44	73.3%
Price	09	15%
Package	0	0
Brand Image	03	05%
Prestigious	04	6.7%
Total	60	100%



As per table 6, the reason why consumer prefer branded products based on few criteria 73% choose brand due to their quality, 15% of respondents go with price, 7% selected prestige.

FINDINGS

The study reveals that irrespective of gender and educational qualification people prefer branded products according to the respondent's response majority of the people have used online method to shop, and it is understood that people prefer only branded products while shopping. Sometimes people don't select the brand they usually prefer but they change their mind to buy another brand maybe due to the availability, offers or discounts given by another brand. The reason why people go with branded product is due to the quality of their product. There is no relationship neither between gender and educational qualification in buying a branded product.

SUGGESTIONS

The following are the suggestions have been suggested after the study:

1. Company should create good brand image in the minds of the customers.
2. Enhance the quality of the product in order create brand awareness.
3. Creating awareness online product availability.
4. Product should be available any time so that customers don't shift to other brands.

CONCLUSION

Online shopping is the convenient mode of shopping and in this present scenario majority of the people started shifting to online mode of shopping. Internet marketing is the best mode of marketing to convert a product into a brand. The fact is brand is the key factor that impacts consumer behaviour, keeping this as important criteria companies have to create brand awareness. Our survey aimed on the impact of brand on consumer behaviour, majority of the respondents select the product based on brand and quality is the key factor to prefer brand. In order to create brand image companies have to maintain the quality of the products.

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Scope of Customer Value Creation in Healthcare Service Business through Digitalized Eco System in the Post Covid Scenario

¹Kirtika Das and ²Payel Chaudhuri

¹IGNOU (Research Scholar (Phd Management), Royal School of Business, India

²Royal School of Business, the Assam Royal Global University, the Assam Royal Global University, Guwahati, Assam, India

ABSTRACT

The health care industry is the sector of the economic system that provides goods and services to treat patients with curative, rehabilitative or palliative care. Our nation's healthcare system affects not only the wellbeing of our citizens, but the strength of our society as a whole. Healthcare is a critical pillar of the national security framework that affects not only individual health, but also economic efficiency and public confidence specially during Pandemic times (COVID-19). Service firms like hospital organizations are realizing the significance of patient-centred philosophies and are turning to quality management approaches to help in managing their businesses. The current work will enable the research scholars in identifying the gap areas in Healthcare Industry, Services Industry with the aid of Digitalized way (e.g., Social media marketing) in healthcare. This will pave way for the researchers to explore research in healthcare in a more refined and directed manner. Research Questions involve in this study as:

- How to improve healthcare service quality by digital methods?
- What are the customer expectations of Digital healthcare system?
- How to improve healthcare service quality affordably?

The objective of this paper is to understand the customer expectation & perception of digital services related to healthcare.

To identify the service gaps in non-medical services in online and offline mode.

To find the factors that affect satisfaction of customers. Lastly the research also focusses on the relationships between Service Quality, Patient Satisfaction and Patient Loyalty. The increasing importance of delivering quality service among (Health Care Promotion). There is an unexplored opportunity for the HCPs to use Information and Communication Technologies to reach patients providing them with tailor made solutions and superior Service Quality. Recent literature has revealed that patients have started discussing healthcare online giving rise to the concept of eHealth and Patient. s

Keywords: Pandemic, Total Quality Management (TQM), Health Care promotion (HCP), Digitalization, Service Quality Measurement Scale (SERVQUAL), Healthcare Design, CBT-Tools (Computer based tools), Digital platform.

1. INTRODUCTION

In the era of competitive environment, service sector is under tremendous pressure to deliver continuing performance & quality improvement while being customer focused. In recent years, it was observed that healthcare has become one of the extremely complex industries in the world (Bartolini et al., 2011). There are an increasingly number of medical specialisations, complex therapies & equipment's, disease burden, increasing healthcare quality dimensions, rapid growth in the world healthcare market & several service units revolve around different organisations (Ovretveit, 2000). The need to increase the effectiveness & efficiency of healthcare services in the present situation is the need of the hour and requires attention towards continuous improvement. Indeed, there has been an unprecedented interest on behalf of social organisations, physicians, doctors, healthcare management & government alike into the investments both financial & human in deploying continuous improvement to improve healthcare services by focusing on different management tools like continuous quality improvement (CQI); total quality management (TQM); business process reengineering (BPR); accreditation programs, simulation models etc. The role of marketing with digital transformation in improving healthcare industry: In this digital era of healthcare the broad perspective of relationship is becoming increasingly important, healthcare advertisers are being persuaded that the patients become more interested to access information that enable them to empowers them with new technical innovations, digital health techniques which are boosting patients' awareness, safety measures in proper controlled manner. (Purcarea, 2016).

The global outbreak of the coronavirus pandemic (COVID-19) has prompted the shift to remote work in many industries to prevent the spread of the infectious disease. As direct person-to-person contact is being circumvented, consumers' purchasing behaviours have rapidly transitioned to online media. Thus, the pandemic has helped accelerate the development of digital infrastructure in many industries (Kim, 2020). For example, organizations have developed cloud-based IT infrastructures to pursue new opportunities in offering contactless or contact-free services through mobile software, video conferencing, expanded telemedicine, e-education, telecommuting, and mobile transactions (Xiao and Fan, 2020).

Also, numerous studies are available on Indian healthcare focusing on various healthcare aspects and related issues such as SQ, SQ dimensions, SQ model, customer satisfaction (CS) and many others. Despite all these attempts there is still lack of literature available on development of Digital Marketing Business an integrated quality model for Indian HCEs. Some of the selected studies on healthcare & related issues in Indian context as reported in the healthcare literature will be presented for further research.

1.1 Definition and Characteristics of Services

Definition of Service: The American Marketing Association was the first to define services in the year 1960 as "activities, benefits, or satisfactions which are offered for sale, or provided in connection with the sale of goods." The defining characteristics of a service are:

1. Intangibility: Services are intangible & do not have a physical existence. Hence services cannot be touched, held, tasted or smelt. This is most defining feature of a service & that which primarily differentiates it from a product. Also, it poses a unique challenge to those engaged in marketing a service as they need to attach tangible attributes to an otherwise intangible offering.
2. Heterogeneity/Variability: Given the very nature of services, each service offering is unique and cannot be exactly repeated even by the same service provider. While products can be mass produced and be homogenous the same is not true of services.
3. Inseparability/Simultaneity of production and consumption: This refers to the fact that services are generated and consumed within the same time frame.

1.2 Types of Services

1. Core Services: A service that is the primary purpose of the transaction. E.g.: a haircut or the services of lawyer or teacher.
2. Supplementary Services: Services that are rendered as a corollary to the sale of a tangible product.

Difference between Goods and Services

GOODS	SERVICES
A physical commodity	A process or activity
Tangible	Intangible
Homogenous	Heterogeneous
Production and distribution are separated from their consumption	Production, distribution and consumption are simultaneous processes.
Can be stored	Cannot be stored
Transfer of ownership is possible	Transfer of ownership is not possible

1.3 Digitalisation: Digitalisation is to make available anything regarding products or services available through integration of digital technologies using internet to the customers.

Digital Marketing is the Tool to Promote the Products or Services Produced by the Industry to the Ultimate Customers through Digital Technologies. It is also personified by an extensive selection of products or services leading brand marketing tactics, which mainly use Internet as a hub for promoting intermediate, in addition to other media vehicles like TV, Radio & Newspapers.

History of Digitalisation: In 1990s the concept of "Digital Marketing" was said to be used. Then it was going under dormant phase & again was active in 2000. From 2000-2010.

Digitalisation in marketing became more prominent. The swift evolution of digital media has twisted new prospects & avenues for advertising & marketing.

Digital Marketing Activities Are

- Search Engine Optimization (SEO)
- Search Engine Marketing (SEM)
- Campaign Marketing
- Content Automation
- Content Marketing
- Display Advertising
- E- Books
- E-Commerce Marketing
- E-Mail Direct Marketing
- Social Media Marketing

1.4 Customization: When any company deals its customer on preference basis or provide individually differentiated products or services on acceptable & affordable prices & delivery channels for each customer, then this is termed to be Customization.

1.5 Marketing management is the process of planning and executing the conception, pricing, promotion, and distribution of ideas, goods, and services to create exchanges that satisfy individual and organizational goals.

1.6 Customer Value creation: Creating value for customers means providing useful products and services that customers consider worthy of their time, energy and money. Creating value means maximizing benefits within an acceptable price point. Benefits and cost are two key components of customer value.

1.7 Servqual Model: **Servqual** is a multi-dimensional research instrument designed to capture consumer expectations & perceptions of a service along five dimensions that are believed to represent service quality. SERVQUAL is built on the expectancy-disconfirmation paradigm, which, in simple terms, means that service quality is understood as the extent to which consumers' pre-consumption expectations of quality are confirmed or disconfirmed by their actual perceptions of the service experience. When the SERVQUAL questionnaire was first published in 1985 by a team of academic researchers, A. Parasuraman, Valaire Zeithaml and Leonard L. Berry to measure quality in the service sector, it represented a breakthrough in the measurement methods used for service quality research. The diagnostic value of the instrument is supported by the model of service quality forming, the conceptual framework for the development of the scale (i.e. instrument or questionnaire). The instrument has been widely applied in a variety of contexts & cultural settings & found to be relatively robust. It has become the dominant measurement scale in the area of service quality.

1.8 Health Defined: Health and healthcare need to be distinguished from each other for no better reason than that the former is often incorrectly seen as a direct function of the latter. Health is clearly not the mere absence of disease. Good health confers on a person or groups 'freedom from illness & ability to realise one's potential. Health is therefore best understood as the indispensable basis for defining a person's sense of wellbeing.

According to World Health Organisation's (WHO) constitution: "Health is a state of complete physical, mental and social wellbeing & not merely an absence of disease or infirmity" (WHO, 1948, p.100). In recent years, this statement has been amplified to include leading a socially and economically productive life (Park, 2007, p. 13).

1.9 Healthcare Quality: Healthcare quality has several interpretations. According to Institute of medicine (2001), healthcare quality can be assessed from two viewpoints: patients and technical or professional. The former includes assessment of service provider's ability to meet customer demand, customers' perception & satisfaction. Customer perception with respect to evaluation of healthcare quality has been supported by a number of researchers. (Mashhadiabdol et al., 2014; Kitapci et al., 2014). Many studies observe that quality perceptions impact satisfaction, meaning that the service quality (SQ) is the presiding thing of satisfaction (Parasuraman et al., 1994; Kitapci et al., 2014; Dissanayake et al., 2012).

1.10 Role of Digital Healthcare (During COVID-19)

Digital technologies are being harnessed to support the public-health response to COVID-19 worldwide, including population surveillance, case identification, contact tracing and evaluation of interventions on the basis of mobility data and communication with the public. These rapid responses leverage billions of mobile phones, large online datasets, connected devices, advances in machine learning and natural language processing.

1.11 Digital Contact Tracing: In the COVID-19 pandemic, digital contact-tracing apps have been developed for use in several countries; these apps rely on approaches and technologies not previously tried & controversial in terms of privacy. Early digital tracing initiatives raised concerns about privacy. In South Korea, contacts of confirmed cases were traced through the use of linked location, surveillance and transaction data. In China, the **Alipay Health Code app** automatically detected contacts by concurrent location and automated the enforcement of strict quarantine measures by limiting the transactions permitted for users deemed to be high risk. Similarly, Norway halted the use, data collection from **Smittestopp app** after the country's data-protection watchdog objected to the app's collection of location data as 'disproportionate to the task' and they recommended a Bluetooth-only approach.

2. REVIEW OF LITERATURE

A review of studies done on affordable healthcare service management through digital methods. It helps to identify the existing work done in the field of healthcare service by different researchers. This is essential to gain in-depth knowledge and it helps to identify the research gaps in existing research work. This research included a review of more than 50 existing papers of literature review on the research topic, out of which, 10 relevant-important papers are briefly shown.

Lee1Hee Don and Kim2 K. Kai, Lee D (2016) "**Assessing healthcare service quality: a comparative study of patient treatment types**", HEALTHQUAL: a multi-item scale for assessing healthcare service quality. The purpose of this study is to examine the effects of healthcare service quality (HEALTHQUAL) measurement items. For this study, empathy refers to an attitude of the provider to better serve patients by actively listening and reflecting patients' emotions while providing care services. Tangibles refer to the use of advanced medical equipment and the physical environment to provide proper care services emphasizing the value of place. The author proposes to study a research model to examine mean differences in healthcare service quality among different healthcare user groups. The results indicated a significant difference among measurement items of HEALTHQUAL depending on the type of patient treatment, while there were no significant differences among measurement items of HEALTHQUAL between patients and the public. Considering Lee's study towards conclusion, this study adopted the following measurement items of healthcare service quality: empathy, tangibles, safety, efficiency, and improvement of care services.

Isabel C.P. Marques, Joao J.M. Ferreira H (2020), ELSEVIER, "**Digital Transformation in the area of Health Systematic review of 45 years of evolution**" in this study the research aims to explore the potential of existing digital solutions to improve the quality and safety of healthcare and analyse the emerging trend of digital medicine. The majority of research in digital medicine has been focused on integrated management, electronic medical records and medical images, but a research trend is observed in new areas such as virtual service, the use of portable devices as instruments for monitoring the patient and concern about the privacy of medical documents. Findings indicates categorization in seven areas which was carried out, focusing on integrated management of information technology in health, medical images, electronic medical records, development of portable, mobile devices in health, access to e-health, telemedicine and privacy of medical data. This study reveals great possibilities for SLR with the use of Simple Multi-attribute Rating Technique Exploiting Ranks (SMARTER).

G. Radu, M. Solomon, (Jan 2017), "**The adaptation of healthcare marketing to the digital era**"- This paper examines to evaluate the digital methods of promoting medical services, bringing new patients to a clinic in Bucharest. The study demonstrated the need for digital methods of promoting medical care services in order to expand a business. This study revealed an important role of social networking sites in promoting. This high response was probably responsible due to targeted promoting services. Almost all the new patients who completed the form will remain patients of this clinic in future. The results of the study demonstrated the need for digital methods of promoting medical care services in order to expand a business. A strategic way of thinking in this case implied attracting new patients & offering them quality health care services, which ensured their satisfaction & probability of their recommending the health facility further.

Deema Farsi (2021) "**Social Media & HealthCare, Part 1: Literature Review of Social Media Use by Health Care Providers**"- This paper aims to shed light on Social Media (SM) use worldwide & to discuss how it has been used as an essential tool in the health care industry from the perspective of Health Care Providers (HCPs.) Since the COVID-19 pandemic is favouring digital transitions in many industries and in society as a whole, health care organizations have responded to its first phase of the pandemic by rapidly adopting digital solutions and advanced technology tools. The aim of this review is to describe the digital solutions that have been reported in the early scientific literature to mitigate the impact of COVID-19 on individuals and health

systems. The author finds SM uses to be the best categorized as health promotion, career development or practice promotion, recruitment, professional networking or destressing, medical education, telemedicine, scientific behaviour, and public health care issues. Towards Concluding; in the field of diagnosis, digital solutions that integrate with traditional methods, such as AI-based diagnostic algorithms based both on imaging and clinical data, appear to be promising.

David Glinelli, Erik Boetto, GherardoCarullo, Andrea Giovanni Nuzzolese, Maria Paola Landini, Maria Pia Fantini (2020) “**Adoption of Digital Technologies in Health Care During the COVID-19 Pandemic: Systematic Review of Early Scientific Literature**” –The aim of this review is to describe the digital solutions that have been reported in the early scientific literature to mitigate the impact of COVID-19 on individuals and health systems. In particular, within the reviewed articles, the author identified numerous suggestions on the use of artificial intelligence (AI)–powered tools for the diagnosis and screening of COVID-19. Digital technologies are also useful for prevention and surveillance measures, such as contact-tracing apps and monitoring of internet searches and social media usage. As a concluding note; in the field of diagnosis, digital solutions that integrate with traditional methods, such as AI-based diagnostic algorithms based both on imaging and clinical data, appear to be promising. For surveillance, digital apps have already proven their effectiveness; however, problems related to privacy and usability remain. For other patient needs, several solutions have been proposed, such as telemedicine or telehealth tools.

Babatunde Abiodun Balogun (2017) “**Healthcare Organisation in a Global Marketplace: A Systematic Review of the Literature on Healthcare Marketing**”. This paper presents the results of a systematic review of the literature on healthcare marketing. Internationalisation and globalization of healthcare industry has become a major talking point in today’s business world. The key objectives of the review were to: systematically collect, document, scrutinise, critically analyse the current research literature on supply-side healthcare marketing; to establish the scope of healthcare marketing; to identify the gaps in the literature and make recommendations for further research in this field. The paper discussed on systematic review about globalisation and internationalisation of healthcare organisations rapid growth over past four decades.

A.S. Satish, R. Indra Devi, Sreeram Gemignani (Dec 2018) , “**A Service Quality and its Influence on Customer Satisfaction in a Multi-Speciality Hospital**”, This paper reviews to examine service quality in multi-speciality hospital in a town where fast mushrooming of private hospitals is at large in South India. The purpose of the paper is to examine, evaluate a comprehensive service quality measurement scale for potential usefulness in multi-speciality hospital amidst fast mushrooming of private hospitals at large scale.

Descriptive statistics, correlation & regression analysis was conducted. The study provides an understanding of the dimensions & its role in making the organisation stand out among the intense competition & sustain in the long run.

Carah Alysca, Figueroa, Reema Harrison, et.al, (2019), “**B Priorities & challenges for health leadership & workforce management globally: a rapid review**”, MC Health Services research, article no. 239. This review examines the current & emerging challenges for health systems, at three structural levels, from the overarching Macro (International, National) contents to the meso context of organizations through to the micro context of individuals healthcare managers. Research methods is based on a rapid review of evidence to undertake using a systematic search of selected segment of diverse literature related towards health leadership & management. An explorative review of three electronic databases (MEDLINE, Pub med & Scopus). The paper finally reveals a set of consistent challenges & emerging trends within healthcare sectors internationally for health leadership & Management by representing at three structural levels. At the macro level there included societal, demographic, historical & cultural factors; at the meso level, Human Resource Management challenges, changing structures, etc., at the Micro Level shifting rules and expectations in the workplace for healthcare managers.

Dr. Akanksha Mehta, Dr. Aparajita Singh, Dr. Sharmishta Deshmukh (2020), **The New Era of Digital Transformation in Healthcare: “Emerging Technologies for Value-Centered Marketing in Healthcare Ecosystem.”**This research demonstrates that social media sites play a significant part in promoting social networking. The main objectives of this research are: to present value-centered marketing structure, to define the supporting role for value-centered marketing in analytics as well as health technology. to identify significant value-centered marketing research gaps associated with process, precision, and preferences & to focus on unintentional effects and the concept of justice in technical and theoretical healthcare delivery. The results of this research showed that digital approaches are necessary to improve medical services to expand an enterprise. Research provides true lessons and evaluate the outcomes in learning importance of digital transformation to improve healthcare ecosystems knowing the importance of technology innovation to enhance environments.

Sascha Kraus a, Francesco Schiavoneb (2020) “**Digital transformation in healthcare: Analyzing the current state-of-research**”- The article attempts to assess the research question how multiple stakeholders implement digital technologies for management and business purposes. Its objective is to perform a systematic literature review about the state of the art of digital transformation in healthcare. Findings shows that prior research falls into five clusters: operational efficiency by healthcare providers; patient-centered approaches; organizational factors and managerial implications; workforce practices; and socio-economic aspects. Towards conclusion, the author aims this article to provide an integrative view of the state of the art of digitalization in Health Care literature, find the key management and business applications of Digital-Transformation technologies by Health Care stakeholders and identify a potential future research agenda.

3. RESEARCH GAPS

- There is literature related to the importance of Patient Choice, Patient Engagement, and Patient Experience and the need of HCPs (health care promotion) to work hard to strengthen these aspects. However, limited research is available on the ways to achieve these aspects and to study their repercussions for the HCPs.
- From literature review of different researchers, there is not much discussions made, towards Digital healthcare Service quality.
- A key market challenge is to grasp digital transition accurately into this modern age. But with continual changes for advancement in healthcare technology; experts share views on digital reality, fear of digital age and survival techniques, particularly in the field of healthcare. For example, user engagement with mobile devices is continuously changing: wearables and embedded mobile apps have joined digital marketing fields in detail. There are continuous changes which make it less explorable towards a stable research.

3.1 Research Questions

- How to improve healthcare services through digitalisation?
- What are the customer expectations of Digitalisation of healthcare services?
- What factors affect customer expectation in Health care services?
- What values can be created with digitalisation to match the gaps?

3.2 Research Objectives

- To understand the customer expectation & perception of digital services related to healthcare.
- To identify the service gaps in non-medical services in online and offline mode.
- To find the factors that affect satisfaction of customers.
- To find the role of technology to create value for non-medical services.
- To identify the value creation scope for the online healthcare service provider.

4. RESEARCH METHODOLOGY

4.1 Research Design: It will involve qualitative analysis of the subject.

4.2 Type of Data: To understand the background of the study and finding relevant information pertaining to the study, various books, journals, periodicals, industry reports, etc. has been accessed and mentioned in the present report. In future, more secondary sources of information may be used to fulfil the objectives of the study. With respect to the stated objectives, primary data shall be used for the future study.

4.3 Sampling Technique: The present study shall follow the non-probability sampling method. Convenient sampling technique shall be followed for the study.

4.4 Research Methods: Study is based mainly on secondary data. This is an exploratory source. As this study aims to explore the terms digital health, innovation and digital ecosystems and contribute to the emerging body of literature on digital health innovation ecosystems, a systematic literature review was applied. For this study, structured questionnaire adapting established scales shall be used to collect quantitative data. Further structured interview shall be conducted from the sample. Will involve surveys, questionnaires, Interviews, Case studies, observational trials.

4.5 Data Analysis Tools: For the analysis of quantitative data, SPSS software shall be used for conducting the statistical analysis like T- test, ANOVA and Factor analysis. To analyse qualitative data, Thematic analysis shall be used.

5. CONCLUSION

The health care industry, or medical industry, is the sector of the economic system that provides goods and services to treat patients with curative, rehabilitative or palliative care. Our nation's healthcare system affects not only the wellbeing of our citizens, but the strength of our society as a whole. Healthcare is a critical pillar of the national security framework that affects not only individual health, but also economic efficiency and public confidence. But defining and measuring the quality of service has been a major challenge in healthcare industry. The service quality measurement scale (SERVQUAL) will be widely used in research to measure quality of service. Service firms like hospital organizations are realizing the significance of patient-centred philosophies and are turning to quality management approaches to help in managing their businesses. For its effectiveness, improvement in affordable way, use of Digital methods; electronic technology goes hand-in hand.

The research also focusses on the relationships between Service Quality, Patient Satisfaction and Patient Loyalty. The increasing importance of delivering quality service among (Health Care Promotion) HCPs facilitates patients to make purchase decisions. There is an unexplored opportunity for the HCPs to use Information and Communication Technologies to reach patients providing them with tailor made solutions and superior Service Quality.

The current work will enable the research scholars in identifying the gap areas in Healthcare Industry, Services Industry and Digitally based (e.g., Social media marketing) in healthcare. This will pave way for the researchers to explore research in healthcare in a more refined and directed manner.

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A Mother's Predicament – to Be Miserable or to Be Happy

Shani Mishra and Deepika Dhand

“A mother is born when a child is conceived and dies when she dies.”

ABSTRACT

A mother is supposedly the most contented person. In terms of fulfilling the worldly responsibilities and also her own satisfaction, entering the phase of motherhood is something every woman yearns for. However, if the child dies, or is injured or is gripped by an illness which has no cure, the mother is blamed. What did she do? What was her fault? And then she wishes that she can live without the contentment of having a child. She feels that it is better to not have a child than to have one – an ill one.

Keywords: Pain, survive, intuition, detached

“A Mother's heart is the strongest intuition and that doesn't go wrong.”

The Essence of a Woman

A girl child born in India, especially in the Northern states is not celebrated. From the early years, she is made to feel inferior to her male siblings and cousins. Where her brothers go to school and are allowed to dream and aim high, she can only dream and keep those dreams to herself and rarely she is able to make her dreams a reality. In her younger days she is dependent on her father. When she grows up, the brothers take her father's place and they tell her what to do and what not to do. When she gets married it is again another man dictating her, how to live.

“A child is often used as a weapon against the mother.”

Marriage – Supposedly a Happy Time

Marriage is the coming together of two souls. In India, it is considered the coming together of two families. The bride and the groom do not have a separate identity. It is always linked with the family. With family comes the responsibility of having their own family. Almost immediately after marriage all eyes and ears are focused on one line from the couple. And when that one line is uttered, there is merry making and happy moments.

The focus here is not on the pressure on the female to produce a male heir. Here, it is entirely on the mother who is a happy person experiencing the precious time of her life. She has a life growing inside her. She is plainly busy and in her own world. She is acknowledged by everyone as she is an expectant mother. She feels proud and without being arrogant goes about doing what is required of her.

The Birth of a Baby Boy

Then her baby is born. It is a boy child. The advantage of having a boy in a north Indian family is enormous. Without even going into the monetary benefits, there are a lot to be satisfied about. But in the case of this woman, the in-laws were not particularly happy. The reason was that their son had married on his own. So, whether it is a boy or a girl, it didn't matter. But after the customary one and a quarter month, the in laws visited the son. There the mother was made to feel guilty of her being an outsider in terms of religion. The lady felt that her religion was going to cause so much trouble for her. She trudged on with her life as a new mother with no mental support and nobody to care for her baby when she had to go for work.

When her son was born, her feelings were mixed - joy as it all happened without any complications, slight anger due to the pain undergone and anxiety as to what lay ahead. This anxiety refused to go away and it came to the fore when her son was three months old and he was not achieving the usual milestones. Trips to the hospitals became a regular routine. And by the ninth month specialists had taken over the regular doctors. When we say ninth months the most common thought is of the delivery of a child and the start of a new life on the earth. For them, it was the beginning of their painful journey. The son's illness was diagnosed. He did not have the left kidney and the right kidney was badly damaged – a case of Chronic Renal Failure. They failed to understand why it happened or why it was not diagnosed earlier or why it did not show in the ultra-sonography report during pregnancy.

Grappling with a Hopelessly Incurable Medical Condition

Now it was no use blaming anybody – her son wouldn't lead a normal life – this thought was looming large. Everybody around her had reconciled to the fact that he should go. Only his mother couldn't let go. Her life suddenly turned dark with no end in sight and enveloped in gloominess and still she couldn't think of her little

one going away forever. She wanted to go on with him. In the days and months after the diagnosis all kinds of help and suggestions were extended. Even she would swing between hope and despair. A slight improvement in his condition would make her very optimistic and she would get a feel that life was not all that bad and that her son would survive. She stopped comparing him with the other normal children.

When she was undergoing all these difficulties, the in-laws had their own plans. The mother in law wanted her son to get married again. It was not at all that she couldn't stand her son suffering. It was plainly that he had married on his own and so he was punished and now he should marry again as per her wishes. She was even ready to accept that her son could keep his first wife also. It was bizarre to say the least as the society is so much advanced and nobody would do such a thing as get married again just because the wife didn't deliver a healthy child. Or to keep two wives, one somewhere else and one wife with the parents.

In short, the life of the new mother was slowly turning hell. As for the son, survive he did, for four years. However, it was a very dependent life. His condition turned from bad to worse. The mother busied herself with her work. And whenever she was with him she would take care of all his needs and his smile at all the smaller details would lighten up her day. He gave her the strength to fight and to go on. And then a day came when he fell ill. He hardly had any immunity. The doctors told them that he might just be there for another ten days. They even gave another option – dialysis. The mother had seen the doctor poking her son's arm fifteen times to get blood from his artery. The baby would wince and then cry and look at his mother to help him. The mother saw that pleading look on her son's face and she fiercely fought with the doctors not to go for dialysis.

At that moment she had realized that by saying no to dialysis maybe she was cutting off some days from her son's life. Still she couldn't get a guarantee from the doctors that his condition would be better. In her heart she knew that she was fighting a lost battle. She braced herself to meet every eventuality. Realization dawned upon her that her son has to go. They resigned to this fact and the doctors allowed them to take the baby and go. They came back from the hospital and waited. By the 6th day life was back as before and not just ten days passed, many happy months passed by. Happy months as the child was a happy child. Despite the pains he had the grit to go on. The parents were doing their regular work.

After a year he fell ill again and this time he was in the mother's arms. There was nobody with her at that time. She was terrified of what was happening with her child. And his tiny body shook abnormally with convulsions. Again, with infinite hope she was praying to God not to take him away from her. And God did listen, and he was fine. He survived another two years.

The Family (did not) Support

But did the in-laws give any respite to the mother? It was a big no. They made sure that she suffered every time she came to visit them. The sister in law got some perverse pleasure inviting the mother and the sick child to her house. She would compare her child to this sick child. And the mother in law never left a chance to remind the daughter in law that if the parents are happy, the children get blessed and they don't encounter such problems in life. The parents of the sick child went on in their life. There were instances where everyone fought. But then again, life had to go on. The father in law would expect monetary support for himself. With a sick child and not knowing the hospital bills, the parents didn't bother calculating. They gave what they could. They were actually managing the expenses of the good for nothing brother in law who got married a second time and had a baby girl. For this son, no marriage was performed and for the other son, not one but 2 marriages were performed with full fanfare. It eventually would lead to four marriages. Because the son knew that he would just have to listen to what the parents say especially the mother and for him, life was just going to a shop, sitting there for hours and coming back and sleeping with a woman.

Amidst all this, the mother was not feeling good. She didn't want her son to go. She was unsure of what she wanted in life. She was terrified to the core about her life. She had just one thought that she should be fine to take care of her child as she could see that nobody was interested in doing anything for her sick child let alone wanting him to live. It would be wrong here to say that the others wished him to die too. They actually wanted the child to live, they wanted the son to re-marry, they wanted the misery of the mother to never end.

Yearning for Grandmother's love

When the child turned three, the grandmother, asked her son as to what to do with the sick child. She was looking for some way to get rid of him. There are so many families which have a child, who is either mentally or physically challenged. They all take very good care of them. But in the case of this child, nobody was thinking that he should be taken care of. The parents always got him all the things he needed. The grandmother would even wish that she shouldn't see him in the next visit. She would discriminate between him and her other

grandchildren. Now, what was his fault? He was born that way, she was not giving any peace to the mother. It pinched the mother to see that her son was not given things to eat either which the other grandchildren relished. The mother could afford to buy so many things.

The son was now four years old. The mother felt that his birthday should be celebrated. It was not on a grand scale but they did go out and also cut a cake. The child was very happy. He was not enjoying what the other children of his age enjoyed. By now the mother was almost reconciled to the fact that he will be gone any day. The mother was offered plum jobs. She didn't have the heart to go on. Ten days before he left for his heavenly abode, the mother got a chance to work at a much sought-after place and post with a higher package. However, her heart was not in it. She was counselled by all, to not to let the opportunity go, only a mother's conscience didn't allow. Some super intuition stopped her from going and she was immensely grateful to the Almighty for this. In the final moments of her son, she didn't once say to her son to stay back. She didn't ask God not to take him away. Her sunny boy raised his hands twice and breathed his last. She was detached during his last rites as she knew that he was now better off – away from all the pain. Finally, she had let go.

Days after the Child Passed Away

She felt relieved. Is it not normal for a mother to be happy that her son was now away from suffering? He had passed away. So, it was sad but she felt relieved. She had noticed strange reactions on everyone's face. They looked unhappy. Not because the son passed away but because, the mother would now be free. That look made the woman understand that the world was fine with the sick child alive, only just so that the lady and her husband were never free of tension. Even after the child passed away, the mother was not made to feel comfortable.

The mother was made to feel that she was as good as a barren woman. And it was so much of a pressure that suggestions like adopt a child from one of the family members was also seriously thought about by the family. The mother kept herself away from all the ruckus. She was happy that she was finally free. She was not free of sadness of losing her child. She was free of that constant dead feeling of no future in sight. She knew that her son would be gone. But she was not ready to go for another child. She had lost interest in working. She was terrified of venturing out, the thought of something happening to her which would leave the child without anyone caring for him was a scarier thought.

The Color Purple

In this book by Alice Walker, the main character Celie, is a mother to two children born out of rape by her father. Later on, in the story we read that he was not her father. But, he was married to her mother, so the relationship was that of a step-father. In that capacity too, he shouldn't have raped her. Celie, was not shown the children. Still she felt some stirrings for her children when she saw children who she thought looked like her. The yearning to hold a child never left her. But she was deprived of her rights to be a mother. Her children were given away. She was married off to a man who was already a married man with four children of his own. Celie's step-children too never regarded her as a mother. Though, she did her duties well. She cleaned, mopped, cooked and tended to all their needs as well as husband's needs.

Once a Mother, Always a Mother

She was now free to work. She was free to go out. She was free to attend parties and family weddings. Inwardly, she was happy, outwardly, she had to put on a face which was not a happy face. She had to show others that she was not feeling complete. The pressure on her was too much to go for another issue. Despite, saying so many times that they were not planning for another baby, the family did not relent. They pestered her to have a baby. Every event was a happy one for everyone. Except for her as she was constantly made to realise that there was something missing and that missing thing was her status of not having a child.

"If her child is suffering, a mother is never happy. If the child is no more, the mother cries often, the pain never goes away completely."

Even if she tries to take interest in the things around her, she is often pulled back into gloom by her very own people. How is she wrong if she is happy? After suffering for so many years, at least she got some respite. Strange are the ways of the world for a woman. And what should the woman do? She has a right to that freedom. She can never be happy as she lost a child. But she had done everything that she could humanly possible do. Now, she was relieved of that knot. To be happy or not to be – that's her predicament.

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A ML Model to Predict Adverse Drug-Drug Interactions in Covid 19 Treatment

P. Margaret Savitha¹ and M. Pushpa Rani²

¹Department of Computer Science, Jyothi Nivas College, Bengaluru, Karnataka, India

²Mother Teresa University, Kodaikanal, Tamil Nadu, India

ABSTRACT

Coronavirus disease 2019 (COVID19) is the latest threat that humanity is battling against and which has caused the entire planet to go on red alert. Though there are prescriptions for the treatment of COVID19 it is not clear if a single course of treatment can be followed for all humans. The medical practitioners are at a phase where they have to treat based on a trail-and-error basis and closely monitoring the progress in patients. Among various attempts to discover a path-finder that will ascertain continuity of human race on this planet, the approach towards a machine learning model that could predict adverse drug-drug interactions in the course of COVID19 treatment is explored. The complexity of drug combinations and play-field for drug interactions increases with underlying comorbidities conditions in patients, their age and external factors. In this study we have tried to combine the research done to predict adverse drug-drug interactions along with the study of the adverse drug interactions in patients undergoing COVID19 treatment and having comorbidities. The objective of this study is to be able to predict potential adverse drug reactions in COVID19 patients by using machine learning techniques. This way medical practitioners will be able to know before administering a drug, if it has potential to cause an adverse reaction in the body of the consumer. The survey will serve as a stepping stone for researchers to be able to get step closer and better in devising solutions that will enable preventive medication and save human lives

Keywords: Drug effect, COVID, COVID19, preventive medication, machine learning, deep learning, DDI, prediction, neural network, adverse drug reaction.

1. INTRODUCTION

[1]The field of machine learning has made tremendous progress over the past decade. Improved deep learning algorithms coupled with increased computational capacity catalyzed the growth of the field into stratosphere. As a result, machine learning has been used in a diverse array of applications. Arguably the most crucial application of machine learning has been in the fight against COVID-19 pandemic. The recent outbreak of the novel coronavirus officially known as Severe Acute Respiratory Syndrome-Coronavirus-2 (SARS-CoV-2) has progressed into global pandemic. Up to September 6, 2020 the World Health Organization (WHO) recorded 26,763,217 confirmed cases and 876,616 deaths in 216 countries worldwide [50]. An estimated 20–51 % of affected patients are reported to have at least one comorbidity [51,52]. These affected patients with underlying comorbidities may have a greater risk of poor clinical outcome including severity, mortality, and admission to ICU [53–55]. Again, it is expected that given the percentage of individuals with comorbidities affected by the COVID-19, the use of polypharmacy for treatment of existing chronic disease conditions might be a routine

Researchers have aggressively - and often successfully - pursued a number of different avenues using machine learning to battle COVID-19. A range of machine learning applications have been developed to tackle various issues related to the virus. In this paper, we present the latest results and achievements of the machine learning community in the battle against the global pandemic. In contrast, with other existing surveys on the subject we provide a general overview that is nuanced enough to provide a substantial insight. Our survey includes preprint works to ensure the most up-to-date coverage of the topics. The current applications of machine learning to COVID-19 can be divided into four groups:

- a. Forecasting
- b. Medical diagnostics
- c. Drug development
- d. Contact tracing

Deep learning algorithms have been successfully deployed to forecast the number of new infections. Recurrent neural networks have shown superior performance in time-series forecasting over traditional approaches such as ARIMA models. Researchers have used recurrent networks, and their variant long short-term memory networks, to successfully model the spread of the infection and predict the future number of infections in population. Arguably the most important application of machine learning is in the field of medical diagnostics that is made possible by the advances in computer vision. Machine learning has achieved near human level

accuracy in many image recognition tasks. Therefore, it is no surprise that image recognition software is successfully being used to detect signs of COVID-19 in patient chest X-ray images. In many parts of the world where an effective clinical testing procedure is not available or unaffordable chest X-ray images and CT scans provide the only option to diagnose the virus. Studies have shown that deep learning approaches can diagnose COVID-19 based on chest X-ray image with over 99% accuracy. Smart contact tracing using artificial intelligence has helped authorities locate potential infected persons. A number of software solutions based on artificial intelligence are currently in use to trace spread of the virus. Machine learning has been used to help guide researchers to new discoveries in pharmacology. In particular, variational autoencoders have the ability to analyze perturbations in chemical composition that can lead to possible new medicines. Applying autoencoders to the existing flu vaccines can help identify potential avenues to creating COVID-19 vaccine.

The challenge to fight off the global pandemic and help the humanity has spurred researchers across disciplines. In an effort to accelerate scientific research on COVID-19 the publishing community has made all the related publications freely available to the public. As a result, we are able to access and assess all the current research and present our survey to the readers. Our goal is to provide a quick, but sufficiently detailed, overview of the current state of the art in machine learning research applied to COVID-19. We hope our survey will supply the reader with the necessary information to facilitate a deeper investigation into the topic.

2. DRUG-DRUG INTERACTION AND ADVERSE DRUG REACTION

The incidence of DDI is due to the reaction of two or more drugs react together in the patient's body. DDI will cause adverse effects and sometimes serious health issue will occur to the patients. This may cause severe side effect whereas it may result in allergies or sedative situation that will slow down the reaction. The intake of more medicine together for long period may cause health complications to the patient. The DDI discovery process at the early stage is a necessary event to prevent the health of the patient. If DDI is not identified then it will cause complicated issue to the patients [12].

The issues in ADR is addressed by the investigation of drug consumption, it is suitable to investigate many other facts that is the reason for the cause of ADR. The effect of ADR is forecasted by the investigation of structural resemblances of proteins and compounds and later the DDI is investigated. Incidence of DDI is caused by the unexpected ADRs, forecast and identification of ADRs triggered by DDI that is highly significant [14]. Numerous Deep learning and machine learning based techniques are developed for the identification of DDIs [15, 16]. The former is to decide whether a DDI occurs among two drugs, while the final one is to regulate the variety of DDI such as ADVICE, EFFECT, INT and MECHANISM [17]. The dataset is interpreted with the following type of interactions:

Category	Sample	Sentence	Annotation
Effect [17]	Vitamin K – Effect of Coagulation The Coumadin (anti-coagulant) effect is increases. Minimizes the Vitamin K availability.	The effect of drug 1 neomycin sulfate is improved by the drug 2 by minimizing availability of Vitamin K.	Drug 1 and 2 dropped into the category of effect because the sentence depicts interaction effect of pharmacodynamics.
Mechanism [18]	The effect of endoxifen concentration is minimized paroxetine that also minimizes the effect.	The effect of drug 1 Paroxetine will minimizes the concentration of plasma of drug 2 endoxifen about twenty percent.	The interaction among drug 1 and 2 falls under the category of mechanism the sentence defines a mechanism of pharmacokinetics.
Advice [18]	The phenelzine, cronin and fluoxetine interrelate with them and it is not endorsed to be managed together.	The drug 1 fluoxetine and drug 2 crocin will be managed to receive the drug 3 phenelzine to the patients.	The interaction among the drug 1 and 3 or drug 2 and 3 falls under the category of advice. The intake of drug 1 and 3 or drug 2 and 3 is not allowed.
Interaction	The MAOIs and meperidine increase the chance of risk by the toxicity of serotonin.	General interaction of drug 1 MAOIs and drug 2 meperidine.	No other data is delivered in the sentence where it is excluded from the touching of interaction only by drug.

Table 1: Types of drug-drug interactions

Effect: The sentence denotes the consequence of DDI that defines the mechanism of pharmacodynamics interaction of drug.

Mechanism: The sentence defines the mechanism of pharmacokinetic.

Advice: The sentence determined as the recommendation or opinion based on the sentence.

Interaction: The sentence only denote an interaction of drug without delivering any other comprehensive information. Some varieties of DDI is given in Table 1.

3. LITERATURE SURVEY

A literature search was conducted to analyse the studies carried out on COVID19 treatment and causes for fatalities. The clinical characteristics of the patients undergoing COVID19 treatment from 24 studies[2] is summarised below:

The total number of case files considered is 5,586 patients. This includes cases files with comorbidities like cardiovascular diseases, cerebrovascular diseases, chronic kidney diseases, chronic liver diseases, pulmonary diseases, hypertension, diabetes, malignancy and HIV. The mean age of the patients ranges between 41 and 63 years

The analysis if comorbidities [2] in COVID19 patients reveals that cardiovascular diseases, hypertension and diabetes was associated with the clinical outcome of COVID19 treated patients

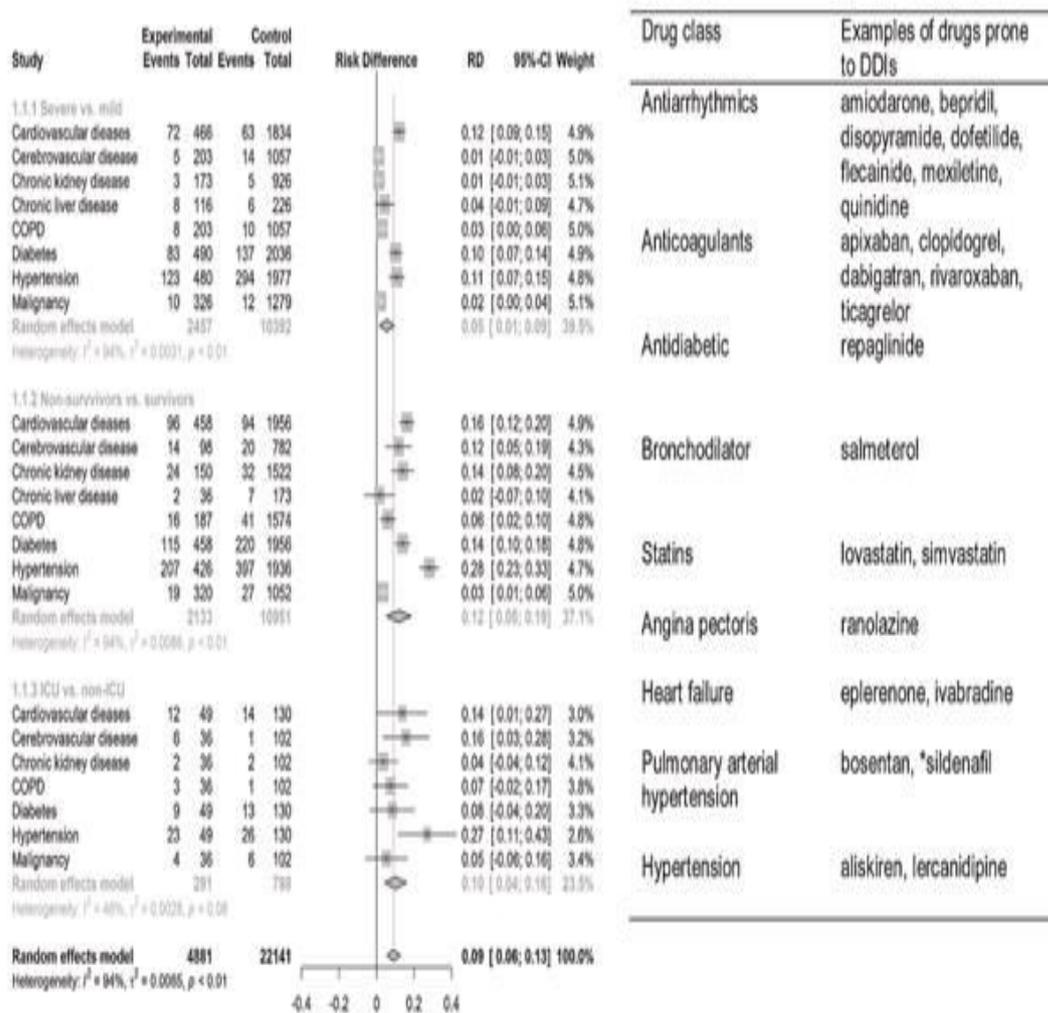


Table 2: Summary of COVID19 studies

Clinical characteristics of COVID-19 patients included in 24 eligible studies.

Author (year)	Origin	Design	Age (years)	Number of Patients									
				All	CVD	CRV	CKD	CLD	Diabetes	Hypertension	Malignancy	COPD	
Cao et al., 2019 [47]	China	NA	54	102	5 (5%)	6 (6%)	4 (4%)	2 (2%)	11 (11%)	28 (28%)	4 (4%)	10 (10%)	
Chen et al., 2020 [48]	China	RD	62	274	23 (8%)	NA	NA	NA	47 (17%)	93 (34%)	7 (3%)	18 (7%)	
Deng et al., 2020 [49]	China	RD	NA	225	NA	NA	NA	NA	NA	NA	NA	NA	
Feng et al., 2020 [50]	China	RD	53	476	38 (8%)	17 (4%)	NA	NA	49 (10%)	113 (24%)	12 (3%)	22 (5%)	
Guan et al., 2020 [51]	China	PD	47	1099	27 (3%)	15 (1%)	8 (1%)	NA	81 (7%)	165 (15%)	10 (1%)	12 (1%)	
Huang et al., 2020 [52]	China	PD	49	41	6 (15%)	NA	NA	1 (2%)	8 (20%)	6 (15%)	1 (2%)	1 (2%)	
Huang et al., 2020 [52]	China	RD	44	202	NA	NA	NA	NA	19 (9%)	29 (14%)	NA	NA	
Itelman et al., 2020 [53]	Israel	RD	52	162	NA	NA	2 (1%)	NA	30 (19%)	49 (30%)	NA	2 (1%)	
Javanian et al., 2020 [54]	Iran	RD	60	100	20 (20%)	NA	12 (12%)	NA	37 (37%)	32 (32%)	4 (4%)	12 (12%)	
Liu et al., 2020 [55]	China	RD	49	40	NA	NA	NA	NA	6 (15%)	6 (15%)	NA	NA	
Shi et al., 2020 [56]	China	RD	63	671	60 (9%)	22 (3%)	28 (4%)	NA	97 (15%)	199 (30%)	23 (3%)	23 (3%)	
Sun et al., 2020 [57]	China	RD	44	55	NA	NA	NA	NA	5 (9%)	8 (15%)	NA	NA	
Wan et al., 2020 [58]	China	RD	47	135	7 (5%)	NA	NA	2 (2%)	12 (9%)	13 (10%)	4 (3%)	NA	
Wang et al., 2020 [6]	China	RD	56	138	20 (15%)	7 (5%)	4 (3%)	4 (3%)	14 (10%)	43 (31%)	7 (10%)	4 (3%)	
Wang et al 2020 [59]	China	RD	51	107	13 (12%)	6 (6%)	3 (3%)	6 (6%)	11 (10%)	26 (24%)	NA	3 (3%)	
Wu et al., 2020 [60]	China	RD	43	280	57 (20%)	NA	3 (1%)	7 (3%)	NA	NA	5 (2%)	NA	
Xie et al., 2020 [61]	China	RD	60	79	7 (9%)	NA	NA	NA	8 (10%)	14 (18%)	NA	NA	
Xu et al., 2020 [62]	China	RD	41	62	NA	1 (2%)	1 (2%)	7 (11%)	1 (2%)	5 (8%)	NA	1 (2%)	
Xu et al., 2020 [63]	China	RD	46	703	35 (5%)	NA	10 (1%)	29 (4%)	64 (9%)	118 (17%)	9 (1%)	13 (2%)	
Yang et al., 2020 [4]	China	RD	59.7	52	5 (10%)	7 (14%)	NA	NA	9 (17%)	NA	2 (4%)	4 (8%)	
Zhang et al., 2020 [64]	China	RD	57	140	7 (5%)	NA	NA	NA	17 (12%)	42 (30%)	NA	2 (1%)	
Zheng et al., 2020 [65]	China	RD	45	161	4 (3%)	4 (3%)	NA	4 (3%)	7 (4%)	22 (14%)	NA	6 (4%)	
Zhao et al., 2020 [66]	China	RD	46	91	NA	NA	1 (1%)	NA	3 (3%)	NA	3 (3%)	1 (1%)	
Zhou et al., 2020 [67]	China	RD	56	191	15 (8%)	NA	2 (1%)	NA	36 (19%)	58 (30%)	2 (1%)	6 (3%)	

*Median or average age (years). Abbreviations: cardiovascular disease (CVD), cerebrovascular disease (CRV), chronic kidney disease (CKD) and chronic liver disease (CLD), retrospective design (RD), prospective design (PD), not specified (NS), not available (NA).

TABLE 3: Study of comorbidities

STUDY	OBJECTIVE	METHODOLOGY	DATA	RESULTS
Kapoor et al., (2020)	Forecast daily new cases in the US.	A spacio-temporal graph neural network is used to learn the complex interactions between the time and mobility data. The model is implemented via GNN framework.	NYT COVID-19 and the Google Dataset/Reports. includes positive cases in the US over the period of Jan-Apr, 2020. dataset Mobility The data	GNN model achieves correlation of 0.998.
Ardabili et al., (2020)	Comparative study of ML forecasting models.	Compared GA, PSO, GWO ANFIS, and MLP approaches and their accuracy for different lead-times.	Worldometer. Number of COVID-19 cases for 5 countries over the period of Jan-Mar, 2020.	ANFIS and MLP produce the best results with correlation of 0.999.
Melin et al., (2020)	Make up to 10-day ahead predictions of number of confirmed cases and deaths.	Ensemble of neural networks consisting of 3 modules: 2 nonlinear autoregressive networks (NAR) with different parameters and 1 function fitting network (FITNET). The output of the modules is combined via a fuzzy integrator.	Mexico Government (coronavirus.gob.mx). Confirmed cases of COVID-19 and related death cases in Mexico. The data on the state and country level over a 110-day period.	%RMSE predicted confirmed cases on the country level 0.0808; %RMSE for the states ranges from 0.0322 to 0.2157. %RMSE predicted number of deaths on the country level 0.0914; %RMSE for the states ranges from 0.0175 to 0.2094.
Arora et al., (2020)	Predict the number of next day (and week) positive cases.	Three LSTM-based models - stacked, convolutional, and bi-directional LSTM - are tested.	Ministry of Health and Family Welfare (India). Number of positive cases in 32 states and territories in India over the period of Mar 14, 2020 to May 14, 2020.	Average MAPE for stacked, convolutional, and bi-directional LSTM model are 5.05%, 4.81%, and 3.22% respectively.

da Silva et al., (2020)	Predict the number of new cases 1, 3, and 6 days ahead.	Various ML models - Bayesian neural network, cubist regression, kNN, random forest, and SVR - are considered. In addition, variational mode decomposition (VMD) preprocessing is applied. Exogenous input variables - temperature and precipitation - are also considered.	John Hopkins University repository and Brazilian State Health Offices API. Number of daily positive cases for 5 states in the US and Brazil until Apr 28, 2020.	Mixed results with different models achieving the best outcomes on various subsets of data. The best models achieved an out of sample forecasting error of 3%.
Shahid et al., (2020)	Predict the number of positive, death, and recovery cases	ARIMA, SVR, and LSTM models are compared. The models are applied to data from 10 countries.	China Data Lab, 2020, "World COVID-19 Daily Cases." Number of confirmed, death, and recovery cases over the period of Jan 22, 2020 to Jun 27, 2020.	Mixed results, but in general LSTM appears to produce better results. For instance, LSTM has the lowest MAE values for confirmed cases and deaths as 2.0463 and 0.0095 respectively.
Rustam et al., (2020)	Predictions for the next 10 days based on the on data from previous 56 days.	Linear Regression, LASSO, Support Vector Regression, and Exponential Smoothing (ES) are used. The predictions are made for infection, death, and recovery rates.	John Hopkins University repository. Number of confirmed, death, and recovery cases worldwide over the period of Jan 22, 2020 to Mar 27, 2020.	ES achieves the best results in death rate prediction with $R^2 = 0.98$. LASSO achieves the best results in confirmed rate prediction with $R^2 = 0.98$.
Direkglu et al., (2020)	Use previous 3 days to forecast the next 10 days	LSTM model is used to forecast the number of new cases and deaths regionally and worldwide.	WHO, CCDCP, and Worldometer. Number of confirmed, death, and recovery cases worldwide over the period until Apr 10, 2020.	The trained LSTM model achieves 1.5% RMSE.

TABLE 4: ML based research studies in COVID-19 forecasting

Machine Learning Based Research in Pharmacology

STUDY	OBJECTIVE	METHODOLOGY	DATA	RESULTS
Ahuja et al., (2020)	Vaccine development against COVID-19.	Deep Neural Network-based AI programs: synthetic chemist and Search Algorithm for Ligands (SAM) are used.	COVID-19 Open Research Dataset (CORD-19).	New approaches combining integrative medicine with AI models are emerging in the recent race to utilize ML techniques and AI capabilities to develop an effective vaccine against COVID-19.
Abbasi et al., (2020)	Identify a suitable vaccine candidate and construct an epitope-based vaccine against COVID-19.	A computational framework using reverse vaccinology, bioinformatics, immunoinformatics and AI based strategies.	NCBI database in FASTA format. Crystal structures of human alleles: Protein Data Bank.	Spike protein (Surface glycoprotein), B-cell and T-cell epitopes were predicted for the construction of an epitope-based vaccine.

Yazdani et al., (2020)	Develop a multi-epitope peptide vaccine against the SARS-CoV-2.	A variety of ML methods including ANN, SVM, BepiPred, ANTIGENpro and VaxiJen are employed.	NCBI database in FASTA format IEBD database.	Designed-vaccine construct consists of several immunodominant epitopes has high antigenic capacity and induce humoral and cellular immune responses against SARS-CoV-2.
Ong et al., (2020)	Predict proteins candidate for vaccine against COVID-19.	Vaxign- RV and Vaxign-ML strategies are used. The sequence conservation and immunogenicity of the predicted protein were further investigated.	NCBI and UniProt databases.	S protein had highest protective antigenicity score. nsp3 protein - with the second highest antigenicity score - was predicted as an alternate vaccine candidate.
Beck et al., (2020)	Predict binding affinity values between commercially available antiviral drugs and target proteins.	Deep learning-based MT-DTI was compared to DeepDTA, gradient boosting and regularized least-squares model.	DrugBank, Drug Target Common (DTC) database, BindingDB and NCBI databases.	MT-DTI performance best compared to a DeepDTA and ML-based algorithms (SimBoost and KronRLS). Atazanavir is the best chemical compound against the SARS-CoV-2 3C-like proteinase.
Ke et al., (2020)	Identify pre-existing drugs with anticoronavirus activities.	Deep learning-based AI-system was established. The predicted drugs were tested in vitro for verification and the results were fed back to the AI system for relearning.	DrugBank: https://www.drugbank.ca marketed drugs: Vismod-Database 1: SARS-COV, HIV, Influenza, other drugs. Database 2: 210 inhibitors of the 3C-like protease of SARS-CoV. egib, Gemcitabine, Clofazimine, Celecoxib, Brequinar, Conivaptan, Bedaquiline and Volcapone were identified as potential candidates against COVID-19.	
Kowalewski & Ray, (2020)	Identify chemicals that interfere with SARS-CoV-2 targets.	A machine learning drug discovery pipeline consisting of multiple support vector machines (SVM) models and random forest algorithm (RFA) was developed	NUNII, DrugBank, Therapeutic Targets and bioassay database, ZINC.	SVM model with the RBF kernel outperformed regularized Random Forest or performed comparably.
Keshavarzi et al., (2020)	Review of ML-based drug development.	A multifaceted and comprehensive investigation of existing literature of AI-based approaches (SUMMIT, GAN, RF, SVM, RFE, LSTM) used for COVID-19 drug and vaccine development. The results were used to create a database: CoronaDB-AI.	Complete toxicity dataset from distinct databases, including ToxCast and Tox21. Comprehensive epitope-based dataset.	SML-aided molecular docking is one of the most prevalent approaches for virtual screening. 3CLpro is the most popular target for virtual screening. Spike protein has been the most popular candidate for virtual vaccine discovery

Table 5: ML based research studies in pharmacology

Extraction of DDI is a general extraction of relation, which retrieves semantic relations among numerous entities from the text of natural language. The machine learning approaches incorporated in the extraction relation that is categorized as supervised, unsupervised, semi-supervised techniques and supervision of distant values [39]. Supervised techniques necessitates training of annotated data where every entity pair uses variety of pre-defined relation for labelling. There are certain publicly available datasets namely ACE dataset 2005 [40],

MUC and Task 8 SemEval-2010 dataset [41]. The presentations of supervised methods utilises deep learning [42] that is usually better than feature-based approaches [43] and kernel techniques [44].

Although the data comprises tuples with high-quality, generally these datasets are expensive and small to produce. Additionally, supervised classifiers are precise to a definite vertical area and hard to spread because they necessitates newly trained annotated data to perceive varieties of new relations. Semi-supervised learning is also a significant topic in NLP that utilises some small datasets to acquire how to retrieve relations and depend on the bootstrapping methods to achieve the unlabelled data. The main semi-supervised relation retrieval techniques encompasses bootstrapping techniques, propagation of label and active learning techniques. Bootstrapping algorithms exploits few instances to learn model or patterns for relation extraction, like KnowItAll [45], SnowBall [46] and DIPRE [47].

5. Proposed System - Results of Experimentation

Based on the analysis of the different AI techniques depicted a machine learning model system has been experimented and the results are presented in this section.

The experiment was conducted in two stages.

Stage 1:

From a set of drug-pair information build an AI technique that could classify the drug pair in a binary classification 0 or 1. 0 denotes that the drug-pair is not a candidate for an adverse drug reaction. 1 denotes that the drug-pair is a potential candidate for an adverse drug reaction

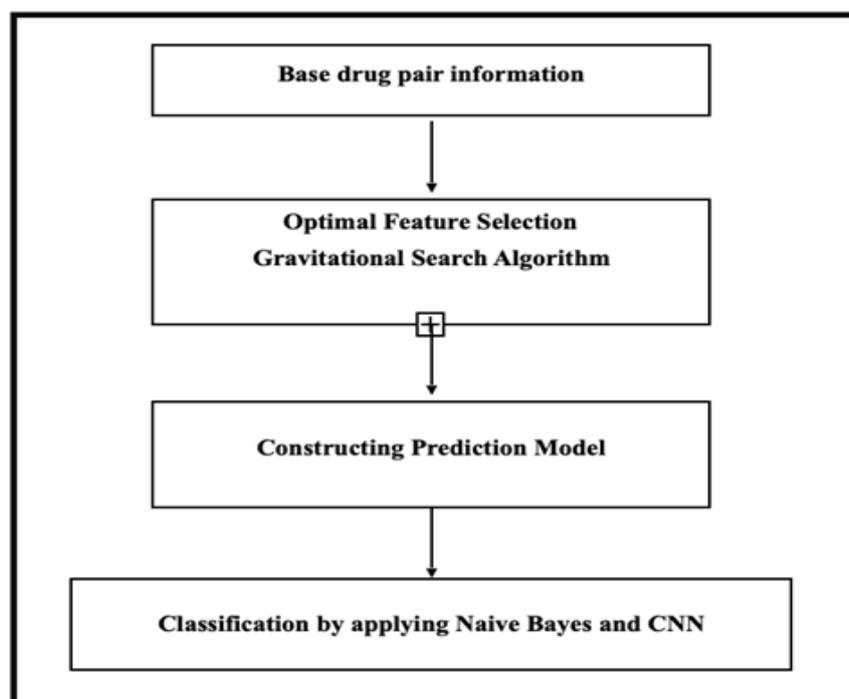


FIGURE 1: Proposed system

The drug pair information was downloaded from the SIDER database. Sample drug-pair information is given below

The data was divided in the ratio of 70:30 with 70% used as training set and 30% used as testing set. This data was manually normalized to remove outliers and a set of 5322 row items was selected for the experimentation. This data was stored in a csv file and used as the data source for stage 1 analysis.

Gravitational search algorithm - The below code that is published in GitHub was utilized for the feature section process

Source code reference from Github: <https://github.com/mikegrudic/pytreegrav.git>

Pytreegrav is a package for computing the gravitational potential and field of a set of particles. It includes methods such as brute-force direction summation and for the fast, approximate Barnes-Hut tree code method [48].

Results of Stage 1

Number of drug-pairs experimented	Number of drug pairs classified as 0	Number of drug pairs classified as 1
5322	3661	1661

3661 drug-pairs were classified as having no adverse reactions and 1661 were classified as having adverse drug reaction

Accuracy Index: 0.73

For accuracy calculation, the adverse drug reaction classification for all the 5322 drug pairs was verified in the SIDER database. This was done manually by downloading the data in excel and building formula in excel to compare the results. It was observed that the algorithm showed 73.11% accuracy. To improve the accuracy stage 2 was conducted

Stage 2:

Feed the classified adverse effects from Stage 1 and improve the classification on a scale between 0 and 1, with 0 signifying complete absence of adverse drug reaction and 1 signifying complete presence of adverse drug reaction. The values in-between indicate the intensity.

To study if the accuracy of prediction improves when Multi-class classification is applied, the classified adverse reaction data from stage 1 was fed into the error-correcting code algorithm built using CNN. In this case 0.5 was taken as the mid-point and used to segregate the results of computation

Results of Stage 2

Number of drug-pairs experimented	Number of drug pairs classified as 0 and 0.5	Number of drug pairs classified as 0.51 and 1.0
5322	2649	2773

Accuracy Index: 0.78

This time it was observed that the accuracy index was higher than the result obtained in stage 1. This is because of the multi-classification technique that provided the degree of adverse reaction. Although for experimentation purpose 0.5 was used as the line of segregation to decide if the drug-pair fell into the negative bucket and all values above 0.5 into the positive bucket, medical experts are best position to decided the scale. This is done only for IT computation purpose and should not be used as the scale to decide ADR. This experiment only proves that it is possible to predict the adverse interaction between drug pairs to an extend of 78%

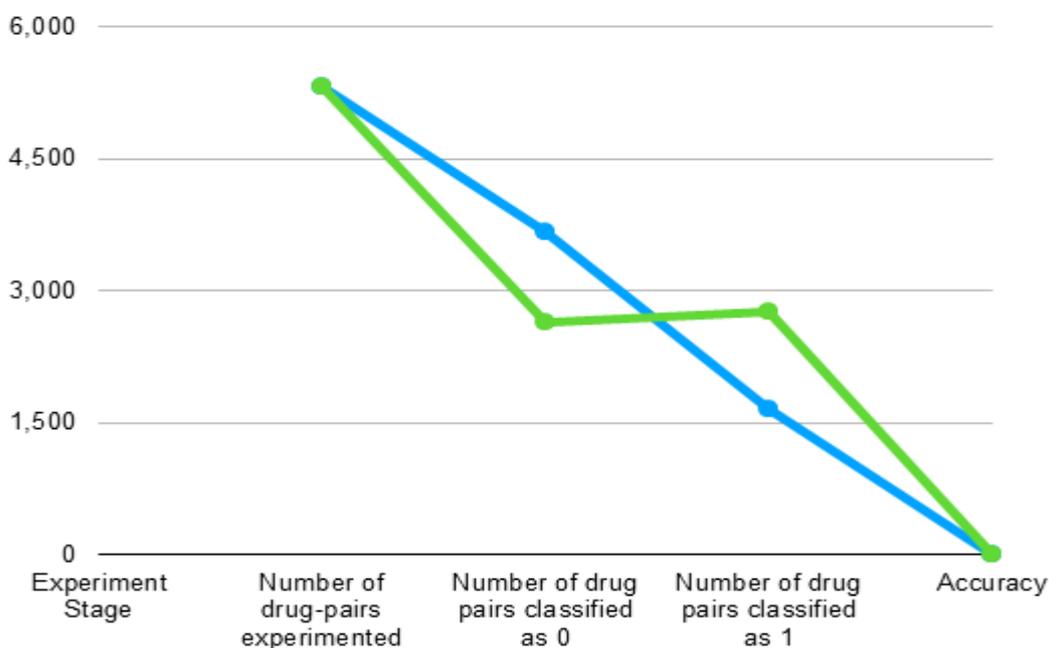


Figure: 2 Stage wise progress

4. CONCLUSION

COVID19 treatment related research is of prime importance as the pandemic challenges the very existence of humankind. As multiple theories exist in the prescription and treatment of disease which involve multiple drugs, it is crucial to identify and be able to predict drug pairs that could cause adverse reaction and potentially harm the health of an individual, especially in the long-term. In this paper, a comprehensive survey of the existing literature has been conducted on the major studies in predicting the adverse effects. The researchers identified that the discovery process of side effect or drug effect is efficiently attained by applying CNN technique. CNN also has certain limitation and the enrichment of feature selection as well as optimization is required in adverse effect discovery from DDI. A proposed system based on research done has been experimented and results documented. The results show that there is scope for further research and improvement in the accuracy of the prediction.

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Identification, Screening of Heavy metal Resistant Bacteria and Bioremediation of Heavy Metals in Polluted Soil by Using Different Bacterial Strains

Venkatesh Vangeapurapu and Alapati Krishna Satya*
Department of Biotechnology, Acharya Nagarjuna University, India

ABSTRACT

The industrialization has led to contamination of the environment with heavy metals. Contamination can be inorganic or organic or biological. Heavy metals are considered to be the most toxic environmental contaminants. Heavy metals are continuously discharged into natural systems. Arsenic (As), Lead (Pb), Zinc (Zn), Cobalt (Co), Chromium (Cr), Nickel (Ni), Mercury (Hg), Cadmium (Cd), Copper (Cu) and Magnesium (Mn) are some highly toxic heavy metals. Hazardous heavy metals can enter into plants, soils, and sediments from processes associated with domestic, municipal, agricultural and industrial activities. The process of involvement of microorganisms to reduce pollutant concentration is known as bioremediation. It is a natural process and its importance of biodiversity has increasingly been considered for clean-up of metal contaminated and polluted ecosystem. Microorganisms degrading heavy metals and adopted to convert toxic heavy metals to non-hazardous form. These processes are eco-friendly. This article focuses on the bioremediation process and the use of microorganisms to remediate heavy metals. The remediation of the hazardous wastes can be accomplished by composting. Heavy metals are not degraded during composting they may be converted into organic combinations that have less toxicity and less bioavailability than mineral combinations of the metals.

Keywords: Heavy Metals, Bioremediation, Composting, Contaminated Soil, Minimum inhibitory concentration, 16S rRNA, Organic Matter, Organic Carbon.

INTRODUCTION

In recent years, discharges of large volumes of heavy metals from industrial activity and mining, with final deposition in the soil, have led to increases in soil heavy metal concentrations. Using of pesticides and fertilizers may leads to heavy metal deposition in soil. Heavy metal compounds are often used in color pigments, batteries, fertilizers, or other industrial products. Then, these deposited elements are bio-absorbed into the biosphere. Hazardous organic materials are generated widely in domestic, municipal, agricultural and industrial activities. The biological treatment builds up stable organic compounds through composting and reduces concentrations of organic pollutants. Bioremediation can be used to lower the levels of chemical contaminants in soils. Bioremediation by composting is an economically attractive method for cleaning polluted soils. Research also has been conducted into the degradation of heavy metals in soils and the effects on mineralization of Heavy metals contained in the compost.

Permissible limits for land application of Heavy Metals in organic waste

SNO	HEAVY METALS	LIMITS (mg / kg)
1	As	>10
2	Cd	>5
3	Cr	>50
4	Cu	80-300
5	Pb	100-300
6	Zn	200-1000
7	Ni	50-100

An efficient way of removing toxic metal contaminants from the environment and stabilizing the ecosystem is to make use of indigenous bacteria with mechanisms capable of degrading such heavy metals, or genetically engineered bacteria to treat polluted environments by converting toxic heavy metals into non-hazardous forms. However, the bioremediation process will only be successful if only bacteria with proven ability to remediate and tolerate heavy toxicity are utilized. Bacteria are essential in remediation of heavy-metal-contaminated environments as they have a variety of ways to endure metal toxicity. The exploitation of biodegrading bacteria to sequester, precipitate, or change the oxidation state of numerous heavy metals has been widely studied (Bankar and Nagaraja, 2018). And also bacteria are known to have crucial roles in the biofortification of Zn and Fe in cereal grains (Gosal et al. 2010; Rana et al. 2012; Sharma et al. 2012). Some bacteria have been implicated in the biofortification of grains of wheat and rice with Fe and Zn (Abaid-Ullah et al. 2015; Ramesh et al. 2014). Bacteria capable of solubilizing insoluble sources of Zn can enhance uptake of Zn by 21% in soybean plants (Sharma et al. 2012). There are different mechanisms in microbes increase the availability of Zn

and Fe in soil and increase the bioavailability. *Pseudomonas sp.* (96-51), and *Agrobacterium sp.* (Ca-18) bio-inoculants were able to solubilize the zinc hydroxide and zinc phosphate or other insoluble Zn salts and increase the availability of Zn to rice plants for a longer time in soil.

MATERIAL AND METHODS

Collection and Preparation of Soil Samples

Surface soil samples were collected from municipal domestic and contaminated soil in Guntur. Samples were collected from the soil surface (5cm²) and at a depth of approximately 10 cm, after which they were placed in sterilized polyethylene bags using a sterilized spatula. , the wet soil samples were spread on dry papers to dry under room temperature and all soil samples were stored at room temperature until analysis. The soil samples were ground, sieved, weighed, and packaged in small brown envelopes and labeled.

Isolation of Heavy Metal Tolerant Bacteria

Ground and dried soil samples were passed through a sieve (2 mm) to remove large pieces of debris and vegetation. The soil sample was serially diluted in which 9ml of sterile saline solution (0.9% NaCl) in 10 test tubes and then 1ml of sample was added to the first test tube to have 10⁻¹ repeated up to 10⁻¹⁰ then 0.1 ml of the dilution was spread on the surface of the nutrient agar plates where the metals were added and incubated at 37°C for 2-3 days, individual colonies differing in morphological appearance were selected for further studies and sub-cultured on the same media. After the bacterial growth, added 500 µL of the overnight culture to 500 µL of 50% glycerol in a 5 mL cryovial and gently mix to make glycerol stock. Freeze the glycerol stock tube at -80°C.

The bacterial strains were aseptically streaked on nutrient agar plates to determine heavy metal tolerance. The nutrient plates were supplemented with 10 mg/L to 300 mg/L of NaAsO₂, CdSO₄, K₂Cr₂O₇, CuSO₄.5H₂O, PbCl₂, ZnSO₄ and NiCl₂.6H₂O. The nutrient agar plates were used and observed growth at 37°C.

After preliminary screening of soil samples containing heavy metal degrading bacteria, Streak plate technique was followed by isolation. Control plates were prepared without heavy metal

In this study, a total of 6 bacterial strains able to grow in the presence of toxic metals. They were *Escherichia coli*, *Salmonella typhi*, *Bacillus licheniformis*, *Bacillus thuringiensis*, *Pseudomonas aeruginosa* and *Pseudomonas putida*.

Preparation of Bacterial Inoculum

After screening of heavy metal degrading bacteria, the bacterial culture was added to 5L of nutrient broth for respective selected bacterial lines and incubated at 37 °C for 48 hrs. After the growth of bacteria the inoculated solution was added to soil beds. During the degradation or in time intervals mix the soil for better bio-degradation or composting.

Heavy Metal Stock Solutions

A separate stock solution of NaAsO₂, CdSO₄, K₂Cr₂O₇, CuSO₄.5H₂O, PbCl₂, ZnSO₄ and NiCl₂.6H₂O was prepared in 100ml capacity flask by dissolving appropriate quantities of pure metal powders in 1% nitric acid with double distilled water.

Determination of Minimum Inhibitory Concentration (MIC)

The bacteria isolates were grown on heavy metal incorporated media against respective heavy metal to determine MIC. It was identified by increasing the concentration of the heavy metals on LB agar plates until the bacteria failed to grow on the petri plate, concentration of the heavy metals was from 50 µg/mL to 3000 µg/mL and MIC was determined at 37°C after 24hrs.

Heavy Metals Analysis

All heavy metals have strong toxic effects at high concentrations and regarded as environmental pollutants. Bioremediation that uses the remarkable ability of bacteria to absorb or adsorb the heavy metal elements and compounds from the environment and to metabolize in their tissues for the removal of pollutants from the environment. Soil samples from the selected sites were collected in triplicates and were dried at 105°C to constant weight. Three replicates of 0.5 g sediments were acid-digested. Each extraction vessel was added with 5 ml of conc. HNO₃, 2 ml HCl and 1 ml of HF. The vessels were capped and heated in a microwave unit at 800 W to a temperature of 210°C for 20 min with pressure of 40 bar. The digested samples were analyzed for the metals by atomic absorption spectrophotometer using flame atomization. Results are expressed on dry weight basis. The total content of heavy metals in the soil was determined by X-ray fluorescence spectrometry (As, Cd, Pb, Cr, Zn, Cu, Ni).

16S Rrna Based Identification of the Heavy Metal Resistance in the Selected Bacterial Samples

16S rRNA is considered for describing phylogenetic similarities among bacterial communities. It can be used for a complete assessment of bacterial diversity. The bioremediation processes can be determined by identification of 16S rRNA sequences obtained from contaminated environments. Kou et al. (2018) reported that the study of 16S rRNA gene amplicon helps to study the abundance and diversity of the microbial community in soil polluted with heavy metals.

Physico-Chemical Analysis of Polluted Soil

The physical parameters of the polluted soil samples were soil moisture, Water holding capacity, soil pH, temperature, Electronic conductivity and humification index and physical parameters were estimation of soil macro nutrients and micro nutrients.

Estimation of Organic Carbon and Organic Matter

The estimation of organic Matter in soil can be expressed as the content of organic C in the soil. Organic Matter contains about 50-60 percent of organic Carbon. Organic carbon can be estimated by colorimetric method.

Colorimetric Method: Sucrose is used as a primary standard C source. pick different quantities of sucrose in 100ml flasks. Take 10 ml of $K_2Cr_2O_7$ and 20 ml of concentrated H_2SO_4 in each flask and leave for 30 minutes. Prepare a blank in the same way without adding sucrose. A green color develops, which is read on spectrophotometer at 660 nm, after adjusting the blank to zero. take the reading so obtained against milligrams of sucrose as C. Add 10 ml of 0.1667M Potassium dichromate and 20 ml of concentrated Sulphuric acid containing 1.25 percent of Silver sulphate. Stir the reaction mixture and allow it to stand for 30 minutes. The green color of chromium sulphate so developed is read on a spectrophotometer at 660 nm after setting the blank, prepared in the similar manner, at zero.

Percent C = milligrams of C observed \times 100 / 1000 (observed reading is for 1 g soil, expressed as milligrams).

Percent OM = %C \times 1.724.

Estimation of Soil Minerals

Several solvents have been tried to extract and estimate the available micronutrient status of the soil. Of these the Diethylene Triamine Penta Acetic Acid (DTPA) was found to be the most suitable solvent for estimating the available Fe, Mn, Zn, and Cu by the use of Atomic Absorption Spectrophotometer.

RESULTS AND DISCUSSION

The bacterial strains were aseptically streaked on nutrient agar plates which were supplemented with heavy metals in respective concentrations. After incubation, the plates were observed for growth of bacteria.

Determination of Minimum Inhibitory Concentration (MIC)

After incubation the bacteria isolates growth was observed on media against respective heavy metal. The growth was observed more when the concentration was least (50 μ g/mL) and the isolates had less growth or failed to give colonies when the concentration of the heavy metals was very high (3000 μ g/mL) and MIC data was taken where the lowest concentration of heavy metal inhibited growth of bacteria after incubation. MIC of heavy metals showed high tolerance to Lead, by the selected six bacterial strains.

Minimum inhibitory concentration (MIC) is the lowest concentration at which isolate is completely suppressed bacterial growth was recorded. In this study order of MICs for the selected six bacterial strains was found to be Pb > Cu > Cd > Ni > Zn > Cr > As - for the *Escherichia coli* It was resistant against As with MIC of 60 μ g /mL, Cd with MIC of 150 μ g /mL, Cr, Ni with MIC of 300 μ g /mL, etc., has been recorded. Here demonstrated that *Bacillus*, *Pseudomonas sp.* bacteria are resistant to heavy metals (Pb, Cu, Ni, Zn); *Pseudomonas sp.* bacteria were found to the most multiple heavy metals resistant with MIC against Pb (1900 μ g /mL), Cr (600 μ g /mL) and Cd (1500 μ g /mL). Among six bacterial strains, *Escherichia coli* was identified here as the lowest capacity against respective heavy metals.

Minimum inhibitory concentrations of six bacterial strains against Heavy metals

Heavy metals	<i>Escherichia coli</i>	<i>Salmonella typhi</i>	<i>Bacillus licheniformis</i>	<i>Bacillus thuringiensis</i>	<i>Pseudomonas aeruginosa</i>	<i>Pseudomonas putida</i>
As	60	100	120	150	100	150

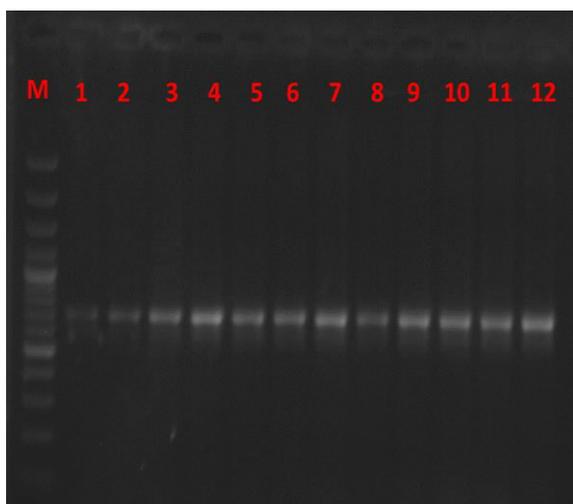
Cu	250	200	1000	1500	1200	1500
Zn	350	300	400	400	450	550
Cd	150	500	250	150	1500	1200
Cr	300	250	350	300	600	500
Ni	300	400	600	500	1000	1200
Pb	200	500	1800	1600	1900	1800

16S rRNA Based Identification of the Heavy Metal Resistance in the Selected Bacterial Samples

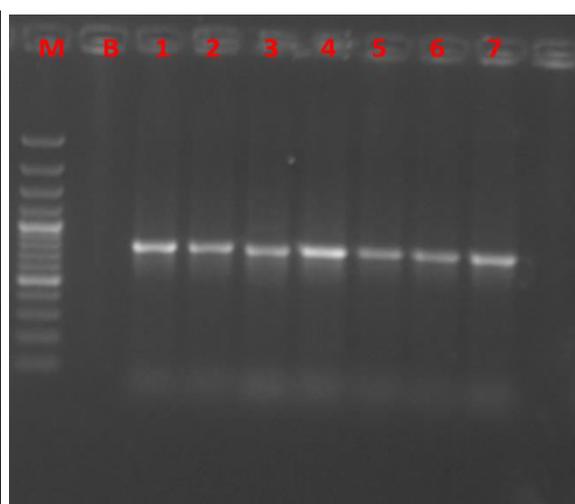
Genomic DNA was extracted from the isolated bacteria using a genomic DNA Prep Kit. The extracted DNA is used as a template for PCR to amplify the 16S rRNA gene. For identification of the isolated bacteria, the partial 16S rRNA gene sequence was compared with the full sequence available in the GenBank database using a BLAST search (NCBI).

Genomic DNA was isolated and was amplified by using the universal bacterial 16S rDNA primers, F(5'-AGAGTTTGATCATGGCTCAG-3') and R (5'-TACGGCTACCTTGTTACGACTT-3'). PCR was performed with a 50 µl reaction mixture containing 1 µl of DNA template, 0.5 µl of each primer at a concentration of 5mM, 5 µl MgCl₂/ Buffer and 5 µl dNTP's at a concentration of 10mM, 0.5 µl of Taq polymerase. PCR was used to incubate reactions through an initial denaturation at 94°C for 1min, annealing at 52°C for 1min, extension at 72°C for 1min and final extension at 72°C for 5min. PCR was carried out in a Thermal cycler (BioRad, India). PCR products were analyzed by 0.8% (w/v) agarose gel electrophoresis in 1XTAE buffer with ethidium bromide (0.5µg/ml).

Escherichia coli

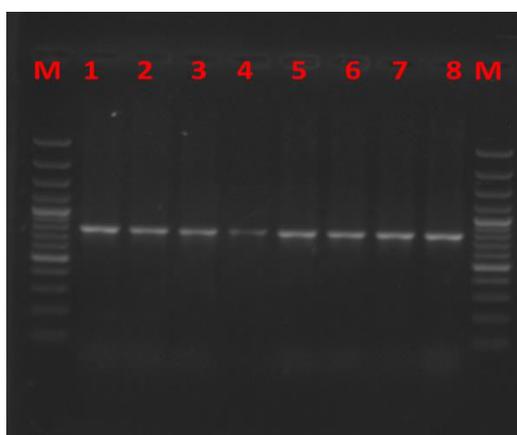


Salmonella typhi

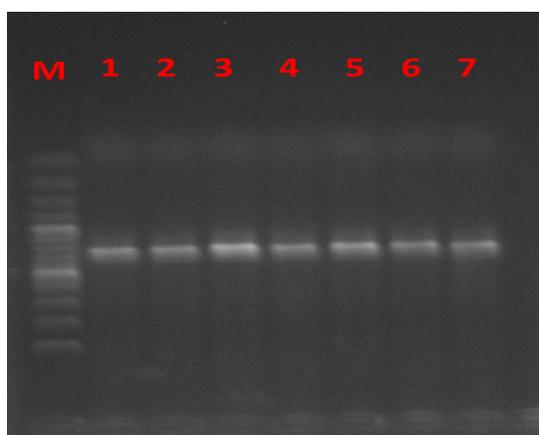


M stands marker, Lane 1 to 12 and 1 to 7 shows 16S rRNA gene in different isolates of *Escherichia coli* and *Salmonella typhi*

Bacillus thuringiensis

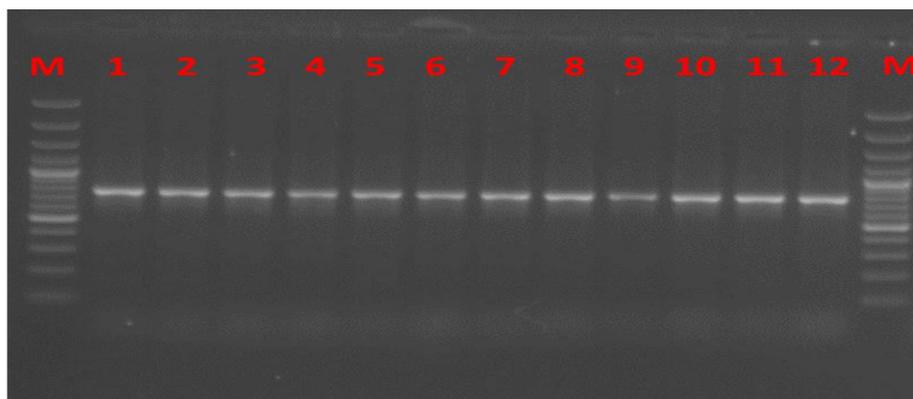


Bacillus licheniformis



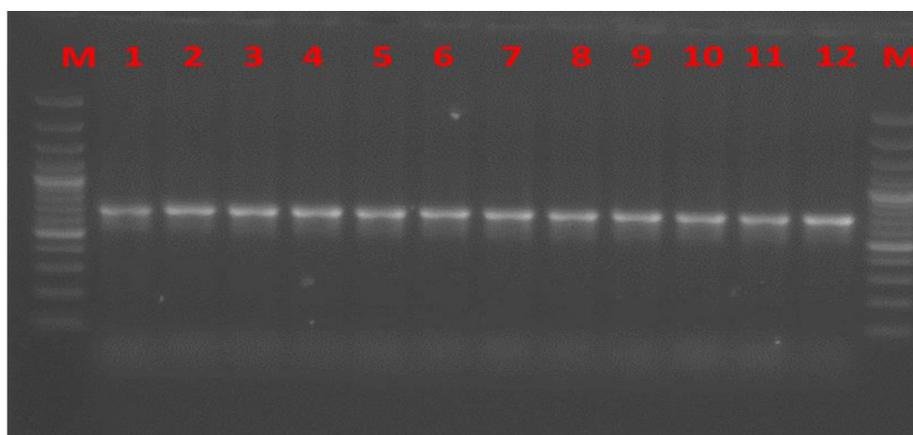
M stands marker, Lane 1 to 8 and 1 to 7 shows 16S rRNA gene in different isolates of *Bacillus thuringiensis*, *Bacillus licheniformis*

Pseudomonas aeruginosa



M stands marker, Lane 1 to 12 shows 16S rRNA gene in different isolates of *Pseudomonas aeruginosa*

Pseudomonas putida



M stands marker, Lane 1 to 12 shows 16S rRNA gene in different isolates of *Pseudomonas putida*

Physico-Chemical Analysis of Polluted Soil during Different Stages of Composting

After inoculation of the heavy metal degrading bacteria to soil beds, the bacterial lines degraded inorganic compounds to form organic or bio-available compounds to the microbes or plants. That could reduce the concentrations of heavy metals in the soil. For the better result we mix the cocopeat to soil during the degradation in time intervals. After degradation of soil (after 90days), soil separated from soil bed and we analyzed the physico-chemical parameters (Aggregate values of 3 batches were given in the below table) of the soil. The physical parameters were soil moisture, Water holding capacity, soil pH, temperature, Electronic conductivity and humification index and chemical parameters were estimation of soil macro nutrients (N, P, K), micro nutrients (Na, Ca, Fe, Mg, Zn, Cu, Cl, Mn) and heavy metals (As, Pb, Cr, Ni, Cd) .

S.No	Sample days	Initial concentration	B1	B2	B3	B4	B5	B6	Recommended standards
1	Temperature (°C)	46	44	40	42	42	46	45	NA
2	Moisture (%)	75	56	58	46	48	54	50	45-65%
3	pH	9.0	8.5	8.16	8.75	8.82	7.68	7.65	6.5 - 8
4	Electronic Conductivity (dS/m)	6.5	6.0	5.5	6.0	5.5	6.0	5.5	>6
5	Organic Carbon (%)	12.50	17.80	16.95	17.36	17.19	16.83	16.27	>30
6	Organic matter (%)	21.50	30.68	29.22	29.92	29.64	29.01	28.04	35 - 45%
7	Water holding capacity (%)	45	57	55	60	58	55	67	NA
8	Available N (g/Kg)	4.2	1.624	1.638	1.694	1.684	1.750	1.750	NA
9	Available P (mg/g)	1.5	3.35	3.65	3.7	3.85	3.35	3.3	>5
10	Available K (mg/g)	7.5	9.7	9.1	8.5	8.3	7.5	6.9	>10

11	Na ⁺ (mg/g)	3.5	3.8	3.2	4.2	4.7	3.6	3.3	NA
12	Ca ⁺² (mg/g)	50	35	40	30	35	30	30	20 - 40
13	Fe ⁺² (mg/g)	8.5	6.5	6.0	5.5	5.5	5.0	4.5	NA
14	Mg ⁺² (mg/g)	6.5	4.5	4.2	4.8	5.0	4.8	4.5	>5
15	Zn ⁺² (ppm)	1200	420	490	360	390	450	480	>1850
16	Cl ⁺² (mg/g)	5.8	4.4	4.6	3.9	3.6	3.2	3.0	>5
17	Cu ⁺² (ppm)	420	280	250	310	290	250	250	>1500
18	Mn ⁺² (ppm)	40	25	20	20	20	15	15	>200
19	Pb ⁺ (ppm)	60	40	45	40	40	30	35	>500
20	Cr (ppm)	70	55	50	55	50	45	40	>210
21	Ni (ppm)	30	20	25	25	20	15	15	>180
22	As (ppm)	40	35	30	30	30	35	30	>20
23	Cd (ppm)	20	15	15	10	10	5	5	>10



The bacterial isolates inoculated to the soil beds (**B1:** *Escherichia coli*, **B2:** *Salmonella typhi*, **B3:** *Bacillus licheniformis*, **B4:** *Bacillus thuringiensis*, **B5:** *Pseudomonas aeruginosa*, **B6:** *Pseudomonas putida*)

CONCLUSION

The bio remediation is an efficient way of removing toxic metal contaminants from the. From the pooled data six isolates showed higher the biodegrading capacity on heavy metals and converted them into bio available compounds which is the major objective for this study. According to physical and chemical analysis among six bacterial isolates *Pseudomonas aeruginosa* and *Pseudomonas putida* degrade the heavy metals more in polluted soil. Minimum inhibitory concentration (MIC) is the lowest concentration at which isolate is completely suppressed bacterial growth was recorded. In this study order of MICs for the selected six bacterial strains was found to be Pb > Cu > Cd > Ni > Zn > Cr > As. Among six bacterial strains, *Escherichia coli* was identified here as the lowest capacity against respective heavy metals. These bacterial isolates have been used greatly in the clean-up of the environment with proven ability to remediate and tolerate this heavy metals toxicity.

ACKNOWLEDGMENT

We give glory to my parents and family members for the blessings bestowed upon us. Very much thankful to Faculty of Biotechnology Department, Acharya Nagarjuna University, Guntur for their guidance and assistance during my study.

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Descriptive Study on Difference between Role of Accounting Services and Accounting Practices by Small Medium Practitioners (SMPS)

Varsha Vaswani and Monali Ray
Pillai College Research Centre, Panvel, India

ABSTRACT

In the Accounting context, sustainable accounting is always a good accounting practice and accounting services serve the better facets of growth for business environment. operating the research for title of study taken into descriptive form. AS inaccessibility of thorough facts of difference between role of Accounting Services and Accounting Practice and Small medium practitioners (SMPs). Hence research of study authors aspiration is to take alongside and high lightened the difference with narrated new conceptual framework, which are enduring and competitive in approach with business in new normal age. Both factors of study variables i.e., accounting practice and role of accounting services of Small medium practitioners (SMPs) and chartered accountants play a vital role for all kinds of MSMEs in diverse segments. Some businesses are publicly disclosing their records system to maintain brand and quality with clean technology practice. For that every business accountant can ensure owner of business that there is gain benefits from its sustainable practice which enhance employee's retention brand loyalty, distribution of wage, etc., This helps companies to become more sustainable. Hence, to know better need to understand the that the following factors efficacy such as:

- Accounting practice and
- and Role of accounting services by SMPs through sustainable accounting approaches

Moreover, to understand the difference between these factors and their efficacy of connection with business advice, financial decisions, behavioral finance, clear communication, integrate to assess benefits, organize internal system, drive efficiency, provide credibility, link up with strategy and resources, etc. which is need of every business.

The problem of study is that both factors are competitive and perform by Small Medium Practitioners (SMPs) and Professional Accountants. But in modern different ways become more based on cost of accounting and services rather to follow ethical approach for the practice of measuring, analyzing, and reporting a company's, social and impact on environment. The research of study has set objectives related to title and findings by descriptive analysis. the study related factors variables namely acknowledge as:

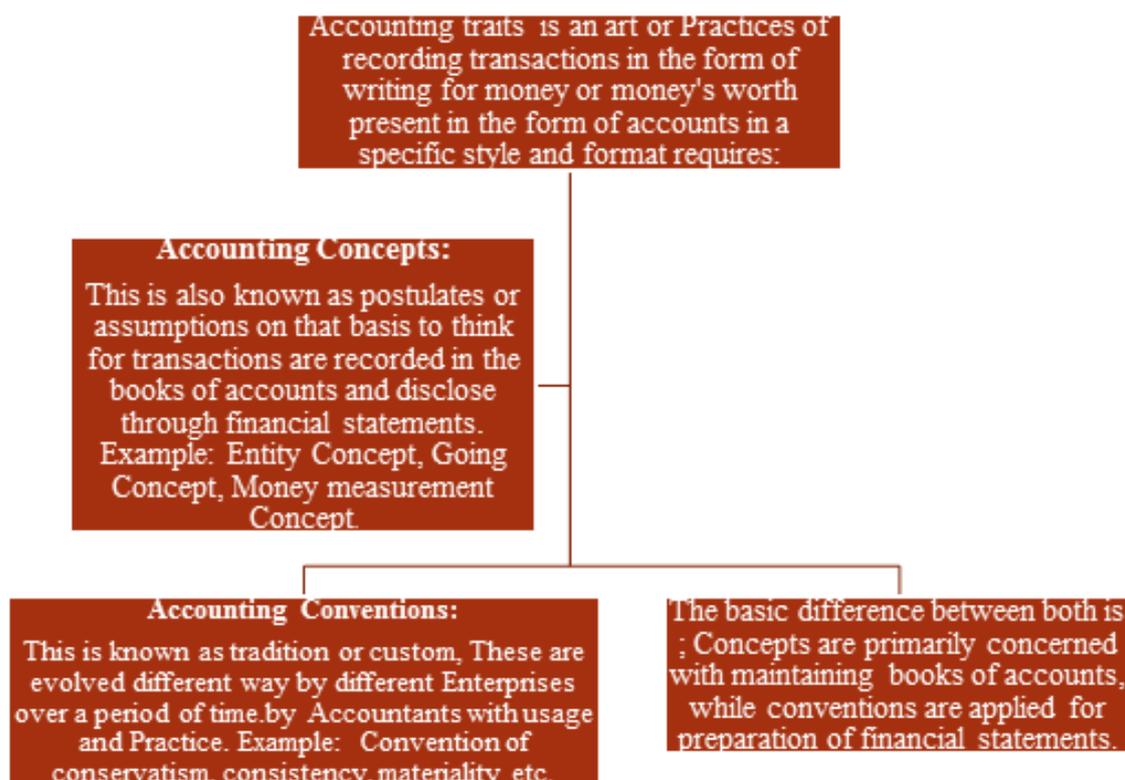
Accounting services and accounting practices by Small medium practitioners (SMPs) sound new buzz variables and how does both are impactful for sustainable environment and in different methods of accounting in new normal post covid -19

Keywords: Accounting Practice, Accounting Services, Small and Medium Practitioners (SMPs), Sustainability in accounting and financial behavior.

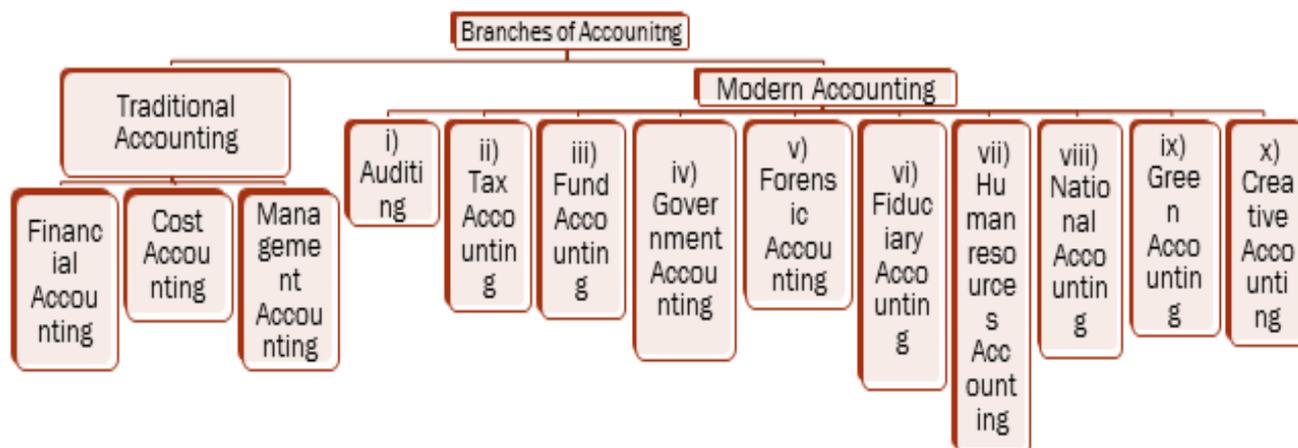
1. INTRODUCTION

Accounting always been prominent language of business. To make ascendable need to maintain proper records and practices, their role of accounting services provides valuable advice to understand position of business. In present scenario many tools of accounting packages help business to practice smoothly daily review of records optimize the business progress. No one like to follow non-compliance or pay penalties etc.

a) Accounting and Its Traits



b) Branches of Accounting



There are two branches of accounting i.e., Traditional and Modern branches of accounting have been developed to satisfy the needs & requirements of different stakeholders.

c) Accounting Practice

Accounting practice is systematic procedure and controls that are used by entity's accounting department to control over the accounting records & entries as based on accounting records other reports are maintained like cash flow statement, fund flow statement, financial statements payroll, taxes, cash book etc. and they are basis of task done by auditor while auditing the accounting statements. Hence, apart from recording organization must look after the authorization part. Hence the following equated concept make perfect insight of it as.

Education + knowledge + training + analytical skills + experience.

For example, accountants or clerical staff for data entry should not have access to company statement views or other reports so that information cannot be leaked or misused. There should be proper practice by every organization as it is a basis for many external and internal reporting and decisions.

Accounting Services: This implies measurement, processing, and communication of information about economic entities including, but is not limited to, financial accounting, management accounting, auditing, cost containment and auditing services, taxation, and accounting information services

Example of Accounting Services: Maintain employee attendance records, in-time, out-time to calculate proper salary and overtime, etc.

- Maintain fixed assets register, inventory records register, investment register, cancelled cheques and records of cheques issued and deposited shareholders' register, etc.
- Keep records of bills payable, sales, expenses, and payments and receipts, collection from debtors, calculation of depreciation, etc.

d) Small Medium Practitioner's (SMPs)

"The definition of SMP varying from one jurisdiction to another. IFAC describes SMPs as practices that exhibit the subsequent characteristics: their clients are mostly SMEs; they use external sources to supplement limited in-house technical resources; and that they employ a limited number of professional staff."

SMPs offers professional services that help their clients to comply with regulation and enhance their business performance. One amongst the ways in which SMPs serve the varied business needs of their clients is by maintaining relationships with trusted experts from other disciplines, including bankers, lawyers, and IT specialists, who also serve small businesses.

Nature of SMPs

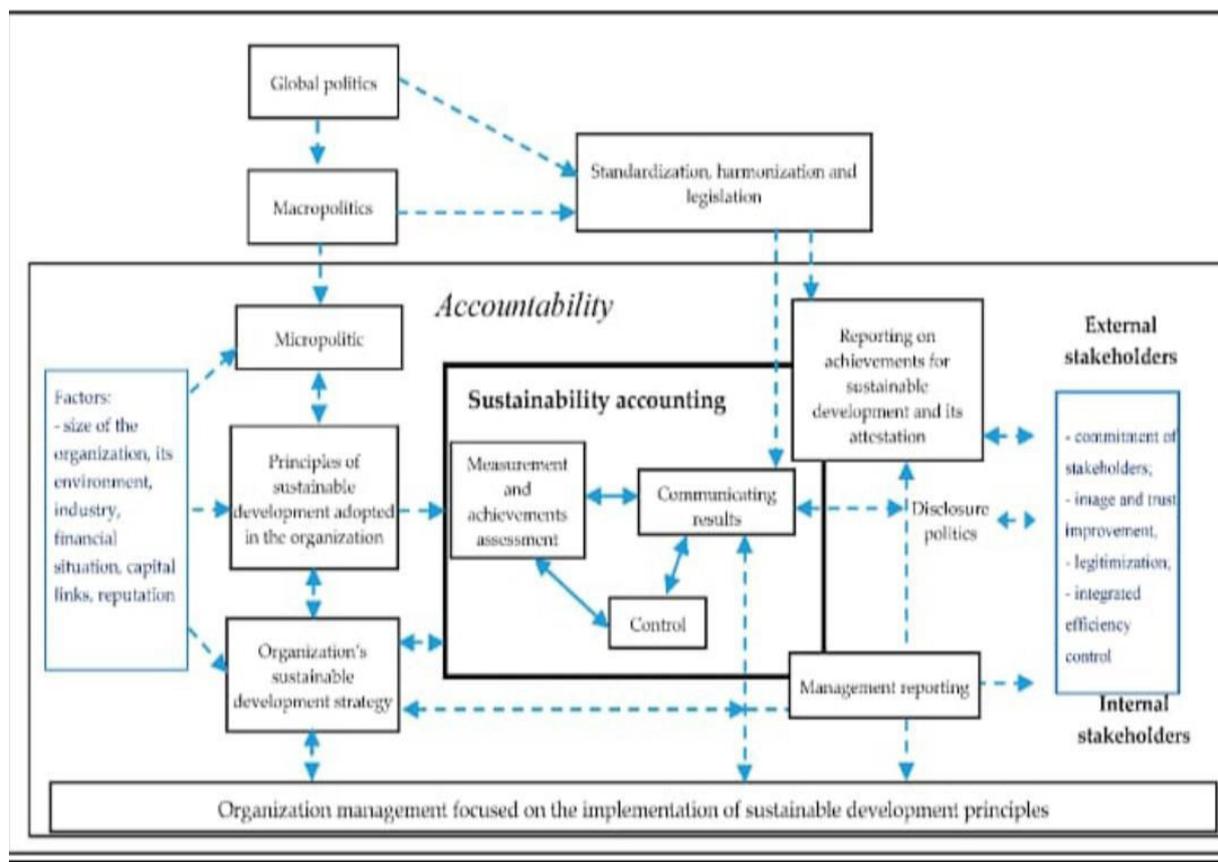
- SMPs provide help in Accounting Practices among Business and wider society
- SMPs offer personal growth to theirs's Employees & long-term career.
- SMPs work from agility and spread everywhere ages from 17 to 30+ and already learning that how to handle multi-generational workforce.
- SMPs provide various accounting services and Practices to different sorts of small business holders further advising for career, growth, and development mobility.
- SMPs are Creative and dealing with the modern tools of digitalization to provide services with none delay in any filing or projects.

e) Sustainable Accounting

Sustainability accounting is that the practice of measuring, analysing, and reporting a company's social and environmental impact. this was originated about 20 years ago is thought as subcategory of financial accounting that focuses on disclosure of non-financial information about firms' performance to external stakeholders like capital holders, creditors, etc

Following are 13 indicators must analyse deeply with the assistance of accountants or accounting practice

- i. Material costing, Production costing, Logistics, Trade and distribution, Promotion, Consumption and after sales services, Waste management.
- ii. Design the products requirements to produce and its cost.
- iii. Reuse and recycling cost, Analyse margin
- iv. From pin to induce penny each step should be sustainable
- v. Sustainability of accounting associated with accounting services for a small business
- vi. As starting start up or small business requires plenty of skills and efforts. as the owner, need time to bear time consuming responsibilities.
- vii. Hence, need assessment through outsourcing of financial and accounting dated.
- viii. This saves time, penalties, late nightmare, Efficiency to cut back cost expert guidance and suggestions.



Sustainable Accounting

- ix. Finding right accountant is de facto tasking move must take smart move
- x. For small business and MSMEs must find suitable accountants that are small medium practitioners or CPA
- xi. A good accountant helps to provide reverences from previous clients and new policies to grow business
- xii. Secondly their method of communication and their aspects of doing work
- xiii. Finally cost of accounting and their preference of charge client monthly or hourly, holding great conversion is the need of business with accountants

This way sustainability also can be maintained but now a days their performance got bit negative toward small business client due to this study of research review some cases which speaks about opinion related to impact is not too good or bad.

This may be good when they align services and practice with sustainable order in practical way rather only in theory.

2. STATEMENT OF THE PROBLEM

Through this research, intended to understand the analysis of difference between Accounting Services and Accounting practice and how these two variables are impactful. Despite various methods and accounting information the businessman has lack of access of financial information and awareness regarding accounting technology, software, packages, SMPs Accounting practice uses, Schemes of to get subsidies.

They also have misconception that Accounting services plans to purchase are costly in nature and no use to invest much on accounting technology and accounting practices of professional accountants and SMPs they believe in simple pattern of recording transactions based on traditional aspects. hence, this paper needs to the orient title of study to insight the scope, difference, and scope to the extent of better accounting sustainability for business, MSMEs etc.

3. REVIEW OF LITERATURE

- (Carolyn B. Levine, 2008) and other authors examined critical accounting policy disclosure in medium scale industries in Iran. They studied that what types of Main hypothesis in this study was if a firm unexpectedly discloses as accounting policy as critical. The related account was more likely to have high post disclosure

magnitude or variance. Second hypothesis was if a firm that discloses a policy as critical have higher litigation risk than firms that do not disclose the policy critical. The study concluded that the financial reports provide qualitative responses to the inquiries made in the SEC proposal as well as insights into the use of the critical accounting policies section as a mean of providing information and providing safe harbor protection for information.

- (Azhar) and his fellow researchers investigated the financial management components and techniques practiced by the SMEs in Malaysian firms. The findings of the study showed that three components of financial management to be categorized as core components practiced by the SMEs, that is, financial planning and control, financial accounting, and working capital management. They finally concluded that these three pivotal components of financial management should not be overlooked in accounting practicing system to maintain the growth of the SMEs.
- (Shahabi) and the colleagues in their study explored the accounting practices of SMEs in Iran. They found that the application of accounting information system used by Iran MSMEs to assess their financial performance is inefficient. They took a sample of 75 MSMEs from different parts of Iran and compared the accounting system of sampled MSMEs. They suggested that the Government should conduct training program to appraise SMEs to keep proper books and prepare final accounts.
- (Pacioli, 1447-1517) He was an Italian mathematician and Franciscan friar who also collaborated along with his friend Leonardo da Vinci (who also took math lessons from Pacioli)." The system presented by him thought as accounting cycle now a days in business recording, He has given conceptual clarity of ledger accounts He has mentioned that a trial balance is statement with balanced ledgers".
- The Enron scandals in 2001 shook the accounting industry, for example. Arthur Andersen, one of the world's largest accounting firms at the time, went out of business.

4. OBJECTIVES OF THE STUDY

1. To Study on difference between role of Accounting Services and Accounting Practices by Small medium practitioners (SMPs)
2. To study the scope of sustainable accounting practices and services followed by small business.

5. HYPOTHESIS

H₀: There is no difference between role of Accounting Services and Accounting Practices by Small medium practitioners (SMPs)

H₁: There is difference between role of Accounting Services and Accounting Practices by Small medium practitioners (SMPs)

H₀ sustainable accounting practices and services has no scope for not for small business

H₂: sustainable accounting practices and services has great scope for small business

6. RESEARCH METHODOLOGY AND RESEARCH DESIGN

Research Methods

Descriptive source of research is the background research done by researchers on already existing information regarding the title of this study from case studies ICAI Journal articles, SMPs articles, ACCA Journals, ICAI, CS journal articles, websites, thesis, etc. Analysis and interpretation pie diagram represent the data as the per sequence of objectives and Hypothesis. Being manually tested chi square to tested hypothesis manually.

7. DATA ANALYSIS AND INTERPRETATION

A Survey was Conducted by Taken in Descriptive form from Cases and Review, Etc.

Observed the descriptive study with respect to the accounting practice and accounting services and its role for sustainability in accounting of small given by opinion-based and came to know that the difference as the following table depicted information in finding of study while tested hypothesis

Finding of study & Testing Hypothesis

Justification of Hypothesis-1:

To Justify Our First Objective: To Study on difference between role of Accounting Services and Accounting Practices by Small medium practitioners (SMPs)

H₀: There is no difference between role of Accounting Services and Accounting Practices by Small medium practitioners (SMPs)

Following distinguished description proving the null hypothesis to be accepted or prohibited

Descriptive outlooks	Study on Accounting Practice/ Small medium practitioners SMPs	Study on Accounting Services & its role for business/ corporates
1. Meaning 2.	Accounting practice is the process and activity of recording the day-to-day financial operations of a business entity this is necessary to produce the legally required annual financial statements of a company. Accounting practice is reporting source of accounting language	This means the measurement, processing, and communication of financial information about economic entities including, but this is not limited to, financial accounting, management, auditing, cost accounting containment and auditing services, taxation, and accounting information system
3. Definition	Accounting practice is defined as the company can produce the annual and legally required financial statements: <ul style="list-style-type: none"> • Income Statements, • Comprehensive Income statement, • Balance sheet, • Cash flow Statement of stakeholders. And in simple words it is defined as: "Accounting practice is scientific in approach, and it is an art to learn and practice to get financial reports".	Accounting services means the activities defines in subsections (1) (2) of section 150 of Act of 2000 on Accounting. means providing bookkeeping services, tax preparation services, except as provided in section 26 of this Act, compilation of financial statements and services which provide advice or technical assistance to public, profitability, or product line of business, or to assist in the assessment of advisability of acquisition of all parts of business
4. Methods /Types	Various accounting methods are used by business for their accounting practices: Three primary methods are: <ul style="list-style-type: none"> ➤ Cash accounting ➤ Accrual accounting ➤ Hybrid accounting Other way of methods they use accounting policies <ul style="list-style-type: none"> ➤ Generally Accepted Accounting Principles (GAAP), ➤ and Accounting Standard as per need of business type ➤ Accounting disclosure to present the financial statement to analyze the decision-making aspects, ➤ various techniques of accounting 	Different types of accounting services <ul style="list-style-type: none"> ➤ Bookkeeping ➤ Chartered accounting ➤ Tax accounting ➤ Financial accounting ➤ Comptroller services ➤ Forensic accounting ➤ Accounting audit ➤ Internal auditing ➤ Government accounting ➤ Management accounting ➤ Public accounting ➤ Payroll ➤ Process entity formation ➤ Bank loan advising ➤ MSMEs business advice ➤ Software packages system
5. Principles	Accounting principles are rules and concepts applied to accounting activities. Generally Accepted Accounting Principles (GAAP) refers to a common set of accounting [principles, standard and procedures issued by financial accounting standard board (FASB)] <ul style="list-style-type: none"> ➤ Revenue recognition ➤ Historical cost principles ➤ Matching principle ➤ Full disclosure principles 	Principle to reduce error & increase efficiency, investments, Smart decisions, Accurate financial records, Professional tax consultation with state and federal tax laws: <ul style="list-style-type: none"> ➤ Ethical regulation equips with improving record prices and ➤ produce data for growth and vision to realize goals in business
6. Special consideration	As the digital and physical worlds have integrated. Hence, today accounting information system typically computer based with special accounting software. <ul style="list-style-type: none"> ✓ Accounting practice and their attached system produce financial reports used internally by management to assess performance and for strategic planning. ✓ Accounting practice culture often sets individual standard, behavior, and attitude ✓ These way of doing business can, manifest into good or bad norms on aggregate. in 	This is main reason why business professional outsources accounting and bookkeeping provider is essential for ongoing concepts of accounting because, they need a cautious process and select the accounting services to consider their approach of commendations and reflection of high service qualities. Hence, following special consideration need to keep while providing accounting services: <ul style="list-style-type: none"> ✓ On time execution of agreement with any kind of business performance of best

<p>worst cases.</p> <ul style="list-style-type: none"> ✓ Accounting practice can lead to financial scandals High profile scandals include Enron in 2001; Sunbeam WorldCom and Tyco in 2002, and Toshiba in 2015 ✓ Honesty, neutrality, secrecy, professional conduct with competent care ✓ Accounting policies changes in accounting estimates and errors ✓ Disclosure of accounting policies and applicability of accounting standard. ✓ Evaluate reporting implication, timeline, ✓ Recognize data manage resources and ✓ Avoid risk of noncompliance. 	<p>in services</p> <ul style="list-style-type: none"> ✓ Cost packing of services ✓ Provide advice, options, and update to guide to maintain proper records ✓ Provide guidance n bridge loan system ✓ Exhibits project advice without intention of many benefits ✓ Making trust and faith of client ✓ Compensation, execution benefits ✓ Payroll analysis advice ✓ Sold purchase transactions valuation ✓ Amalgamation, issues share exchange rate advice ✓ Change in software system benefits security risk analysis.
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Through secondary sources of information from source of above table analysed and examines that there is a difference between both aspects of accounting services and accounting practices accounting practice exists as the daily recording of accounting and financial data as per **Generally Accepted Accounting Principles (GAAP)** and as per current law practice.

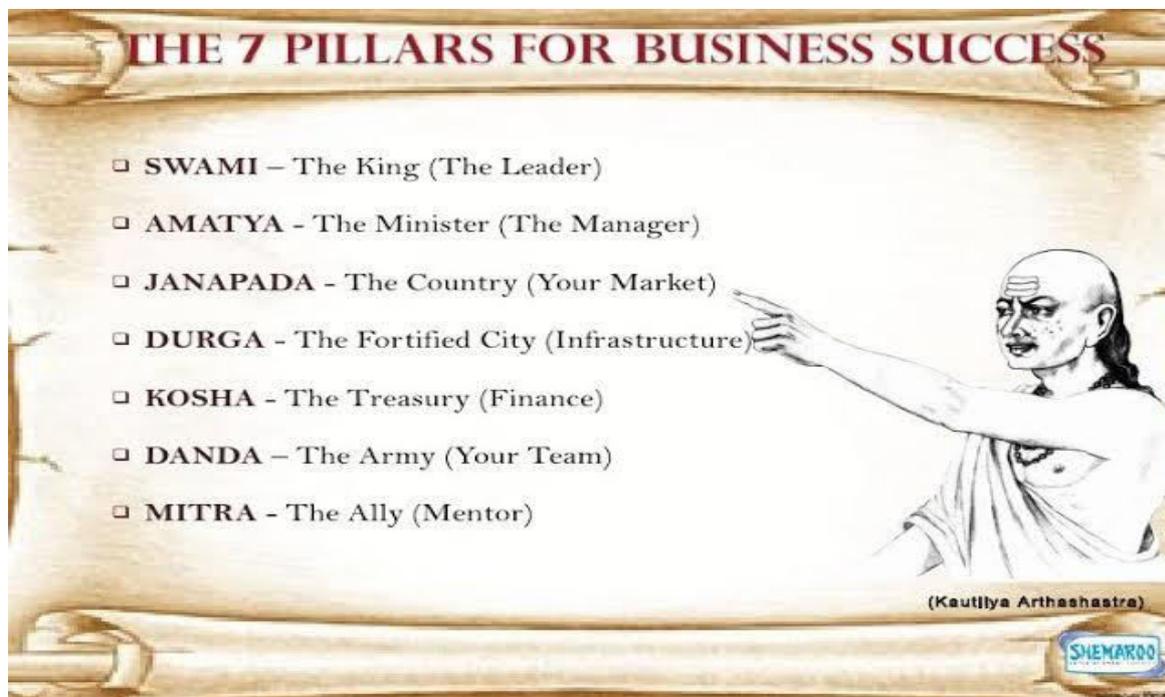
Interpretation of Hypothesis-1 Therefore, our null hypothesis (H_0) is rejected which strongly assure that, there is a difference between role of Accounting Services and Accounting Practices by Small medium practitioners (SMPs).

Justification of Hypothesis-2

To justify our second objective: To study the scope of sustainable accounting practices and services followed by small business

For proving second objective, study of research has framed second hypothesis.

H_0 : sustainable accounting practices and services have no scope for small business.

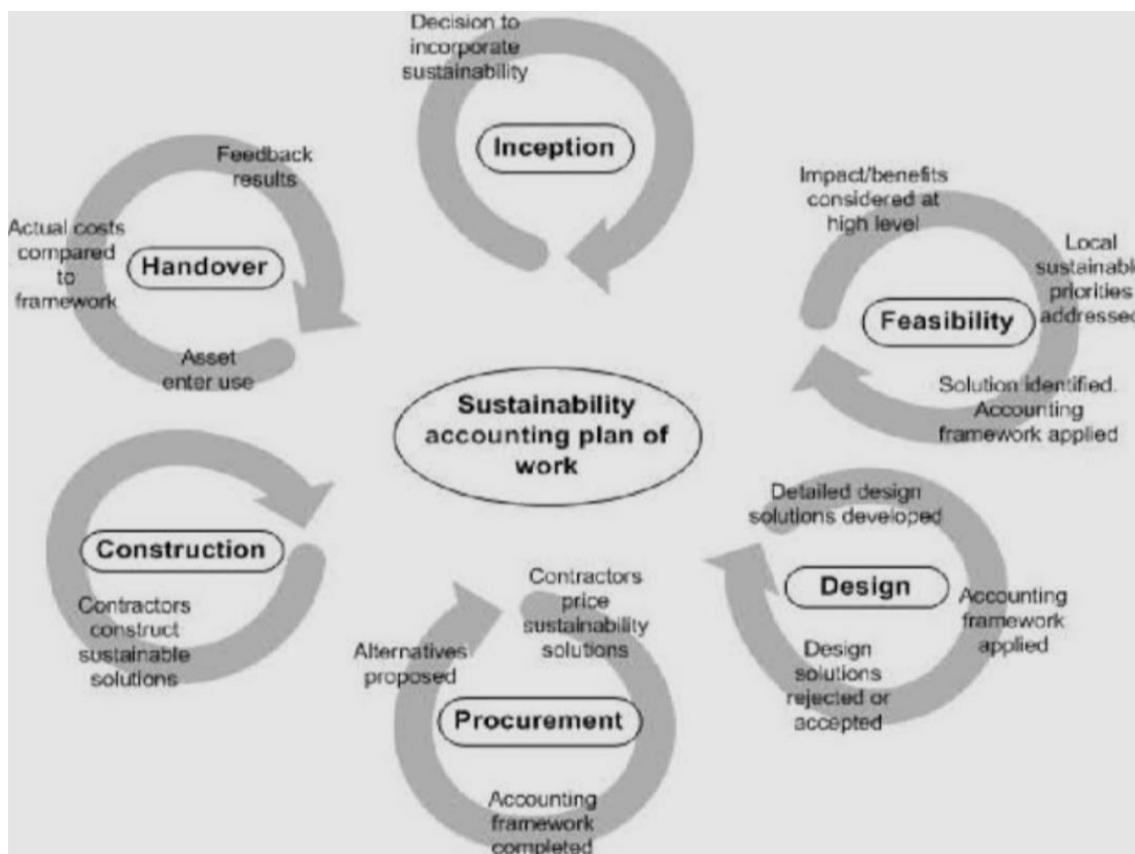


Picture:1 Sustainability in business published theoretical and practical sources for research of study reviewed deeply and found result related to review the Sustainable Accounting through accounting services and SMPs and its impactful aspects and Sustainable business accounting environment Information strongly enough provided description that to have sustainable accounting in business and it should be mandatory in nature to run smooth sail of business, the old rules but modern approach help to bring positive impact either positive if use in systematic way or negative if intended selfish way to perform in business.

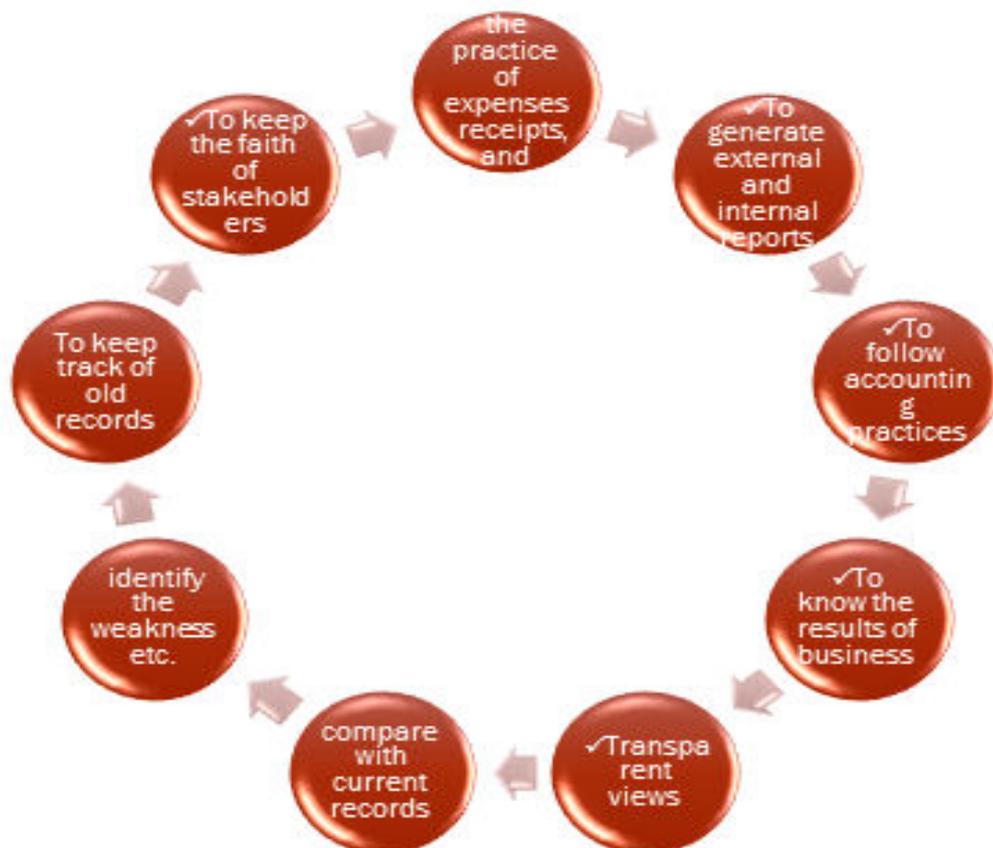
Return must be the productive one either in form of profit or penalties so there is impactful reward of accounting practice if use systematically with accurate records.

Picture 2: Sustainability scope with practice and role of accounting services

There are different types / methods accounting services which are scope full for small or large business.



The above pictorial information is intellectually to explain that sustainable accounting and practice has great impact in small business so must maintain accurately.



Above cycled areas indicated that how sustainable accounting practice and accounting services are scope full for small business. SMPs, Accounting services roles are Creative and working with the modern tools of digitalization to provide services without any delay in any filing or projects.

Therefore, our null hypothesis (H_0) is rejected which assure that strongly that There is great scope and aspects of sustainable accounting services and accounting practice in Sustainable business accounting environment

Interpretation of Hypothesis-2 Sustainable accounting practices and services has great and positive impactful scope for small business indicated in above aspects

8. FUTURE SCOPE OF THE STUDY

- SMPs provide various accounting services and Practices to different kinds of small business holders. Sustainable Accounting offer work life balance
- SMPs are working under compliance of ethical code of conduct and sustainability in accounting
- SMPs are people Business. They are mostly working as external auditors of forensic accountant.

9. LIMITATIONS OF THE STUDY

1. The study was limited to the descriptive analysis of secondary data based on articles by SMPs and accounting services providers and their view
2. Being an opinion survey by the sighting conceptual framework, there may be some subjectivity involved and hiring accounting practice SMPs is costly especially for small business

10. RECOMMENDATIONS OF THE STUDY

Every business has following questions.

How to rectify the error in the accounting system?

How to make process for going forward?

Backed by the solution is with entrepreneurship only. In the age of new normal everybody is aware about importance of sustainable business environment help us to to cope up with many issues. It is recommended that always be updating and installing best Sustainable accounting practices into business accounting services, Software packages. so, that these are always improving the effectiveness and efficiency of the process.

11. CONCLUSION

Another vital role of accounting services is payroll which can't dine by owner alone to record employee's payroll. But the loophole to appoint accounting services packages and leak information, cyber security fraud can be happened and not get quality control, accounting services may mislead about tax system and charge is too high.

Irrespective of type of business every one need accounting services though limitation is there but need to do how to appoints accounting services and do best way of accounting practice for this businessman has to be intelligent and knowledgeable in terms of accounting practice in sustainable business environment.

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In Silico Molecular Docking Studies of Phytochemicals from *Cissus Quadrangularis* L. against Estrogen Receptor & Phospholipase A2

Ishwari Wale, Dr Akshada Koparde and Dr R. C. Doijad

Krishna Institute of Medical Sciences Deemed to be University's Krishna Institute of Pharmacy, Karad, India

ABSTRACT

Objective: *Cissus quadrangularis* a perennial plant of grape family is traditionally used as an herbal medicine for treating inflammation caused by hemorrhoids, gastric ulcer and bone disorders. Phospholipase A2 is a type 1 transmembrane glycoprotein having role in inflammatory responses. Along with this, the estrogen receptor is a ligand dependent transcription factor that regulates a large number of genes in target tissues and it is important for normal development of bone. The objective of this study was to show the binding of *Cissus quadrangularis* derived biologically active compounds against estrogen receptor and Phospholipase A2

Methods: The 3D structure of COX-2 enzyme protein structure was taken from PDB database (PDB ID: 6cox). The structures of plant derived compounds were retrieved from the PubChem database. Docking studies had been carried out through PyRx tool involving AutoDock 4.2. Further molecular interaction between ligand and receptor was analyzed using Ligplot plus software.

Result: Friedelin scored highest docking score against estrogen receptor followed by Lupeol, where as Quadrangularin A possess highest binding energy against Phospholipase A2, which proves its best anti-inflammatory activity.

Conclusion: The in silico studies on compounds reported from *Cissus quadrangularis* showed that they possess potential medicinal values with anti-inflammatory activity and in the management of postmenopausal osteoporosis which form insight's to develop new lead for this clinical condition.

Keywords: *Cissus quadrangularis*, Molecular docking, Inflammation, Phospholipase A2, Estrogen receptor, osteoporosis, Ligplot.

INTRODUCTION

Cissus quadrangularis is a vine that grows in Africa and parts of Asia. It is commonly called as Asthisamhari which is a succulent plant, belonging to family Vitaceae. It is one of the most commonly used medicinal plants because of its unique characteristics all parts of the plant are used as a medicine. Each phytoconstituent plays very crucial role in treatment of various diseases. It is used in the management of Diabetes, Weight loss, Inflammation, Osteoporosis etc¹. In this work, we have illustrated the binding potential of various phytoconstituent with Estrogen receptor and Phospholipase A2 which are involved in Osteoporosis and Inflammation respectively. Estrogen receptor is widely distributed in bones and bone marrow. This Estrogen hormone is very necessary for skeletal homeostasis which helps to regulate bone remodeling. Generally, woman's ovaries make most estrogen hormone till menopause, but after than period level of hormone lowers down which is one of the leading cause of postmenopausal osteoporosis. Estrogen works by two receptors ER-alpha and ER-beta. Therefore, compounds of this plant is evaluated for enhancement of estrogen level by agonistic action on its receptors². Phospholipase A2 is a lipolytic enzyme which helps in digestion and metabolism of phospholipids in turn results in formation of fatty acids (Mainly Arachidonic acid). The metabolism of the arachidonic acid leads to synthesis of prostaglandins and leukotrienes which are actively involved in inflammatory process. By inhibiting the action of Phospholipase A2, ultimately anti-inflammatory effect can be achieved.³ According to a review of literature, there is no evidence to show the binding affinity of biomolecules from *Cissus quadrangularis* with PLA2 & ER. Hence current study includes in silico docking analysis of active biomolecules from *Cissus quadrangularis* against Phospholipase A2 and Estrogen receptor.

MATERIALS AND METHOD

1) Phytochemicals -

In this study, Ten compounds are selected which are derived from *C. quadrangularis*. The structure of all the phytochemicals retrieved from PubChem Database. PubChem is a public database which consist of structures of millions of drugs in 2D as well as 3D conformer. This is also called library of Drug Molecules. For following study the structures are downloaded in 3D conformer which is available in SDF format. Pubchem ID of selected molecules are mentioned in table below⁴

Table 1: List of ligand and Pubchem ID

Sr.No	Ligand	Pubchem ID
1.	Quadrangularin A	5318096
2.	Kampferol	5280863
3.	Piceatannol	667639
4.	Resveratrol	445154
5.	Quercetin	5280343
6.	Luteoline	5280445
7.	Alpha- asarone	636822
8.	Stigmasterol	5280794
9.	Lupeol	259846
10.	Friedelin	91472

2) Protein Preparation-

Three Dimensional crystallographic structure of Phospholipase A2⁵ (PDB ID- 1POE) & Estrogen receptor (PDB ID -1G50)⁶ were retrieved from Protein Data Bank and used as a protein target for our in silico studies which is shown in figure below. All bound water, hetero atom, unwanted side chains were removed from it using Discovery Studio Visualizer (Accelrys software Inc.,San Diego,CA). Further polar hydrogen and kollman charges were added in order to improve the docking scores. Here, protein molecule format get changed from .pdb to .pdbqt whereas q stands for addition of kollman charges and t stands for deletion of hereto atoms⁷

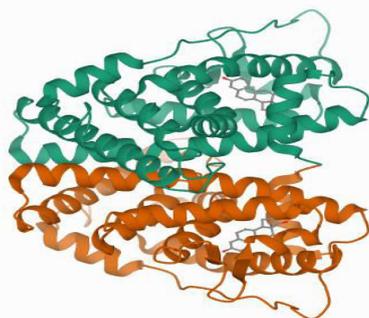


Figure 1: Estrogen receptor (PDB – 1G50)

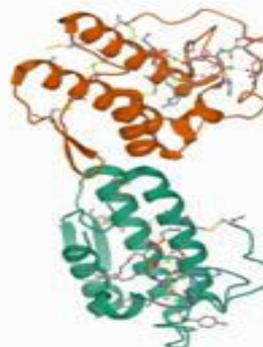


Figure 2: Phospholipase A2 (PDB – 1POE)

3) LIGAND PREPARATION

The structures of all selected ligand were retrieved from pubchem database. The format of each file was .SDF . Each ligand was viewed in Discovery Studio 2016 and saved into .pdb format for further treatment. For successful docking run both the components should be available in .pdb format before initiation of study. 2D structures of all the ligand molecules shown in figure below.⁸

Table 2: Ligand parameters.

Ligand	Formula	Molecular Weight	No.of Atoms
Quadrangularin A	C ₂₈ H ₂₂ O ₆	454.47068	56
Kampferol	C ₁₅ H ₁₀ O ₆	286.2363	31
Picetannol	C ₁₄ H ₁₂ O ₄	244.24268	30
Resveratrol	C ₁₄ H ₁₂ O ₃	228.24328	29
Quercetin	C ₁₅ H ₁₀ O ₇	302.2357	32
Luteoline	C ₁₅ H ₁₀ O ₆	286.2363	31
Alpha-asarone	C ₁₂ H ₁₆ O ₃	208.25364	31
Stigmasterol	C ₂₉ H ₄₈ O	412.69	78
Lupeol	C ₃₀ H ₅₀ O	426.7174	81
Friedelin	C ₃₀ H ₅₀ O	426.7174	81

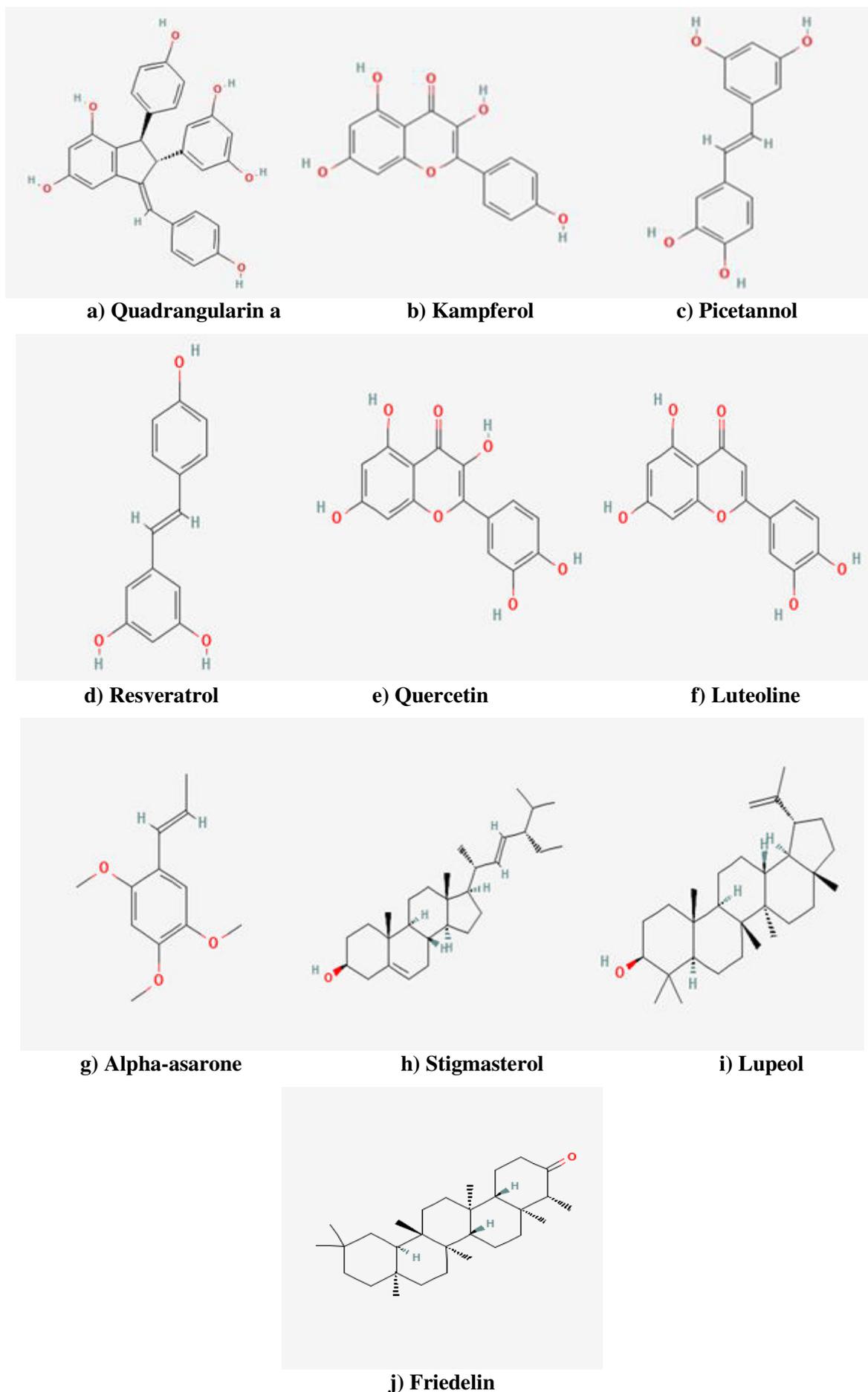


Figure 3- 2D structure of ligand molecule⁹

4) Docking Procedure-

Docking studies were performed using PyRx tool. It is a large body of established free source includes Autodock 4 & AutodockVina, Auto wizard in one. Especially this tool allows multiple ligand docking in very short span. Here, knowledge about Prompt command is not required whereas in AutodockVina it needs. It also includes open Bable which is helpful to import SDF files of ligand molecules which will convert it into .pdb format like our desired receptor molecule. In turn it also involves the facility of minimization of energy for all the selected ligand simultaneously. The grid map consist of 90 * 90*90 grid points with 30.8 Å⁰ for phospholipase A2 and 60 60 60 grid points with 30.5 Å⁰ for Estrogen receptor. The docking calculation performed under flexible ligand , while the protein is kept rigid . Other docking parameter setting were applied as a default.¹⁰

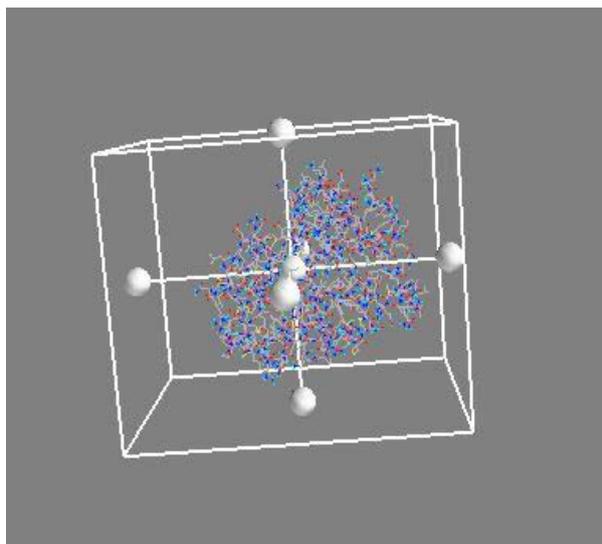


Figure 4: Grid of 1G50

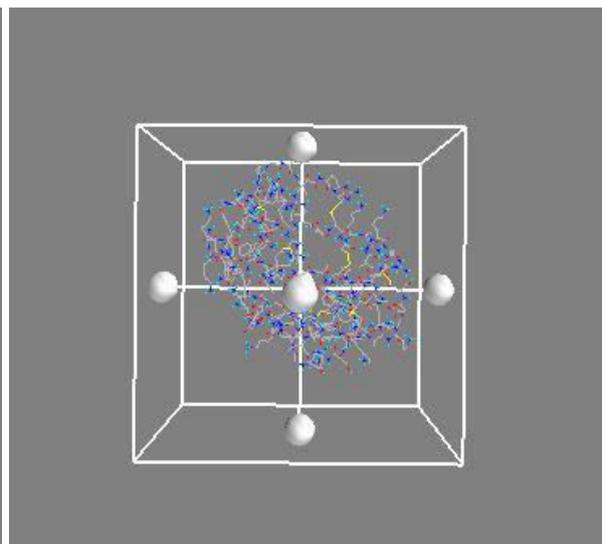


Figure 5: Grid of POE

5) Molecular Interaction

The protein – Ligand interaction were studied using Ligplot⁺software. It help us to generate schematic diagram of complex in 2- Dimensional view . With the help of this it is possible to analyse the Hydrophilic and Hydrophobic interaction between amino acid and ligand molecule.

To run the Ligplot⁺software java must be there in your device. Although, procedure to install ligplot is quite time consuming and tedious but result analysis is very quick. Finally whatever files are generated during analysis that are viewed by using PyMol software.¹¹

RESULTS & DISCUSSION

A) Binding Interaction with Estrogen Receptor -

The all selected ligand are subjected to docking studies. Studies are conducted using PyRx tool in built Autodock Tools. Upon successful autodockrun, result files are generated and which can be viewed using Excel sheet. In the present study, Friedelin and Lupeol showed the best docking pose with highest binding energy.

Table 3: Binding energy of compound with 1G50

Ligands	Binding Energy of Compound Kcal/mol with(1G50)								
	1	2	3	4	5	6	7	8	9
Quadrangularin A	-9.3	-9.1	-9.1	-8.6	-7.4	-7.3	-6.9	-6.9	-6.7
Kampferol	-8.0	-8.0	-7.9	-7.8	-7.8	-7.7	-7.6	-7.5	-7.5
Picetannol	-7.5	-7.5	-7.4	-7.3	-7.1	-7.1	-7.1	-7.0	-6.9
Resveratrol	-7.3	-7.3	-7.3	-7.2	-7.0	-6.9	-6.9	-6.8	-6.8
Quercetin	-8.2	-8.1	-8.1	-8.0	-7.7	-7.7	-7.7	-7.7	-7.5
Luteoline	-8.2	-8.1	-8.0	-8.0	-7.8	-7.7	-7.7	-7.6	-7.5
Alpha-asarone	-5.6	-5.5	-5.5	-5.5	-5.4	-5.4	-5.3	-5.3	-5.3
Stigmasterol	-10.3	-10.3	-10.2	-10.2	-9.9	-9.7	-9.7	-9.6	-9.3
Lupeol	-10.7	-10.5	-10.5	-10.4	-10.4	-9.8	-9.8	-9.7	-9.6
Friedelin	-11.6	-11.3	-11.3	-11.2	-11.0	-11.0	-10.7	-10.4	-10.3

Total nine modes for each ligands were generated, out of that, one best dock were selected for Friedelin and Lupeol. Further in depth molecular interaction were studied using Ligplot. Results of binding energy with Estrogen receptor were tabulated based on their different modes in table



Figure 6: Docking of Friedelin with 1G50

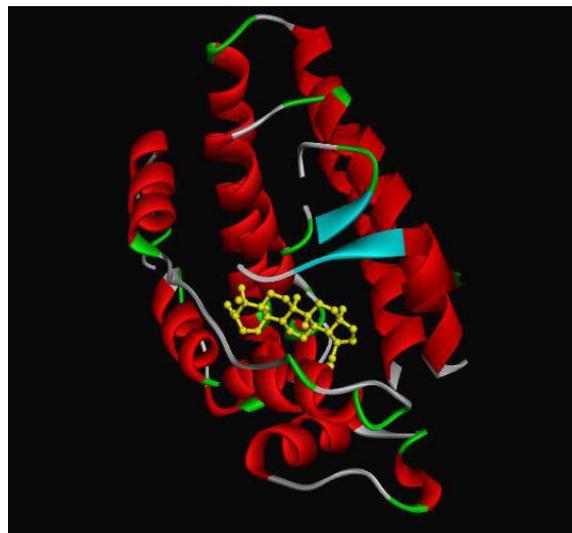


Figure 7: Docking of Lupeol with 1G50

The number of hydrogen bond and hydrophobic interaction between Friedelin and 1G50 residues were shown in table.

Table 4: Interaction between ligand and estrogen receptor

Ligand	Hydrogen Bond Interaction	Hydrophobic Interaction
Friedelin	No	Tyr526,Leu391,Leu346 ,Ala350 Thr347,Leu384,Gly521,Leu544 Val534
Lupeol	No	Thr347,Leu384,Gly521,Leu544 Leu391, Val 534 , Met522, Met528

Friedelin showed the most favorable docking pose in the catalytic site with predicted binding energy of -11.6 kcal/mol. Surprisingly, Friedelin as well as Lupeol do not forms any hydrogen bond interaction with Estrogen receptor. Therefore, modification in the structural moiety or the preparation of derivatives will be the better opportunity to extend this study further in upcoming days. The interaction between Lupeol and 1G50 resulted in binding energy of -10.7 kcal/mol. Contrary to this, compound makes very good hydrophobic interaction with nearby 9 different amino acids.



Friedelin and 1G50 complex

Figure 8: 2D plot of Friedelin interaction With estrogen receptor active site



Lupeol and 1G50 complex

Figure 9: 2D plot of Lupeol interaction with estrogen receptor active site

B) Binding interaction with Phospholipase A2 -

Docking results showed that interaction of QuadrangularinA, Kampferol and stigmasterol with phospholipase A2 has the highest binding energy.

Table 5: Binding energy of compound with 1POE

Ligands	Binding Energy of Compound Kcal/mol with (1POE)								
	1	2	3	4	5	6	7	8	9
Quadrangularin A	-9.7	-7.8	-7.6	-7.6	-7.5	-7.4	-7.4	-7.4	-7.3
Kampferol	-9.0	-8.2	-8.2	-7.8	-7.8	-7.8	-7.6	-7.5	-7.4
Picetannol	-8.1	-8.0	-7.8	-7.8	-7.1	-7.1	-7.1	-7.0	-6.9
Resveratrol	-8.1	-8.0	-7.7	-7.4	-7.1	-7.1	-6.9	-6.8	-6.7
Quercetin	-8.8	-8.2	-7.9	-7.8	-7.7	-7.6	-7.3	-7.3	-7.1
Luteoline	-8.8	-8.0	-8.0	-7.5	-7.5	-7.4	-7.2	-7.2	-7.1
Alpha-asarone	-6.3	-6.1	-5.8	-5.7	-5.3	-4.8	-4.7	-4.7	-4.6
Stigmasterol	-9.0	-8.6	-8.6	-7.9	-7.7	-7.5	-7.3	-7.3	-7.3
Lupeol	-8.0	-7.9	-7.8	-7.7	-7.6	-7.5	-7.5	-7.3	-6.9
Friedelin	-8.6	-8.3	-8.1	-8.0	-7.8	-7.8	-7.6	-7.3	-7.2

Although Kampferol and stigmasterol differs in structure a lot shows the same docking score of -9.0 kcal/mol . Apart from this Quadrangularin A was found to be showing -9.7 kcal/mol of binding energy having highest anti-inflammatory property even when it compared to steroid derivative i.e, Stigmasterol.

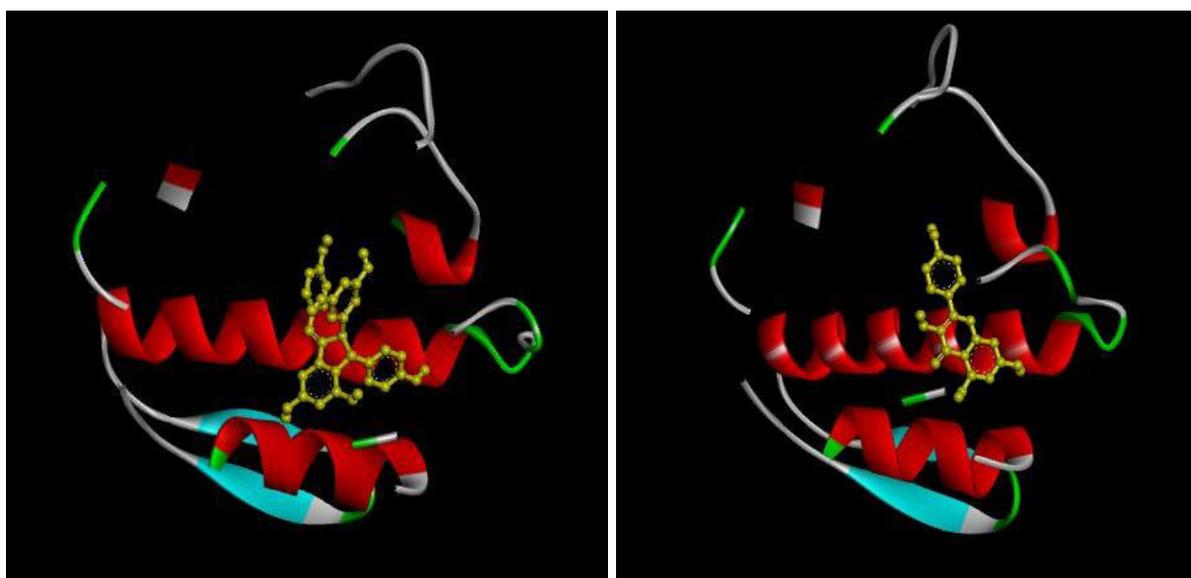


Figure 10: Docking of Quadrangularin A with 1POE **Figure 11:** Docking of Kampferol with 1POE

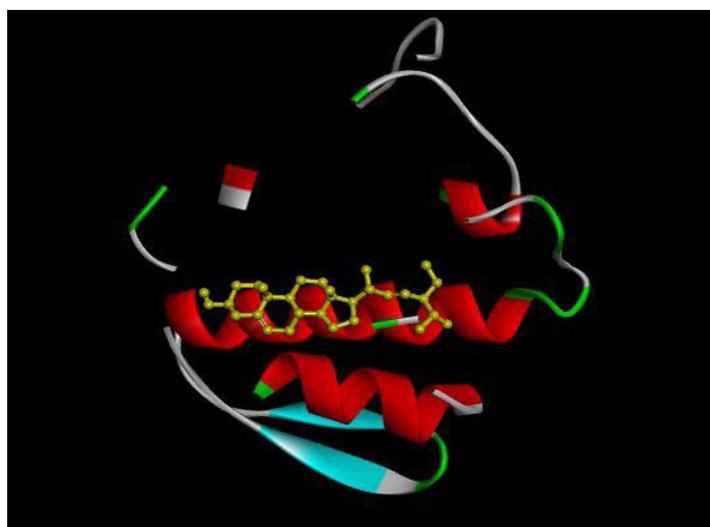


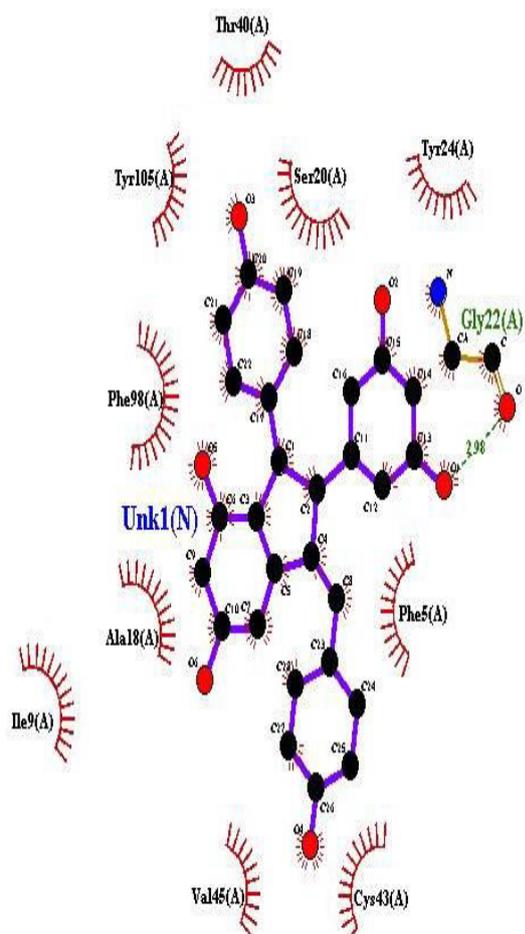
Figure 12: Docking of Stigmasterol with 1POE

Whereas, Alpha asarone possess least binding score of -6.3 kcal/mol. To extend this study further , molecular interaction were studied using Ligplot . Quadrangularin A formed only one hydrogen bond that to with Glycine22, Kampferol has 3 hydrogen bond with different amino acids and stigmasterol forms with phenylalanine . In addition to this, this compound also forms hydrophobic interaction which is mentioned in table

Table 6: Interaction between ligand and Phospholipase A2 receptor

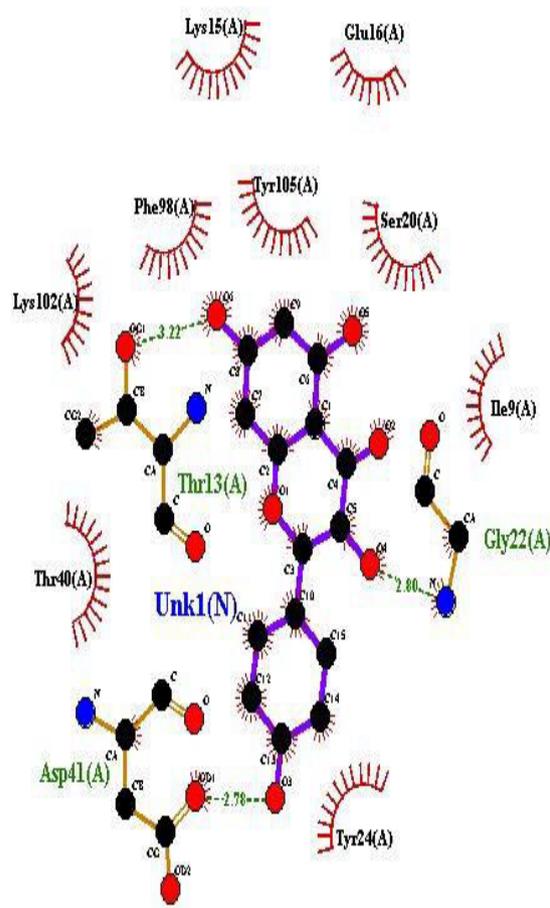
Ligand	Hydrogen Bond Interaction	Hydrophobic Interaction
Quadrangularin A	Gly 22	Tyr24, Ser20, Thr40 ,Tyr105 Phe98 ,Ala18, Val45 , Cys43, Phe5
Kampferol	Asp41 , Thr13 , Gly22	Lys15, Glu16, Phe98 , Tyr105 Ser20 , Lys102 ,Thr40, Tyr24 Ile9
Stigmasterol	Phe63	Thr40 , Ser20 , Thr13 , Tyr24, Gly22 , Phe5 ,Lys15, Glu16

Molecular Docking is a computer aided technique that elucidates how small molecule like Inhibitor, drug candidate, substrate and the target macromolecules like receptor or enzyme interact together. This technique is commonly used in developing new drug candidates and also for the understanding in binding interaction.



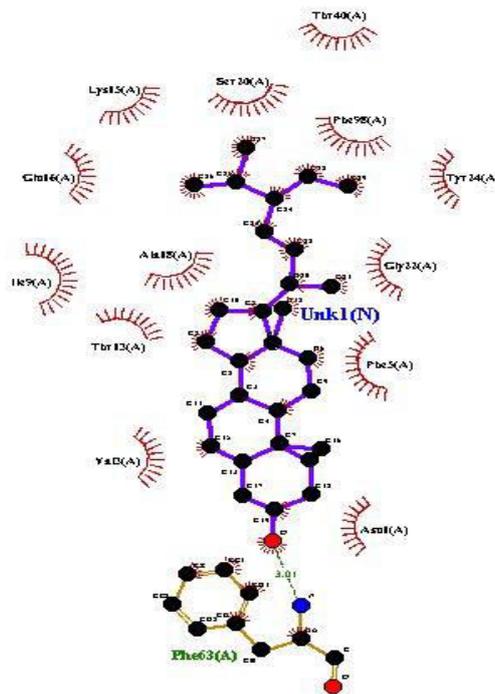
Quadrangularin A and IPOE complex

Figure 13: 2D plot of Quadrangularin A interaction with receptor Phospholipase A2 active site



Kampferol and IPOE complex

Figure 14: 2D plot of Kampferol interaction with receptor Phospholipase A2 active site



Stigmasterol and IPOE complex

Figure 15: 2D plot of stigmasterol Interaction with receptor Phospholipase A2 active site

CONCLUSION

The pharmacological activities of the medicinal plant, *Cissus quadrangularis* were found to be antioxidant, anti-inflammatory, antioxidant, free radical scavenging, antiulcer, and bone healing, analgesic and diuretic. In this study, we focused on the management of postmenopausal osteoporosis and anti-inflammatory properties of the plant. The plant compounds showed better binding features with the estrogen receptor as well as phospholipase A2 enzyme. Thus these compounds can be effectively used as drugs for treating inflammation and osteoporosis. The insights gained in this work can be further used in experimental studies to develop leads of drugs against these two receptors.

ACKNOWLEDGMENTS

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College Students Academic Stress: A Study of Medical and Engineering Students in Srinagar (J&K)

Basit Javeed Qureshi, Shafia Nazir, Sameena Mohi-Ud-Din and Humera Ashfaq
Department of Applied Sciences, University of Kashmir, Jammu and Kashmir- 190006, India

ABSTRACT

Academic stress is mental suffering due to predicted academic difficulties or failure or merely the knowledge of the potential of academic failure. Academic stress is amongst all students, but it is quite common among students in professional courses. This study aimed to investigate academic stress among medical and engineering college students in India. In addition, the difference between medical and engineering students concerning academic stress was also analysed. Descriptive and quantitative research design was applied in this study. A questionnaire was used to elicit answers from students as part of a survey strategy. 200 respondents were selected for the study. Descriptive analysis and T-test were performed to achieve goals. Findings revealed that academic stress varied among medical and engineering college students, more stress was found in male students in contrast to female students. This work has various theoretical and practical ramifications for many stake holders. Counselling may be provided to students to help them deal with their academic stress.

Keywords: academic Stress; engineering Students, medical Students, students

INTRODUCTION

Academic stress is described as the body's reaction to academic pressures that surpass pupils' adaptive capacities. It is estimated that 10–30% of students suffer academic stress at some point throughout their academic careers. Indeed, academic stress significantly affects students enrolling in institutions with rigorous academic requirements (Alsulami et al., 2018). Professional education life has often been identified as a demanding stage of one's life (Bhandari, 2012), characterised by mental and emotional strain (Lin & Huang, 2013). Professional students often face a number of academic, social, and personal obstacles during their time there (Lin & Huang, 2013). Among the primary types of stress cited by college students, those associated with academic evaluation stand out (Ekpenyong, Nyebuk, & Aribo, 2013).

Oral presentations, academic overload, lack of time to satisfy responsibilities, and tests are the most often cited sources of stress in the academic setting. Indeed, stress may be exacerbated when students leave their parents and attend college for the first time, since psychological symptoms, including stress, have been seen to be prevalent among first-year college students. The preparatory years' highly competitive school atmosphere is another stress-inducing component. In research revealing the dark side of the competition, the authors argue that excessively competitive conduct or the belief that one has become too inferior may raise a person's susceptibility to depression, anxiety, and stress. Feld (2011) studied the stress impact on high-pressure college preparation school students and found that stress's detrimental physical and psychological consequences and associated unhealthy behaviours, such as widespread and chronic sleep deprivation, are prevalent.

Engineering and medicine are two of the most respected professions in India. However, the path of the student is not smooth, as they experience several emotional obstacles and problems as they reach graduation. Theoretically, frequent semester examinations increase the prevalence of stress among engineering students; however, medical students experience greater stress due to their extensive curriculum, time constraints, perfectionist standards, limited relaxation and recreation time, and increased academic pressure. Increased stress levels raise the incidence of psychiatric disorders such as depression, anxiety, substance abuse, and suicidal ideation (Behera et al., 2021).

Consequently, it is essential to investigate academic stress among engineering and medical students. Therefore, this research focused on engineering and medical students in the Kashmir region of India.

LITERATURE REVIEW

Academic Stress

Academic stress, such as course activities, course load, exams, teaching and learning troubles, placement issues, and heavy workload, is a significant contributor to psychological suffering among medical and engineering students. Academic stress relates to psychological suffering and burnout, which may have personal and professional repercussions, such as an increase in the risk of medical errors, malpractice claims, and the possibility of physician suicide. In his theoretical study on academic stress, Putwain (2007) stated that there was

a great deal more to learn about stress in the educational setting, especially its potential involvement in negative health, educational, and psychological consequences. Since then, the majority of research on this issue has concentrated on university students studying health sciences, i.e. those in care professions.

Medical and Engineering Students

An increasing amount of research indicates that medical and engineering poses a mental health risk to students. The mental health of medical and engineering students worsens throughout their graduate education, while the incidence of depression, anxiety, and burnout rises, according to longitudinal studies conducted in several countries. Numerous researches have investigated possible pathogenetic variables affecting the mental health of students. Workload, competitiveness, sleep deprivation, lack of social support, and the suffering and death of patients all contribute to the stress and poor mental health of medical and engineering students (Kotter et al., 2014). The pursuit of higher education is considered to be demanding, particularly in the area of medical and engineering streams. Many studies have indicated that stress levels of medical students are actually high (Miller, 1994; Saipanish, 2003; Ray & Joseph, 2010). Also, as contrasted to the general public, medical students encounter increased anguish, anxiety and despair. A research done at Cornell's College of Engineering indicated that 62 percent of engineering students were highly concerned about their results. Academic grounds include enormous syllabus, the complexity of the subject, lengthy studying hours, and emotional issues including lack of peer support, competitive climate, strict authoritarian and non-encouraging faculty, lack of leisure activities, remaining away from home, financial concerns, uncertain future, cultural and minority challenges, mismatch between competence and expectation, are some drivers of stress among medical and engineering pupils (Wolf, 1994; Supe, 1998; Foster & Spencer, 2003; Schneider, 2007).

OBJECTIVES

- To study the academic stress among medical and engineering students.
- To compare male and female medical and engineering students on academic stress.

METHODOLOGY

In order to achieve the objectives of the study following methodology has been adopted.

RESEARCH DESIGN

In this study, the quantitative and descriptive research design was used. Sample included male and female medical and engineering students selected from four colleges of Srinagar city. Following four colleges were included for sample collection:

- Government Medical College (GMC) Srinagar.
- Sheri Kashmir Institute of Medical Sciences (JVC) Bemina, Srinagar.
- National Institute of Technology (NIT) Hazratbal, Srinagar.
- Institute of Technology (IOT) University of Kashmir, Srinagar.

200 students were selected from these colleges. Descriptive and T-test analyses were performed to achieve the aims of the research.

Measures

"Academic stress scale" by Jain and Dikshit (2016) was used for the study.

Respondents' Profile

Table 1

Responses		
Age group (in years)	f	%
17-20	87	43.5
21-24	113	56.5
Total	200	100.0
Stream		
Medical	95	47.5
Engineering	105	52.5
Total	200	100.0
Gender		
Male	110	55.0
Female	90	45.0
Total	200	100.0

The table shows the respondent profile by age, educational stream and gender. It shows that 87 (43.5%) respondents are 17-20 years of age, 112 (56.5%) are 21 -24 years. It also reflects that 95 (47.5%) are from medical stream, 105 (52.5%) are from engineering stream, 110 (55.0%) are male and 90 (45.0%) are female.

Table 2: Group Statistics (Stream)

STREAM	N	Mean	Std. Deviation	Std. Error Mean
Medical	95	2.9377	1.03097	.10578
Engineering	105	2.5008	1.00383	.09796

Table 3: Independent Samples Test (Stream)

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
	Equal variances assumed	.104	.047	.256	198	.04	.03693	.14398	-.24700	.32085
	Equal variances not assumed			.256	194.845	.03	.03693	.14417	-.24741	.32126

The results of the "Independent Sample t-Test" make it possible to examine the link between the mean variation of demographic characteristics (educational stream) and dependent variable (academic stress). If p is less than 0.05, the relationship between the means is statistically significant.

The results of the Independent Sample t-Test for the educational stream and dependent variable are shown in the table below. The "Levene's test of equality of variance" reveals that the significance level is less than 0.05, showing that variances do differ significantly. Consequently, the academic stress of respondents varies significantly.

For academic stress, averages for medical students (2.9) are higher than those for engineering students (2.5). This implies that medical students have more stress than engineering students.

Table 4: Group Statistics (Gender)

Gender	N	Mean	Std. Deviation	Std. Error Mean
Male	110	2.9167	1.00956	.09626
Female	90	2.5204	1.02598	.10815

Table 5 Independent Samples Test (Gender)

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
	Equal variances assumed	.019	.01	-.026	198	.01	-.00370	.14455	-.28875	.28134
	Equal variances not assumed			-.026	189.012	.02	-.00370	.14478	-.28930	.28189

The results of the "Independent Sample t-Test" make it possible to examine the link between the mean variation of demographic characteristics (gender) and dependent variable (academic stress). If p is less than 0.05, the relationship between the means is statistically significant.

The results of the Independent Sample t-Test for gender and dependent variable are shown in the tables below. The "Levene's test of equality of variance" reveals that the significance level is less than 0.05, showing that variances do differ significantly. Consequently, the academic stress of respondents varies significantly.

For academic stress, averages for males (2.9) are higher than those for females (2.5). This implies that medical students have more stress than engineering students.

DISCUSSION

The findings revealed a significant difference between engineering and medical students on academic stress. More academic stress was found in medical students in comparison to engineering students. Moreover, the comparison of male and female students on academic stress revealed a significant difference among the two groups, more stress was found in male students in contrast to female students.

Students' mental health, particularly in terms of academic stress and its effects, has become a major concern for academics and policymakers as the number of student suicides increases worldwide (Misra & McKean, 2000). The current survey found that the majority of medical and engineering pupils face academic stress. The majority of parents judge their children's performance by comparing it to that of the top student in the class. As a consequence, students acquire a feeling of competitiveness. Some parents even prefer to diminish the student's accomplishment with the highest grade by asserting that the instructor may have favoured him or her. Due to their concern for their children's wellbeing and knowledge of the competition for admittance into prestigious institutions, parents exert pressure on their children to achieve (Almeida & Kessler, 1998). The widespread unemployment in India has also prompted parents to exert pressure on their children to achieve better. Some parents want to realise their unrealised ambitions via their children. Many parents hire three to four or more private instructors for their children (Alsulami et al., 2018). On days without academic instruction, art or music classes are offered. Students have little time watching television, playing, communicating with their neighbours, or even getting enough sleep. Naturally, such pupils become anxious wrecks as the test pressure increases (Alsulami et al., 2018).

IMPLICATIONS

This area of research has several theoretical and practical ramifications for a variety of parties. Theoretically, it has validated a novel framework including academic dimensions in the Indian setting, which might guide future researchers to investigate new causes of academic stress in colleges.

Authorities must consider the ramifications of such occurrences and carefully prepare in order to be controllable during this difficult period. Administrators must be capable of balancing and regulating the situation so as to avoid or prevent the physical and psychological issues that emerge from these situations. Teachers working in higher education institutions should be equipped with the proper orientation to control their own stress to assist students concerning their academic stress.

The findings of the research highlighted the significance of understanding academic stress among medical and engineering students. Periodic training sessions for students should be developed to increase their knowledge of academic stress and good coping strategies. Teachers may use interventions to aid kids in coping with stress. Teachers may divide challenging assignments into manageable parts that may be finished without stress. Meditation and yoga may be taught to students in order to help them deal with stress and preserve mental wellness. Counsellors and psychologists may facilitate sessions at colleges to assist medical and engineering students with their psychological concerns. These sessions may also be done in collaboration with faculty members in order to get a deeper understanding of the issues experienced by students. The faculty may also assist these experts in designing successful assessments for academic programmes, which may alleviate anxiety or tension. It is crucial to include student feedback while establishing academic programmes. This would contribute to the improvement of the psychological health of pupils. Periodically, various stress-relieving activities, such as outdoor excursions and extracurricular activities, might be organised for pupils.

FUTURE WORK

This study was conducted across the Indian subcontinent, enabling scholars to examine other sites in future studies. Future researchers may enhance the sample size to boost the generalizability of the study. This paradigm may also be investigated from a socio-cultural and ethnic standpoint. This research methodology might be broadened to include a range of mediators and moderators in the future. In the future, demographic groups other than students may be examined.

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Allergic Rhinitis (AR) and Sleep Disturbance (SD) in Young Adults

Humera Ashfaq, Dr Shafia Nazir, Basit Javeed Qureshi and Sameena Mohi Ud Din

Department of Human Development, University of Kashmir, India

ABSTRACT

A young person, bridging adolescence and adulthood, is a critical period of development. A person is considered young when he/she form a family, takes responsibility, starts a business, and gets a job. It is called the healthiest period of life. Despite all the positives, young people tend to neglect their health that in the long-run impact their life. One among them includes Allergic Rhinitis (AR), one of the commonest atopic diseases that contribute to considerable morbidity commonly known as hay fever is caused due to pollen allergies, dust mites, animal dander, smoke, and perfumes. Although it is not a life-threatening disease, albeit, its prevalence is high and is often undiagnosed ample of people suffer from allergic rhinitis and is characterized by rhinorrhea, sneezing, nasal itching, and nasal obstruction. Nasal congestion is a well-known symptom in AR, is related to sleep-disordered breathing or sleep apnea. Sleep apnea is a condition in which a person has repeated episodes of awakening due to oxygen cessation for seconds. Sleep is considered an important factor for overall functioning. Various studies related to allergic rhinitis and sleep were reviewed to know the impact of AR. This paper analyzes the effect of allergic rhinitis on sleep. Furthermore, it examines the co-relationship between rhinitis and sleep. The researchers concluded that allergic rhinitis had a significant effect on the quality of life, it decreases work productivity and increases the economic burden, and have a reflective effect on mental health, learning ability, quality of sleep of young people.

Keywords: Allergic Rhinitis, Obstructive Sleep apnea (OSA), Young adults

INTRODUCTION

Young adulthood is a period of optimal growth and development, as they complete the process of physical maturation, move into adults roles, develop relationships and form a family. Young adults are at their optimal health, and the stage is considered the healthiest time of life span. Physical performance is at its peak, women also reach their peak fertility. As they develop their roles they get busy in day to day life and most of the diseases get easily neglected which will affect them in later years of life [1] one among them includes Allergic Rhinitis -clinically defined as an inflammation of the nose induced by IgE mediated response due to exposure of foreign substances, referred to as allergens. It is estimated that about 40% of the world's population suffers from this disease. In Asia Pacific region it is about 10% - 30% [3,4,8]. An allergen is a usually harmless substance capable of triggering a response that starts in the immune system and results in an allergic reaction. An antigen that is capable of stimulating a type1 hypersensitivity reaction in atopic individuals through IgE responses. Allergens contribute to the development of Asthma and habitual snoring in later years. Studies have shown that up to 80% of asthmatics have rhinitis and that 10%-40% of rhinitis patients have asthma [2,5,6,8]. It is classified as seasonal allergic rhinitis (SAR) and perennial allergic rhinitis (PAR). SAR is most common and is diagnosed as pollen allergies while PAR occurs in the surroundings and induces symptoms all year round, it includes house dust mites, molds [5,6,7]. WHO (world health organization) in collaboration with ARIA (Allergic rhinitis and its impact on asthma) 2001 has classified allergic rhinitis based on duration and severity of symptoms as Intermittent or mild and persistent or moderate to severe. Patients with Intermittent AR have symptoms that occur for four or fewer days per week or not more than four consecutive weeks while Persistent AR lasts for more than 4 days per week and more than five consecutive weeks [2,5,7]. IgE mediated substances in contact with the allergens cause sensitized mast cells release of newly synthesized mediator, including Histamine, Proteases, Cysteinyl Leukotrienes (CysLTs), Prostaglandins and Cytokines they are responsible for the early phase symptoms of Allergic rhinitis like sneezing, pruritus, rhinorrhea, and sore throat. Whereas in the late phase these mediators infiltrate the nasal mucosa such as Basophils, Eosinophils, Neutrophils, Mast cells, and Monoclear cells which are responsible for nasal congestion [2,9]. Allergic rhinitis can be diagnosed by taking a blood sample, (RAST) Radio Allergo Sorbent Test. It needs equipment and is usually considered to be unsafe because of using radioactive isotope, another test (MAST) Multiple allergens simultaneous tests are considered to be safe as compared to RAST because it uses photo reagent, while as Skin prick test(SPT) is widely used and approved. Allergy avoidance and Pharmacological treatment are proven to be effective, Oral Antihistamine is given to the patients which help to reduce sneezing and sore throat. Intra Nasal corticosteroids are improved and can be used for nasal obstruction as well. Modern immunotherapy is given to the patients which include Allergy shots or injections and SILT (Sublingual Immunotherapy) in the form of tablets to ease the symptoms [2,8,9,10]. Late phase mediators like Histamine, CysLTs, IL 1 β , and IL-4 increase the severity of

nasal congestion which blocks the airways of the nose and the person feels difficult to breathe during sleeping [11,12,18]. Sleep is essential for both mental and physical well-being and has a direct impact on patients' sleep quality, work productivity, increased daytime sleep and affected cognition [13,16]. Poorly controlled symptoms of allergic rhinitis increase the risk of sleep impairment and development of Asthma and OSA (Obstructive sleep apnea) [14,15]. Nasal obstruction increases the negative pressure in the lower airways that leads to the partial or intermittent collapse of the Pharynx and increases the risk of OSA [17,19]. The International Classification of Sleep Disorders (ICSD-3) characterized Obstructive sleep apnea as repeated episodes of complete or partial obstructions of the upper airway of the nose which affects respiration during sleep. OSA is prevalent in perennial allergic rhinitis as compared to seasonal allergic rhinitis [16,20].

REVIEW OF LITERATURE

Liu et.al (2020) conducted a study on the association between allergic rhinitis and sleep: A systematic review and meta-analysis of observational studies with a 95% confidence level on 27 articles to see the associations of allergic rhinitis with sleep duration and sleep impairment and the study found that AR significantly impacts sleep quality and is also related to insomnia, obstructive sleep apnea and snoring.

Munoz-Cano et.al (2018) studied the severity of AR impacts on sleep and anxiety: results from a large Spanish cohort on a sample of 670 adults of age group above 18 years were grouped in Perennial and Seasonal rhinitis. Anxiety depression, sleep quality, and HRQOL were evaluated by using HADS (Hospital anxiety and depression scale), MOS (Medical outcome sleep scale), and HRQOL(Health-related quality of life) Esprint 15. Statistical analysis was done on students' t-test, ANOVA, multiple linear regression model, Tuckey test, and logistic regression with p-value <0.05. The findings of the study conclude that AR is responsible for Anxiety and Depression among patients, perennial rhinitis worsens the quality of sleep and quality of life as well in subjects.

Gadi et.al (2017) examined the prevalence of allergic rhinitis and atopic markers in obstructive sleep apnea. The cross-sectional study on 177 patients with sleep-related complaints in which subjects were interviewed and data was analyzed with t-test, chi-square, and Fisher exact test with $p < 0.05$, results of the study showed a positive correlation between the allergic rhinitis and atopic markers in obstructive sleep apnea.

Wongvilairat et. al(2016) conducted a study on the prevalence of high risk of Obstructive sleep apnea in patients with Allergic rhinitis Cross-sectional studies were used to examine the subjects of age group 18 and above with a sample size of 120 (45 male and 75 females). Clinical examination (skin prick test), sleep scale questionnaire (Stop Bang Questionnaire), and visual analog scale was used as tools in the study. Data were analyzed by independent t-test, Mann-Whitney test, and chi-square. The finding of the study concludes that subjects with allergic rhinitis are at higher risk of getting OSA (Obstructive Sleep Apnea) as compared to non-allergic ones.

Teodorescu et.al (2015) studied the association between asthma and the risk of developing obstructive sleep apnea. Population prospective epidemiology study (The Wisconsin sleep cohort) on the sample of 1,521 adult employees of age group 30-60. Questionnaire is used as a tool in the study, parametric statistical analysis with p-value <0.05. The findings of the study reveal Asthma among adults was significantly associated with OSA.

Miller et.al (2007) conducted a study on Allergic rhinitis affects sleep quality in adults Cross-sectional studies were done on the age group of 18-50 years. 591 subjects having AR and 502 healthy subjects were taken for the study and the study reveals that there is a close relationship between allergic rhinitis and sleep quality, patients with allergic rhinitis have more common sleep disorders as compared to normal people.

Leger et.al (2006) conducted a study on Allergic rhinitis and its consequences on quality of sleep Controlled cross-sectional epidemiological study was carried out with a sample of 591 patients of age group 18-50 years suffering from allergic rhinitis at least for 1 year, questionnaire and scale were used to collect data and the data were analyzed by chi-square test and Kruskal-Wallis test. The study reveals that there is a close relationship between allergic rhinitis and sleep disturbance.

Duran et. al(2001) studied obstructive sleep apnea-hypopnea and clinical features in a population-based sample of subjects aged 30-70 years: Cross-sectional study on 2,148 patients aged 30-70 years both male and female were examined. Analysis of the study was done on t-test, chi-square test, and logistic multiple regression. The finding of the study reveals that OSAH (obstructive sleep apnea-Hypopnea) prevalence is high with increased age. Habitual snoring, breathing pauses were also associated with OSAH. According to the researcher, there is a linkage between hypertension and OSAH.

CONCLUSION

Allergic Rhinitis is not a life-threatening disease but its prevalence among young adults is increasing. It causes an inflammatory disorder of the nose that affects the nasal airways with symptoms of nasal itching, watery eyes, and rhinorrhea. In past, it was regarded as a trivial disease little or no attention was paid to the symptoms but it had a direct effect on daily activities, work productivity, quality of sleep, and overall quality of life. Patients having rhinitis had a hard time falling asleep, have repeated episodes of awakening, daytime sleepiness, and habitual snoring. Subjects having allergic rhinitis have higher chances of getting asthma in later life. There is a close link between OSA (Obstructive Sleep Apnea) and Allergic Rhinitis. Allergy avoidance is recommended in treating mainstay allergies, in mild to moderate allergies antihistamines and intranasal corticosteroids are used while in severe cases immunotherapy is given, although it is time-consuming and in some cases may increase economic burden but is worthwhile/valuable to combat with allergy.

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Preparation and Evaluation of Polyherbal Anti-Dandruff Hair Oil

Ambad Shruti S, Nagoba S. N*, Varsharani Jadhav and Ashwini Dhengle

Department of Pharmaceutics, Channabasweshwar Pharmacy College (Degree), Latue, Maharashtra, India

ABSTRACT

Dandruff is a common disorder affecting the scalp and can be an embarrassing condition. Now Currently available treatment options have certain limitations, either due to poor efficacies or due to compliance issues. *Malassezia furfur* is main dandruff pathogen it is lipophilic dimorphic yeast, which is the normal fungal flora of the human skin. Polyherbal hair oils have always attracted considerable attention, when compared to synthetic drugs. The aim of this study to develop a anti-dandruff poly-herbal hair oil that could be used to treat hair issues such as dry or flaky scalp and thinning hair, as well as stimulating hair growth, prevent dandruff, and increase volume to the shaft. The formulated Polyherbal hair oil contains a preparation and assessment of polyherbal anti-dandruff formulation i.e. variety of herbal plants the containing the goodness of Neem, Bhrami, Coconut oil, Hibiscus, Castor oil that have traditionally been used to promote hair growth and remove dandruff. The method used for carrying out the formulation by using direct boiling method at a temperature of 60-80°C for 15-20 minutes until light brown coloured solution is obtained. The formulated Poly herbal hair oil was subjected to evaluate the anti-dandruff activity against *M. furfur* by agar well diffusion assay. The hair oil formulation was considered to be the best formulation for dandruff problem especially against the causal organism *M. furfur*.

Keywords: Dandruff, Polyherbal, *Malassezia furfur*, Evaluation, Antifungal.

INTRODUCTION

Now a days there is a wide use of herbal cosmetics due to the belief that they have fewer side effects and better safety. Dandruff is becoming the major and very common problem of hair. Hair is one of the most important of our body that improves the overall appearance of a person. The hair fall, Dandruffs, split ends, grey hair are the major problem associated with persons hair. Hair, also with sebaceous glands, sweat glands, and nails, is among the most essential parts of the body, acting as protective appendages and integument accessory structures. Each hair develops in three stages: Anagen (growth), Catagen (involution), and Telogen (regeneration) (rest). The Anagen process will last from between 2 - 6 years. The growth activity of the hair increases during the catagen process, and the hair transitions to the next phase. The catagen phase lasts about 2-3 weeks. The telogen process occurs when the hairs enter a resting state. Dandruff is a non-inflammatory and chronic condition which is characterised in the most common dermatological skin problem, related to the scalp that is eminent by an excessive range of scalp tissue being affects. The main symptom of dandruff is formation of scale on the scalp and it is frequently associated with seborrhoea. Seborrhea is the precursor of seborrheic dermatitis. Dandruff is caused by the yeast *Pityrosporum ovale*, which feeds on the lipids and proteins found in skin. This initiates the enzymatic activity and releases proinflammatory free fatty acids causing tissue destruction and inflammation on skin. The fungal infection is further developed due to contribution of toxic chemicals released by the yeast and the hypersensitivity caused by the lipase activity. Dandruff characterizes excessive scaling of the scalp, patches of loosely adherent flakes; it is a universal scalp disorder usually accompanied by itching. ***Malassezia furfur*** is main dandruff pathogen it is lipophilic dimorphic yeast, which is the normal fungal flora of the human skin. The etiology of dandruff appears to be dependent upon three factors that are sebaceous gland secretions, microfloral metabolism, and Individual susceptibility. *Malassezia furfur* the Lipophilic yeast is widely accepted to play a keen role in dandruff. The level of *Malassezia* increases by 1.5 to 2 times at the time of dandruff.

To overcome these problems, As a hair tonic, hair oil containing herbal medicines is used. Hair tonics and hair grooming aids are the two major categories of hair care products. Polyherbal hair oil is recommended and is used to treat a variety of hair problems. They stimulate hair growth, enhance hair charm, and prevent hair loss. Hair oil promotes hair growth while also moisturising the scalp, resulting in healthy hair. The underlying research deals with the preparation and assessment of polyherbal anti-dandruff formulation containing the goodness of Bhrami, Neem, Coconut oil, Hibiscus, Castor oil.

There are various methods available for the preparation of hair oils direct boiling method, paste method and cloth method. After preparation second main step is evaluation of preparation hair oil. The next final step is determination of its therapeutic efficacy.

MATERIAL AND METHODS

Collection of Plant Parts Various plant materials were collected for the preparation of polyherbal hair oil. viz., Neem, brahmi, hibiscus from the Sunpure extract Pvt. Ltd. Delhi. Castor oil and Coconut Oil from the Local Market, Latur, Maharashtra, India and was properly authenticated

PLANT PROFILE

Table 1: Role of Herbs in Polyherbal Hair oil

Sr. No	Name of Drug	Biological Name	Uses
1	Neem	(Azadirachta Indica)	Promote Healthy Hair Growth. Reduce Dandruff. Treat fungus Growth.
2	Brahmi	(Bacopa Monnieri)	Hair Growth
3	Hibiscus	(Hibiscus Rosa-Sinensis)	Antidandruff
4	Castor Oil	Ricinus Communis	Moisturizer.
5	Coconut Oil	(Cocos Nucifera L.)	Moisturizer, Vehicle.

Table 2: Ingredients Used in Formulation of Poly-herbal Hair Oil.

Sr. No	Name of Drug	Quantity (%)
1	Neem	2%
2	Brahmi	2%
3	Hibiscus	2%
4	Castor oil	2%
5	Coconut Oil	25%

FORMULATION OF POLYHERBAL HAIR OIL

The formulation of poly-herbal hair oil was prepared by the following mentioned processes.

i) Cloth method

ii) Paste method

iii) Direct boiling method

i) **Cloth Method:** The dried drug was weighed and tied in a muslin cloth. This cloth was then hanged in coconut oil base, with continuous boiling, stirring and finally the oil was filtered.

ii) **Paste Method:** Paste method was used where fresh fruit or pulp or the desired part of the plants were converted into paste with very little amount of water and kept overnight After this the wetted drug was mixed in coconut oil base and boiled with continuous stirring at a constant temperature, until the water droplets in oil stop knocking and the drug has completely extracted in the oil. The Oil was then filtered through a muslin cloth.

iii) **Direct Boiling Method:** The crude drugs were powdered, weighed and directly boiled in coconut oil with continuous stirring and heating until the drug had completely extracted in the oil base.

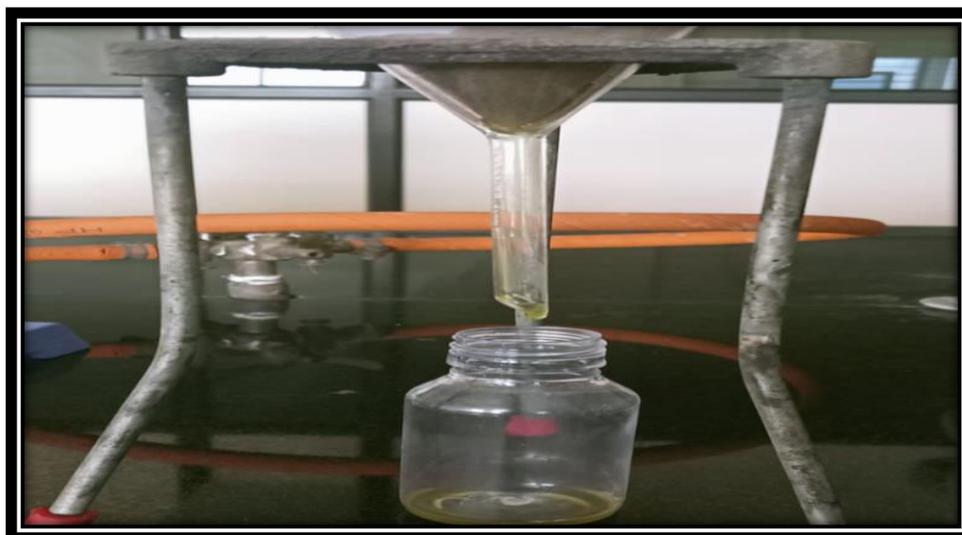


Figure 1: Formulation of Polyherbal Hair Oil

EVALUATION OF POLYHARBLE HAIR OIL

Physical and biological evaluations of the formulated polyharbal herbal oil were performed.

1] Organoleptic Property

Color, physical state and odour were manually determined for various organoleptic properties.

2] pH

A pH metre was used to examine the pH of poly-herbal hair oil.

3] Viscosity

It is a calculation of a liquid's resistance to flow; the higher the viscosity, the greater the resistance to flow. Ostwald's viscometer was used to evaluate the viscosity.

4] Refractive Index

Using a refractometer, it was determined.

5] Specific Gravity

Initially empty specific gravity bottle was weighed. Then the same specific gravity bottle was filled with water and again weighed. Later specific gravity bottle was replaced with hair tonic and weighed again. Weights are noted and thus specific gravity of hair tonic was calculated. Weight of empty specific gravity bottle = w1gms.

Weight of specific gravity bottle with water = w2gms.

Weight of specific gravity bottle with hair tonic = w3gms.

Specific gravity bottle of water = 0.9961 g/cm³.

Specific gravity of hair tonic was calculated as $\rho = \frac{w3-w1}{w2-w1} \times \rho_{water}$

6] Acid Value

Preparation of 0.1 molar solution Weighing 0.56 g KOH pellets and dissolved it in 100 mL distilled water while being constantly stirred The prepared 0.1 molar KOH solution was poured into the burette. Preparation of sample 10 ml of oil were taken and dissolved in 50 ml of a 1:1 ethanol/ether mixture that was vigorously shaken. Then 1 mL phenolphthalein solution was added, and it was titrated with a 0.1 molar KOH solution.

Acid value was calculated from the following equation.

Acid value = $5.61 \times \frac{n}{w}$

7] Saponification Value

In a 250 ml conical flask, 1 mL of oil was correctly measured, and 10 mL of ethanol: ether mixture (2:1) was added. 25 mL of 0.5 N alcoholic KOH was mixed to this flask. The flask was held for 30 minutes and then cooled. Using phenolphthalein indicator, 0.5 N HCl was used to titrate the cooled solution. The amount of KOH in mg consumed was calculated as below.

Saponification Value = $28.05 \times \frac{(X-Z)}{W}$

8) Evaluation of Antifungal Activity:

Stock solution for antifungal activity: For antifungal study each compound was dissolved in DMSO at a concentration of 5mg/ml and 10mg/ml stored in a refrigerator till further used.

Antifungal activities of the formulation were evaluated by means of agar well diffusion assay. The assay was carried out according to the method of Sabouraud dextrose agar was used for the growth of fungus. Media with acidic pH (pH 5.5 to 5.6) containing relatively high concentration of glucose (40%) is prepared by mixing (SDA) Sabouraud dextrose and distilled water and autoclaved at 121°C for 15 minutes. Twenty five ml of molten (45°C) SDA medium was aseptically transferred into each 100mm×15mm sterile Petri dish. For counting of spore (fungi) were suspended in normal saline to make volume up to 1ml and then counted with help of haemocytometer (neubar chamber). Once the agar was hardened, 6mm wells were bored using a sterile cork borer. Then concentration of 100µl and 200µl was placed in each the well and the plates were incubated for 72 hour at 29°C. Two wells in each petri dish were supplemented with water and reference antifungal drug marketed hair oil (1mg/ml) dissolved in water serve as negative and positive control respectively. The antifungal activity was measured as the diameter (mm) of clear zone of growth inhibition

RESULTS

Poly-herbal hair oil is one of the most well recognized hair treatments. Herbal hair oil not remove dandruff but also reverses dry scalp and increases hair growth. It provides numerous essential nutrients required to maintain normal function of sebaceous glands and promotes natural hair growth. The poly-herbal hair oil was prepared from various herbs (Table 1) and their importance in the formulation is presented in (Table 2) The various parameters like viscosity, pH, irritation test, saponification value and acid value of herbal hair oil was evaluated (Table 3).

Table 3: Evaluation of Polyherbal Hair Oil

Sr. No.	Parameter	Inference
1	pH	7.2
2	Viscosity	0.93
3	Refractive Index	1.412
4	Specific Gravity	0.937
5	Acid Value	1.557
6	Saponification Value	193

7. Anti-Fungal Evaluation (Antidandruff Activity):

The formulated Poly herbal hair oil was subjected to evaluate the anti-dandruff activity against *M. furfur* by agar well diffusion assay are given in Table 4 and Figure 2 Antifungal activities of the prepared Formulation were evaluated by means of agar well diffusion assay. The assay was carried out according to the method of Sabouraud dextrose agar (Hi media) was used for the growth of fungus. The Polyherbal hair oil formulation contains the extracts of herbal plants in Neem-2%, Brahmi2%, Hibiscus-2%, Catosr oil-2ml and 25 ml of coconut oil. However the hair oil formulation was considered to be the best formulation for dandruff problem especially against the causal organism *M. furfur*.

Table 4: Antifungal Activity of Sample A against *Malassezia Furfura*

Sr. No.	SAMPLES	CONC. (mg/ml)	ZONE IN DIAMETER (mm) against <i>M. Furfur</i>
1	Control	-	00
2	Standard (Marketed Hair Oil)	1	15
3	Polyherbal Hair Oil	100 μ l	02
4	Polyherbal Hair Oil	200 μ l	04



Figure 2: Antifungal Activity of Sample against *Malassezia Furfura*

CONCLUSION

From the present investigation it was found that the formulated poly-herbal hair oil has optimum standards and further standardization and biological screening establishes the efficacy of formulated poly-herbal hair oil. The antifungal activity of the formulation studied on *Malassezia Furfura*, in which formulation observed better antifungal activity. At last it can be concluded that, this polyherbal hair oil formulation has significant quality.

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Design Development and Characterization of Polyherbal Gel Containing Hair Rejuvenating Herbs

Wadde Malika Sharnappa, Nagoba Shivappa N* and Swami Avinash B

Department of Pharmaceutics, Channabasweshwar Pharmacy College (Degree), Latur, Maharashtra, India

ABSTRACT

The objective of the present research work was to develop polyherbal gel containing four different hair rejuvenating herbs i.e. **Bhringraj** (Eclipta Alba) family: Astraceae as a “KING OF HAIR” for rejuvenating quality, **Brahmi** (B. monnieri) family: Scrophulariaceae as antimicrobial, **Amla** (Embilca officinalis) Indian Gooseberry enriched of vitamin C provide boosted nutritional quality, promote hair growth and **Fenugreek** (Trigonella Foenum Graecum) family: Fabaceae used as hair tonic. The polyherbal gel is formulated using various excipients such as gelling agents like Carbapol 934, and Xanthan Gum, methyl paraben as preservative, polyethylene glycol (PEG) as penetration enhancer, PVP as stabilizer, triethanolamine to adjust the pH, glycerin as humectant and water are used as solvent. The prepared gel was subjected for physical evaluation i.e., color, appearance, spreadability, pH, viscosity, In-vitro diffusion study, FT-IR study and stability study. Based on results batch F6 was found best stable polyherbal gel.

Keywords: Brahmi, Amla, Fenugreek, Bhringraj, In-vitro diffusion study, Stability study

INTRODUCTION

Traditionally, hair loss was treated with the topical application of different herbal remedies, which were a result of long years of observation and painstaking effort by holistic practitioners. In traditional Indian system of medicine many plants and herbal formulations are reported for hair growth promotion as well as improvement of quality of hair, but lack of sound scientific backing and information limits their use. In present study, the main objective is to formulate and evaluate polyherbal gel containing hair rejuvenating herbs for hair growth activity which can overcome the problems of hair in a natural way.

Herbs chosen for the study are Bhringraj, Brahmi, Amla and Fenugreek. Plants are selected for this purpose on the basis of their reported activity i.e. Emblica Officinalis and Trigonella have antioxidant activity, anti-lice, antidandruff activity as well as hair growth and soothing effects, which promote hair follicle formation whereas Eclipta Alba show antimicrobial activity because it contains coumestans like wedelolactone, desmethylwedelolactone, furanocoumarins, oleanane and taraxastane glycosides. So main objective is to formulate and evaluate the polyherbal gel containing hair rejuvenating herbs for hair growth activity which can overcome the problems of hair in a natural way as synergistic effect.

MATERIALS AND METHODS

The herbal drugs Bhringraj, Brahmi, Amla and Fenugreek are obtained from ‘Vital Herbs’. Carbapol 934, Xanthan gum, Glycerin, PVP, Methyl paraben, Polyethylene glycol, Triethanolamine were received from Loba chemie laboratory, Vikas pharma, Goregaon, Hi media Laboratories, Ozone international Mumbai, Molychem, Mumbai respectively. All other ingredients used were of analytical grade.

PREFORMULATION STUDY

Organoleptic Characteristics

All drugs were tested visually for its physical appearance.

Solubility Study

Solubility of all drugs was tested in the various solvents (water, methanol, ethanol, etc) at room temperature by adding additional amount of drugs in solvent till supersaturation.

Spectroscopic Study

All drugs have been calibrated using UV spectroscopy individually and based on this one isocratic point was chosen further to carry out drug analysis as we have developing polyherbal gel.

FTIR Study

Drug excipient compatibility study was conducted using FTIR. Combination of all drugs and excipients was taken in 1:1 ratio and tested twice taking 1 month gap in between. Results were observed for any interaction.

FORMULATION OF POLYHERBAL GEL

Six different herbal gel formulations were prepared by simple gel preparation method. Bhringraj, Brahmi, Amla and Fenugreek extract gifted by 'Vital Herbs' used as API in which carbopol and xanthan gum is used as gelling agent. Other excipients used are methyl paraben as preservative, glycerin as humectant, poly ethylene glycol (PEG) as penetration enhancer, PVP as stabilizer and triethanolamine for adjustment of pH. Firstly, gelling agent was dispersed in distilled water. It was kept aside to swell, which was further stirred to form a gel. 5 ml of distilled water is taken to dissolve methyl paraben and propylene glycol was added to it. Further, required quantities of drug extracts was mixed to the above mixture and volume made up to 100 ml by adding remaining distilled water. All the ingredients were mixed properly and with continuous stirring at 800 rpm for 1 hour. Triethanolamine was added drop wise for the adjustment of pH (6.8-7) and also to obtain a gel at required consistency. Quantities of ingredients taken is mentioned in table no. 1.

Table 1: Formulation Table

Ingredients	F1	F2	F3	F4	F5	F6
Fenugreek extract	0.35g	0.35g	0.35g	0.35g	0.35g	0.35g
Amala extract	0.25g	0.25g	0.25g	0.25g	0.25g	0.25g
Brahmi extract	0.05g	0.05g	0.05g	0.05g	0.05g	0.05g
Bhringraj Extract	0.25g	0.25g	0.25g	0.25g	0.25g	0.25g
Xanthan Gum	0.5g	1g	1.5	-	-	-
Carbapol 934	-	-	-	0.5g	1g	1.5g
PVP	5mg	5mg	5mg	5mg	5mg	5mg
Glycerin	3ml	3ml	3ml	3ml	3ml	3ml
Methyl paraben	10mg	10mg	10mg	10mg	10mg	10mg
PEG	6ml	6ml	6ml	6ml	6ml	6ml
Triethanolamine	Q.S.	Q.S.	Q.S.	Q.S.	Q.S.	Q.S.
Water	Up to 100					

EVALUATIONS OF GEL

Physical Appearance

The physical appearance was visually checked for the texture color of gel formulations.

pH

The pH of all herbal gel formulations were determined by using the digital pH meter. Electrodes were completely dipped into the herbal gel formulations and pH was noted.

Viscosity Determination of formulations

Brook field viscometer was used to determine viscosity. The sufficient quantity of gel was filled in wide mouth jar separately the height of the gel was filled in the wide mouth jar should sufficiently allow to dip the spindle. The RPM of the spindle was adjusted to 2.5RPM. The viscosities of the formulations were recorded.

% Assay:

About 1 g of gel formulation was weighed and 10 mL methanol was added to dilute it. This solution is filtered in 0.45 µm filter to remove any sort of excipients. Then this filtrate is analyzed on UV for drug content i.e. % assay.

In-Vitro Study Diffusion Studies

The in-vitro diffusion of drug from the different gel preparations were studied using the classical standard cylindrical tube fabricated in the laboratory; a simple modification of the cell is a glass tube of 15mm internal diameter and 100 mm height. The diffusion cell membrane was applied with one gram of the formulation and was tied securely to one end of the tube, the other end kept open to ambient conditions which acted as donor compartment. The cell was inverted and immersed slightly in 250 ml of beaker containing 100 ml of phosphate buffer pH 7.4 as a receptor base and the system was maintained for 24 hrs at 37±0.5° C. The sample was withdrawn at the 1 hr interval of the time for 24 hrs. The media was stirred using magnetic bead on hot plate magnetic stirrer.

Accelerated Stability Studies

The accelerated stability study was conducted for the period of 1 month as per ICH guidelines. The optimized herbal gel formulation was subjected to stability in collapsible tube was stored at 40±2° C at 75% RH. The parameters like Appearance, pH, % drug content were tested periodically.

Antifungal Activity

Antifungal activity was evaluated by means of agar well diffusion assay. For antifungal study each compound was dissolved in DMSO at a concentration of 5mg/ml and this stock solution was stored in a refrigerator till further used.

Sabouraud dextrose agar (Hi media) was used for the growth of fungus. Media with acidic pH (pH 5.5 to 5.6) containing relatively high concentration of glucose (40%) is prepared by mixing (SDA) Sabouraud dextrose and distilled water and autoclaved at 121 °c for 15 minutes. Twenty five ml of molten (45°c) SDA medium was aseptically transferred into each 100mm×15mm sterile petri dish.

For counting of spore (fungi) were suspended in normal saline to make volume up to 1ml and then counted with help of heamocytometer (neubar chamber). Once the agar was hardened, 8mm wells were bored using a sterile cork borer. Then 0.1ml (100µl) from each stock solution of the compounds having final concentration of 5mg/ml was placed in each the well and the plates were incubated for 24 hour at 29°c.

Two wells in each petri dish were supplemented with DMSO and reference antifungal drug Miconazole (1mg/ml) dissolved in DMSO serve as negative and positive control respectively. The antifungal activity was measured as the diameter (mm) of clear zone of growth inhibition.

RESULTS AND DISCUSSIONS:

All herbal drug was obtained was appeared as brown fine powder except Fenugreek which is of dark yellow in color. Solubility study shows all drugs were soluble in ethanol and poorly soluble in water. All drugs were calibrated using UV spectroscopy the results shown in fig 1. FTIR study confirmed that there were no significant change and hence it can be concluded that the drug and excipients are compatible (fig 2, 3 and table 2).

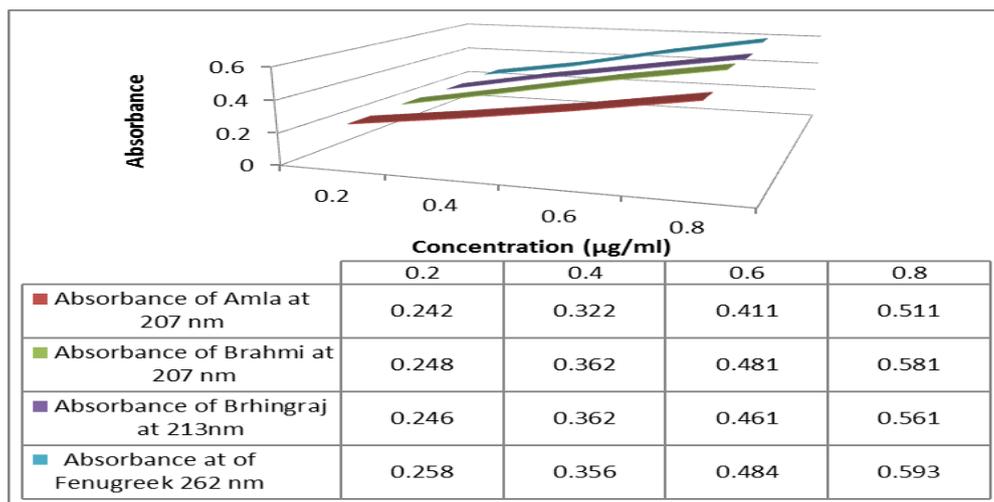


Figure 1: UV spectroscopy

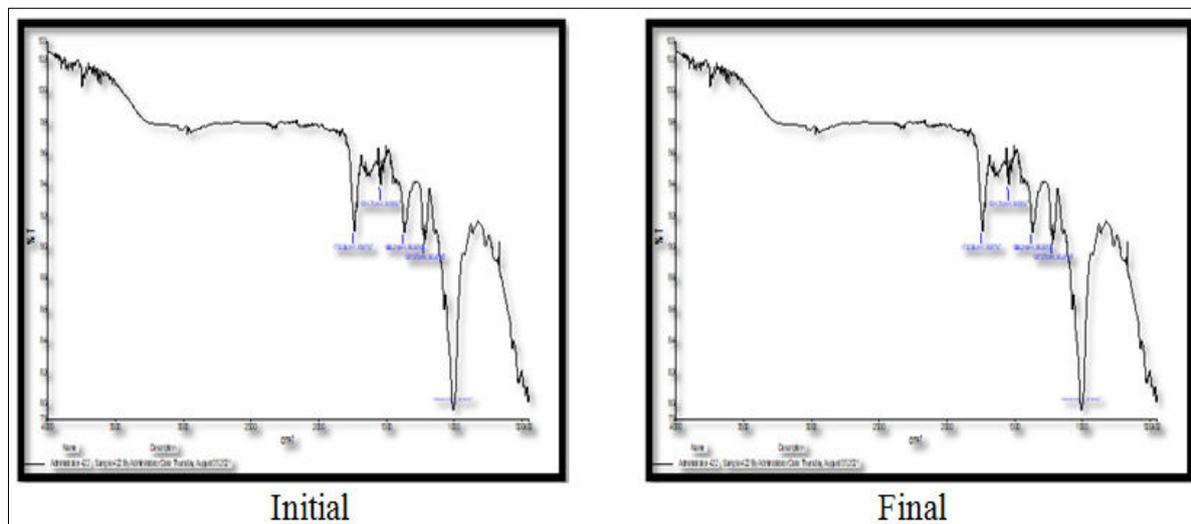


Figure 2: FTIR of all drugs with all excipients

Table 2: Interpretation of FTIR of all drugs with all excipients

Sr. No.	Functional group	Standard frequency	Observed Peak
1	C=O stretching	1085-1050 cm ⁻¹	1022 cm ⁻¹
2	N-H Stretching	3350-3310 cm ⁻¹	3339 cm ⁻¹
3	C-O-C Stretching	1050-1040 cm ⁻¹	1022 cm ⁻¹
4	O-H Bending	1390-1310 cm ⁻¹	1380 cm ⁻¹

All the gel batches were tested for appearance and found as yellowish brown in color homogeneous in nature without any clumps (fig 3). pH was ranged from 6.8-7. Viscosity and spreadability was in ideal range of gel. % Drug assay was highest for F6 batch (table 3). % Drug diffusion study showed that F6 batch released maximum drug till 7hr with steady pattern so that this batch was considered as optimized (table 4, fig 4) and subjected to accelerated stability study. Accelerated stability study conducted on optimized batch showed formulation was stable throughout the study (Table 5, 6). Antifungal activity of optimized batch against *C. albicans* strains was performed as polyherbs chosen were reported for antifungal activity. Results shown than antifungal potential was enhanced as compared to individual herb in combination by synergistic effect (table 7, figure 5).



Figure 3: Polyherbal gel

Table 3: Evaluation test of polyherbal gel

Batches	pH	Viscosity (cps)	Spreadability (gcm/sec)	% Assay
F1	6.8	4237	18.36	95.88%
F2	6.9	4124	19.37	96.78%
F3	7.0	3714	21.37	97.55%
F4	6.9	3440	22.13	96.63%
F5	6.9	3688	19.45	94.44%
F6	6.8	4132	22.38	98.23%

Table 4 : %Drug diffusion study

Time (Hr)	% Drug Release					
	F1	F2	F3	F4	F5	F6
0	0	0	0	0	0	0
1	11.39	17.96	17.62	20.11	18.69	24.18
2	28.16	26.56	32.18	30.12	27.19	35.76
3	39.74	32.67	44.81	49.18	34.63	48.89
4	43.92	39.84	53.64	56.29	49.28	57.69
5	51.49	48.17	69.37	62.84	58.71	71.23
6	68.32	65.49	76.94	79.43	77.18	84.17
7	71.11	69.21	84.79	89.32	83.21	91.12

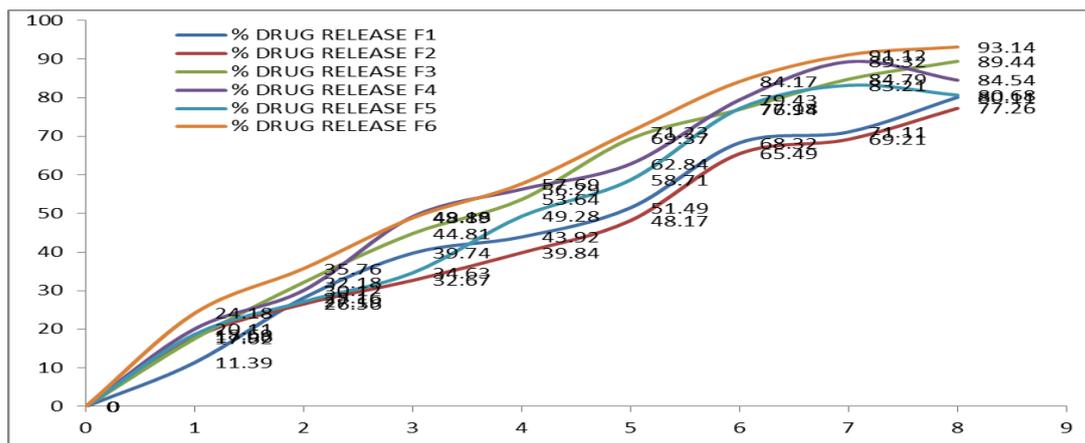


Figure 4: %Drug diffusion study

Table 5: Stability Study

Sr. No.	Time in days	Spreadability (g.cm/sec)	Viscosity (cps)
1	01	22.13	4237
2	15	21.37	4524
3	30	19.95	4714

Table 6: %Drug diffusion study of optimized batch F6

Time in Hours	% Drug Release Initial	% Drug Release after 15 Days	% Drug Release after 30 Days	% Drug Release after 45 Days
00	00	00	00	00
1	24.18	22.12	21.01	21.31
2	35.76	23.45	23.08	22.78
3	48.89	35.72	35.44	35.63
4	57.69	48.43	48.42	48.54
5	71.23	57.54	57.32	57.63
6	84.17	71.44	71.24	71.45
7	91.12	84.32	84.24	84.54
8	93.14	91.12	90.31	90.11

Table 7: Antifungal activity of optimized batch against C. albicans

Samples	Concentration(mg/ml)	Zone in diameter(mm)
Control	-	-
Standard (Miconazole)	1	18
1	100 µL	10
2	100 µL	12



Figure 5: Antifungal activity of optimized batch against C. albicans

CONCLUSION

From the research concluded that herbs can be the best alternative to allopathic treatment however to potentiate the herbal drugs it must be combined with 2 or more other herbs which will give synergistic rational product. As we have chosen four different herbs i.e. Bhringraj, Brahmi, Amla and Fenugreek having antioxidant,

antimicrobial as well as hair growth promoting activity however we have only studied antifungal action which was as better as synthetic drug. Although the formulation is better to state it is hair rejuvenating action it is necessary to perform clinical studies.

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Justice: New Phenomenon on Homosexuality

Shalini Dwivedi¹ and Vineeta Agrawal²

¹Department of Law, Pt. Ravi Shankar Shukla University, (State Government University) Raipur (C.G.)–492001, India

²J.Yoganadam Chattisgarh Law College (Govt. College Affiliated to Pt. Ravi Shanker Shukla University), Raipur (C.G) – 492001, India

ABSTRACT

They have also understood that the respective families are planning to forcibly marry them off to men once their undergraduate studies are over. The woes of the two women highlights the problems faced by the LGBTQ+ community despite a 2018 Supreme Court verdict having decriminalized homosexuality in the country. This story is of Kerala and a recent news happened their Debate Both inside and beyond the lesbian and gay society, opinions concerning lesbian and homosexual "wedding" have been highly divided, abnormal, and sinful. Homosexual marriage poses a danger to the family, marriage, and morals, and lesbians and gay men are the enemies of the family. Marriage is a heterosexual institution that refers to the union of a woman and a man as wife and husband. This is the "quasi fact" of marriage. Lesbian and homosexual men have the right to participate in marry as a human good, thus when debating the right-wing, proponents of gay marriage often respond on their own grounds or make an equality case. The ideologies of passionate love as well as the concept of meeting "just one" who satisfies all of our sexual and romantic wants continue to inform conventional western interpretations of personal partnerships. Even those in typical partnerships must understand urges that go beyond the monogamy ideal since desire is not physically or psychologically restricted.

Keywords: Bisexual, LGBTQ, Marriage, Sexual Relationship, Gay Marriage, Heterosexual.

1. INTRODUCTION

Everywhere in the world whatever the cultural or religious environment, human right violation are perpetrated on the grounds of real and perceived sexual orientation and gender identity. Lesbian, gay, bisexual and transgender minority people who basically have different sexual orientation which result in to denial of basic rights in the family and society. But prima facie they are the human being and therefore they are entitled to all human rights as well as fundamental rights in India.

The right to life and personal liberty includes right to privacy. The constitution of India does not directly provide the right to privacy as a part of the fundamental right but it has been emphasized time to time by the supreme court in various cases therefore it is considered as a part of fundamental rights. Recently also right to privacy recognized as fundamental rights and even extension and entitlement of his right talked for sexual minority in India by constitutional bench of supreme court of India.

Prior to Justice KS Puttaswamy case in the writ petition of Suresh Kaushal, the supreme court observed that only a miniscule fraction of the country's population constitute lesbians, gay, bisexual or transgender and thus, there cannot be any basis for declaring the section 377 ultra virus of provisions of Article 14, 15, and 21 of the constitution. The reference of correctness of *Suresh Koushal case* (legalization of homosexuality) is pending before a constitution bench. And in the light of constitutional bench's judgement of right to privacy and its possible inclusion of sexual minority will raise many legal issues and challenges. This paper is humble attempt to find out all those possible socio- legal issues and challenges after recognition of right to privacy and further legalization of homosexual relationship.

2. PRIVACY DEFINED

The recognition of 'privacy' is deeply rooted in history and religion. Several religious scriptures, texts and classical write-ups recognize the importance of privacy. There is recognition of privacy in the Quran and in the saying of prophet Mohammed.

The term 'privacy has been described as "the rightful claim of the individual to determine the extent to which he wishes to share of himself with others and his control over the time, place and circumstances to communicate with others. It means his right to withdraw or to participate as he sees fit. It also means the individual's right to control dissemination of information about himself; it is his own personal possession" Edward Shils defines privacy as a "Zero relationship" between two or more persons in the sense that there is no interaction or communication between them if they so choose"

This aspect also concerns the extent to which government authorities can exercise control over personal choices: for instances, by determining whether a pregnant woman has the right abortion, or whether an HIV- infected person has the right to marry or have children.

Prof. Radhika Rao, of university of California, Hasting College of Law, Categories privacy as (i) information privacy refers to limiting access to the personal information, such as medical records. Office. (ii) Spatial privacy is to limiting access to certain places, likes the home. (iii) personal privacy is to limiting access to the person including the physical body and its image. (iv) decisional privacy is for limiting interference with personal decisions. Like marketing, white (V) Relational privacy is for limiting interference with intimate relationship such as the family.

3. PRIVACY AS A HUMAN RIGHT

The 1948 Universal Declaration of Human Rights serves as the current worldwide standard for confidentiality, This especially safeguards contact and geographic privacy. According to Article 12 of a UDHR:

Nobody should have their privacy, families, homes, or communication arbitrarily invaded, or have their image or honour damaged. All have an entitled to counsel protection from these types of intrusions or assaults.

Many other international agreements expressly acknowledge the confidentiality. The same phrase has been incorporated in Article 17 of the ICCPR, Article 14 of the UNCMW, and Article 16 of a UN Convention Convention on the protection of Children (UNCPC).

In Indian perspective, a broad interpretation of the life and personal liberty has allowed Article 21 to ensure the privacy rights. The judgments of Kharak Singh v. state of UP & Ors. established the parameters of the privilege as well as the acceptable restrictions on its execution. and Gobind v. state of MP. which were adhered to in several other instances.

4. THE LAW OF PRIVACY IN INDIA

By using a novel construction of the Charter, the case established a privacy rights. 'Right to life' and the 'Right to freedom'. One of the rights is the one to privacy "reasonable restrictions" Regarding the Article 19(1) right to freedom of speech and expression (a) As a result of the prohibition being comprehensively listed, unless a broadcast violates a person's privacy even though it is "morally unacceptable" or "lewd," Article 19 is not violated (2). However, the courts have nonetheless used a willful misinterpretation of the right to life to carve out a fundamental right to life despite this gap in the law and right to freedom of movement.

In India, the ordinary legal system and constitution are basically the multiple causes from which the right to privacy derives. A commercial claim for penalties for an unauthorised violation of privacy is admissible under law.

According to constitutional law, the essential freedoms of life and liberty protected by Constitutional right include an underlying right to privacy.

A right to privacy has already been understood to encompass this. However, it is necessary to read the fundamental right to privacy derived from Article 21 alongside the fundamental freedom to disclose any part of general value, given to fair constraints.

5. LEGISLATIVE HISTORY OF SECTION 377 OF ENGLAND AND INDIA

England

The Fleta, written in 1290, and subsequently the Britton, written in 1300, are the first records of Sodomy becoming a criminal under common law in England. Both passages advocated for the burning alive of Sodomites. The religious judicial branch with so transgressions. Henry VIII's English parliament passed the Buggery Act in 1533, which was officially known as an Act for the Suppression of the Crime of Buggerie (25 Hen. 8 c. 6). It was the first Criminal Homosexual activity statute in the nation. The Action is known buggery as an unlawful sex encounter outside God's and man's will and imposed the death penalty for its conduct. Later, the courts limited the definition of this Act to simply encompass anal intercourse and torture. The Act was in effect until 1828, when it was repealed.

Queen Elizabeth I replayed the Buggery Act of 1533 in 1563, and as a result, it served as the foundation for the later criminalization of sodomy throughout the British Colonies. In 1817, oral -genital sex was dropped from the concept of buggery. The Infraction Toward People Act of 1828 (9 Geo.4 c. 31) and Section 125 of the Crimes Act (India) Act of 1828 both abolished the Act (c. 74). Buggery remains a serious offense under Sections 15 of the Offense Toward People Act of 1828 and 63 of the Criminal Law (India) Act of 1828, which superseded it.

Buggery wasn't any long a serious offense in England once the Offenses Toward Person Act 1861 was passed. It resulted in a sentence of 10 years in prison if convicted.

India

The offence of sodomy was introduced in India on 25.06.1828 through the Act for improving the administration of criminal justice in the East Indies (9.George.IV.). Chapter LXXIV Clause LXII Sodomy and it be enacted, that every person convicted of the abominable crime of buggery committed with either mankind or with any animal, shall suffer deaths a felon

In 1837, a Draft penal Code was prepared which included: Clauses 361 whoever intending to gratify unnatural lust, touches for that purpose any person or any animal or is by his own consent touched by any person for the purpose of gratifying unnatural lust, shall be punished with imprisonment of either description for a term which may extend to fourteen years, and must not be less than two years; and clause 362- whoever intending to gratify unnatural lust, touches for that purpose any person without that persons free and intelligent consent, shall be punished with imprisonment of either description for a term which may extend to life and must not be less than seven years, and shall also be liable to fine.

Presently Section 377 of IPC read as: Unnatural offences: - whoever voluntarily has carnal intercourse against the order of nature any man, woman or animal, shall be punished with imprisonment of life, or with imprisonment of either description for a term which may extend to ten years, and shall also be liable to fine.

Explanation- penetration is sufficient to constitute the carnal intercourse necessary to the offence described in this section.

6. RECENT JUDICIAL DISCUSSION ON LGBT'S RIGHT TO PRIVACY

Recently In case of *Justice K S putt swamy* the 9 Judges' constitutional bench (herein after constitutional bench) of Supreme court of India has opened the door for legalization of sex relationship.

The constitutional bench stated that, The High Court's misguided reliance on foreign standards "in its eagerness to preserve a so freedoms of LGBT individuals" is also untenable in our opinion. Lesbian, homosexual, bisexual, and transgender people's rights could be considered "so-called" freedoms. The phrase "so called" appears to imply the practise of a liberty under the guise of an illusory privilege. This is an incorrect interpretation of the LGBT majority's private information demands. Their liberties are not "so-called," but rather genuine rights based on strong fundamental philosophy. They have the right to life. They live in peace and dignity. They really are the core of freedom and liberty. Sexuality experience is an important aspect of one's personality. Equality under the law necessitates the non-discriminatory preservation of every identity." Furthermore, the bench held that the Consists of everyday items logic that punishment of a few is still not an indicator of wrongdoing is incorrect and it can be adopted. As a result, we dislike the way Koushal has treated LGBT people's privacy and dignity concerns on these issues.

The constitutional bench left the constitutional validity of section 377 of IPC before a larger Bench because the section 377 lawsuit is still ongoing. In its troubling judgement, Justice Sanjay Krishna Kaul explicitly concurred that Justice Chandrachud's position that Suresh Koushal should be considered to have come from a nine-judge panel. The decision to overturn the division bench's decision in Suresh Koushal should only have been made according to process.

In justice K.S. Puttaswamy.,SC, stating that secrecy is only a recognised right arising from other characteristics of rights and dignity recognised and guaranteed by the fundamental human rights contained in Part III of the Indian Constitution This right stems not only from the constitutional protection of life and personal liberty in Article 12. The court determined in its decision:

"Privacy includes at its core the preservation of personal intimacies, the sanctity of family life, marriage, procreation, the home and sexual orientation. Privacy also connotes a right to be left alone. Privacy safeguards individual autonomy and recognizes the ability of the individual to control vital aspects of his or her life. Personal choices governing a way of life are intrinsic to privacy. Privacy protects heterogeneity and recognizes the plurality and diversity of our culture. While the legitimate expectation of privacy may vary from the intimate zone to the private zone and from the private to the public arenas., it is important to underscore that privacy is not lose or surrendered merely because the individual is in a public place. Privacy attaches to the person since it is an essential facet of the dignity of the human being."

"Lesbians, homosexual men, bisexuals, and transgender people make up a tiny minority of the population of the nation, and in the past 150 years, fewer than 200 rupees have been used to prosecute them, according to the

Lower Court of the High Court (as per the reported orders) for violating the requirements of Articles 14, 15, and 21 of the constitution, and therefore cannot be used as a solid foundation for establishing that section 377 of the IPC is unconstitutional.

7. INTERNATIONAL EXPERIENCE: SECTION 377 IPC AS AN INFRINGEMENT OF THE RIGHTS TO DIGNITY AND PRIVACY

Thus, it has been determined that the right to privacy safeguards a "private area wherein person may develop and be oneself." This capability is used in line with individual freedom.

Citing the renowned article "The right to privacy" by Charles Warren and Louis D. Brandeis in *Gobind v. State of M.P.*, It was emphasised that man is able to claim his privacy rights, or the desire to be left alone, freely, rather than as a byproduct of his attempts to safeguard other concerns. In *Bowers, Attorney General of Georgia v. Hardwick et al.*, Blackmun, J., wrote a dissenting opinion. made it plain that the oft-quoted "right to be left alone" must be understood as an ability to live one's life, express one's self, and decide things about one's interpersonal relationships without suffering consequences. The concept of private acknowledges that each of us has a right to a space of personal closeness and independence that enables us to forge and cultivate interpersonal connections sans interference from of the larger society. This area of intimate intimacy is really about how one expresses their libido. Invading another precinct while displaying one's sexually will amount to a breach if done consenting but without causing harm to another.

J. referenced the following sentence from *Paris Adult Theatre I v. Slaton* in *Bowers v. Hardwick* Blackmn., Even wilful ignorance could conceal the truth that sex and intimacy is a Delicate, Key interaction of human life, essential to family life, communal health, and the promotion of intellectual personality. The manner we communicate our sexual is at the heart of this domain of intimate closeness. If we exhibit our libido consenting but without causing harm to each other, an intrusion of the that zone will constitute a violation of our dignity."

8. RAPE LAWS

Male rape in India is not included within the general definition of rape, and therefore if a gay or a female in lesbian relationship shall be raped by same sex partner, legally speaking, it would not be considered to be rape as opposite sex missing in any of the relationship. Thus, legislature shall have to be changed the existing law in light of prospective legalization.

9 FIGHTS WITH HIV-AIDS

To criminalize the act of homosexuality is a big lacuna but not to highlight the rape against LGBTQ community leads to major disappointment for the society as rape and other offences will led to SIT (sexually transmitted disease) and unfortunately, they are ignored and their disease due to this offence has not been highlighted.

CONCLUSION

The prosecution of same-sex behaviour has a detrimental influence on these people's life. Power dynamics resulting from masculine conceptions, social attitudes towards feminized males and their sexual practice led to uncertainty, disrespect, and quarrels/fights in their affectionate relationship. Besides the learning so we are required to move more further and to allow new laws such as rape laws to protect homosexual partners. We must build new spaces instead of simply protesting within existing structure that constantly tells us how they need help about which we are not aware of. But by changing thoughts and lives, not just by echoing words in a courtroom that exists in a society whose homophobia it not just condones, but encourages.

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14. (1975) 2 SCC 148
15. A.21, constitutional of Indian states – "No person shall be deprived of his personal liberty except according to procedure established by law. "
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17. Article 19 (2)
18. Article 21
19. Article 19 (1) (g)
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Formulation and Evaluation of Herbal Antipsoriatic Nanoemulsion

Waghmare Kanchan R, Moholkar A.V*, Nagoba S.N, Sayyad Firdos J, Sayyed Simakausor N, Dande Pradnyarani A

Department of Pharmaceutics, Channabasweshwar Pharmacy College, Latur, Maharashtra, India

ABSTRACT

India has a rich tradition of plant-based knowledge of healthcare. Modern pharmaceutical technology is being combined with traditional health medicine to increase its efficacy. The aim of the present research is to develop and design a nanoemulsion of psoralen as an effective treatment for psoriasis disease. Psoralen is a furanocoumarins antipsoriatic with broad spectrum activity. The drug efficacy of topical formulations is limited by instability due to their poor solubility in the vehicle and low permeability. Therefore, to overcome these problems, nanoemulsion has been designed. Topical nanoemulsion containing 1% psoralen with different oils (Olive oil) and surfactants [Tween 80], co-surfactant [PEG400], and distilled water. Various oil-in-water nanoemulsions are prepared by the spontaneous emulsification method. The nanoemulsion formulations that passed the thermodynamic stability test were characterized for appearance, pH, FTIR, viscosity, drug content, drug entrapment efficiency, and *in-vitro* drug release study of psoralen determined by Franz diffusion cells and stability study.

Keywords: Herbal nanoemulsion, topical drug delivery, psoralen, in-vitro drug release, stability

INTRODUCTION

Nanoemulsion is thermodynamically defined as isotropic. Stable transparent or translucent systems of oil and water. These are usually stabilized by a droplet-sized surfactant ranging from 5 to 200 nm. The different nanoemulsions' advantages over microemulsions are: A nanoemulsion has a much larger surface area and is free of energy than macro emulsions, which makes them an effective transportation system. This system does not show any problems. Self-creaming, agglomeration, coalescence, etc. Macroemulsion are commonly associated with deposits.

A nanoemulsion is a spontaneous emulsification process to improve solubility. Poorly water-soluble drug bioavailability It is non-toxic and non-irritating, so it can be easily applied to the skin and mucous membranes. The use of nanoemulsion as a delivery system can improve and enable the effectiveness of medicines. The total dose is reduced and laterally minimized. Nanoemulsion is used as a drug carrier in the topical treatment of diseases, especially skin diseases. You can do it. It contains a variety of hydrophobic and hydrophilic active ingredients. This improves the accumulation of active ingredients at the site of action, reducing side effects. A nanoemulsion can be provided. Controlled release and sustained release of the antipsoriatic drug Psoralen are used in this formulation. Prescribe nanoemulsion. Various conventional topical administrations in the form of psoralen include creams or lotions, but side effects are associated with psoralen therapy for irritation, pain, redness, etc.; psoralen nanoemulsion overcomes these problems. Psoralen belongs to a pharmacognistic class obtained naturally in the seed of Psoralen corylifolia. Psoralen, the drug, is a furanocoumarins ring containing a broad spectrum antipsoriatic agent, an active substance that interacts with cutaneous T-cell lymphoma. These preparations apply to the skin surfaces that provide local or systemic effects.

OBJECTIVES

- The main objective of the study is to develop topical nanoemulsion.
- To choose the appropriate excipients based on physicochemical properties of the drug.
- To formulate and evaluate the nanoemulsion.
- To increase therapeutic effect at targeted site.
- To reduce dose frequency and side effects.

MATERIALS AND METHODS

A. Materials:

Psoralen sample obtained from yucca enterprises. A-246, Antop hill warehousing Ltd., Wadala (E), Mumbai 400 0371, M.S., INDIA. All other chemicals and solvents used are of analytical grade.

B. Methods:

Determination of the Melting Point

The melting point of a drug is determined using the Thiel's tube capillary method. The drug filled in capillary by sealing one end of it. This is attached to thermometer and placed in paraffin oil contained Thiel's tube & heated. Drug melting temperature was noted as melting point.

Solubility Study

For solubility determined, adding drug to the solvent (either aqueous or non-aqueous) beyond saturation and is maintained at room temperature for 24 hours with rare shaking.

Creating a Standard Calibration Curve for Psoralen

Psoralen dilutions were made in methanol, to obtain 2, 4, 6, 8 & 10 µg/ml concentrations. Absorption was measured at 311 nm with a UV spectrophotometer. Use plain methanol as the reference solution.

Compatibility Study

Compatibility studies were performed using a Perkin Elmer FTIR Spectrophotometer. A physical mixture of drugs, oils, surfactants, and co-surfactants is prepared and mixed in appropriate amounts. Potassium bromide About 100 mg of this mixture is hydraulically pressed onto transparent pellets. 15 tones of pressure are applied to the IR press. The radiation range of PerkinElmer is 4000-400 cm⁻¹. IR spectrums are matched by the appearance or disappearance of peaks.

Pseudo-Ternary Phase Diagram Study

Creating a pseudo-ternary phase diagram is time-consuming, especially when it comes to defining it accurately. It's a hassle boundary. This takes care, however; no observations are made in the metastable system. Very little free energy is required to form an emulsion. The formation is thermodynamically spontaneous. Or, mixture phase behavior, and you can use phases to capture the configuration diagram. To study the phase diagram in detail, olive oil (as oil), Tween 80 (surfactant), and PEG400 (co-surfactant) were selected to study. A pseudo-ternary phase diagram is created individually for each surfactant mixture ratio and O/W nanoemulsion area. Pseudo ternary phase The chart was created using the water titration method. Surfactant (Tween 80) and co-surfactant (PEG 400) It is mixed in different volume ratios (surfactant mixture). (1:1, 1:2, 2:1). These mixing ratios of surfactants are selected because they also reflect the increased concentration of co-surfactant. References to surfactants for detailed study of the phase diagram of nanoemulsion formulation Olive oil is optimized as an oil phase based on solubility studies. In the phase diagram, oil (olive oil) and specific surfactant mixing ratios were completely mixed in different volumes. The ratio goes from 1:9 to 9:1. A combination of 13 different oils prepares a surfactant mixture (1:1, 1:2) for research to define the boundaries of the phases that are accurately formed in the state diagram. In either case, the aqueous phase is slowly titrated. Combine the oil and surfactant mixture separately. At each interval, 5 ml. of the aqueous phase is added, up to a total of 50 mL. Visually clarify and observe the phase with the magnetic stirrer. Calculation of the ratio of oil to surfactant mixing also occurs at the same time. The physical condition Plot on a pseudo-three-component phase diagram The first axis represents the aqueous phase and the second axis represents the aqueous phase. The third represents the mixture of surfactants and co-surfactants (surfactant mixture). fixed volume-to-volume ratio

Preparation Method of Nanoemulsion:

Prepare homogenous mixture of oil, surfactant and psoralen drug. Drug was accurately weighted to represent 1% w/w of the total weight of the nanoemulsion formulation and then added to previous mixture. Oil phase then added dropwise to aq. phase mixing using homogenizer for 30 min O/W nanoemulsion is formed.

Table 1: Formulation of nanoemulsion

Formulation	Surfactant mixture	Oil/surfactant mixture(ratio)	% w/w of components in Nanoemulsion formulation			Drug % w/w
			Oil	S. mix	water	
F1	1:1	1:9	5	45	50	1
F2	1:1	1:8	5	40	55	1
F3	1:1	1:7	5	35	60	1
F4	1:2	1:9	5	45	50	1
F5	1:2	1:8	5	40	55	1
F6	1:2	1:7	5	35	60	1

EVALUATION OF NANOEMULSION

1. Thermodynamic Stability

The nanoemulsions were exposed to thermodynamic stability test as below.

Heating-Cooling Cycle

The nanoemulsions were exposed to refrigerator temperature & extreme i.e. 4 °C and 45°C. Temperature cycle was followed for 48hr. And observed for stability of nanoemulsions.

2. Ph Measurement

The pH values of various nanoemulsion formulations are measured with a digital pH meter. First, dissolve 1 g of nanoemulsion in 100 ml of distilled water. Then the pH was measured.

3. % of Drug Content:

1 ml of nanoemulsion is mixed with 10 ml of a suitable solvent. Different aliquot concentrations can be prepared using the appropriate dilution. After filtering the stock solution, absorption is measured by UV spectroscopy. The drug content is an equation obtained from linear regression analysis of the calibration curve.

4. Viscosity Measurement

The viscosity of the nanoemulsion is determined using the Brookfield Viscometer. Fill a 25 ml beaker with 20 ml of nanoemulsion. Viscosity is measured at spindle number 6 at 10 rpm.

5. In Vitro Diffusion Study:

Diffusion studies of prepared nanoemulsions in Franz diffusion cells and cellophane membranes were used in this experiment. Take a nanoemulsion sample (5 ml.). With cellophane membranes, diffusion studies are performed at 37 °C using 250 ml (25%) of methanol. phosphate buffer as a dissolution medium (pH 7.4). 5 ml Each sample was taken regularly at 1, 2, 3, 4, 5, 6, and 7. After 8 hours, each sample is replaced with the same volume of fresh dissolution medium to maintain the subsidence condition. Samples are analyzed with a UV spectrophotometer for drug content at 311nm.

6. Accelerated Stability Studies:

Stability studies were performed to investigate stability of formulation. As per ICH guidelines optimized nanoemulsion was subjected to accelerated stability study at 4°C, room temperature and 40°C/60±5%RH for a period of 3 months.

RESULTS AND DISCUSSION

A. Organoleptic Properties

The Organoleptic properties of psoralen can be seen According to USP NF monographs.

Table 2: Organoleptic properties

Properties	Specification as per USP 1996	Result
Colour	White	White
Odour	Odorless	Odorless
Nature	Amorphous	Amorphous

B. Spreadability:

The Spreadability is good and sticks well on skin. Melting point analysis the melting point of Psoralen was observed to be 160 OC which complies with melting range of standard 161- 165 °C.

C. Solubility:

Solubility of psoralen was found to be in different solvents are given below

Table 3: Solubility study

Sr. No	Solvent system	Specification as per USP 1996	Result
1	Ethanol	Soluble	Soluble
2	Oleic acid	Soluble	Soluble
3	Tween 20	Soluble	Soluble
4	PEG 400	Soluble	Soluble
5	Methanol	Soluble	Soluble
6	Water	Soluble	Soluble
7	Chloroform	Insoluble	Insoluble
8	Ether	Insoluble	Insoluble

D. Determination of Drug-Excipients Compatibility Study

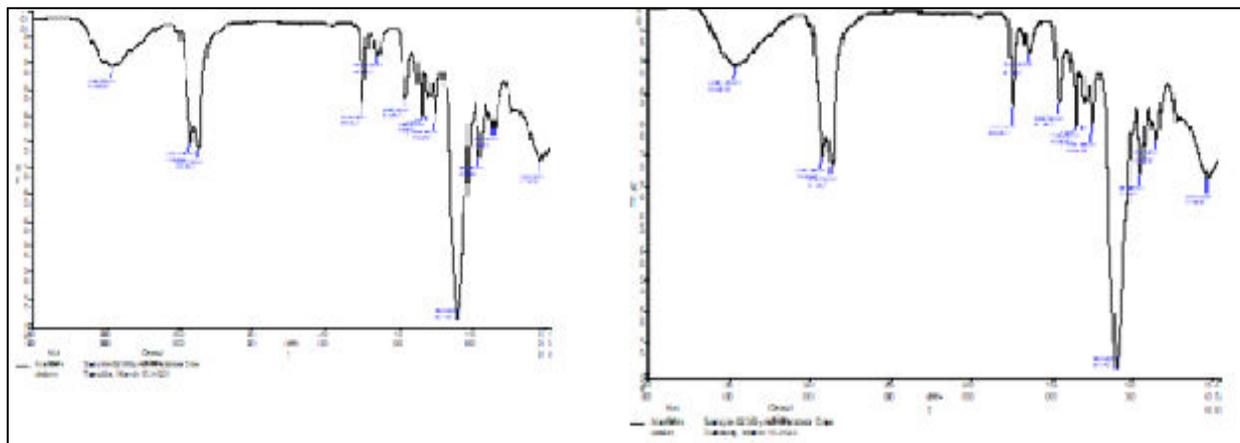


Figure 1: FTIR of psoralen and nanoemulsion formulation

E. Identification of the Drug by UV Spectroscopy:

The UV spectrum of psoralen in phosphate buffer solution pH 5.5 is in the range of 200-400nm. The spectrum indicates that the absorption max of psoralen was 311nm, which is matched with the max given in the Indian pharmacopeia.

The Standard Calibration Curve of Psoralen

Psoralen shows maximum absorption at wavelength 311 nm in a phosphate buffer solution of pH 5.5. A standard curve was plotted by taking the absorption of diluted stock solution (2, 4, 6, 8, 10, and 12) g/ml at wavelength 311 nm. The calibration curve of Psoralen is given below.

Table No.4: Standard calibration curve of Psoralen

Concentration (ug/ml)	Absorbance
2	0.235
4	0.410
6	0.621
8	0.821
10	1.023

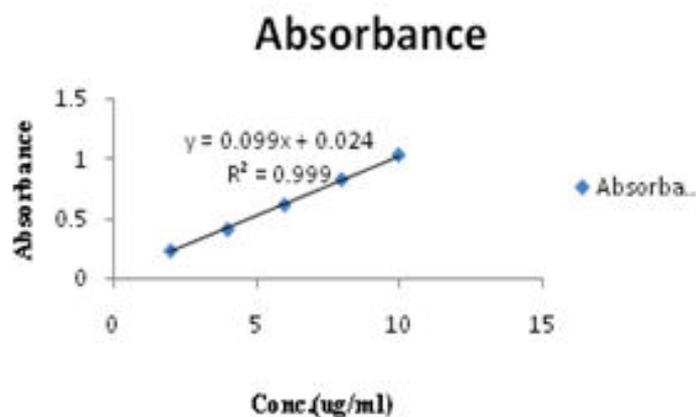


Fig.No2. Calibration curve

Table No.5: Appearance pH and drug content nanoemulsion formulation

Formulation code	Appearance	pH	% Entrapment efficiency	Drug content (%)
F1	Yellowish clear dispersion	5.5 ± 0.2	63	78.5
F2	Yellowish clear dispersion	5.4 ± 0.3	55	67.87
F3	Yellowish clear dispersion	5.5 ± 0.2	73	71.86
F4	Yellowish clear dispersion	5.3 ± 0.2	54	82.50
F5	Yellowish clear dispersion	5.4 ± 0.2	50	79.57
F6	Yellowish clear dispersion	5.5 ± 0.3	82	88.52

Table No.6: Viscosity of Nanoemulsion

Formulation code	Viscosity
F1	4930
F2	4230
F3	5730
F4	5960
F5	6511
F6	6730

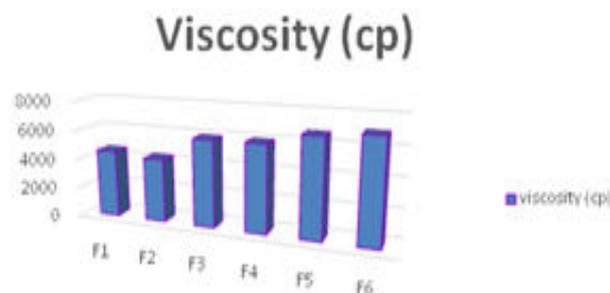


Figure no.3: Viscosity

F. Size and Shape of Particles:

1) Microscopic Study

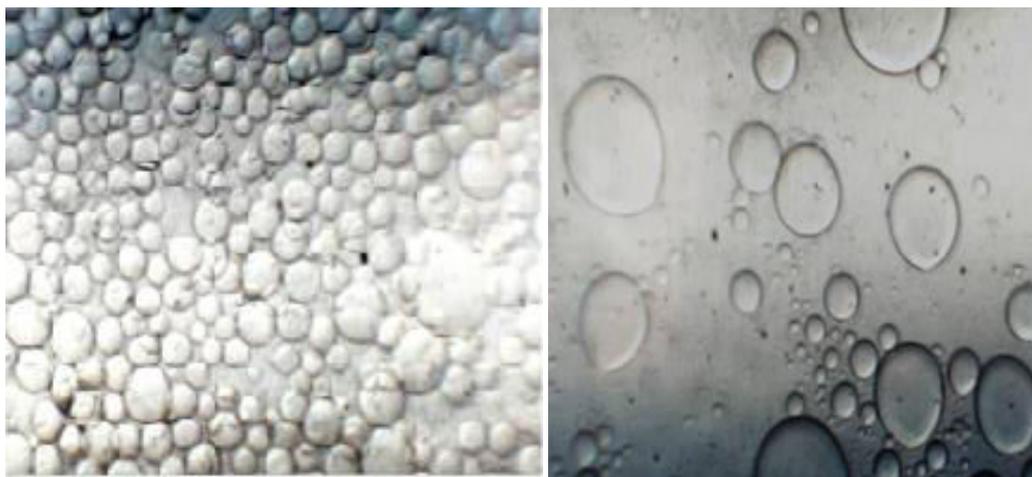


Fig no.4: Microscopic Images

2) SEM:

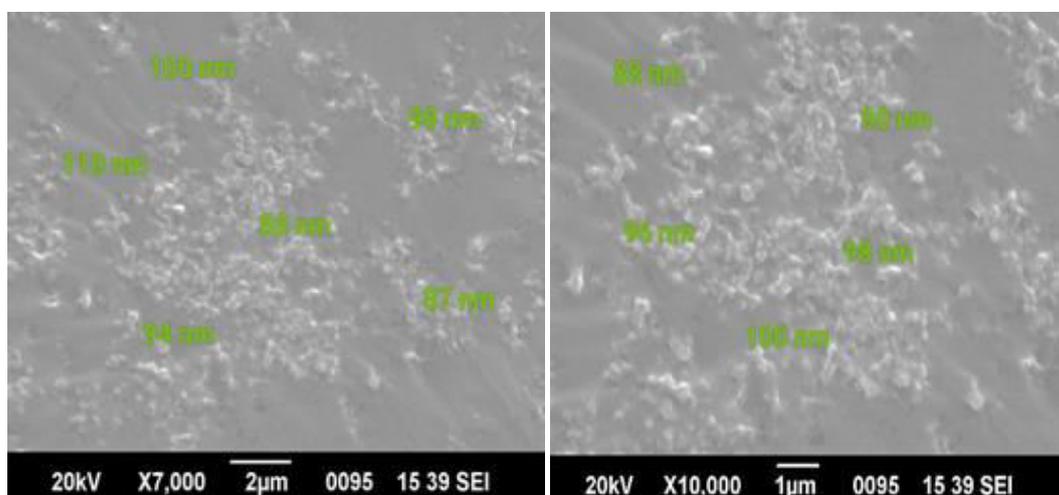


Figure no. 5: SEM

3) Zeta potential:

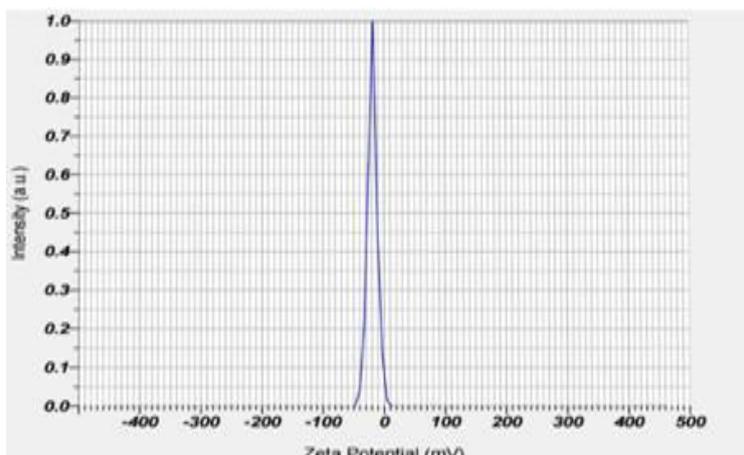


Figure no.6: Zeta potential.

G. In-Vitro Drug Release:

Table 8: In-vitro drug release (in %)

Time in (hrs)	F1	F2	F3	F4	F5	F6
0	0	0	0	0	0	0
0.5	6.86	5.59	4.5	3.38	9.22	5.80
1	12.77	11.86	10.95	9.53	14.13	7.97
2	22.75	15.95	17.29	20.45	25.49	16.09
3	35.04	33.22	30.04	28.68	38.22	27.16
4	46.4	44.13	43.22	40.04	52.78	50.60
5	57.30	55.04	53.22	51.58	69.10	71.75
6	68.3	65.53	68.12	67.20	75.25	81.68
7	71.2	70.2	81.23	76.35	90.24	82.10
8	76.2	75.25	90.70	82.10	94.70	95.25

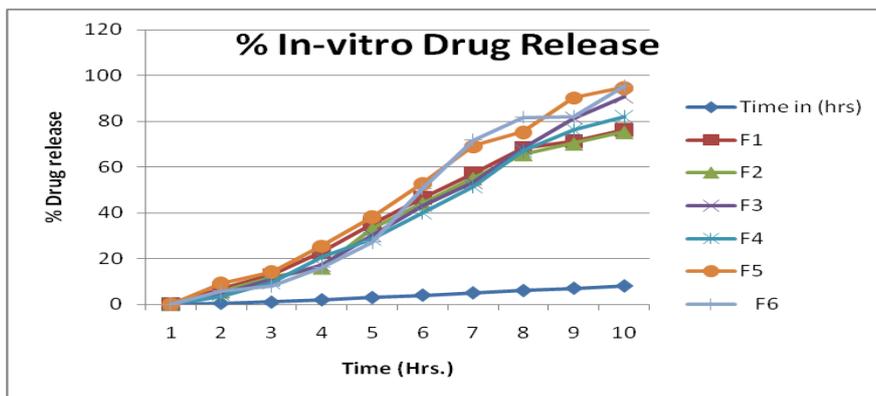


Figure No.7: % In vitro drug release

The results of in-vitro drug release from different formulations are tabulated in table 7 and graphically shown in fig.no.7. The prepared formulation batch F5 shows a better release profile as compared to other preparations F1, F2, F3, F4 and F6.

H. Stability study: The batch F6 formulation show the highest drug content therefore subjected to accelerated stability study result was given below

Table no.7: Stability study of nanoemulsion formulation

Formulation code	Month 1		Month 2		Month 3	
	pH	% Drug content	pH	% Drug content	pH	% Drug content
F6	5.5	88.52	5.0	86.23	4.8	85.14

The above stability study result was obtained that the there was no any significance changes in formulation.

CONCLUSION

In this study, psoralen included a nanoemulsion formulation for solubility. Expansion was a voluntarily well-prepared emulsification process. Nanoemulsion topical drug administration oleic acid, Span 80 (surfactant), and ethanol (co-surfactant) were successful. Used as a suitable carrier system for incorporating psoralen for local drug delivery. Various prescriptions are created based on the composition and drug loaded on the nanoemulsion. The prepared prescription for F5 has a better release profile than others. Results conclude that the nanoemulsion drug delivery system can be effective approach for topical application in the treatment of psoriasis. However clinical trials is needed further; before commercial use.

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Evolution of a Dalit Woman Writer

Parvathi T. S

Department of English, MES College, Marampally, Aluva, India

ABSTRACT

The paper delves in the issues of plight of the modern 21st century Indian woman writer who is always reminded that she is nothing but only a woman before the phallogocentric world. Who has no right to stand up against marital rape, abuse, violation of her fundamental rights both in her personal or political domain. Meena Kandaswamy's novel, "*When I Hit You: Or, A Portrait of the Writer as a Young Wife*" very strongly shows the gender bias attitude of the society where the artistic growth of a woman is not appreciated. The novel gives us a very heart rendering psychological description of what actually goes in the mind of the protagonist, though she is treated worse than an animal. The novel is the survival story of a writer in isolation. The artistic growth of Meena Kandaswamy can be traced along the evolution of their writer-characters. Which shows the various phases of the writer's journey towards self-actualisation such as self-discovery, self-awareness and self-realisation. The novel is not only the expression of the literary creativity of the author but also a medium to encode the troubled relationship of a woman to art. In the act of writing Meena Kandaswamy discovers her own voice and identity.

This paper will try to find answers to these poignant questions which have baffled the modern Indian society. Being a dalit women she need to face multiple oppression in the name of caste, class and gender. Here Meena Kandaswamy express her pain through writing and becomes a way to give voice to the repressed female sexuality. Since the start of the postmodern feminist movement many women writers and scholars have examined how notion of the female body oppress women's lives, how ideas about the female bodies are socially constructed and how these social constructions are used to control women's lives, and how women can resist these forces. Thus, it becomes apparent that the social construction of women's bodies is a political process, which reflects reinforces or challenges men and women's differential access to power and resources. So here Meena Kandaswamy proved that it is only through the expression of female bodily experiences through words that the phallogocentrism can be opposed

INTRODUCTION

Meena Kandaswamy's *When I Hit You or the Portrait of the Artist as a Young Wife* is the survival story of a dalit woman writer in solitude. The protagonist is a young educated woman, who is also a writer moves with her newly wed husband to a strange city where an attack on her tongue, mind and body begins. The story is told in the first person narrative. The protagonist is married to a professor with whom she was in love. She is a writer who is well-read and has a roaring intellect and he also seems to share many of the same opinions. Meanwhile, the husband is a man who comes from a higher class and caste and works as a lecturer. For the husband, this is his second marriage, after his previous marriage to an upper caste woman ran aground. After the marriage he changes himself into a husband-teacher to teach his wife-student the ways of a typical, obedient wife and always reminded that she is nothing but only a woman.

MAIN BODY

The misogynist husband used his ideologies to abuse his wife by robbing her identity. He exploited her in every possible way. He finds mistakes with everything that she does. Like any coward, he uses small failures as an excuse to beat her. To manage the situation she satisfies her husband with a "requisite Humility" that makes his male mind satisfactory. She becomes the actress, the self-anointed writer and the cinematographer of her role. She was bestowed with a creative freedom when she falls out of her role of a wife. But that's just a temporary escape like the story, the situation and the role change every day, every hour and every time she sits and contemplates.

When she defied him, the demon went to great lengths to beat her and brutally rape her. Her everyday life included this grim, violent and aggressive scenario. He was not supposed to be her husband rather a stranger with whom she had to share her bed, her mind and her body to. "I want love, but i want it at an arm's distance, from where it cannot reach to hurt me" (238). The husband doesn't want his wife either to 'come out of the closet' of the house or to connect herself with the social media. It is a kind of banishment from the physical as well as the virtual world. Beyond this inhuman act he continuously raped her without her consent, abusing her body and bruising her mind. She needed to reclaim her body and assert her identity and sexuality. He dictates her what to do, how to behave in public, whom to talk and even how much time she should spend online;

Come off face book. Its narcissism, its exhibitionism. It's a waste of time. I have said this to you a thousand times. It's merely you voluntarily feeding information straight to the CIA, RAW, IB, to everyone who is haunting my life. Every fucking things being monitored. Your life may be a peep show but I am a revolutionary. I cannot let you in endanger me. (50).

This is a plain and simple blackmailing which pushes her in to the corner and an act of career suicide. "I simply count myself lucky that he asks me only to deactivate and not actually delete my face book account" (52). Later he demands all of her passwords and took control of her entire life. She is always under his surveillance and feels completely cut off from the rest of the planet. She commits as temporary "career suicide" and bids farewell to the world with a final message which says that she was busy with a writing project. She pretends to live a writer's life in isolation. The next form of torture is sharing her email password with her husband, which leads to disagreements and periodic checking of her computer. She was a writer but her husband deletes all her old emails and contacts and thereby deleting her existence of being a writer. She was trapped in an unknown city confined in the three walls of the house with a husband who was always ready to punish her with his belt and other gadgets in case if there was even the tiniest mistake. She feels nauseous and robbed of her identity when she comes to know that her emails have been replied by her husband. But, before fully losing her identity, she tries to fight back. She refuses to forget her words or that she is a novelist, and instead began composing letters to imaginary lovers, despite the fact that she was allowed only a limited time that use a computer. She poignantly writes letters to imaginary lovers:

I write to you because I can. But her act of writing disturbed him: Why does this man calls you dearest? Why have you cleared your trash can in your email inbox? Why there only nine telephone calls on the call log of your phone, whose number have you deleted? Why haven't you washed the sink? Why are you trying kill me by trying to over salt my food. Why can't you write as anonymous? Why did you not immediately reject the conference invitation when you bloody knows that lam not going to let you travel alone? (69).

The wife in the novel was very critical about the theorists of the western world and of the way the husband was following them blindly. Her concern was if there was any problem about them about their conjugal life, it could have been solved by them only. To establish an identity, one should follow her/his individual way rather should not follow others. She was critical of Beauvoir, Kristeva, Spivak and even Althusser too. Women have been kept from writing for a many reasons, including the fact that it is an efficient strategy for perpetuate patriarchy, as well as the power it entails to protect and subvert patriarchy. The man made language has always silenced the contribution of women writers. Since the start of the modern feminist movement many women writers and scholars have studied how ideas about the female body influence women's lives, how ideas about the female body are socially constructed, how these social constructions are used to regulate women's lives, and how women can resist these forces. As a result it is clear that the social construction of women's bodies is a political problem, which reflects, reinforces or challenges men and women's differential access to power and resources. Women are reduced to mere physical entities with no conscience or mind under the patriarchal system. In order to free women from the patriarchal defined subjectivities of their self, the theories of the postmodern feminists seek to reclaim and revalue the female body in the writings of women and to instate a liberated female subjectivity, which has been distorted by patriarchy. Women's bodies, they argue, have been appropriated by patriarchy in the interests of men. The political objective is to liberate women from patriarchal control of their minds, bodies, subjectivity and language. So the selfhood and self-actualisation that women writers seeks through their writing can be pursue only by reclaiming the female body from which they have been alienated because the fundamental unique experience of the female is her experience of her sexuality, her body, and the functions and capacities of the body. Women writers who want to break free from the phallogocentric connection must, therefore, write about their bodies. In the male-dominated world of letters, women writers struggle to carve out a distinct "room."

Meena Kandaswamy shows how the celebration of the body and the female sexuality can be a medium of the "Ecriture Feminine" as proposed by Helene Cixious the writings on the experiences of the body of a female writers with their own words. She champions her own body as well as the narrator's body;

My written body opens up only to the extend to demarcate. It does not require the permission of my parents, it does not require the approval of society. My words might reveal a generous cleavage, a breaking waist, but they do not let anyone put their hands on me. Wrapping my body in to words, i prove it against the prying eye, against inspection. I have sheathed it against the hands of the others. My women's body, when it was written down, is rape resistant (240).

The narrative ends with the utter despair but a sense of hope is always there for the narrator as well as the writer: "I am the woman who asked for tenderness and got raped in return. I am the woman who has done her sentence. I am the woman who still believes, broken heatedly, in love" (249). The narrator tries to thrive for a 'room of her own' The only thing one can do is to come out marital life. The fantasy of the marriage is totally shattered when a writer comes to write down the bitter experience of her own marital life. Kandasamy's voice, echo social expectation and silence around the violence. Kandasamy speaks through her unnamed character the pain and trauma through which she goes through, which crushes her soul, smashes her body and tear her identity and equality apart. Kandasamy's unnamed protagonist has suffer an existential crisis, but she quickly decides that she will not allow herself to be lost. This affirmation is spontaneous. Kandasamy express her pain through writing that how men demolish and Dwarf her existence, who threaten them and their powerful regime by disobeying them, they just mute and muffle their voices.

For long four months she spends a hellish life with her husband as he heinously treats her mentally and physically. She uses her words against her abusive husband in order to avoid violence other times to provoke him. Her only weapon is her words. It is words that build her world invincible and allow her escape the harsh world; words that give birth to another woman, gave her wings to fly at her will and smuggled her out of the oppressive situation. With the help of words she conjured a brave self to face her own reality.

Kandasamy writes: "In the eyes of the world, a woman who runs away from death is more dignified than a woman who runs away from her man. She does not face society's stone-throwing when she becomes away free" (Kandasamy, 209). She made her own world with her language that can hide her pain. She conceals her actual, worn-out physical self behind the imaginary, scar-free, flawless body she creates with words. She has full authority over it. The written body is rape resistant. . Words help her to escape the harsh reality of the world. . Words released the strange, rebellious and ecstatic woman hidden inside her. Words gave her wings to fly at her leisure and smuggled her out of the oppressive situation, a situation in which she had fought so hard and for so long to wriggle out of the problems and find refuge within the words that gave her wings and courage to fly. Through the act of writing she expose multiple levels of oppression that she had to face in the society as a women; sexual oppression, class and caste oppression. The patriarchal forces, both direct and indirect the interference of the family and social conditioning impede their growth as individual and writer. Their liberalised education and sense of individuality create an acute awareness of the unequal rights of the gendered roles they play. Conflict ensues when they attempt to burgeon as a writer, crossing the barriers set by the traditional society, and liberating themselves from the inhibiting forces of patriarchy. Their writer-characters are in quest for identity and space for themselves.

CONCLUSION

With the turn of the twenty-first century an indelible trail of women writers can be found. The once muted female sounds became so loud that the androcentric world cannot ignore their presence. And the fact that creativity and imagination is not a male exclusivity has become an acknowledged fact. But to secure a place for themselves in the world of letters women writers had to trudge along thorny paths. They had to fight against the politics of innovation and the patriarchal schemes that suffocate female creativity. The woman-as-writer establishes a connection to her art beyond what society has accorded her since she is denied a legitimate space within the phallogocentric world. To gain a footing the woman writer taps the subversive property of writing, whose defensive power has been directed against her to perpetuate patriarchy. The author and the protagonist (being of the same gender) expose the dominant male bias towards women's writing. The woman-as-writer performs a dual function. She deconstructs the distorted images generated by patriarchy. She extends the frontiers of fiction to include the new world, the new realities of the reconceptualised woman. This act of liberation works out not for the writer-character alone but for the entire womenfolk and for the author especially, for she obtains a clearer vision of her vocation.

Thus through this double simultaneous process the author-as-artist problematizes her own relationship to her art. On the textual level, the protagonist becomes empowered as she is reconnected to her own 'self' from whom she has been culturally disconnected. On another level, the author undermines the phallogocentric, the cultural codes of the male-centred language that disempowered women. The link between the writer's life and career in the novel extends to the author also. A parallel phase of crisis, discovery, and actualisation can be traced in the life and career of the author as well. Interviews and articles by the authors authenticate that autobiographical elements are woven into the texture of the novels. To analyse how the writers encode their troubled career in the novels, a review of their lives is conducted, particularly the events that have gone into the making of the writer and other minor details that mirror the author and the writer-lives. The writer-character though not the autobiographical self of the author is her alter-ego. The fact is that the writer-character becomes a medium for

the author to discover her 'self,' to test her 'voice' and 'integrity.' Thus, the texts become a medium for the woman writer to problematize her own relationship to art in and through the process of writing.

The artistic growth of Meena Kandaswamy can be traced along the evolution of their writer-characters. Which shows the various phases of the writer's journey towards self-actualisation such as self-discovery, self-awareness and self-realisation. The novel is not only the expression of the literary creativity of the author but also a medium to encode their troubled relationship to art. The true 'self' of the writer emerges when the writer identifies the needs of the 'society'. This realisation provide her the courage and confidence to counter the curbing forces of patriarchy. Every genuine work encapsulates the author's deep yearning for selfhood. In the act of writing Meena Kandaswamy discovers her own voice and identity. As a result, the 'self' appears. Social problems are also essential to authors. They have a strong moral compass. As a result, they feel morally obligated to reveal and reform society's inequities. Women writers are committed to write on the cruelties and injustices meted out to women. They raise consciousness and revalorise womanhood. They express their social commitment and female solidarity by instilling a sense of worth in women and inspiring them to validate their lives. But often women writers are constrained to shirk their responsibility to women in distress and society at large due to the intervention of patriarchal forces. Meena Kandaswamy challenges this forces through act of writing. She has realized her true strength and strikes out as an independent woman. A pen in woman's hand can rattle up patriarchy, for this gives her immense power: to educate, agitate and organize. The novel *When I Hit You* or the *Portrait of the Artist as a Young Wife* is the struggle of a woman against tradition of writing, sexual abuse and equality in marriage which continues even today. This is the quest for her own identity as a dalit woman writer.

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Formulation and Evaluation of Etoricoxib Topical Gelfor Management of Osteoarthritis

Rupesh R. Choure¹, Vijayendra Swamy S. M^{2*}, Nagoba Shivappa N³, Giram P. S⁴, Ashika Sanganalum Mattha⁵, Rohit Kombade⁶, Sachin Kabade⁷ and Varsharani Jadhav⁸

^{1,2,3,4,6,7,8}Department of Pharmaceutics, Channabasweshwar Pharmacy College (Degree), Latur, Maharashtra, India

⁵School of Medicine, Spartan University, Saint Lucia

ABSTRACT

The main aim of this study is to formulate & evaluate the etoricoxib gel preparation for the management of osteoarthritis, which has anti-inflammatory activity. In order to limit the pharmacological or other effects of the medicine on the skin's surface, topical drug delivery is defined as the administration of a pharmaceutical dosage form to the skin to treat osteoarthritis. A wide range of pharmaceutical dosage forms, including semisolids, liquid preparations, sprays, and solid powders, are included in topical drug delivery systems. Gels, creams, and ointments are the most popular semisolid topical drug delivery preparations. A cross-linked polymer network swelling in a liquid medium is what makes a gel. The interaction between the solid-state polymer and the liquid component significantly impacts its characteristics. Gels do not have a constant flow. The liquid dispersion medium and the reaction of the polymer create an Etoricoxib, a weekly water-soluble oral NSAID linked to several side effects, including bleeding, ulcers, and dyspepsia, although these can be avoided by applying the medication topically. The purpose of the formulation of the gel for the topical distribution of etoricoxib was to make it more soluble and so increase skin permeability by the use of penetration enhancers like propylene glycol, the solubility of etoricoxib was examined in a solvent like ethanol; Gel was prepared by using the cold method, One percent etoricoxib and various concentration of Carbopol 934 like 0.5%, 1%, 1.5 % were tested for pH, viscosity, Spreadability, drug content. The optimized gel has 1.5% carbopol gel formulations carrying a concentration that have greater Spreadability, stability and drug content than those containing a 0.5%, 1% concentration of carbopol.

Keywords: Etoricoxib, Topical gel, Gelling agents, Hydrophobic.

INTRODUCTION

A topical medicine is a top medication applied topically to the skin to treat or cure certain skin conditions. There is widespread support for topical medication administration. This administration method has successfully given various medications for both local and systemic impact. Due to benefits like avoiding first-pass effects (drug metabolism by the liver, having been absorbed through the skin), gastrointestinal irritations (condition or disease that occurs within the gastrointestinal tract), and metabolic degradation associated with oral administration, this method of drug delivery has grown in popularity¹. Anti-inflammatory medications' systemic adverse effects can be overcome, and their action increased by applying them topically at the location of the inflammation³. Because skin has a vast surface area and is easy to access, drug delivery through the skin has long been considered a viable option. A two-component, cross-linked, three-dimensional network of structural elements is referred to as a gel. Organic macromolecules, mainly polymers or inorganic particles, can make up the structural components of the gel network⁵.

USP defines gels as a semisolid system consisting of dispersion made up of either small inorganic particles or large organic molecules enclosing and interpenetrated by a liquid. Gels consist of the two-phase system in which inorganic particles are not dissolved but merely dispersed throughout the continuous phase, and large organic particles are dissolved in the continuous phase, randomly coiled in the flexible chains⁶.

Etoricoxib is a nonsteroidal anti-inflammatory drug (NSAID) that belongs to the COX-2 inhibitor class and is used to treat moderate joint pain and swelling brought on by various types of arthritis. Etoricoxib belongs to the Class II category under the biopharmaceutical Classification system. Etoricoxib treats osteoarthritis, rheumatoid arthritis, acute gouty arthritis, and low back pain⁷.

It is extremely low aqueous solubility, and poor dissolution can hinder formulation efforts and restrict the drug's therapeutic use by delaying the rate of absorption and the onset of action when administered orally. Oral treatment is also linked to a higher risk of side effects or therapeutic failure and significant drug loss in the target organ. Additionally, etoricoxib oral dosage produces gastrointestinal discomfort.

This work has attempted to create an etoricoxib gel formulation that will maximize percutaneous absorption and lessen the side effects associated with oral treatment.

Topical Versus Oral Route Administration

Nonsteroidal anti-inflammatory drugs (NSAIDs) are a standard treatment for osteoarthritis, but taking them orally has been linked to an increased risk of gastrointestinal, cardiovascular, hematologic, hepatic, and renal side effects. As a result, many doctors and pharmacists are now researching topical pain relief gels and creams as an alternative to pills.

Topical Etoricoxib aims to reduce systemic adverse effects while also encouraging compliance.

When NSAIDs are applied topically, a high concentration (equivalent to that obtained via oral route) is observed in the dermis and muscles, with less gastrointestinal effects. Plasma concentrations are 5% to 15% of those obtained through systemic administration. The evidence in joints is weaker, but topically applied NSAIDs appear to reach the synovium.

A systematic review of topical NSAIDs for acute musculoskeletal conditions (such as strains and overuse-type injuries) studied 3455 subjects and concluded that the preparations could provide good levels of pain relief without the systemic adverse events associated with oral NSAIDs. Using diclofenac, ibuprofen, ketoprofen, and piroxicam observed positive outcomes.

Particular European League against Rheumatism studies and the International Osteoarthritis Research Society suggest the increasing importance of using topical medication and state that topical NSAIDs are preferred over oral NSAIDs for mild-to-moderate pauciarticular hand and knee osteoarthritis in patients with sensitivity to oral compounds. The UK NICE guidelines for knee and hand osteoarthritis recommend using paracetamol and topical NSAIDs over oral NSAIDs, COX2 inhibitors, and opioids.

About Osteoarthritis

Centres for Disease Control and Prevention (CDC) states osteoarthritis (OA) is the most common form of arthritis, also called a degenerative joint disease or "wear and tear" arthritis, where the cartilage within a joint begins to break down, and the underlying bone begins to change. Some symptoms manifested in OA are pain, joint stiffness (especially in mornings), swelling, decreased flexibility and weakness, causing a reduction in quality of life. These changes usually develop and worsen slowly with time. National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIH) suggests it is associated with old age, obesity, female gender, genetics, prior joint trauma, repetitive activities, and metabolic, neurologic, or hematologic conditions. OA can occur in single or multiple joints and usually affects joints asymmetrically. The most affected joints include the joints of the hand, such as the distal interphalangeal, proximal interphalangeal, and the first carpometacarpal joint of the thumb; weight-bearing joints such as the hip and knee; first metatarsophalangeal joint of the foot; and cervical and lumbar spine.

OA is usually a clinical diagnosis, though tests are performed to support the diagnosis and rule out other potential diagnoses. Some of the tests performed are Plain radiography, Magnetic Resonance Imaging (MRI), Ultrasound and Laboratory testing such as Markers of inflammation (erythrocyte sedimentation rate and C-reactive protein level), Immunological tests (antinuclear antibodies and rheumatoid factor), etc.

Exercise, weight loss, physical therapy, ice-heat pack and braces or heel wedges are some non-pharmacological treatment options which decrease pain and improve function. The several options for pharmacological treatment include analgesics (acetaminophen), nonspecific NSAIDs, COX-2 specific inhibitors, capsaicin cream, Intra-articular corticosteroids, and Hyaluronic Acid derivatives. Various surgical procedures considered is arthroscopic debridement, high tibial osteotomy, monocondyle replacement, patellofemoral replacement, unicondylar knee arthroplasty or total knee arthroplasty, and the surgical option is explored only when all nonsurgical measures fail.

MATERIALS AND METHODS

Etoricoxib was obtained from Swapnroop Research Private Limited. Carbopol 934 and Sodium CMC were procured from Horizon Chemical Ltd. Propylene glycol, Propylparaben, and ethanol from SD. Fine Chem. Ltd Mumbai, India.

Preformulation FTIR

This technique is used to analyze the compatibility of the drug and excipients, and it is used to establish the structure of unknown compounds and analyze functional groups; the sample was analyzed between 4000 - 400 cm^{-1}

Calibration Curve of Etoricoxib Drug

100mg drug was dissolved in 100ml ethanol (a stock solution I 1000 µg/ml) pipette out 10 ml from stock solution I and dilute up to 100ml with ethanol (stock solution II 100 µg/ml) pipette out 0.5, 1, 1.5 2 ml from stock solution II and dilute up to 10 ml with ethanol and analyze the sample using UV Spectrophotometer at 240nm

Preparation of Topical Gel

Etoricoxib uses various formulae to try with polymers such as Sodium CMC and Carbopol 934. Some formulations with Carbopol 934 resulted in the best gel formulation, which was non-sticky, smooth and stable.

With constant stirring, Carbopol 934 was dispersed in distilled water. Double distilled water was taken, and the required amount of propylene glycol and propylparaben were dissolved by heating in a water bath. Cool the solution before adding Propylene glycol 400. The required amount of Etoricoxib was added to the above mixture, and the volume was increased by adding the remaining double distilled water. Finally, the whole mixed ingredients were mixed adequately into the Carbopol 934 gel with continuous stirring, and 3 to 4 drops of triethanolamine were added to the formulation to adjust the required skin pH (6.9-7) and to obtain the gel formulation at the required consistency.

Table No 1- Formulation table

Ingredients(% w/w)	EG1	EG2	EG3	EG4	EG5	EG6
Carbopol934	500mg(1%)	250mg(0.5%)	750mg(1.5%)	500mg(1%)	250mg(0.5%)	750mg(1.5%)
Etoricoxib	500mg	500mg	500mg	500mg	500mg	500mg
Ethanol	2.5ml	2.5ml	2.5ml	5ml	5ml	5ml
Propyleneglycol	2.5ml	2.5ml	2.5ml	2.5ml	2.5ml	2.5ml
Propyl paraben	30mg	30mg	30mg	30mg	30mg	30mg
Purifiedwater	50ml	50ml	50ml	50ml	50ml	50ml

EVALUATION OF TOPICAL GEL

1) Physical Examination¹²

The developed formulations were examined visually with the naked eye for clarity, colour, homogeneity, consistency, and grittiness. Gel smears were made on glass slides and looked at under a microscope for the presence of any insoluble particles.

2) Measurement of pH¹³

At room temperature, the pH of the sample was measured using a digital pH meter (New Heights Pharmaceuticals Ltd, Nigeria); after dipping the electrode in the gel for 10 seconds, the value was read using the digital interface.

3) Viscosity¹⁶

The viscosity of formulated Etoricoxib gel was measured using Brookfield viscosity (Centex Pharmaceutical Ltd, Nigeria) at room temperature with spindle no. 06. at 10 pm.

4) Spreadability¹⁷

Spreadability was measured using an apparatus consisting of a wooden block with a pulley at one end. The Spreadability of gels was determined using this method based on their slip and drag characteristics. An excess of the gel formulation under study (about 2 to 3gm) was placed on this ground slide. The gel formulation was then sandwiched between this ground slide and another glass slide with the exact dimensions of the fixed ground slide and a hook. For 4 to 5 minutes, A. 1 kg weight was placed on top of the two slides to expel air and provide a uniform film of the gel formulation between the slides. The excess gel formulation was scraped off the edges. The top plate was then subjected to an 80 gm pull. With the help of a string attached to the hook, time is the time it takes the top slide to cover a distance of 7.5 cm in seconds. A narrower interval indicates greater Spreadability. The following formula was used to calculate Spreadability.

$$S = M.L / T$$

Where,

S = denotes the gel's Spreadability

M = denotes the length moved by the glass slide.

T = time in seconds required to separate the slides completely

5) % Assay¹⁸

A specific amount (100mg) of advanced gel formulation was dissolved in 100ml of pH 6.8 phosphate buffer. The volumetric flask containing the gel solution was mechanically shaken for 2 hours to ensure complete drug solubility. This gel solution was filtered and spectrophotometrically estimated at 240 nm (Shimadzu UV 1800) with phosphate buffer (pH 6.8) as a blank.

6) Drug content¹⁹

1gm Etoricoxib gel dissolved in 100 ml ethanol, stirred for 15 min using a magnetic stirrer, and filtered the solution with Whatman filter paper 0.45 µm; check the absorbance at 240nm.

7) % In vitro drug diffusion¹⁹:

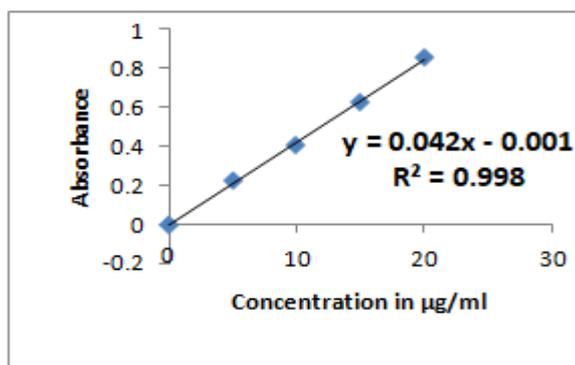
The diffusion studies of the prepared gel were carried out Franz diffusion cell through a cellophane membrane .1gm of the sample was taken into the cellophane membrane, and the diffusion studies were carried out at 37 ± 1°C using 100ml phosphate buffer ph 7.4 as a dissolution medium .5ml of each sample was withdrawn at an interval of 1, 2, 3,4,5,6,7,8,10,12 hr and replaced with an equal volume of fresh dissolution medium. the sample was analyzed at 240 nm

8) Accelerated stability study¹⁹:

Stability study was conducted as per ICH guideline Q1A .stability chamber over ~~ten~~ sufficient quantity of gel formulation packed in a stability container and kept in stability chamber at temperature 40 °C and RH 75 % samples were taken on 90 days for the pH viscosity, invitro and drug content to determine stability profile.

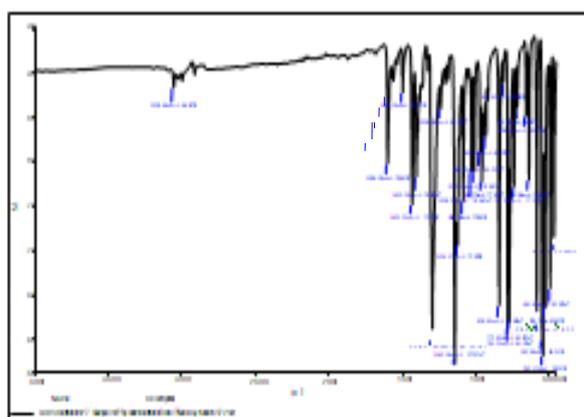
RESULTS & DISCUSSION

1. Standard Calibration curve

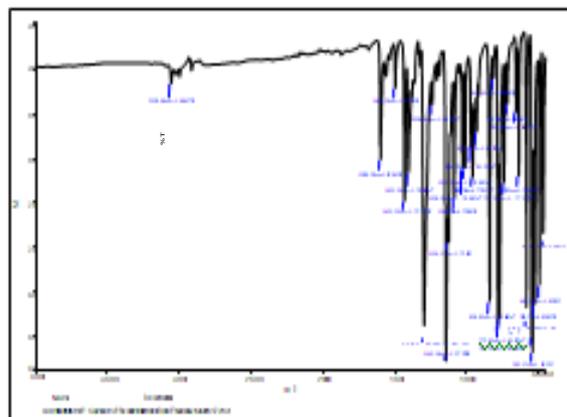


Sr.No.	Concentration	Absorbance
1	0	0
2	5	0.218
3	10	0.404
4	15	0.624
5	20	0.848

2 .FTIR



FTIR of Drug



FTIR of Drug + excipients

All gels were white and homogeneous, and smears were transparent, with no grittiness or particle presence. The pH values of gel batches were found to be in the 6.7-7.0 range, which is comparable to skin pH. Viscosity is an essential parameter for characterizing gels because it influences drug release. All formulations had a viscosity range of 8145 to 9223 cps. Spreadability was found to be 13.97 to 16.90 gm. cm/ sec, and drug content was found in the range of 92.52 to 95.67 %. Drug release was found to be 0 to 87.57. The table displays the results of physicochemical parameters such as pH, viscosity, and drug content for all batches.

Table No.2- Physicochemical characterization of Etoricoxib gel

Formulation code	Nature	pH	Viscosity(Cps)	Spreadability Gm.cm/sec	Drug content (%w/w)
EG1	White Homogeneous	6.7	9223	16.03	93.25
EG2	White Homogeneous	6.8	8754	15.42	92.54
EG3	White Homogeneous	6.9	8248	16.90	95.34
EG4	White Homogeneous	6.8	8543	16.70	94.67
EG5	White Homogeneous	6.7	8145	14.53	93.59
EG6	White Homogeneous	7.0	8690	13.97	92.52



Fig no. 1 Etoricoxib gel formulation Batches

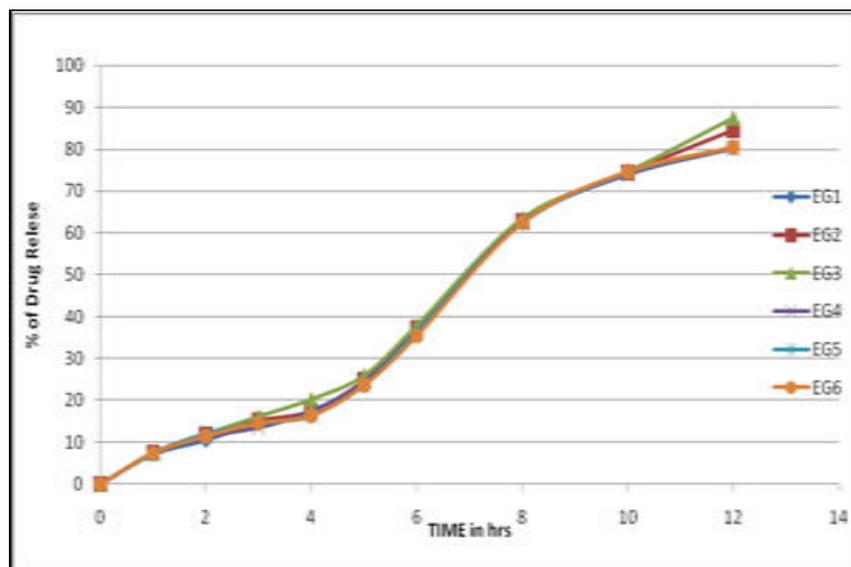
% Drug Release

Time in hr	EG1	EG2	EG3	EG4	EG5	EG6
0	0	0	0	0	0	0
1	7.1	7.5	7.5	7.4	7.3	7.4
2	10.52	12.02	12.02	11.34	12.1	11.53
3	14.62	15.22	16.2	13.57	14.45	14.6
4	16.32	17.5	20.32	17.45	16.53	16.43
5	24.23	24.83	26.01	24.58	23.74	23.65
6	36.4	37.3	38.03	36.5	36.33	35.42
8	62.5	62.8	63.57	62.7	62.45	62.43
10	74.2	74.33	74.75	74.04	74.53	74.65
12	80.2	84.53	87.57	80.32	80.58	80.43

Stability study

The stability of the gel was monitored at 40 °C at 75% RH for three months. The formulated gel was evaluated for physical stability, viscosity, pH, drug content and in vitro release.

	Viscosity	pH	Drug content	% Drug release
For initial month	8248	6.9	95.34%	87.57
After three months	8201	6.7	94.24%	86.33



CONCLUSION

The gel is one of the most recent technologies used to control gel release for topical use. Furthermore, they will be used to load hydrophobic drugs such as Etoricoxib. Gel incorporates water-soluble gel bases, penetration enhancers, and preservatives to improve its stability. Research executed, Etoricoxib gel development with Carbopol 934 as gelling agents was successfully formulated and evaluated. Investigations showed drug content of optimized batch EG3 has a drug content of 95.34%, and enhancement of drug penetration with controlled release of 87.57% up to 12 hr will reduce the frequency of administrations, giving more patient compliance. It can be concluded that gel containing Etoricoxib will show enhanced anti-inflammatory action.

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Segment Reporting: A Case Study of NTPC & TATA Power Limited

Ankita and Kripa Shankar Jaiswal

Department of Commerce, Mahatma Gandhi Kashi Vidyapith, Varanasi, India

ABSTRACT

With the increasing complexity of business enterprises and also the growing popularity of cluster-type businesses, it's become clear that consolidated finances reporting, while obviously necessary, might not necessarily provide users with sufficient insights for the making of informed decisions. AS-17 in India mandates listed and other companies to report information by segments. Information about an entity's geographical and business segments has relevancy in assessing the risks and returns of a diversified or multinational entity that such information is usually difficult or impossible to see from aggregated data. Segment reporting requires companies especially those which are multi-product and multi-location to disclose their segment-wise operations in their annual reports moreover as in their quarterly reports. the standard of segment reporting is defined because the number of financial statement items (e.g., sales, profits, assets) disclosed per segment. Segment reporting by line of business and by geographic region are analysed separately. In India, the accounting principle 17 was issued within the year 2001 by The Institute of Chartered Accountants of India. The practice of exposing segment information by the Indian Companies was on a slow pace. Companies from major industries are chosen for this study thanks to the actual fact of their contribution towards the expansion of the country's economy, potentially making the findings applicable to other developing economies. this case study highlights the segment reporting of NTPC and TATA POWER LTD. How the assessment of segment reporting is distributed and the way it's useful for the external users? This study develops an experimental proxy for the standard of segment reporting from the information in company's annual reports. A firm reporting by segments leaves more information within the hands of stakeholders and helps to boost the standard of choices undertaken by them.

Keywords: Segment reporting, geographic segment, business segment, stakeholders, information disclosure

INTRODUCTION

In today's competitive market a businessman doesn't deal in any particular product or market but it wants to serve in multiple products/services and operates in several locations. So, it can cover wide area and face cut-thought competition when a firm function in multiple products/service and in numerous retail it to you must predict and analyse risks and opportunities. of these information must be recorded in proper reports, which is thought as segment reporting. it's this variety which has raised the question of whether a more comprehensive style of accountability and disclosure is desired. during this regard, the potential of segment reporting as an appropriate type of disclosure seems to own achieved some recognition, both at the national and international level. Segment disclosure could be a value-relevant source of knowledge that helps investors to form informed decisions. the knowledge provided by the corporate on a segment wise basis helps the investors to rate the corporate in a very more critical manner. The investor can have a radical study of the corporate before investing within the same which helps him to scale back the chance perception/premium. This accounting principle isn't mandatory for tiny and Medium Sized Companies. Financial disclosures are often separated into two components; the standard (i.e., decision usefulness) and therefore the amount (i.e., quantity) of disclosure. the standard of segment reporting is defined because the number of monetary statement items disclosed per segment. Those entities whose securities aren't publicly traded but favor to disclose segmental information voluntarily in financial statements that adapt with the IFRS, should accepted fully with the wants of IAS. This standard should be applied in complete sets of published financial statements that suits International Accounting Standards (IAS). In India this standard involves effect in respect of accounting periods commencing on or after 1.4.2001 and is mandatory in nature from that date in respect of: Enterprises whose equity or debt securities are listed on a recognized securities market in India and enterprises that are within the process of issuing equity or debt securities that may be listed on a recognized exchange in India as evidenced by the Board of Directors' resolution during this regard. Also, all other commercial industrial and business reporting enterprises, whose turnover for the accounting period exceeds Rs. 50 crores.

CONCEPT

The objective of this Standard is to line up principles for reporting financial information, about the various forms of products and services an enterprise produces and therefore the different locations during which it operates. This Standard should be applied in presenting general purpose plan. The necessities of this

Standard are applicable just in case of consolidated financial statements. An enterprise should adapt with the necessities of this Standard fully and not selectively. If one financial report contains both consolidated financial statements and also the separate financial statements of the parent, segment information need be presented only on the idea of the consolidated financial statements. Within the condition of reporting of segment information in consolidated financial statements, the references during this Standard to any budget items should clear up to be the relevant item as appearing within the consolidated financial statements.

IMPORTANT TERMS USED WITH SEGMENT REPORTING

A **business segment** is a different component of an enterprise that is engaged in providing an individual product or service or a group of related products or services and that is subject to risks and returns that are different from those of other business segments.

A **geographical segment** is a observable component of an enterprise that is engaged in providing products or services within a particular economic environment and that is subject to risks and returns that are different from those of components operating in other economic environments.

A **reportable segment** is a business segment or a geographical segment identified on the basis of foregoing definitions for which segment information is required to be disclosed by this Standard.

Enterprise revenue is revenue from sales to external customers as reported in the statement of profit and loss.

Segment revenue is the aggregate of (i) the portion of enterprise revenue that is directly applicable to a segment, (ii) the relevant portion of enterprise revenue that can be allocated on a reasonable basis to a segment, and (iii) revenue from transactions with other segments of the enterprise.

Segment expense is the aggregate of (i) the expense resulting from the operating activities of a segment that is directly applicable to the segment, and (ii) the relevant portion of enterprise expense that can be allocated on a reasonable basis to the segment

Segment result is segment revenue less segment expense.

Segment assets are those operating assets that are employed by a segment in its operating activities and that either are directly applicable to the segment or can be allocated to the segment on a reasonable basis.

Segment liabilities are those operating liabilities that result from the operating activities of a segment and that either are directly applicable to the segment or can be allocated to the segment on a reasonable basis.

REVIEW OF LITERATURES

Kelly, G. J. (1994) this study provided existential evidence about the structure of proprietary cost and agency cost arising from discretionary segment disclosures and non-disclosures.

Herrmann, D., & Thomas, W. (1996) had indicated in their study that analysis of segment reporting practices of firms in the European Union and to identify factors which potentially influence the quality of disclosure. The results indicate that the quality of segment reporting is significantly affected by country, firm size, and exchange listing.

Tang R.Y.W. & Zha J. (2001) examined the segment reporting practices of 120 fortune 500 companies and reveal what industry and geographic segments were reported, what segment information items were disclosed and what transfer pricing methods were used to account for intersegment sales.

Jack B, Pauland W. James A. Largay (2004) this article examined the management approach to segment reporting from a user point of view that should be of great interest to corporate financial executives and conclude that, despite more segment data being reported, the potential of the new management approach to significantly benefit users is compromised by uneven compliance among reporting companies. The complicity of external auditors in compliance shortcomings should concern all stakeholders in the financial reporting process.

Kwok, W. C. C., & Sharp, D. (2005) this study provided significant experimental data and analysis on the international standard-setting process as conducted by the forerunner of the International Accounting Standards Board (IASB).

Ronald, M. O., Nyangosi, R., & Martin, L. (2011) examined annual report of Indian commercial bank and as well as Kenyan bank and find out there is no difference between the disclosure practices of Indian banks and Kenyan banks though they are adopting different accounting standards.

Kumar, F. J., & Sridharan, G. (2014) examined the both segment information disclosure of the Indian Listed Companies listed in Bombay Stock Exchange and National Stock Exchange among select Industries and the factor that influence their level of segment disclosure.

Altaf N.(2014) in the study analysed such segmental reporting practices of Nifty Fifty companies in view of their impact on stock market performance. This study develops an empirical proxy for the quality of segment reporting from data in corporate annual reports, and provides evidence that financial markets performance.

Souza, J. A., Neto, A. S., Benedicto, G. C., & Mendonça, D. J. (2016) this study aims to identify the factors that influence the level of disclosure of information about operating segments of Brazilian companies.

Roy, G. G., & Das, B. (2019) examined the segment revenue, segment expenses, segment result, and the investment in non-current assets of each segment of NTPC, mainly classified on the basis of business segment and geographical segment.

Gutsche R. & Rif A. (2019) In this paper examined US-sample based evidence that suggests that segment reporting under the “management approach” of ASC 280 (SFAS 131) biases analysts’ earnings per share (EPS) forecasts and show that the error in EPS forecasts corresponds to a profitability “gap” between profitability aggregated from segment reporting and profitability computed from consolidated financial statements.

OBJECTIVES OF THE STUDY

1. To understand the performance of the enterprise
2. To assess the risks and returns of the enterprise
3. To examine whether the companies are disclosing the items required by the segment reporting as per Accounting Standards or not.
4. To make the comparison between the segment reporting procedure of NTPC and TATA Power Ltd.
5. To provide a fruitful suggestions for further betterment

RESEARCH METHODOLOGY

Sources of Data

The present study is totally based on secondary data supported with certain interviews. The secondary data are arranged from the annual reports, magazines, books, and published and unpublished articles.

Scope of the Study

To meet the objectives for this study only annual statements of the NTPC and Tata Power Ltd company have been collected and used for the period of 5 years from 2016–2017 to 2020–2021.

Period of Study

In this study, data have been analysed for a period ranging from the financial year 2016–2017 to 2020–2021.

SEGMENT REPORTING OF NTPC: DATA ANALYSIS

A brief review of the segment reporting of NTPC may be summed up as follows. The information for NTPC are taken and picked up for five years from 2016–2017 to 2019–2021 from the published annual reports of NTPC. The Group has two reportable segments, as described below, which are the Group’s strategic business units. The strategic business units offer different products and services, and are managed separately because they require different technology and marketing strategies. The subsequent summary describes the operations in each of the Group’s reportable segments: Generation of energy: Generation and sale of bulk power to State Power Utilities. Others: It includes providing consultancy, project management & supervision, energy trading, oil and gas exploration and coal mining. Information regarding the results of every reportable segment is included below.

Highlights of the Segment Revenue Information of NTPC for the Year 2016–2017 to 2020–2021

Segment revenue

Financial Year	Generation of energy INR(Cr.)	Other Business INR(Cr.)	Total Revenue INR(Cr.)
2016-2017	77968.75	3313.87	81282.62
2017-2018	81465.15	6637.65	88102.8
2018-2019	92051.75	7563.50	99615.25
2019-2020	101578.45	7503.00	109081.45

2020-2021	95579.68	4884.47	100464.13
Total	448643.78	29902.49	478546.25

Table 1

Highlights of the Segment Expense Information of NTPC for the Year 2016–2017 to 2020–2021.

Segment expenses

Year	Generation of energy INR(Cr.)	Other INR(Cr.)	Total INR (Cr.)
2016-2017	60163.01	3253.27	63416.28
2017-2018	63343.52	6384.728	69728.248
2018-2019	75765.45	7179.66	82855.11
2019-2020	70890.23	6897.61	77787.84
2020-2021	71785.93	4918.81	76704.74
Total	341948.14	28634.078	370492.218

Table 2

Highlights of the Segment Result Information of NTPC for the Year 2016–2017 to 2020–2021

Segment result

Year	Generation of energy INR(Cr.)	Other INR(Cr.)	Total INR(Cr.)
2016-2017	17805.74	60.06	17865.8
2017-2018	18121.63	252.922	18374.552
2018-2019	16286.30	383.84	16670.14
2019-2020	30688.22	605.39	31294.31
2020-2021	23793.73	(34.34)	23759.39
Total	106695.62	1267.872	107964.192

Table 3

Highlights of the Segment Assets Information of NTPC for the Year 2016–2017 to 2020–2021

Segment assets

Year	Generation of energy INR(Cr.)	Other INR(Cr.)	Total INR(Cr.)
2016-2017	132682.79	5001.20	137683.99
2017-2018	159113.41	6715.07	165828.45
2018-2019	193688.62	6587.89	200276.51
2019-2020	249707.52	8496.37	257861.49
2020-2021	296267.42	10653.55	306920.97
Total	1031459.76	37454.08	1068571.32

Table 4

SEGMENT REPORTING OF TATA POWER LTD: DATA ANALYSIS

Tata Power Company Ltd is India's largest private sector power utility with an installed generation capacity of over 2785 MW. The data for Tata Power Ltd have been taken and collected for 5 years from 2016–2017 to 2019–2021 from the published annual reports of Tata Power Ltd. Information reported to the Chief Operating Decision Maker (CODM) for the purpose of resource allocation and assessment of segment performance focuses on business segment which comprises of Generation, Renewable, Transmission & Distribution and Others.

Highlights of the Segment Revenue Information of TATA POWER for the Year 2016–2017 to 2020–2021

Segment revenue

Year	Power INR(Cr.)	Other INR(Cr.)	Total INR(Cr.)
2016-2017	24879.4	3205.88	28085.28
2017-2018	27373.60	3124.54	30498.14
total	52253	6330.42	58583.42

Table 5(a)

Year	Generation	renewable	Transmission and distribution	Other	Total
2018-2019	15645.16	3610.39	14147.28	234.03	33636.86

2019-2020	14532.74	3977.45	14002.70	255.53	32768.42
2020-2021	13432.27	5887.68	16669.66	262.16	36251.77
Total	43610.17	13475.52	44819.64	751.72	102657.05

Table 5(b)

Highlights of the Segment Expense Information of TATA POWER for the Year 2016–2017 to 2020–2021
Segment Expenses

Year	Power INR(Cr.)	Other INR(Cr)	Total INR(Cr)
2016-2017	21721.18	2896.92	24618.1
2017-2018	23726.48	2949.22	26675.7
Total	45447.66	5846.14	51293.8

Table 6 (a)

Year	Generation	Renewable	Transmission and distribution	Other	Total
2018-2019	13158.55	2183.54	12020.27	65.27	27427.63
2019-2020	11767.28	2477.79	12080.56	62.41	26388.04
2020-2021	10722.46	4393.43	14992.64	179	30287.53
Total	35648.29	9054.76	39093.47	309.68	84103.2

Table 6(b)

Highlights of the Segment Result Information of TATA POWER for the Year 2016–2017 to 2020–2021
Segment result

Year	Power INR(Cr.)	Other INR(Cr.)	Total INR(Cr.)
2016-2017	3158.22	308.96	3467.18
2017-2018	3647.12	175.32	3822.44
total	6805.34	484.28	7289.62

Table 7(a)

Year	Generation	Renewable	Transmission and distribution	Other	Total
2018-2019	2486.61	1426.85	2126.99	168.76	6209.21
2019-2020	2765.46	1499.66	1922.14	193.12	6380.38
2020-2021	2709.81	1494.25	1677.02	83.16	5964.24
Total	7961.88	4420.76	5726.15	445.04	18553.83

Table 7(b)

Highlights of the Segment Assets Information of TATA POWER for the Year 2016–2017 to 2020–2021
Segment Assets

Year	Power	Other	Total
2016-2017	62266.42	4116.79	66383.21
2017-2018	62865.9	1811.68	64677.58
total	125132.32	5928.47	131060.79

Table 8(a)

Year	Generation	Renewable	Transmission And Distribution	Other	Total
2018-2019	39842.59	18315.93	17338.05	1001.24	76497.81
2019-2020	40076.13	19533.81	17859.05	1361.59	78830.58
2020-2021	37717.32	22702.98	25554.98	1469.98	85975.28
Total	117636.04	60552.72	60752.08	3832.81	242773.65

Table 8(b)

INTERPRETATION

A brief review of the segment reporting of NTPC and TATA POWER LTD can be summed up as follows:

The segment revenue earned by NTPC has been compared over the period 2016–2017 the total segment revenue earned by NTPC was INR 81282.62 while the total segment revenue earned during the last financial period 2020–2021 was INR 100464.13. From above table 1 it can be concluded that the NTPC segment revenue is increasing in the subsequent years. If we saw the same way for TATA Power segment revenue earned over the

period 2016–2017 was INR 28085.28 while the total segment revenue earned during the last financial period 2020–2021 was INR 36251.77. From above Table 5 (a & b) it can be concluded that the TATA Power segment revenue is increasing in the subsequent years. We can observe that TATA Power segment revenue growth is increased almost 30% in 5 years whereas NTPC revenue growth is just 25%. So it looks that TATA Power have higher revenue growth in last 5 years.

The segment expenses incurred by the NTPC have been compared over the period 2016–2017 was INR 63416.28, while the aggregate segment expenses incurred during the last financial period 2020–2021 was INR 76704.74. From Table 2 it can be concluded that the segment expenses are increasing in the subsequent year. The segment expenses incurred by the TATA POWER have been compared over the period 2016–2017 was INR 24618.10, while the aggregate segment expenses incurred during the period 2020–2021 was INR 30287.53. From Table 6 (a & b) it can be concluded that the segment expenses are increasing in the subsequent year. We can observe that TATA Power & NTPC both segment expenditure have increased to 20% in last 5 years.

During the period 2016–2017 the aggregate segment result of NTPC was INR 17865.8, while the segment result during the period 2020–2021 was INR 23759.39. From Table 3 it can be concluded that the segment result is increasing in the subsequent years. Whereas during the period 2016–2017 the aggregate segment result of TATA POWER was INR 13467.18, while the segment results during the period 2020–2021 were INR 5964.24. From Table 7 (a & b) we can observe that TATA Power result in increased from 2016 to 2020, whereas their result declined for last financial year and the reason for this may be their higher expenditure that covers almost 80% of their revenue. We can observe that NTPC have better segment result than TATA Power as per last financial year data.

Table 4 shows segment assets of NTPC for the period ranging from 2016–2017 to 2020–2021. During 2016–2017 the total segment assets of NTPC were INR 137683.99. The aggregate segment assets during the period 2020–2021 were INR 306920.97. Table 8 (a & b) shows segment assets of TATA POWER for the period ranging from 2016–2017 to 2020–2021. During 2016–2017 the total segment assets of TATA POWER were INR 66383.21. The aggregate segment assets during the period 2020–2021 were INR 85975.28. It can be concluded that the segment result is increasing in the subsequent years for both the companies. We can see that in last 5 years NTPC assets have increased more than 100% whereas TATA Power have just approx. 40% asset growth.

So by observing all segment business accounting of NTPC & TATA Power we can say that NTPC have better clarity and growth w.r.t. TATA Power.

LIMITATION OF THE STUDY

The data are purely secondary and collected after the publication of annual reports. The study analysed only segment revenue, segment expenses, segment result, and segment assets, the data regarding the associated liabilities for each segment is not given; therefore, the segment liabilities are not reconciled with the segment assets.

SCOPE OF FURTHER RESEARCH

There is a scope of further research on the segment reporting where the other financial components like liabilities, depreciation and amortization, noncash expenses, equity, and operating cost of each segment can be compared and analyzed.

FINDINGS AND SUGGESTIONS

The present case study is concentrated on the segment revenue, segment expenses, segment result, and also the investment in non-current assets of every segment of NTPC and TATA Power Ltd, mainly classified on the premise of business segment and geographical segment. It's clearly indicated that segments that have high sales and high net encourage the corporate to take a position more in such profit-making segments as compared to low sales with low income segments.

CONCLUSION

NTPC is improving from year to year in their segment reporting. the corporate has satisfactorily accomplished segment reporting by classifying their business and geographical segments. TATA POWER are following the accounting principle for the aim of segment reporting in its financial plan reporting, and therefore the company has significantly used the segment reporting information for taking their various investment judgments. The researcher has taken an approach to handle the problem of how information is disclosed segment-wise within the annual reports published by the businesses by considering the factors mandated by The

Institute of Chartered Accountants of India specifically on the disclosure level of Primary and Secondary Information disclosure.

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Formulation and Evaluation of 6-Mercaptopurine Loaded Lipid-Polymer Hybrid Nanocarrier

Dande Pradnyarani A, Nagoba Shivappa N*, Swami Avinash B, Sayyad Firdos J, Waghmare Kanchan R, Sayyed Simakousar N and Jaishatte Arti A

Department of Pharmaceutics, Channabasweshwar Pharmacy College (Degree), Latur, Maharashtra, India

ABSTRACT

The purpose of the present study is to formulate and evaluate 6-mercaptopurine loaded Lipid-Polymer Hybrid Nanocarrier (LPHNC) for site specific drug delivery. 6-mercaptopurine is a purine antagonist it inhibits DNA synthesis by inhibiting purine containing nucleotides. Firstly, 4 batches of LPHNCs were prepared by employing single step emulsion solvent evaporation method consisted of drug, polycaprolactone (PCL), Hydrogenated soya phosphatidylcholine (HSPC), soya lecithin, Poloxamer 188, organic solvent. All batches evaluated for %EE, drug content, in-vitro drug release and on the basis of this F2 batch was found to be optimized batch. The optimized batch was also subjected for SEM, Zeta potential and accelerated stability study.

Keywords: 6-Mercaptopurine, LPHNCs, HSPC, in-vitro drug release, accelerated stability study

1. INTRODUCTION

The use of cytotoxic drugs in their free form to inhibit cell division of cancer cells or to kill cancer cells i.e. chemotherapy still remains the choice of treatment in cancer. Although the anticancer agents have improved patient survival rate, their treatments are not effective enough due to non-specific toxicity, unfavorable pharmacokinetics, less bioavailability, dose dependent side effects etc. Due to these threats, nanocarriers have been attempted for cancer therapy as quite encouraging systems. In last decades, nanotechnology has emerged as most promising tool in the pharmaceutical field for development of novel drug carrier system providing versatile clinical application and scale-up for industrial production. Lipid and polymer nanocarriers are two different drug delivery systems which have been approved by US FDA for clinical use.

Lipid nanocarriers are biocompatible, biodegradable, harmless or less toxic and non-immunogenic. However, Lipid nanocarrier have some drawbacks like physical and chemical instability during storage and content leakage. The polymer nanocarriers provides stability in biological fluids and during storage, ability to offer some limitations like polymer cytotoxicity, less biocompatibility. Recently, Lipid and polymer based nanocarriers have been merged together to integrate the benefits and to overcome the possible drawbacks of both of them and developed a newer system namely Lipid-Polymer Hybrid Nanocarrier (LPHNCs).LPHNCs has overcome the drawbacks like content leakage, toxicity and provide benefits like controlled drug release, stability during storage, increased circulation time and bioavailability. 6-mercaptopurine is a purine antagonist it interfere with DNA of cancerous cell and stops the cell division at S phase, it is used in treatment of Leukemia. But it's poor aqueous solubility and permeability limits the clinical application of 6-mercaptopurine. This problem might be overcome by use of LPHNC.

MATERIALS AND METHODS

A. Materials

6-Mercaptopurine was purchased from HiMedia Laboratories Pvt. Ltd., Thane, Hydrogenated Soya Phosphatidylcholine(HSPC), soya lecithin was gifted by lipidome Lifesciences, Gujrat, Polycaprolactone received from Biochemika, other reagents used were analytical grade.

B. Methods

1. Preformulation:

Physical appearance of drug

6-mercaptopurine was observed for colour, odour, nature etc.

Solubility study

The solubility of drug was determined by adding an excess amount of drug to test tube containing 2ml of solvents (water, warm ethanol, PBS 6.8) and kept at room temperature for 24hrs.

Estimation of 6-mercaptopurine by UV spectroscopy method

For stock solution, 10 mg quantity of 6-Mercaptopurine was dissolved in warm ethanol and volume made up to 100ml with PBS 6.8 in 100 ml volumetric flask to obtain 100µg/ml solution. From this, aliquots of 0.2, 0.4, 0.6,

0.8, 1.2 ml pipetted out and diluted up to 10 ml with PBS 6.8, to get the 2, 4, 6, 8, 10, & 12µg/ml working solution and absorbance of each solution was measured on UV spectrophotometer at 325nm.

Fourier Transform Infra-red Spectroscopy (FTIR)

The FTIR study was carried out on drug, excipients to find out the compatibility in between drug-excipients, over the range 4000-400 cm⁻¹ on Perkin Elmer FTIR spectrometer.

2. Formulation of 6-mercaptopurine loaded lipid polymer hybrid nanocarrier

Formulation of LPHNC was carried out by single step Emulsification solvent evaporation method. Briefly, phospholipid (HSPC), soya lecithin, Polycaprolactone with 1:2 ratio were taken as shown in table 1. Firstly, PCL and 6-mercaptopurine were dissolved in 4ml DCM and 1ml warm ethanol respectively. Then these two organic phases mixed together and to this lipid was added. This organic phase is added dropwise to the aqueous solution containing (1%) poloxamer 188 with continuous high speed stirring at room temperature for 3hr. After 3hr stirring the dispersion kept in deep freezer for self assembly.

Table 1: Formulation of LPHNCs

Ingredients	Formulation batches			
	F1	F2	F3	F4
Drug (mg)	5	5	5	5
PCL (mg)	20	25	20	25
HSPC (mg)	40	50	-	-
Soya lecithin (mg)	-	-	40	50
Poloxamer 188 (%)	1	1	1	1
Ethanol (ml)	1	1	1	1
DCM (ml)	4	4	4	4
Distilled water (ml)	10	10	10	10

3. EVALUATION

Physical appearance of LPHNCs

Formulations was observed for physical appearance.

%Entrapment Efficiency

The percentage entrapment efficiency of formulated LPHNCs were determined by measuring the concentration of untrapped drug in the supernatant when it exposed to high speed centrifugation. The prepared LPHNCs were subjected to ultracentrifugation (Refrigerated Centrifuge, Dolphin instrument) at 14000 rpm at 4°C for 1hr. The clear supernatant was collected and the amount of untrapped drug in the supernatant was estimated by Shimadzu UV 1800 spectrophotometer at 325nm. %EE was calculated by following formula,

$$\%EE = \frac{(\text{total drug} - \text{untrapped drug})}{\text{total drug}} \times 100$$

Drug Content

LPHNCs subjected to ultracentrifugation at 14000rpm at 4°C solid content separated approx.50 mg LPHNC were dissolved in 5 ml of warm ethanol by shaking manually for 2min, diluted with PBS 6.8 up to 10ml and then absorbance was recorded by using UV spectrophotometer. Drug content was calculated by using equation of standard calibration curve,

$$\text{Drug content} = \frac{\text{sample absorbance}}{\text{standard absorbance}} \times 100$$

In-Vitro Drug Release Study

The in-vitro drug release study has performed by using dialysis membrane. For this study, dialysis membrane soaked overnight in PBS 6.8.5ml of nanocarrier formulation containing known amount of drug was placed in a dialysis membrane tied to diffusion tube. Sample containing membrane tube was placed in a beaker of 100ml containing PBS 6.8 maintained at 37°C and stirred with the help of a magnetic stirrer at 1500rpm.5ml samples from PBS 6.8 (receptor compartment) were withdrawn at different time intervals and replaced with same amount of fresh PBS 6.8 so as to maintain sink condition. The samples withdrawn were filtered and analyzed at 325 nm on UV.

SEM, Zeta Potential

Optimized formulation was subjected to Scanning Electron Microscopy (SEM) for morphological assessment. Zeta potential was determined for stability study.

Stability Study

Stability studies were performed to investigate stability of formulation. As per ICH guidelines LPHNCs were subjected to accelerated stability study at 4°C/60±5% RH, room temperature and 40°C/60±5%RH for a period of 3 months.

4. RESULT AND DISCUSSION

Drug characterization

6-mercaptopurine is yellow, odorless, crystalline powder. Melting point of 6-mercaptopurine was found to be 312-313°C. It is freely soluble in warm ethanol, soluble in PBS 6.8, insoluble in water.

Standard Calibration Curve of 6-mercaptopurine

The working solutions of 2-12µg/ml was scanned using UV spectrophotometer from 200-400nm range and the spectrum was recorded at 325nm. The slope equation $y=0.0559x+0.2491$ with R^2 value 0.997 obtained by plotting absorbance against concentration (µg/ml).

Table 2: Absorbance value of 6-MP

Concentration (µg/ml)	Absorbance
2	0.360
4	0.482
6	0.586
8	0.683
10	0.795
12	0.935

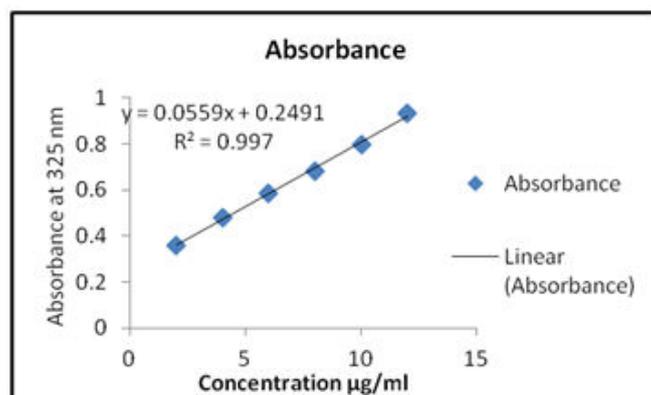


Fig.No.1: Calibration curve of 6-MP

Drug-Excipient Compatibility study

The frequencies of 6-mercaptopurine were compared with standard frequencies of 6-mercaptopurine were within reported range indicate that obtained sample was pure. The FTIR of physical mixture of drug with excipients shown that there was no significant change in peak were occurred which indicate that absence of any interaction between excipients and drug.

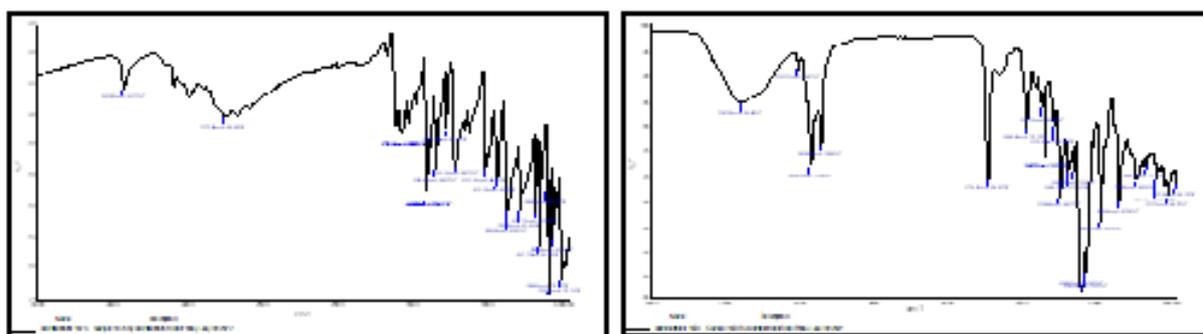


Fig. No. 2 A) FTIR of Pure drug & B) FTIR of Drug+Excipients

Table 3: Interpretation of FTIR Spectra

Functional group	Standard peak cm^{-1}	Observed peak of drug cm^{-1}	Observed peak drug+excipients cm^{-1}
N-H	3500-3350	3425.90	3392.29
S-H	2600-2550	2752.84	2854.89
C-N	1342-1266	1274.08	1342.37
C-H	2800-2700	2752.84	2924.03
C-C	1600-1686	1571.42	1466.41
C=C	1680-1710	1343.40	1360.31
C=O	1725-1705	—	1724.74

Physical Appearance, Entrapment, Efficiency, Drug content

F1, F2 batches were appeared as milky white dispersion while F3, F4 were slight yellowish dispersion. %EE and drug content of F2 batch was found highest among all batches as shown in table 4.

Table 4: Physical appearance, %EE,% Drug content

Formulation batches	Physical Appearance	% EE	%Drug content
F1	Milky white dispersion	79.23	84.03
F2	Milky white dispersion	86.97	90.14
F3	Slight yellowish dispersion	80.02	84.86
F4	Slight yellowish dispersion	73.98	77.45

In-Vitro Drug Release Study

In-Vitro drug release studied by using dialysis membrane in PBS 6.8 at 37°C upto 12 hrs. % Cumulative drug release of batches F1 to F4 obtained as shown in table 5. From all batches F2 batch shown highest % cumulative drug release hence considered as optimized batch.

Table 5: % Cumulative drug release

Time(hr)	%Cumulative drug release			
	F1	F2	F3	F4
0	0	0	0	0
1	14.3	14.19	17.42	15.42
2	25.31	26.52	27.16	25.16
3	30.65	32.26	35.45	35.53
4	36.88	39.88	39.49	42.26
5	42.56	45.31	43.29	47.88
6	48.34	51.40	48.44	52.13
7	54.72	57.13	54.07	57.40
8	60.32	63.36	58.23	62.00
9	66.89	69.04	62.83	68.11
10	72.86	75.11	70.05	72.04
11	78.73	81.1	77.47	77.21
12	85.01	87.52	84.52	81.09

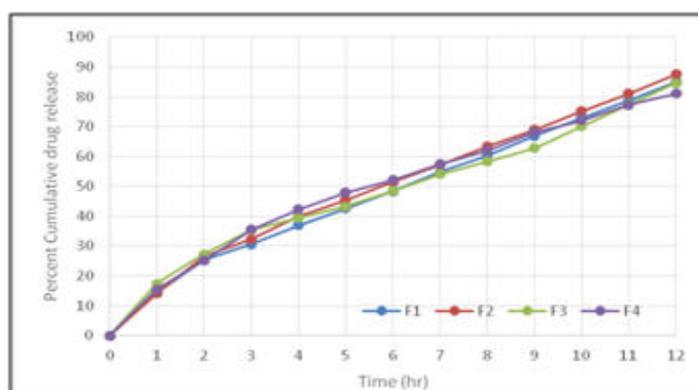


Fig. No. 3: % cumulative drug release

Scanning Electron Microscopy, Zeta Potential

SEM was performed to confirm the formation of LPHNC. SEM images of optimized batch F2 showed that formulated nanocarrier was spherical in shape with smooth surface. SEM images also indicated the particle size i.e. 2µm as shown in Fig. no. 4. Zeta potential found to be -26.1mv which indicate stable formulation.

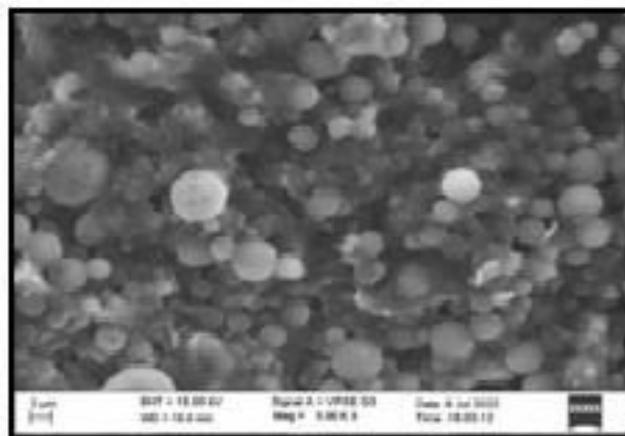


Fig.No.4: SEM image

Stability Study

Stability study have been performed on 6-mercaptopurine loaded LPHNC optimized F2 batch for 90 days at different temperature conditions and formulation evaluated for physical appearance, drug entrapment efficiency and in-vitro drug release as a function of storage condition. From the study, observed that LPHNC stored at 4°C/60±5%RH were found to be stable for duration of 90 days as compared to room temperature and accelerated temperature. The results shown in table 6,7 and fig.no.5

Table 6: Stability study on optimized formulation

Sr. No.	No. of days	Physical appearance	% Drug EE		
			At 4°C	R.T.	At 40°C
	Initial	Milky white dispersion	86.97	86.97	86.97
1	15		86.97	86.90	86.81
2	30		86.85	86.56	85.79
3	45		86.30	85.72	84.38
4	60		86.02	84.89	84.02
5	75		85.89	84.70	83.24
6	90		85.70	83.50	82.53

Table 7: In-vitro release after stability

Time(hr)	% Cumulative Drug Release	
	Initial	Final
0	0	0
1	14.19	14.68
2	26.52	25.70
3	32.26	30.25
4	39.88	38.67
5	45.31	43.53
6	51.40	50.14
7	57.13	55.72
8	63.36	62.49
9	69.04	68.12
10	75.11	75.04
11	81.10	80.00
12	87.52	86.21

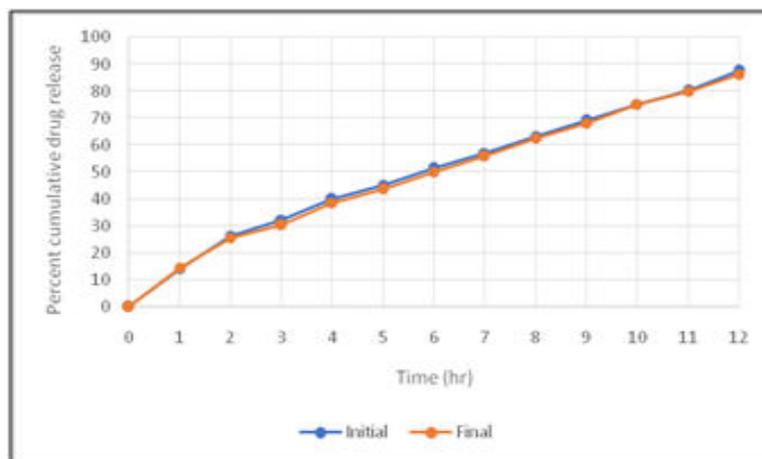


Fig.no.5: % cumulative drug release after stability

CONCLUSION

The LPHNCs containing 6-MP with poor bioavailability were successfully formulated and evaluated for various physicochemical and in-vitro characterization. Among 4 batches F2 batch was optimized one with 86.97% drug entrapment efficiency, 90.14% drug content, 87.52% cumulative drug release, 2 μ m in size, -26.1mv zeta potential. From the stability study, the optimized F2 batch was found to be stable at 4°C/60 \pm 5%RH. Since, LPHNC require less drug, it's side effects also minimized. But it's efficacy can not be predicted hence clinical studies are needed to understand therapeutic action.

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Formulation and Evaluation of Fluconazole Ocular Insert

Kazi Wasim B¹, Khadkutkar Vijayananda K^{2*}, Nagoba Shivappa N³, Kombade Rohit R⁴,
Choure Rupesh R⁵, Zunjare Prashant G⁶ and Sanjay S. Dudhamal⁷

^{1,2,3,4,5,6}Department of Pharmaceutics, Channabasweshwar Pharmacy College (Degree), Latur, Maharashtra,
India

⁷Maharashtra Pharmacy Diploma Institute, Nilanga, Latur 413512, Maharashtra, India

ABSTRACT

The bioavailability of Fluconazole to the ophthalmic epithelium is very low when the drug is administered in the form of an ophthalmic eye drop due to rapid precorneal elimination of the drug. In order to increase the ocular bioavailability Fluconazole ocular insert have been developed. The ocular inserts maintain an effective drug concentration in the target tissues. In the present study an attempt has been made to formulate Ocular insert of Fluconazole with aim of increasing the contact time, achieving proper medication release, reduction in frequency of administration, improving patient compliance and greater therapeutic efficacy. Fluconazole ocular inserts were prepared by using Poly vinyl alcohol and Carboxy methyl cellulose film forming polymers and Propylene glycol as plasticizer. Total Eight formulations were prepared by a solvent casting method and characterized thickness, weight variation, drug content, Moisture content, folding endurance, surface pH, In vitro drug release. The in vitro release of drug from ocular insert was studied using an apparatus similar to that of the diffusion cell and cellphone membrane was used as semi permeable membrane. Formulation F7 shows a maximum cumulative percentage drug release of 85.25% at the end of 4 hours. It was also concluded that Carboxy methyl cellulose and poly vinyl alcohol are good film forming agents and in the presence of plasticizer Propylene glycol. They are promising for achieving better bioavailability to ocular delivery systems for Fluconazole. Stability studies conducted for F7 formulation. The formulation showed satisfactory physical stability at 25 °C and 40°C at 60% and 75% RH respectively. The physical appearance had not changed considerably.

Keywords: Fluconazole ocular insert, Ocular bioavailability, Solvent casting method, In vitro diffusion study, Stability study.

INTRODUCTION ^{1,2,3,4}

The eye is a unique organ with a complex structure and is highly resistant to foreign substances including drugs. Ocular drug delivery is one of the most challenging tasks faced by pharmaceutical scientists. The intraocular bioavailability of the drug through conventional dosage forms like eye drops is very poor because it is topically applied to the anterior portion of the eye and most of the applied dose is lost due to the defensive mechanism of the eye.

Ophthalmic inserts are defined as sterile preparations, with a thin, multilayered, drug impregnated, solid, or semisolid consistency devices placed into a cul-de-sac or conjunctival sac and whose size and shape are especially designed for ophthalmic application.

In Ocular inserts the films are directly applied in the cul-de-sac, improving ocular bioavailability by increasing the duration of contact within the corneal tissue, thereby reducing the frequency of administration.

Fluconazole is a triazole antifungal drug used in treatment of fungal infection where other antifungals have failed or are not tolerated (e.g., due to adverse effects), including candidiasis Tinea corporis, Tinea cruris or tinea pedis, Onychomycosis and Cryptococcal meningitis.

The number of fungal infections has increased dramatically, and those involving the eye pose a serious problem. Fungal eye infections leave over half a million people blinded each year. Infection of the transparent cornea of the eye can be devastating, specially it is caused by a fungus which is Fungal keratitis is one of the most devastating fungal eye infections.

Fungal keratitis is a sight threatening ocular infection that most frequently occur as an infection of candida species. Most fungal keratitis cases are diagnosed too late to save vision, and overall about 100000 eyes have to be removed as a result. In contrast early diagnosis usually saves both vision and the eye, although a high level of expertise, antifungal therapy and often surgery is required. Antifungal drugs are used in the treatment of fungal keratitis basically means of inflammation of the cornea.

The ocular therapy in the fungal infection can be greatly improved by prolonging the precorneal residence time of drug with improved bioavailability of the drug and For achieving this purpose successful results have been obtained with inserts and collagen shields. Several polymeric systems are investigated to fabricate ocular inserts for better ocular bioavailability and retention of drugs.

The present work describes the Formulation and evaluation of an ophthalmic delivery system of an antifungal agent, Fluconazole along with hydrophilic polymers at different concentrations based on concept of ocular insert with better solubility and longer duration of action delivering the drug in zero order kinetics.

MATERIALS AND METHODS

Fluconazole is received as gift sample from Yarrow chem products, Mumbai. Polyvinyl alcohol from Research lab fine Industries, Mumbai. Carboxy methyl cellulose from Ozone International Mumbai, Propylene Glycol from Himedia laboratories.

METHOD OF PREPARATION^{6,7,8}

Solvent Casting Method:

Fluconazole Ocular Insert were prepared by using solvent casting method with Polyvinyl alcohol and Carboxy Methyl cellulose as a polymer in various concentrations (2%,3%,4%,5%) and propylene Glycol (15%) as a plasticizer.

Firstly, Accurate amount of Polyvinyl Alcohol were added in distilled water and stirred slowly with magnetic stirrer until it properly dissolved. Then in the above solution required quantity of propylene glycol and Fluconazole was added to polymeric solution and stirred at 100rpm using magnetic stirrer. After complete mixing the above solution is sonicated for 20 minutes to get clear solution. The solution is poured into clean petri dish by placing them on flat surface then the cast solution is allowed to stand for 24 hours in hot air oven at 37°C temperature. After drying the medicated films are cut into proper size and shape using a cork borer and the separated ocular insert are Stored in an airtight container. Similar Procedure was carried out for preparation of Carboxy methyl cellulose films.



Figure 1. Formulated Ocular Inserts

Table no 1: Composition of fluconazole ocular Films

Contents	Formulation Code							
	F1	F2	F3	F4	F5	F6	F7	F8
PVA (mg)	300	450	600	750				
CMC (mg)					300	450	600	750
PG (ml)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
WATER (ml)	q.s	q.s	q.s	q.s	q.s	q.s	q.s	q.s
DRUG (mg)	76	76	76	76	76	76	76	76

EVALUATION OF FORMULATIONS^{8,9,10,11,12}

The prepared inserts were evaluated for various parameters are as follows:

1. Clarity:

The Formulations were visually checked for the clarity.

2. Uniformity of weight:

All the prepared films were weighed separately on a digital balance. Then the average weight of the film is calculated from the mean value.

3. Thickness:

The thickness of each film is measured using a Vernier caliper for making accurate measurements and the average thickness of all the films is calculated.

4. Percentage moisture absorption:

For calculating percentage moisture absorption, the inserts are weighed and placed in desiccators containing 100ml of a saturated solution of aluminum chloride. Ocular inserts are reweighed after three days.

The formula for calculating percentage moisture absorption is:

$$= \frac{\text{Final weight} - \text{Initial weight}}{\text{Initial weight}} \times 100.$$

5. Drug content uniformity:

A small amount of inserts is cut and dipped in 5 ml phosphate buffer pH 7.4. Then it is taken in a centrifuge tube and centrifuged for 15 min. then is analyzed in UV spectrometry and the concentration of a drug is calculated using a standard plot.

6. Surface pH:

For the determination of surface pH, the ocular insert was allowed to swell in the Petri dish at room temperature for 30 min in distilled water. pH was noted by bringing the glass electrode near the surface of the formulation and allowing it to equilibrate for one minute.

7. Folding endurance:

The film is started to fold from one side and again folded several times until the tearing of the film is to be done. The number of folds that are occurred in the film is its folding endurance till its breakage. The folding endurance of all the films is measured.

8. IN Vitro diffusion studies:

In vitro release of drug from Ocular insert was studied using an apparatus similar to that of the diffusion cell. The drug preparation was kept in a glass tube having a diameter of 3cms and both sides open. The open end was tied with semipermeable membrane and then preparation was inserted into it. The tube was tied to a stand and fixed to such a level so that the surface of membrane touches the brim of dissolution medium in beaker (receptor compartment). The dissolution medium (50ml) used was phosphate buffer of pH 7.4. The medium in the receptor compartment was agitated using a magnetic stirrer at 50rpm \pm 4% maintaining a temperature at 37°C \pm 10. After specified intervals of time 5ml of the sample was taken and replaced with fresh dissolution medium. Then after suitable dilution the absorbance of the sample was taken against blank at 260 nm in UV visible spectrophotometer.

9. Stability:

Stability study was carried out for optimized batch formulation at 40°C temperature in a humidity chamber having 75 % RH for 3 months. After 3 months samples were withdrawn and evaluated for physicochemical properties and analyzed for their drug content.

RESULT AND DISCUSSION

1. Drug Characterization

A. Organoleptic properties: Drug was observed for organoleptic characteristics such as color, odour, and nature; it complies specifications of IP tabulated in Table no.

Table No 2: Organoleptic Characteristics

Properties	Specifications as per IP 1996	Result
Color	white	White
Odor	odorless	Odorless
Nature	amorphous	Amorphous

B. Determination of melting point:

Melting point of Fluconazole was found to be 138°C using a melting point apparatus.

C. Solubility:

The solubility of clotrimazole is found to be as per following table:

Table No 3: Solubility study

Sr. No	Solvent System	Result
1	Ethanol	Freely soluble
2	Methanol	Freely soluble

3	Water	Slightly soluble
4	Chloroform	Insoluble
5	Ether	Insoluble

D. Identification of Drug by UV Spectroscopy:

The UV spectrum of Fluconazole in phosphate buffer solution pH 7.4 in the range of 200-400nm. The spectrum indicates that the observed lambda max of Fluconazole was 261 which is match with lambda max given in Indian pharmacopoeia

Standard Calibration Curve of Fluconazole:

Fluconazole shows maximum absorption at wavelength 261 nm in phosphate buffer solution of pH 7.4, standard curve was plotted by taking absorption of diluted stock solutions (0.2, 0.4, 0.6, 0.8, and 1.0) µg/ml at wavelength 260 nm. The calibration curve of clotrimazole is given below

Table No 4: Calibration curve data of Fluconazole in Methanol

Concentration (µg/ml)	Absorbance
2	0.198
4	0.407
6	0.644
8	0.902
10	1.088

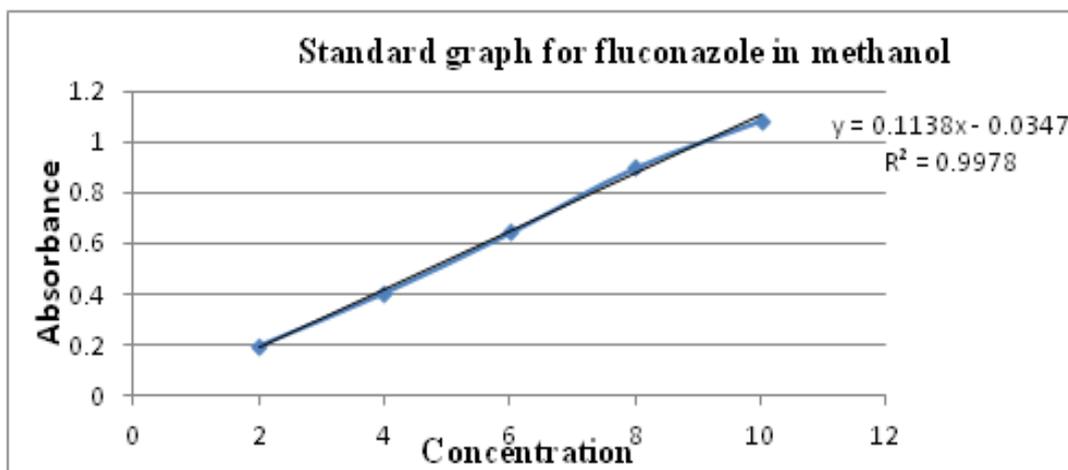


Fig 2: Calibration curve of Fluconazole

2. Identification of Drug by FTIR:

FT-IR spectra were recorded in the region of 400–4,000 cm⁻¹. Assign the major absorption bands to change in absorption bands indicates incompatibility between drug & excipients. Infra- red spectrum of Fluconazole shown in fig 3.

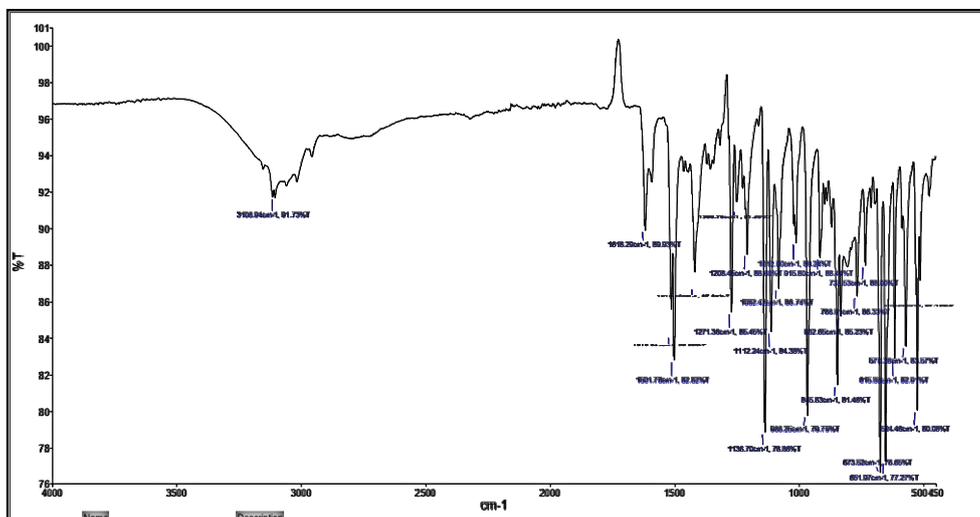


Fig.3: FTIR of Fluconazole

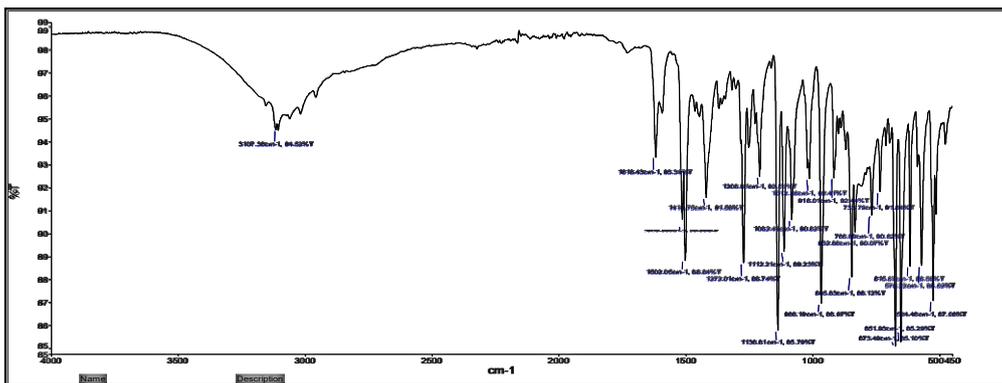


Fig 4: FTIR of Mixture 1 (Drug+ PVA)

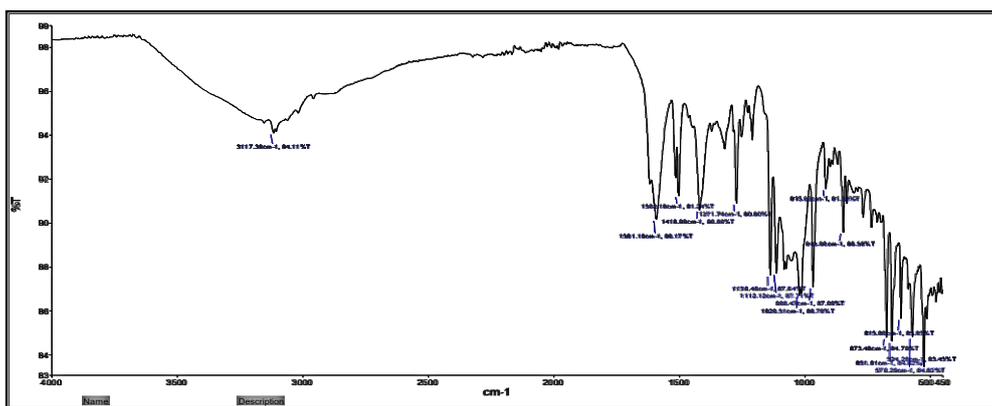


Fig 5: FTIR of Mixture 2 (Drug+ CMC)

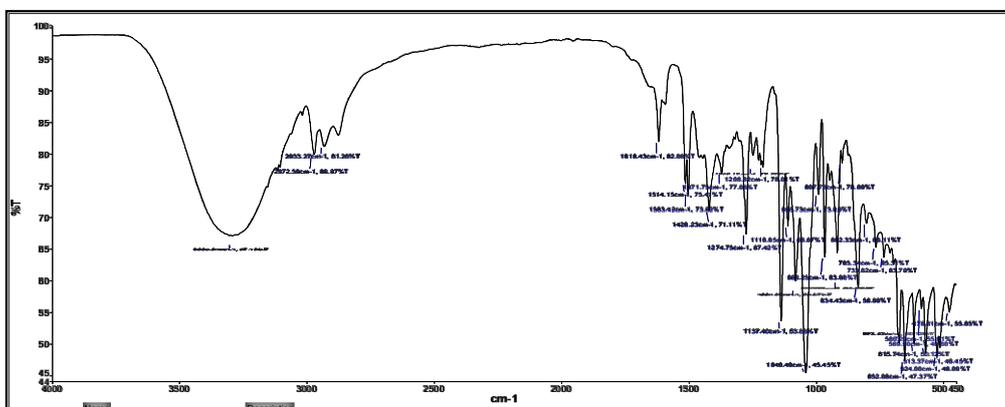


Fig 6: FTIR of Mixture 2 (Drug+ PG)

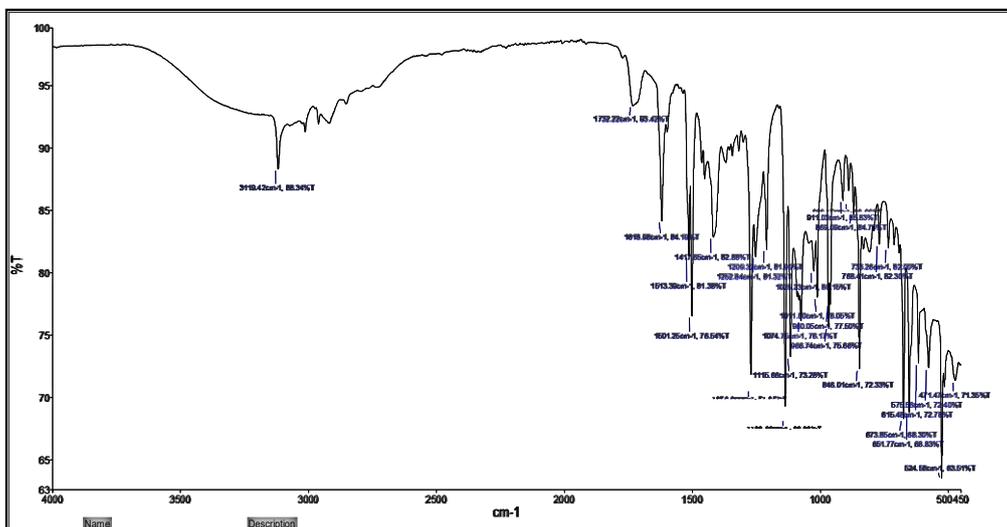


Fig 7: FTIR of formulation (Medicated Ocular inserts)

3. Physicochemical evaluation Of Ophthalmic Inserts:

Table 5: Physicochemical parameter of prepared Inserts

Sr. No	Batch Code	Thickness (mm)	Weight in (mg)	Surface pH	Folding Endurance	Drug Content (mg)	Moisture Content (%)
1	F1	0.31±0.01	5.62±0.3	6.8±0.11	40±2	84.68±0.5	1.8±0.9
2	F2	0.34±0.05	5.81±0.12	7.2±0.18	41±3	81.16±0.7	1.7±0.4
3	F3	0.36±0.04	6.25±0.7	6.8±0.07	43±5	86.24±0.4	1.9±0.6
4	F4	0.38±0.09	6.12±0.5	7.0±0.15	45±3	82.42±0.6	2.1±0.2
5	F5	0.30±0.07	5.12±0.6	6.9±0.11	42±2	80.12±0.6	2.1±0.8
6	F6	0.33±0.02	5.37±0.8	7.2±0.13	41±2	85.32±0.3	2.0±0.5
7	F7	0.35±0.03	5.52±0.04	6.8±0.07	46±3	88.51±0.4	2.5±0.6
8	F8	0.37±0.09	5.87±0.5	6.7±0.09	43±4	83.65±0.3	2.2±0.4

4. IN- Vitro drug release:¹⁰

In vitro drug diffusion studies were carried out for all formulation using Phosphate buffer 7.4 as the dissolution medium. The Formulation F7 shows 85.25% drug release at the end of 4 hours. The data of these studies are presented in table no 6.



Figure No 8: Assembly of in vitro drug diffusion of ocular insert

Table no 6: In vitro drug diffusion profile of Fluconazole Ocular Insert formulations F1-F8

Sr. No	Time (min)	% Drug release							
		F1	F2	F3	F4	F5	F6	F7	F8
1	0	0	0	0	0	0	0	0	0
2	30	11.634	12.44	13.225	13.728	14.05	16.834	14.291	14.211
3	60	18.923	20.410	24.041	23.882	21.41	19.302	24.046	22.965
4	90	34.405	32.170	30.442	30.756	31.440	28.144	33.586	30.483
5	120	45.449	43.96	39.877	39.558	42.140	40.11	44.711	38.65
6	150	55.182	53.13	54.09	52.683	54.06	51.311	56.058	51.057
7	180	64.283	65.81	64.22	66.712	59.00	63.203	67.158	62.39
8	210	67.594	71.594	70.1	74.817	68.86	71.02	74.98	71.313
9	240	77.916	80.916	79.016	82.41	78.23	81.427	85.258	82.903

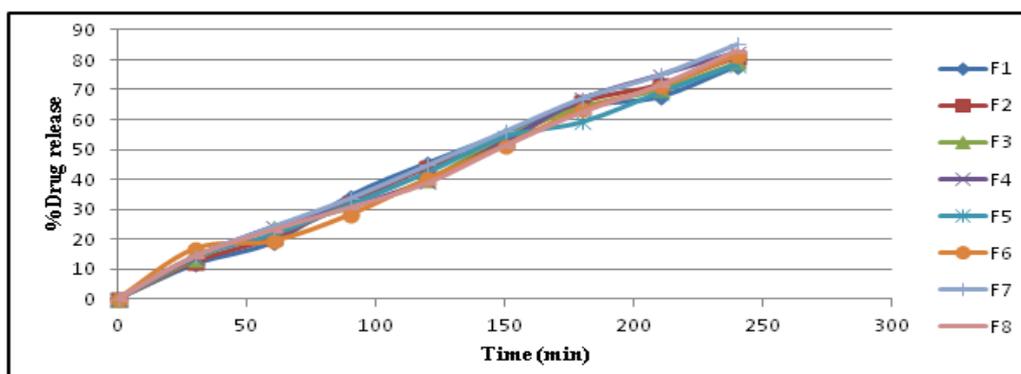


Fig 9: In vitro drug release study profile of different formulation (F1-F8)

5. STABILITY STUDIES:¹²

The selected formulation was tested for twelve weeks at storage condition of 25 °C and 40 °C at 60% and it was analysed for their drug content. The results are shown in Table no. the residual drug content of selected formulation were found to be within the permissible limits. The formulation showed satisfactory physical stability at 25°C and 40 °C. at 60% and 75% RH respectively. The physical appearance had not changed considerably.

Table 7: Stability study for F7 Formulation

Time in Weeks	Stability Study for F7			
	Stored At 25°C /60% RH		Stored At 40° C/ 75% RH	
	Physical Appearance	% Drug Content	Physical Appearance	% Drug Content
0	Positive	88.51	Positive	88.51
4	Positive	86.14	Positive	84.12
8	Positive	87.78	Positive	85.48
12	positive	85.20	positive	83.28

CONCLUSION

Fluconazole was successfully formulated as ocular insert using Poly vinyl alcohol and carboxy methyl cellulose as a viscosity enhancing agent. Ocular Insert produced the prolonged drug release and decreases the nasolacrimal drainage. The present study was to improve the precorneal residence time and achieve better bioavailability. The formulation also promises to reduce the frequency of drug administration, thus improving patient compliance. Physicochemical characterization and in vitro drug diffusion studies indicated that the developed F-7 was found to be best formulation Containing 4% CMC and 2.5% PG as a Plasticizer may prove to be a viable alternative to conventional eye drops in terms of ease of administration with added benefits of sustained drug release which may ultimately result into improved patient compliance.

As the concept involved is novel and the methodology used for the preparation is simple as that of conventional ophthalmic liquid dosage form, it is industrially oriented and economical. Finally, the experimental findings concluded that CMC is a good film forming hydrophilic polymer and Incorporation of PG enhances the permeability and thus therapeutic levels of the could be achieved also that Ocular insert is alternative to conventional eye drops.

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Formulation and Evaluation of Green Tea Extract Niosomal Gel for Acne Vulgaris

Mundhe Renuka M¹, Nagoba Shivappa N^{2*}, Vattamwar Gauri S³, Waghmare Kanchan R⁴, Awale Sumit R⁵, Jadhav Pawan P⁶, Kalburge Mayuri V⁷, Bhosale Sujata B⁸ and Shaikh Saif S⁹

^{1,2,3,4,5,6}Department of Pharmaceutics, Channabasweshwar Pharmacy College, Latur, Maharashtra, India

^{7,8}Department of Pharmaceutical Quality Assurance, Channabasweshwar Pharmacy College, Latur, Maharashtra, India

⁹Department of Pharmaceutics, Y. B. Chavan College of Pharmacy, Aurangabad, Maharashtra, India

ABSTRACT

The present study was to formulate and evaluate the green tea extract loaded niosomal gel using different grades of surfactants such as span and tween for the preparation of niosomes. The main objective of the study was to enhance the antioxidant activity of the formulation. The green tea extract contains polyphenolic compounds such as catechins (30% to 40%) which shows three different activities such as antioxidant, anti-inflammatory and antibacterial activity which are beneficial for the treatment and management of different grades of acne and reduction of lesion count. The standardization of green tea extract sample was done using TLC plate method. Niosomes were prepared by Thin-layer hydration method. Niosomes are prepared with different ratios of drug: cholesterol: surfactant (1:1:2, 1:1:3). The all niosomal dispersion was evaluated for entrapment efficiency, drug content, in-vitro drug release. F6 batch is considered as optimized with in-vitro drug release (71.95 for 12 hr), entrapment efficiency (81.31), drug content (89.74) which is converted to gel. Optimized batch were also evaluated for surface morphology and charge behaviour of done Scanning electron microscopy (SEM), Zeta-potential. Niosomal gel was evaluated for spreadability, viscosity, drug content, Niosomal gel was prepared using Carbopol 934 (0.5%), HPMCK15 (0.5%), propylene glycol, triethanolamine, glycerol and distilled water. The niosomal gel was also evaluated for its antioxidant activity with the help of DPPH test used ascorbic acid as positive control, the niosomal gel showed 51.01% DPPH radical scavenging activity. Optimized batch were subjected for stability study.

Keywords: Niosome, Green tea extract, TLC, Span, Tween, SEM, Zeta-potential, DPPH.

1. INTRODUCTION

Drug delivery system DDS is a new advanced system of drug delivery now a days. It consists of Nano particles liquid crystal vesicles which are biocompatible and produces higher efficiency by helping reduction in development of new drugs. DDS also helps to reduce the problems associated with the drugs. Niosomes are vesicles formed by self-assembly of non-ionic surfactant, they are vesicular delivery systems which are formed via aqueous dispersion of non-ionic surfactant films. The basic process of preparation is the same i.e. hydration by aqueous phase of the lipid phase which may be either a pure surfactant or a mixture of surfactant with cholesterol. Reducing the size of drug carriers to a nanoscale has many benefits including: (1) improving the pharmacokinetics and biodistribution of therapeutic agents, (2) reducing toxicity by accumulation of the drug in the target site, (3) facilitating drug passage between the cells and (4) increasing their retention time in biological systems that increase the efficacy of the drug.

Niosomes are preferred over other bilayer structures due to chemical stability. Bio-degradability, biocompatibility. Low production cost, low toxicity, and easy storage and handling. Acne vulgaris in patients may start during adolescence and persist or have onset in adulthood. Acne has various psychosocial effects that impact patients is quality of life. Plant extracts have been widely used as topical applications for various skin conditions, the EGCG is a potent antioxidant found in green tea extract (camellia sinensis). EGCG received increased attention because of its anti-inflammatory, anti-microbial properties which are beneficial for the treatment of acne vulgaris but due to its hydrophilic nature it has low skin permeation. To overcome this problem the use of nanocarriers such as niosomes one of the best option as it has vesicular system which helps to transfer the hydrophilic as well as lipophilic moieties across the skin membranes. It also increases the retention time of active substances on the stratum corneum and epidermis solving the problem of penetration of active substance. It also increases the retention time of active substances on the stratum corneum and epidermis solving the problem of penetration of active substance. These may act depot to controlled release of drug to give effective action for longer duration because of which the frequency of application may reduce.

2. MATERIALS

Green tea extract was gift sample from SA Herbal Bioactives LLD, M.P. Cholesterol was obtained from Research lab & Chem. Industries Mumbai. Span and tween from Lobachem, Mumbai. Dichloromethane,

Carbopol 934, Triethanolamine from Molychem, Mumbai. HPMC K15 from Meherchem, Mumbai. Polyethylene glycol and glycerol was obtained from Lobachem, Mumbai.

2.1. Standardization of Green Tea Extract Sample:

• TLC Plate Method:

Sample Solution: 4mg/ml of green tea extract in a mixture of alcohol and water (4:1), sonicated for 10 min, and centrifuge. Used the clear supernatant (Freshly prepared and stored at 20⁰C).

Adsorbent: Used a chromatographic plate with an average particle size of 0.2 μm

Sample Application Volume: 1μL

Developing Solvent system: Toluene, acetone, and formic acid (9:9:1)

Analysis: The sample solution is applied on the chromatographic plate with the help of capillary tube at distance of 2cm from the base and the plate is kept in the solvent chamber until the solvent system run without disturbing. After the development of chromatogram, the plates were removed and dried.

Detection: After the drying, the plates containing the developed chromatogram is kept in the iodine chamber for detection of the spots

3. METHOD

3.1. Preparation of Niosomes by Thin Layer Hydration Method:

The cholesterol and different grades of Span (20,40,60,80) and tween 80 were used at a ratio 1:1:2 and 1:1:3 by weight and 100 mg of green tea extract were dissolved in 20ml of dichloromethane, in a 250ml round bottomed flask. The flask was fitted on rotary flask evaporator and connected to vacuum pump. The solvent system is evaporated at 50⁰C using water bath for 10 min. The dried surfactant film was hydrated using 30ml of phosphate buffer saline pH 5.5 for 30 minutes at 50⁰C bath sonicator. The hydrated dispersion kept 2 hours in refrigerator for sealing of vesicles. The niosomal suspension was formed and stored in refrigerator in closed container.

Table No.1: Formulation table for niosomes

Formulation Code	Cholesterol (mg)	Surfactant (mg)	API (mg)	C/S Ratio	Dichloro- methane (ml)	PBs pH 5.5 (ml)	
F1	100	Span20	200	100	1:2	20	30
F2	100		300	100	1:3	20	30
F3	100	Span40	200	100	1:2	20	30
F4	100		300	100	1:3	20	30
F5	100	Span60	200	100	1:2	20	30
F6	100		300	100	1:3	20	30
F7	100	Span80	200	100	1:2	20	30
F8	10		300	100	1:3	20	30
F9	100	Tween80 + Span60	100	100	1:2	20	30
F10	100		200	100		20	30
F11	100	Tween80	200	100	1:2	20	30
F12	100		300	100	1:3	20	30

4. EVALUATION OF GREEN TEA EXTRACT NIOSOMES:

4.1. Scanning Electron Microscopy (SEM) Study:

The optimized niosomal formulation was characterized for their morphology using scanning electron microscope. The lyophilized samples of niosomes were sprinkled and fixed in a SEM holder with double sided adhesive tape and coated by a layer of gold of 150⁰A for 5 to 6 minutes using sputter coater, under a vacuum (3X10⁻¹atm) of argon gas. This sample was then examined with a scanning electron microscope (Quanta Feg) at 10KV accelerate voltage.

4.2. Zeta potential:

The characterization of the surfaces charges property of microspheres is determined by measuring zeta potential. The higher value of zeta potential implies a greater colloidal stability and results in inhibiting the

aggregation of liposomal formulation. It is reported that microspheres with a zeta potential above (+/-) 30mV show stabilization in suspension. Zeta sizer is used to analyse zeta potential.

4.3. Drug content analysis:

The amount of drug in the formulation was determined after lysing the niosomes using 50% methanol and shaken well for the complete lysis of vesicles. After suitable dilution with the phosphate buffer saline pH5.5 the absorbance of the solution was measured at 275 nm in the UV visible spectroscopy using empty niosomes as blank. The drug content was calculated from standard curve using formula.

$$\text{Drug Content} = \frac{\text{Sample absorbance}}{\text{Standard absorbance}} \times 100$$

4.4. Entrapment Efficiency (EE):

Niosomes entrapment efficiency was estimated by Ultracentrifugation method where the dispersion of niosomes were centrifuged at 14000 rpm for 90 minutes. The clear supernant from the resulting centrifuged solution was diluted using pH 5.5 phosphate buffer and analysed for catechins spectrophotometrically and the percentage entrapment efficiency (EE %) was calculated using the following equation:

$$\text{Entrapment Efficiency} = \frac{\text{Total drug in dispersion} - \text{Free drug in dispersion}}{\text{Total drug in dispersion}} \times 100$$

5. FORMULATION OF GREEN TEA EXTRACT LOADED NIOSOMAL GEL

Niosomal suspension (10ml) containing green tea extract equivalent to 2% w/w was incorporated into the gel base composed of Carbopol 940 (0.5%), HPMC K15 (0.5%), Propylene glycol (20%), Glycerol (10%), Triethanolamine (q.s.) and distilled water up to 100ml.

Table No.2: Formulation of green tea extract loaded niosomal gel

Sr. No.	Ingredients	G1	G2	G3
1.	Niosomal dispersion(ml)	10	10	10
2.	Carbopol 940 (gm)	0.5	0.5	1
3.	HPMC K15M (gm)	0.5	1	0.5
4.	Propylene Glycol (ml)	20	20	20
5.	Glycerine (ml)	10	10	10
6.	Methyl Paraben (gm)	0.03	0.03	0.03
7.	Propyl Paraben (gm)	0.01	0.01	0.01
8.	Triethanolamine	QS	QS	QS

6. EVALUATION OF NIOSOMAL GEL

6.1. Appearance: The formulations were observed for the presence of any particular matter. Clarity is one of the most important features. The appearance and clarity is determined by visually.

6.2. PH: Topical formulations should have a pH ranging between 4 to 6. The developed formulations were evaluated for pH by using a digital pH meter

6.3. Drug content: Drug content of niosomal gel was determined by adding methanol to the formulation for lysis of the vesicles. 0.1 ml of niosomal in situ gel was then diluted to 100 ml with Phosphate buffer pH 5.5. Drug content was estimated spectrophotometrically at 275 nm.

6.4. Viscosity Studies: Viscosity of the formulations was determined using Brookfield viscometer (Ametek DV2T) fitted with S-6 spindle at 10, 20, 50 and 100 rpm.

6.5. Spreadability: A weighed quantity of gel (350mg) was taken on glass slide and another glass slide was dropped from the distance of 5cm. The spreadability was measured using equation:

$$S = M.L/T, S = \text{Spreadability}, L = \text{Length of glass slide}, T = \text{Time taken for separation of slide from each other}$$

6.6. In-Vitro of Drug Release:

The diffusion cell consisted of a hollow glass cylinder one end of the cylinder was covered with dialysis membrane which was previously soaked in warm water for 24 hrs. The diffusion cell was placed in a 500ml beaker that served as the receptor cell and the temperature was maintained at 37°C in phosphate buffer (100 ml) pH 5.5 was placed in the receptor cell. Sample withdrawn at specified time intervals and the medium volume was making up with fresh phosphate buffer (pH 5.5).

6.7. Stability Study:

The present study involves investigation of the stability of the optimized niosomal gel under influence of $40^{\circ}\text{C} \pm 2^{\circ}\text{C}$, $75\% \text{ RH} \pm 5\%$, storage conditions for a period of 3 months. The study was carried out to evaluate the effect of storage conditions on essential attributes of gels such as appearance, pH, drug content, viscosity, In-vitro drug release after specified period.

6.8. Antioxidant Property:

The antioxidant activity test done with 1,1-diphenyl-2-picrylhydrazyl (DPPH) 96 well method. $100\mu\text{L}$ of niosomal gel (1mg/ml) were taken in the micro titer plate. $100\mu\text{L}$ of 0.1% methanolic DPPH was added over the samples and incubated for 30 minutes in dark condition. The samples were then observed for discoloration; from purple to yellow and pale pink was considered as strong and weak positive respectively and read the plate on Elisa plate reader at 490nm . Radical scavenging activity was calculated by the following equation:

$$\text{DPPH radical scavenging activity (\%)} = \frac{\text{Absorbance of control} - \text{Absorbance of test sample}}{\text{Absorbance of control}} \times 100$$



Figure No.1: Green tea extract loaded niosome and niosomal gel

7. RESULTS AND DISCUSSION

From the above R_f values of three different spots observed in TLC it is observed that the extract contains the catechins such as Epigallocatechingallet (EGCG), Epigallocatechin (EGC), Epicatechin (EC).

$$R_f = \frac{\text{Distance travelled by solute}}{\text{Distance travelled by solvent}}$$

$$R_{f1} = \frac{1.2}{5.2} = 0.2374$$

$$R_{f2} = \frac{2.3}{5.2} = 0.4423$$

$$R_{f3} = \frac{3.1}{5.2} = 0.5961$$

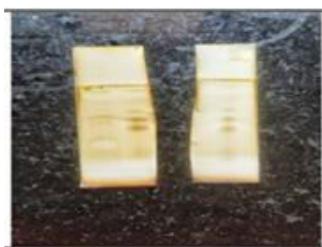


Figure No.2: TLC plate method

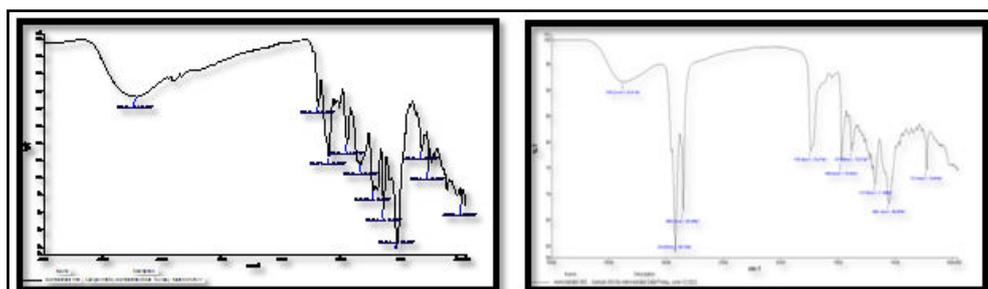


Figure No.3: FTIR spectrum green tea extract sample & FTIR spectra of Niosomal gel

7.1. Calibration curve:

Figure No.4 shows a standard calibration curve with slope, regression coefficient of 0.0191x-0.0669, 0.997 respectively. The curve was found to be linear in the range 20-100µg/ml at λ max 275nm which is the standard λ max of catechins.

Table No.3: Calibration parameters

Sr. No.	Conc.µg/ml	Absorbance at 275 nm
1	20	0.0309
2	40	0.0701
3	60	1.089
4	80	1.444
5	100	1.845

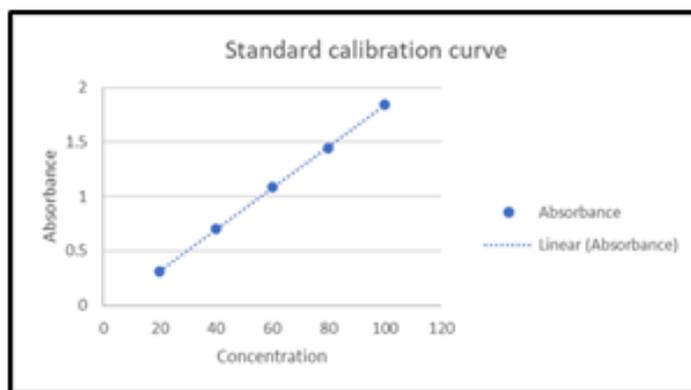


Figure No.4: Calibration curve

7.2. Niosome Characterization:

The size of niosome was found to be 300 nm to 3µm. The SEM images showed the formation of visible vesicles shown in fig 6. The entrapment efficiency of F6 with the highest molar concentration, Span 60, had the highest entrapment efficiency (81.31). The niosomal surface charge i.e., zeta-potential was found to be -14mV shown in fig. The drug content of F6 formulation was found to be 89.75 while other formulation showed less drug content than F6.

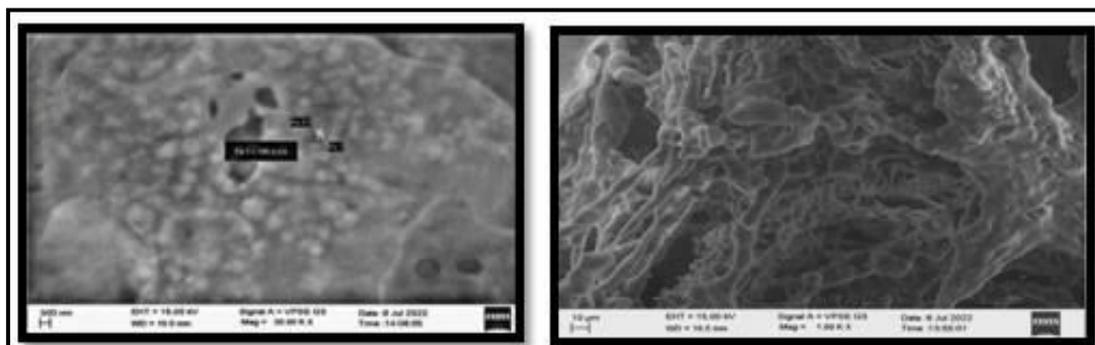


Figure No.5: SEM images of niosomal dispersion

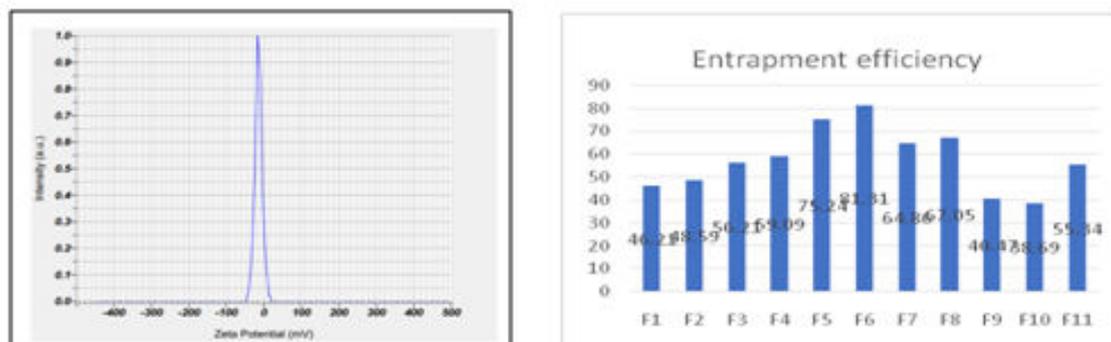


Fig.No.6: Zeta-potential and Entrapment efficiency

7.3. Evaluation of gel containing green tea extract niosome

Table No.3: Evaluation parameters of niosomal gel

Sr. No.	Formulation code	Appearance	Viscosity (cps)	pH	Homogeneity	% Drug content	Spreadability
1	G1	Yellowish brown	8796	5.42	+++	89.62	2.23
2	G2	Yellowish brown	7531	5.61	++	82.10	1.94
3	G3	Yellowish brown	8962	5.36	+	87.05	2.35

Excellent +++, Good ++, Satisfactory +

7.4. In-vitro diffusion studies:

In-vitro permeation of niosomal gel was carried out for 12 hrs. The prepared gel formulation release 88.37 (G1), 84.19 (G2), 81.97 (G3) of drug after 12 hrs as shown in table no In G1 formulation concentration of Carbopol 934 and HPMC K 15 was in the 1% in the ratio 1:1 showed good spreadability and drug release.

Table No.5: % cumulative drug release

Time (hr)	% Drug release		
	G1	G2	G3
0	0	0	0
1	9.72	8.51	7.69
2	15.54	11.60	12.68
3	22.68	15.12	15.97
4	28.11	28.96	24.35
5	38.56	32.38	29.46
6	42.97	42.03	33.98
7	50.01	46.68	47.62
8	56.24	53.91	50.94
9	67.22	65.75	61.16
10	75.15	70.73	66.59
11	81.60	78.31	76.27
12	88.37	84.19	81.97

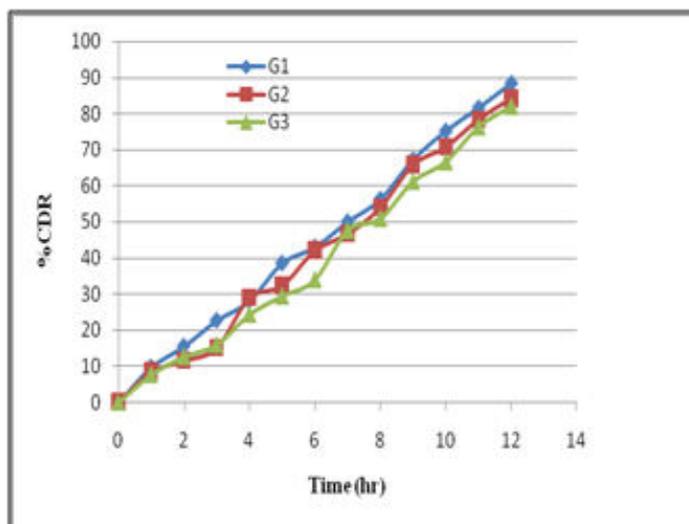


Figure No.7: % cumulative drug release

7.5. Stability studies:

Table No. 5: Stability study of optimized niosomal gel

Appearance	pH	Viscosity	% Drug content
No change	4.86	8524	88.46

Table No. 5: % Drug release after Stability of optimized niosomal gel

Time (hr)	% Drug release	
	Initial	Final
0	0	0
1	9.72	8.51
2	15.54	11.60
3	22.68	15.12
4	28.11	28.96
5	38.56	32.38
6	42.97	42.03
7	50.01	46.68
8	56.24	53.91
9	67.22	65.75
10	75.15	70.73
11	81.60	78.31
12	88.37	87.36

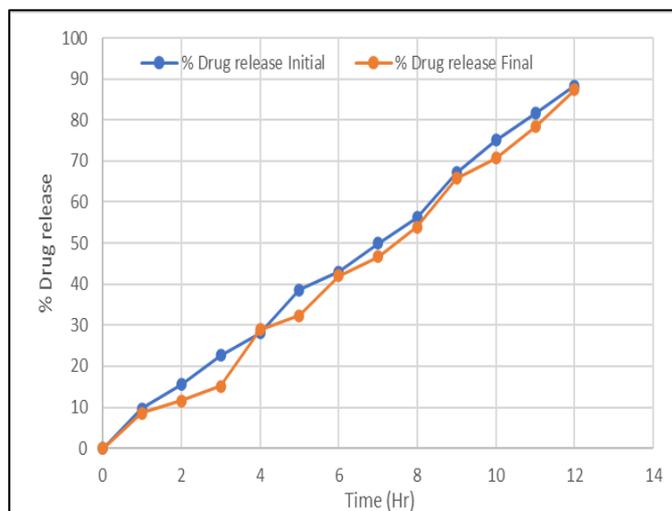


Figure no. 8 % Drug release optimized niosomal gel

The stability studies showed that there is slight decrease in drug release of the optimised formulation at different temperatures at different months but the formulation F6 was stable at room temperature. There was slight change in pH of formulation but no any change in organoleptic properties was observed.

7.5. Antioxidant property:

The antioxidant property of green tea loaded niosomal gel are compare with the standard ascorbic acid. The optimized formulation F6 showed good result at concentration of 1mg/ml. The results for the antioxidant property showed 51.01% DPPH radical scavenging.



Figure No.9: Effect of different compounds against DPPH

8. CONCLUSION

The purpose of this research was to prepare green tea extract loaded niosome for controlled release of drug and incorporate it into topical gel delivery system to reduce side effects. Thin layer hydration method was employed to produce niosome using non-ionic surfactants and cholesterol. The results of FTIR studies proven that there is no interaction between the drug cholesterol and surfactant. Cholesterol is used as a membrane additive, acts as a stabilizer as well as fluidity buffer to improve the stability of the vesicles. The formulations were prepared using different non- ionic surfactants by varying the surfactant concentration (Span 20, 40, 60, 80, tween 80) and keeping the cholesterol concentration fixed. The order of entrapment efficiency of the formulations are as follows Span 60 > Span 40>Span 80 > Span 20 >Tween 80. The formulated niosomes (F6, F4, F8, F2, F10) were characterized for drug content and entrapment efficiency. Out of eleven formulations the F6 formulation were selected for further evaluation study. The optimized Niosomal dispersion were further formulated as topical gel delivery system. The formulated niosomal gel was characterized for the physical appearance, pH and rheological behaviour. The order of in- vitro release of the niosomal gel formulations was found to be G1> G2>G3. From the stability studies, it was found that by using optimum storage condition, niosomal gel formulations was stable on all temperatures. There was only slight difference in drug content and drug entrapment. It is concluded that thin layer hydration method is a useful method for the successful incorporation of green tea extract into niosomes with high entrapment efficiency. The prolonged release of the drug from the niosome suggests that the frequency of administration and adverse effects significantly thereby improving the patient compliance. The administration of drug as gel formulation will enhances its penetration and release.

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Formulation and Evaluation of Herbal Gel for Aphthous Ulcer

Jaishatte Arti A, Nagoba Shivappa N*, Swami Avinash B, Panchal Shital P, Kulkarni Renuka P, Dande Pradnyarani A and Sayyad Firdos J

Department of Pharmaceutics, Channabasweshwar Pharmacy College (Degree), Latur, Maharashtra, India

ABSTRACT

The aim of present study was to formulate and evaluate herbal gel containing liquorice root extract and cordia dichotoma leaves extract for prevention of aphthous ulcer also known as mouth ulcer or canker sores. Herbal oral gel formulation was designed by using liquorice root extract and cordia dichotoma leaves extract as a API with carbopol 934, sodium carboxy methyl cellulose, propylene glycol, methyl paraben, triethanolamine and required amount of distilled water. Carbopol 934 and sodium carboxy methyl cellulose as a gelling agent. The triethanolamine was added to maintain the pH (6.7-7.3) of oral mucosa. More than half of the world's population accepting the herbal medicine and major role of the herbal medicine including the use of plant extract and their active constituents. Herbal medicines are getting increasing patient compliance as they are avoiding typical side effects. Extracts of this herbal plants are useful in the treatment several health problems such as antiulcer, antibacterial, antioxidant, anti-inflammatory, antiviral, and antifungal. The herbal plants are useful for healing as well as for curing of human diseases due to presence of phytochemical constituents. Cordia diachotoma leaves extract showed some essential phytoconstitutions such as alkaloids, tannins, glycosides, starch, saponin, phenols, flavonoids, diterpens, protein and amino acid. Liquorice root extract and it's bioactive ingredients such as glycyrrhizin, glabridin, licochalcone A, licoricidine and licorisoflavan. It posseses potential beneficial effects in aphthous ulcer. The evaluation of herbal gel such as physical appearance, pH, viscosity, spreadability, homogeneity, drug content, in-vitro drug release and stability study. Developed herbal gel formulation was stable, safe and effective for the treatment of Aphthous ulcer.

Keywords: Liquorice root extract, Cordia Dichotoma leaves extract; Herbal gel; Aphthous ulcer.

INTRODUCTION

An oral ulcer is one of the most frequently encountered pathological conditions of the oral cavity in all type of patients. It is caused by the erosion or loss of the upper mucosal layer. These sores are generally painful and are found most frequently on the inside of the lips and cheeks. The etiology of oral ulcers is not yet clear and a variety of conditions are believed to play a role in their occurrence. A variety of viral, fungal, autoimmune, nutritional deficiencies, hormonal changes, psychological stress, malignancy and other factors have been implicated in their causation. The nature, site, duration and frequency of oral ulcers are sometimes determined by the underlying systemic condition if any (e.g. Inflammatory bowel disease). Trauma from a sharp tooth or an over hanging restoration, aggressive tooth brush, smoking could also result in ulcer formation.

A variety of treatments is available however use of herbal medicines is increasing due to its lesser or negligible side effects with improved health benefits. So, the aim of the present research is to formulate and evaluate gel containing herbal drugs i.e. *Cordia diachotoma leaves & Liquorice root extract*. Studies indicate that *Liquorice & Cordia diachotoma both* possesses antiulcer, antibacterial, antioxidant, antimalerial, anti-spasmodic, anti-inflammatory and anti-hyperglycemic properties. By using these herbal extracts attempt have been made to enhance the efficacy of herbal drugs by making it conventional gel drug delivery system. Hypothesizing that, herbal gel will efficiently treat aphthous ulcer; herbal gel were developed and evaluated.

MATERIAL AND METHOD

Liquorice root extract and Cordia Dichotoma leaves extract was purchased from Vital Herbs Delhi, India. Carbopol 934 was received from Loba chem. Mumbai, India. Sodium carboxy methyl cellulose was received from Fine Chem. Industries Mumbai, India. Propylene glycol was received from Cosmo Chem. Pune. Methyl paraben was received from Ozone International Mumbai; India. Triethanolamine was received from Moly chem. Mumbai. All other reagents and chemical were analytical grade.

PREFORMULATION STUDY

Organoleptic Characteristics:

All drugs were tested visually for its physical appearance.

Solubility Profile:

Solubility is expressed in terms of "parts" (1-10 parts), representing the number of milliliters (ml) of the solvent, in which 1 gm of the solid is soluble. The solubility of liquorice extract and cordia dichotoma extract was

checked in different solvents like methanol, ethanol, petroleum ether and water. Liquorice extract and cordia dichotoma extract was freely soluble in water.

Total Ash value:

Weight of empty silica crucible. After 2 gm of powdered extract was weighed into the dish. Dish supported on a pipe clay triangle placed on a ring of tripod stand. Heat with a burner, using a flame about 2 cm high and supporting dish about 7 cm above the flame, powder was heated till vapours almost ceased to be evolved; then lowered the dish and heated more strongly until all the carbon was burnt off. The powder was cooled in desiccator. Weighed the ash and calculated the percentage of total ash with reference to the air dried sample of the crude drug.

Wt. of the empty dish = X gm; Wt. of drug taken = Y gm

Wt. of the dish + ash (after complete incineration) = Z gm

Wt. of ash = (Z-X) gm i.e., 'Y' g of the crude drug gives (Z-X) gm of ash

Therefore 100 gm of the crude drug gives $100/Y \times (Z-X)$ gm of ash

Total ash value of sample = $100 (Z-X)/Y$ %

FT-IR Study

Drug excipient compatibility study was conducted using FT-IR. Combination of herbal extract and excipients was taken in 1:1 ratio and tested using Perkin Elmer FTIR spectroscopy. Spectra obtained were observed for any interaction.

FORMULATION OF HERBAL GEL

Take quantity sufficient of distilled water in a beaker and disperse specified amount of Carbopol 934 and sodium carboxy methyl cellulose with continuous stirring. Kept the beaker a side to swell these gelling agents for half an hour. In another beaker take 5ml distilled water and required quantity of methyl paraben they mixed properly by heating on water bath. Cool the solution, and then add propylene glycol. Further, required quantity of extract was added to the above mixture and this solution was mixed properly to the carbopol 934 and sodium carboxy methyl cellulose gel with continuous stirring. Triethanolamine was added drop wise to the formulation for the adjustment of pH (6.7-7.3) and to obtain the gel at required consistency. Prepared gel was filled in collapsible tubes and stored at a cool and dry place.

Table 1: Formulation table of herbal gel

Ingredients	F1	F2	F3	F4	F5	F6
Liquorice root extract (gm)	2	2	2	2	2	2
Cordia dichotoma leaves extract(gm)	1.5	1.5	1.5	1.5	1.5	1.5
Carbopol 934(gm)	0.5	0.5	0.5	0.5	0.5	0.5
Sodium carboxy methyl cellulose (gm)	3	3.5	4	4.5	5	5.6
Methyl paraben (gm)	0.01	0.01	0.01	0.01	0.01	0.01
Propylene glycol (ml)	3	3	3	3	3	3
Triethanolamine (ml)	q.s	q.s	q.s	q.s	q.s	q.s
Dist. Water (ml)	q.s	q.s	q.s	q.s	q.s	q.s

EVALUATION OF GEL

Physical Appearance

Physical parameters such as appearance and colour were checked. The colour of the formulation was checked by visual inspection. Consistency of formulation was checked by applying on skin.

Measurement of pH

The pH of various gel formulations were determined by using digital pH meter. 1 gm of gel was accurately weighed and dispersed in 100 ml of distilled water and stored for two hours. The pH of dispersions was measured using pH meter. The measurement of pH of each formulation was done in triplicate and average values are calculated.

Homogeneity

After the gels have been set in container. All developed gels were tested for homogeneity by visual inspection after the gels have been set in the container for their appearance and presence of any aggregates.

Spreadability

The spreadability of the gel formulations was determined, by measuring the spreading diameter of 1 gm of gel between two horizontal plates (20cm × 20cm) after one minute attached with the weight.

$$S=M \times L/T$$

Where,

S = Spreadability; M = Weight in the pan (tied to the upper slide); L =Length moved by the glass slide and T = Time (in sec.) taken to separate the slide completely each other.

Viscosity

Viscosity of herbal gel was determined by using Brookfield rotational viscometer at 10, 10, 12, 6, 8 and 8 rpm using spindle no.6.

In-vitro diffusion study

The diffusion studies of the prepared gels carried out in Franz diffusion cell through a cellophane membrane. A one gram sample was taken in cellophane membrane and the diffusion studies were carried out at $37 \pm 1^\circ$ using 100 ml of phosphate buffer (pH 6.8) as the dissolution medium. Five milliliters of each sample was withdrawn periodically at 1, 2, 3, 4, 5, 6, 7 and 8 hrs and each sample was replaced with equal volume of fresh dissolution medium. Then the samples were analyzed for the drug content by using phosphate buffer as blank.

Stability study

The optimized formulation was kept in accelerated stability condition at $40^\circ\text{C} \pm 5^\circ\text{C}$ temperature $75\% \pm 5\%$ relative humidity for a period of 3 months as per ICH guidelines. The placed sample was withdrawn at 1, 2, and 3 months interval and evaluation was carried out for physical appearance, pH, viscosity, Homogeneity, spreadability, viscosity, diffusion study and were performed to determine the stability profile.

RESULTS AND DISCUSSION

Herbal drugs were calibrated using UV spectroscopy (table 2. & fig.1). FTIR study confirmed that there were no significant change and hence it can be concluded that the drug and excipients are compatible (table 3 & fig.2, 3).

Characterizations of Liquorice Root Extract and Cordia Dichotoma Leaves Extract:

State: Solid, fine powder

Colour: Brown and yellowish brown

Odour: Characteristics

Ash value:

The total ash value of *Liquorice root extract* was found to be 6%.

The total ash value of *Cordia Dichotoma leaves extract* was found to be 8%.

Calibration of Liquorice Root Extract and Cordia Dichotoma Leaves Extract:

Table 2: Calibration of liquorice root extract and cordia dichotoma leaves extract

Conc.(ug/ml)	Abs. of Liquorice root extract (λ max at 254 nm)	Abs. of Cordia dichotoma leaves extract (λ max at 254 nm)
10	0.08	0.042
20	0.116	0.057
30	0.137	0.084
40	0.181	0.112
50	0.223	0.141

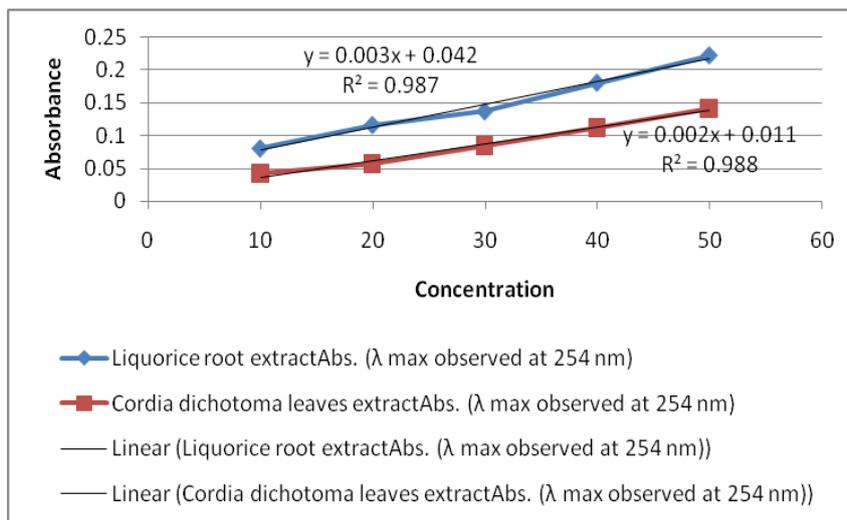


Figure 1: Calibration of liquorice root extract & Cordia dichotoma leaves extract

FT-IR Studies:

Table 3: Interpretation of FT-IR of drugs with all excipients

Sr. No.	Functional group	Standard Frequencies (cm ⁻¹)	Observed Peaks (cm ⁻¹)
1	O-H Stretching	3200-3600	3307.27
2	C-H Stretching	2850-3000	2932.08
3	C=O Stretching	1670-1820	1716.67
4	N-H Bending	1550-1640	1608.59
5	-C-H Bending	1350-1480	1376.43

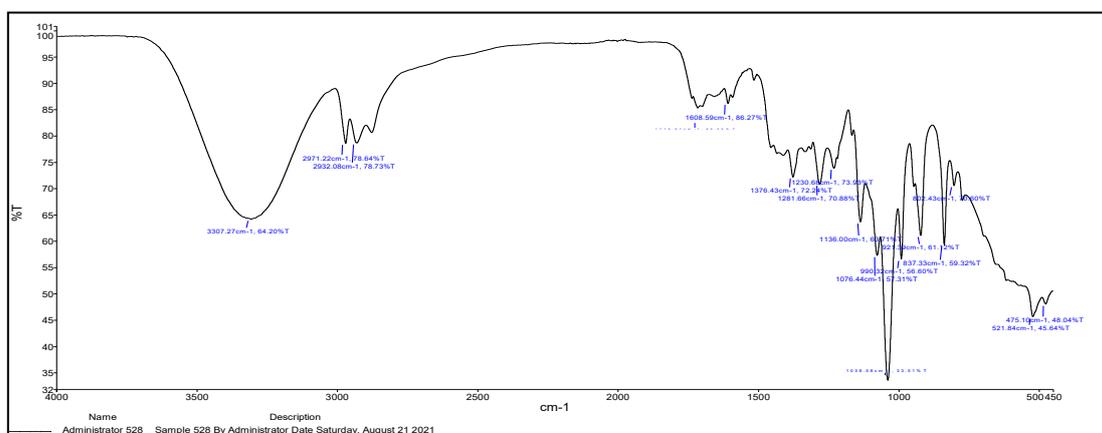


Figure 2: FT-IR of drugs with all excipients

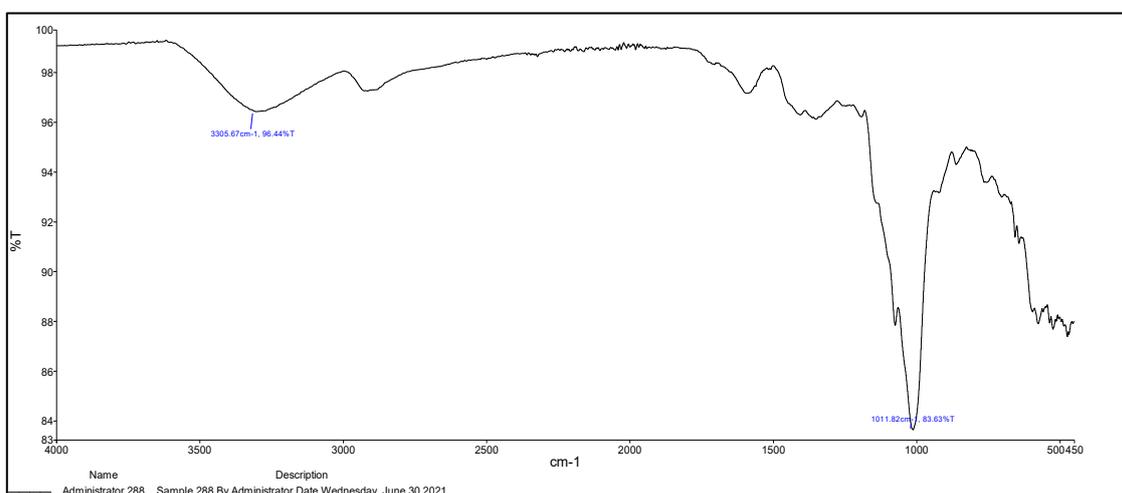


Figure 3: FT-IR of herbal drugs



Figure 4: Herbal gel

Evaluation Test of Herbal Gel:

All the herbal gel batches were tested for appearance and found as yellowish brown, smooth gel, homogenous in nature without any clumps (fig 4). pH was ranged from 6.4-7.2. Viscosity and spreadability was good. % Drug assay was highest for F4 batch (table no. 4). In-vitro diffusion study showed that F4 batch maximum drug released (table no.5 & fig.5). Stability study conducted on optimized batch showed formulation was stable at a environmental temperature (table no. 6, 7 & fig.6).

Table 4: Evaluation test of herbal gel

Formulation Code	pH	Viscosity (cps)	Spreadability (gm.cm/sec)	% Assay
F1	6.4	39100	16.22	86.44
F2	6.6	38114	17.22	87.22
F3	6.5	34988	18.43	92.55
F4	6.9	45687	19.99	94.50
F5	7.2	42111	17.45	89.99
F6	7.1	41786	19.23	91.11

In-vitro diffusion study:

Table 5: Data obtained for In-vitro diffusion study

Time (Hrs)	% Cumulative Drug release					
	F1	F2	F3	F4	F5	F6
0	0	0	0	0	0	0
1	10.42	15.96	17.63	20.12	21.69	20.18
2	20.16	22.32	23.61	29.11	26.22	27.11
3	30.11	32.61	40.82	41.16	36.62	42.18
4	42.92	37.76	52.94	49.72	47.78	56.70
5	49.45	47.27	65.32	58.94	51.29	62.32
6	56.23	55.49	76.93	67.48	74.23	73.17
7	62.10	68.25	78.43	78.79	80.84	78.45
8	70.11	75.70	69.41	89.12	88.82	80.71

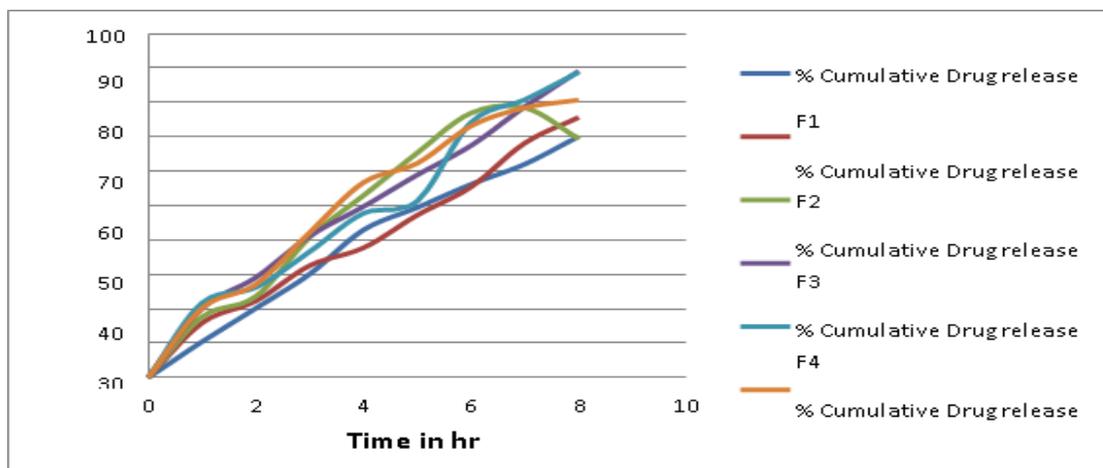


Figure 5: In-vitro diffusion study

Stability study:

Table 6: Stability study of optimized batch

Physical Appearance	pH	Spredability (gm.cm/sec)	Viscosity (Cp)	% Assay
Yellowish brown, Smooth gel, Homogenous	6.8	20.11	21518	89.88%

Table 7: In-vitro diffusion study of optimized batch F4

Time in hrs	% Drug release Initial	% Drug release Final
0	0	0
1	20.12	20.69
2	29.11	24.22
3	41.16	36.62
4	49.72	44.78
5	58.94	52.29
6	67.48	76.23
7	78.79	81.84
8	89.12	88.85

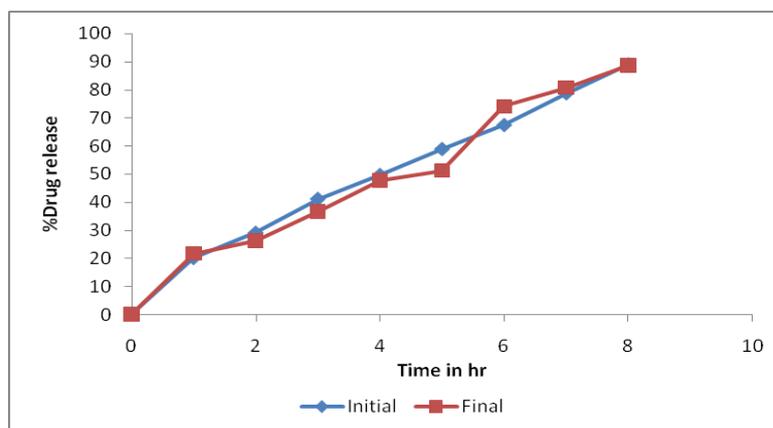


Figure 6: In-vitro diffusion study of optimized batch F4

CONCLUSION

This research work was carried out to develop a new herbal gel formulation for aphthous ulcer. The prepared herbal gel was further evaluated for physical appearance, pH, Homogeneity, Spreadability, Viscosity, In-vitro diffusion study and Drug-Polymer Compatibility Studies. The gel formulation F4 is optimized and found to have all the desirable properties. From the research executed, it can be concluded that combination of Carbopol 934 and Sodium carboxy methyl cellulose can be used as gelling agent and is best suitable for gel formulation. The gel prepared is simple and easy to use. It is significant to formulate liquorice and cordia dichotoma herbal drug extract in the form of herbal gel using polymer for safety, efficacy and better promote antiulcer activity.

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Formulation and Evaluation of Nanocochleates Containing Methotrexate

Sayyad Firdos J, Nagoba Shivappa N*, Swami Avinash B, Dande Pradnyarani A, Waghmare Kanchan R, Sayyed Simakousar N and Jaishatte Arti A

Department of Pharmaceutics, Channabasweshwar Pharmacy College (Degree), Latur, Maharashtra, India

ABSTRACT

The aim of the present study is to formulate and evaluate Nanocochleates containing Methotrexate for the treatment of lung cancer. Methotrexate inhibit DHFR enzyme which is required in synthesis of tetrahydrofolate. The objective of the study is to prepare methotrexate nanocochleate (BCS IV) which provide targeted delivery of drug. Firstly 4 batches of liposomes were prepared using soyalecithin, HSPC and cholesterol and organic solvent by modified thin film hydration method from this on basis of entrapment efficiency, drug content and % in vitro drug release batch F3 was optimized for nanocochleate preparation. Nanocochleates were prepared by trapping method using calcium chloride as bridging agent and it was evaluated for drug content, % entrapment efficiency, in vitro drug release and stability studies.

Keywords: Methotrexate, Liposomes, Nanocochleate, Stability study

INTRODUCTION

Nanocochleates are rod shaped, cigar like structure formed by interaction of lipid vesicles and divalent cation such as Ca^{++} , Mg^{++} . There are two steps involved in the formation of Nanocochleates; first is formation of liposomes and second is formation of nanocochleates by addition of calcium chloride to the formed liposomes. Nanocochleates differ from liposomes as they are rigid-rod shaped structure and have water free interior. As they have water free interior they are less susceptible to oxidation. Nanocochleate is potential drug delivery system as it has many advantages such as easy and safe production, less side effects, biocompatibility and targeted drug delivery. Nanocochleates encapsulate hydrophobic, hydrophilic, positively and negatively charged drug molecule.

Anticancer treatments have many problems and they are overcome by the formulation of Nanocochleates. Nanocochleates deliver the drug to the cancer cell and increase bioavailability and decreases side effects. Methotrexate inhibit DHFR an enzyme that participates in tetrahydrofolate synthesis. Conversion of dihydrofolate to tetrahydrofolate is catalyzed by DHFR. Folic acid is required for synthesis of nucleoside thymidine which is essential in DNA synthesis. Methotrexate is used in treatment of both small and non-small lung cancer. Poor solubility, undesirable side effects associated with it are overcome by formulation of methotrexate nanocochleates.

MATERIALS AND METHODS

Materials

Methotrexate was received as gift sample from Samex Overseas Gujarat, Soyalecithin and HSPC was gifted by Lipidome Lifesciences, Gujarat. Cholesterol was purchased from Research Lab Fine Chem Industries, Mumbai. Other chemicals, reagents and solvents used are sodium chloride, disodium hydrogen phosphate, potassium dihydrogen phosphate, chloroform and ethanol are of analytical reagent grade.

METHODS

Formulation of Liposomes by Thin Film Hydration Method

Modified thin film hydration technique was used for the liposomal formulations. Four batches of liposomes were prepared by using Methotrexate (API), Soyalecithin, HSPC and organic solvents as shown in table no.1. Lipid phase (Phospholipids:Cholesterol = 2:1) was dissolved in 10 ml organic solvent (Chloroform:Ethanol,1:1) in 250 ml RBF containing 4mm glass beads for vortexing. The organic solvent was evaporated under vacuum using rotary flash evaporator, which allows the formation of thin dry lipid film on walls of RBF. This system was maintained at vacuum and 45°C for 10 min, for the complete removal of organic solvent. Methotrexate was dissolved in 15 ml of hydrating media (PBS 7.4) and it was then added to the flask containing liposome vesicles. It was vortexed for 1 hr and the formed liposomes are sonicated for the reduction in size and kept overnight to mature the liposomes.

Table 1. Formulation of liposomes

Batch	Ingredients			
	Drug(mg)	Soyalecithin(mg)	HSPC(mg)	Cholesterol(mg)
F1	2.5	30	-	15
F2	2.5	40	-	20
F3	2.5	-	30	15
F4	2.5	-	40	20

Formulation of Nanocochleate by Trapping Method

From the liposomal batches the batch F3 was optimized and selected for Nanocochleates. 0.1 M 2 ml of calcium chloride was added slowly into liposomal formulation under vortex for 30 min. The yellowish white precipitation of liposomal formulation indicates Nanocochleates.

EVALUATION PARAMETERS:

A. Drug Characterization:

1. Physical Appearance

The physical appearance of methotrexate was observed i.e., colour, odor, nature etc.

2. Determination of Melting Point

Melting point of Methotrexate was determined by melting point apparatus. The drug was incorporated in glass capillary tube which was sealed previously on one end. The capillary tube was then subjected to melting point apparatus and the temperature at which drug start melting was noted.

3. Solubility Study

The solubility of drug was determined by addition of drug in solvent at room temperature and kept for 24 hrs with shaking. At the end of 24 hrs the contents of flask were filtered with whatmann filter paper.

4. Estimation of Methotrexate by UV-Spectroscopy Method

Accurately weighed (10mg) Methotrexate was dissolved in minimum quantity of phosphate buffer pH 7.4 in 100 ml volumetric flask. Then the volume was made up to 100 ml with phosphate buffer 7.4 resulting in standard stock solution (100 µg/ml). A set of standard dilutions of 2,4,6,8,10,12 µg/ml was prepared by transferring 0.2,0.4,0.6,0.8,1.0,1.2 ml aliquots of stock solution (100 µg/ml) to series of 10 ml of volumetric flasks and volume was made up with phosphate buffer pH 7.4. The absorbance of each dilution was measured in UV spectrophotometer at 303 nm. Graph of concentration vs absorbance was plotted.

5. Fourier Transforms Infra-Red Spectroscopy (FTIR)

FTIR study was done on drug and drug excipients mixture to find out the compatibility between them. The FTIR study was performed using Perkin Elmer FTIR in the range of 4000-400 cm⁻¹.

B. Liposomal Formulation:

1. Physical Appearance

The physical appearance of liposomes was observed for physical appearance.

2. % Entrapment Efficiency

Entrapment efficiency of liposomes was determined by centrifugation method. Aliquots (1ml) liposomal dispersion were subjected to centrifugation on a laboratory refrigerated centrifuge (Dolphin Instrument) at 14,000 rpm for 30 min at 4°C. The clear supernatant was removed to separate non-entrapped methotrexate and absorbance was recorded at 303 nm. The sediment in the centrifugation tube was diluted to 100 ml with PBS 7.4 and the absorbance of this solution was recorded at 303 nm. Amount of methotrexate in supernatant and sediment gives a total amount of methotrexate in 1 ml dispersion. The entrapment efficiency was calculated by using the formula,

$$\text{Entrapment Efficiency} = \frac{\text{total drug} - \text{free drug}}{\text{total drug}} \times 100$$

3. In Vitro Drug Release

In vitro drug release from the liposomal formulation was carried out by using dialysis membrane employing in two sides open ended cylinder. Liposomal suspension (4ml) containing known amount of drug was placed in dialysis membrane previously soaked overnight. The two side open cylinder was placed in 100 ml PBS (7.4) maintained at 37°C and stirred with help of magnetic stirrer at 1500 rpm/min. Aliquots (4ml) of release medium

were withdrawn at different time interval and the sample was replaced with fresh PBS (7.4) to maintain constant volume. 1 ml acetonitrile was added to precipitate lipids and dissolve the entrapped Methotrexate and sample was analyzed by UV spectrophotometry at 303 nm.

4. Drug Content

Liposomes were centrifuged at 15,000 rpm for 40 min at 5°C after centrifugation separate drugs in the supernatant. The free drug concentration in the supernatant can be determined by using UV-Vis spectroscopic after suitable dilution.

C. Nanocochleate Formulation

1. % Entrapment Efficiency

It was determined by separating non encapsulated drug from Nanocochleate suspension by centrifugation at 14,000 rpm for 30 min at 4°C. The sediment vesicles were disrupted with EDTA which allows the opening of nanocochleates into liposomes vesicles and 1 ml of ethanol was added and it was diluted with phosphate buffer pH (7.4) The UV absorbance was measured at 303 nm to calculate the entrapment efficiency using the calibration curve equation given above.

2. In Vitro Drug Release

The procedure followed is same as that of liposomes.

3. Drug Content

The procedure followed is same as that of liposomes.

4. Scanning Electron Microscopy (Sem)

Surface morphology and size of optimized Nanocochleate formulation was determined by using scanning electron microscopy.

5. Stability Study

As per ICH guideline stability study of nanocochleate formulation was carried out at 4, 40 °C and R.T. for 3 months and stability parameter such as physical appearance % Entrapment efficiency, *in vitro* drug release was determined as function of storage time.

RESULT AND DISCUSSION

A. Drug Characterization

Drug obtained from Samex Overseas Gujarat was found yellow to orange-brown in colour, odorless and crystalline powder. Melting point of drug was found 193°C which is near to standard i.e., 195°C. Methotrexate is insoluble in organic solvents like ethanol, methanol and chloroform and it is soluble in phosphate buffer pH (7.4)

The UV absorbance of methotrexate standard solutions in the range of 2-12 µg/ml of drug in phosphate buffer pH 7.4 showed linearity at λ max 303 nm. The linearity was plotted for absorbance (A) against concentration (C) with R^2 value 0.998 and with the slope equation $y=0.109x + 0.034$. The absorbance values and standard curve were in below fig.no.1 The FTIR frequencies of Methotrexate are in reported range which indicates that obtained sample was pure.

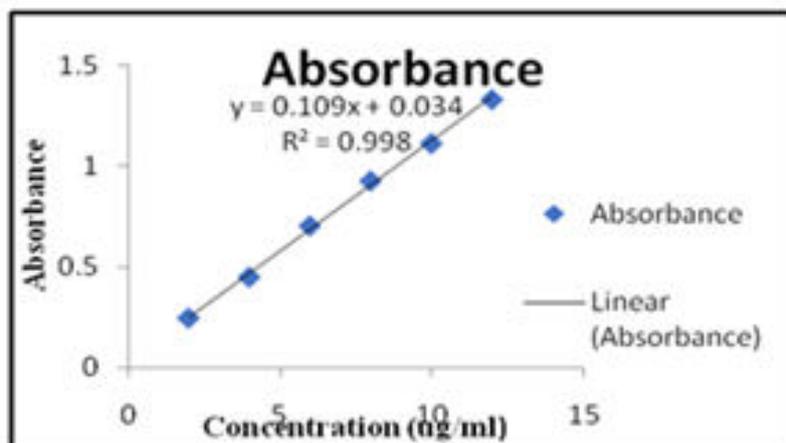


Fig.No.1 Calibration curve of Methotrexate

Table 2: Absorbance value of Methotrexate

Concentration (µg/ml)	Absorbance
2	0.249
4	0.452
6	0.706
8	0.929
10	1.115
12	1.333

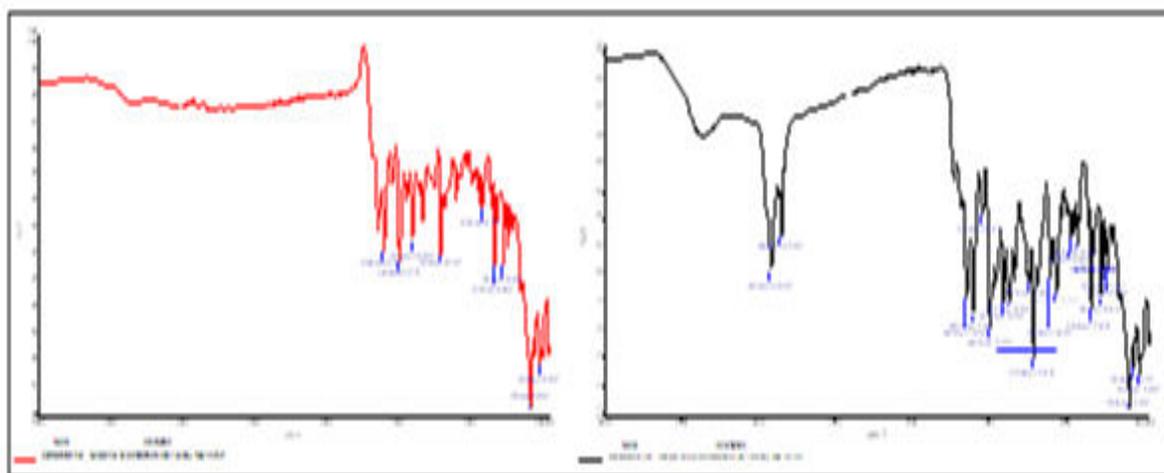


Fig.No. 2 FTIR spectra of a) drug and b) drug + Excipients

B. Evaluation of Liposomes

Liposomes are yellowish white dispersion. Entrapment efficiency of F3 batch was high i.e., 83.30% and drug content was 90.91% (table 3). The *in vitro* release of Methotrexate liposomal formulations were performed and measured the release at 1 hr, 2 hr., 3 hr upto 12 hrs. The formulation F3 shows highest *in vitro* drug release i.e., 88.09% (table 4). From the all liposomal formulations, F3 shows high drug content, entrapment efficiency and *in vitro* drug release and on the basis of that it was optimized for Nanococheleate formulations.

Table.3 Evaluation of liposomes

Formulation	Physical Appearance	% Entrapment Efficiency	% Drug Content
F1	Yellowish white dispersion	69.40	76
F2		77.12	86.82
F3		83.30	90.91
F4		70.54	78.64

Table 4: %*In Vitro* drug release of liposomes

Time (hr)	% Cumulative Drug Release			
	F1	F2	F3	F4
0	0	0	0	0
1	5.59	6.98	7.54	8.01
2	9.11	10.38	12.44	13.54
3	11.89	12.98	13.98	14.32
4	24.56	24.87	26.11	27.47
5	30.15	31.65	34.56	38.98
6	38.04	39.98	41.79	45.92
7	45.12	46.89	48.12	48.91
8	53.65	54.10	57.32	59.61
9	59.43	62.88	64.19	66.06
10	63.98	65.23	68.81	69.12
11	72.00	74.42	76.10	76.81
12	80.12	85.00	88.09	81.98

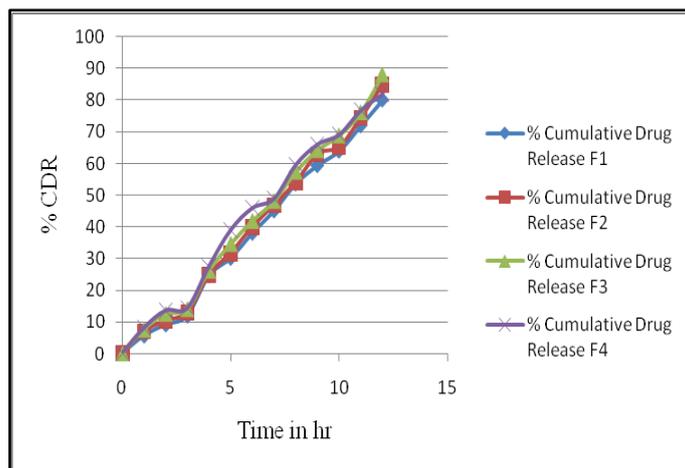


Fig.No.3. % In Vitro release of liposomes

C. Evaluation of Nanocochleates

Nanocochleates were yellowish white dispersion. Shape and surface morphology of Nanocochleate droplet was determined by using SEM showed the intact nature of nanocochleates fig. no.4. Drug content and entrapment efficiency of Nanocochleate was found 92.21% and 88.67% (table 5). *In vitro* drug release was 90.23% upto 12 hr (table 6). Stability study of Nanocochleate shows that they are stable at 4 °C drug entrapment efficiency and *in vitro* was found 83.41% and 89.91 % (table 7).

Table.5 Evaluation of Nanocochleates

Formulation	Physical Appearance	% Drug content	% EE
NCF3	Yellowish white dispersion	92.21	88.67

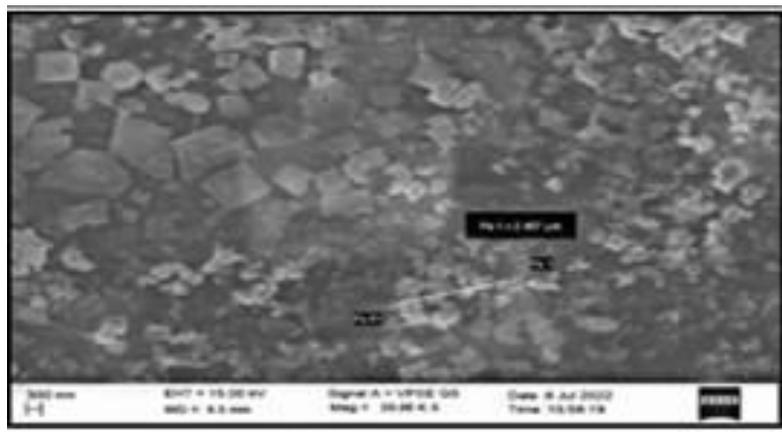


Fig.No.4 SEM image

Table.6: In vitro drug release of nanocochleate

Time(hr)	NCF3
0	0
1	8.89
2	11.23
3	16.32
4	25.52
5	30.03
6	34.23
7	42.44
8	50.52
9	58.98
10	70
11	74.78
12	90.23

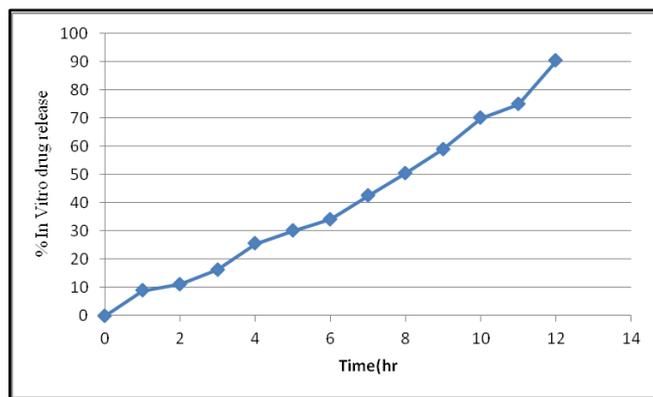


Fig.No.5: % In Vitro drug release

Table 7: Stability of Nanococheate NCF3

Number of days	% Drug Entrapment Efficiency		
	At 4°C	R.T.	At 40°C
Initial	88.67	88.67	88.67
15	88	87.87	87.12
30	86.31	85.23	84.98
45	85.78	84.61	84.12
60	84.98	83.33	83.12
75	84.50	83	82.74
90	83.41	82	81.98

Table 8: In Vitro release after stability

Time(hr)	% In Vitro release	
	Initial	Final
0	0	0
1	8.89	8.12
2	11.23	10.91
3	16.32	15.44
4	25.52	23.30
5	30.03	29.34
6	34.23	34.10
7	42.44	41.26
8	50.52	48.56
9	58.98	56.73
10	70	68.88
11	74.78	73.22
12	90.23	89.91

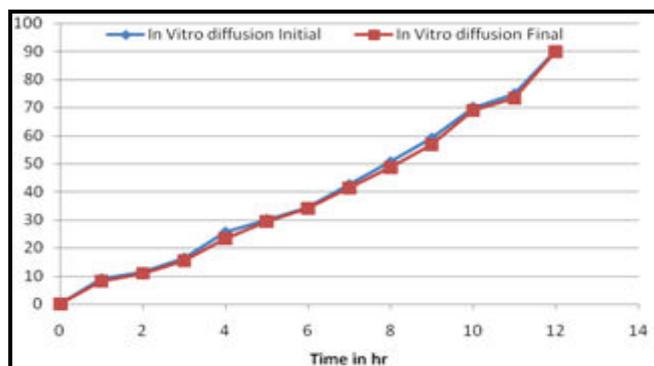


Fig.No.6 % In Vitro drug release initial and final

CONCLUSION

The research conducted can be concluded that, methotrexate drug which belong to BCS class IV can be encapsulated into nanococheate drug delivery system. This research conducted successfully encapsulate poorly

bioavailable drug Methotrexate into Nanocochleate with maximum drug release of 90.23% upto 12 hr. As nanocochleates require small amount of drug for therapeutic action it does not give any side effect and increases its permeability. But no one can predict its efficacy and hence clinical studies are needed to understand capacity of nanocochleate in cancer treatment for human.

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Formulation and Evaluation of Orodispersible Film Containing Atorvastatin Calcium by Using Natural Polymer

Chame Swastika Lahu, Nagoba S. N*, Priyanka U. Telang, Khadkutkar V. K and Surwase S. R
Department of Pharmaceutics, Channabasweshwar Pharmacy (Degree) College, Latur, Maharashtra, India

ABSTRACT

Aim of the present study was to develop and evaluate orodispersible film containing Atorvastatin calcium for hyperlipidemic patients by using natural polymer. Orodispersible films deliver drug directly in the vascular system and bypasses the hepatic first pass metabolism so dose of the drug may also reduce significantly. Orodispersible films were prepared using solvent casting method, hydrophilic polymers were selected as film forming agents such as pectin, xanthum gum and sodium alginate and PEG-400 was used as plasticizer to give flexibility to the films. In FT-IR study no interaction was observed between drug and the excipients. Three blank films were selected for the incorporation of drug. After characterization the drug loaded films and studying their dissolution time & in-vitro drug release studies, among the formulations [F1 – F8] F3, F4, F6, F7 & F8 was selected the best formulation as its disintegration and dissolution time was less and it releases drug to a greater extent from 93% to more than 100% in five minutes. Formulation F7 was selected best formulation as its disintegration and dissolution time was less and it released drug to a greater extent compared to other formulations. Therefore orodispersible films can play an important role in oral drug delivery. Drug loaded films with both the polymers were stable under 40°C/75% RH conditions.

Keywords: Orodispersible film, Atorvastatin Calcium, Polymer, Solvent casting method, Drug release.

1. INTRODUCTION

Rapid or fast dissolving oral thin film is becoming an increasingly popular drug delivery system because of its wide and varied benefits. On contact with saliva, it dissolves within a few seconds, without the need of water, making them particularly suitable for pediatric and geriatric patients. As most of the polymers used in mouth dissolving films (MDFs) are amorphous, dispersion of drug in polymer matrix aids rapid dissolution. These advantages enhance the patient compliance and make pharmaceutical manufacturer invest money in change of the existing products in the market to MDFs.

- **Orodispersible Film** – a thin film that is prepared using hydrophilic polymers that rapidly dissolves on the tongue or buccal cavity.

This is the most advanced form of oral solid dosage form due to more flexibility and comfort.

Overview of Oral Mucosa: Various target sites for drug delivery may include:

- 1) Inner surface of upper and lower lip,
- 2) Gums (gingiva)
- 3) Hard and soft palate
- 4) Floor of mouth (sublingual)
- 5) Tongue and buccal mucosal tissue (cheek)

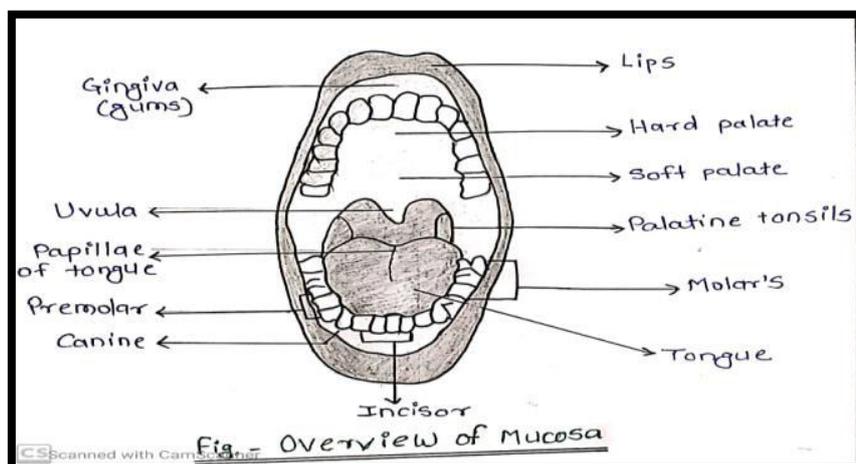


Fig 1: Overview of mucosa

Anatomy of Oral Cavity

Oral cavity is lined by oral mucosa which comprises three different layers :

1. **Epithelium Layer:** made of squamous epithelial cells.
2. **Lamina propria :**
3. **Submucosa:** Contains number of blood vessels and nerve cells.
 - Mucosal area provide unique environment for drug absorption.
 - Relatively neutral pH (approximately 6.2-7.4)
 - Limited enzymatic activity.

ADVANTAGES

- Rapid disintegration and dissolution
- Beneficial for mentally ill, unconscious patients.
- Stable as compared to liquid dosage form.
- Improved onset of action.
- Maximum bioavailability.
- Reduced dose and dosing frequency.

LIMITATIONS

- Limited drug loading capacity. i. e. >50mg.
- Drugs which are unstable at buccal pH cannot be administered.

Ideal Characteristics of a Suitable Drug Candidate

- Drug to be incorporated should have low dose upto 50 mg.
- Smaller molecular weight drugs are more preferable.
- It should have good stability in saliva.
- Smaller and moderate molecular weight.
- Partially unionized at oral cavity pH.

2. MATERIAL AND METHOD

2.1 Drug: Atorvastatin Calcium

2.2 Excipients Required

1. **Film Forming Agent:** Pectin, Xanthum gum, Sodium Alginate
2. **Plasticizer:** Propylene glycol, Propylene glycol 400
3. **Saliva Stimulating Agent:** citric acid, lactic acid, ascorbic acid, tartaric acid.
4. **Surfactant:** sodium lauryl sulphate, benzalkonium chloride, tween, etc.
5. **Sweetening Agent:** glucose, fructose, aspartame, sucralose
6. **Flavoring Agent:** Flavor oils, oleoresin extract, etc.

2.2 Methods Of Preparation

- Solvent casting
- Hot melt extrusion
- Semisolid casting
- Solid dispersion extrusion
- Rolling

Solvent Casting Method

Mixing of drug, polymer and excipients in suitable solvent



Homogenization by magnetic stirrer



Settling aside for 8hr



Casting on petri plate



Drying, peeling and cutting in suitable size

FORMULATION TABLE

Table 1: Formulation details of ATN-Ca Orodispersible film

INGREDIENTS	Formulation code							
	F1	F2	F3	F4	F5	F6	F7	F8
Drug (mg)	160	160	160	160	160	160	160	160
Sodium alginate (mg)	200	250	300	350	-	-	-	-
Pectin (mg)	-	-	-	-	200	250	300	350
Xanthum gum (mg)	50	75	100	125	50	75	100	125
Propylene glycol (ml)	1	1	1	1	-	-	-	-
PEG-400 (ml)	-	-	-	-	1	1	1	1
Citric acid (mg)	150	150	150	150	150	150	150	150
Tween 80 (ml)	q.s.	q.s.	q.s.	q.s.	q.s.	q.s.	q.s.	q.s.
Mannitol (ml)	q.s.	q.s.	q.s.	q.s.	q.s.	q.s.	q.s.	q.s.
Ethanol : Water (ml)	15	15	15	15	15	15	15	15

3. RESULT AND DISCUSSION

3.1 Organoleptic Properties

Organoleptic properties were checked by visually, feel and touch. ATN-Ca appears off-white in colour, crystalline, odourless powder.

3.2 Melting Point: Melting point of ATN-Ca was found to be $170 \pm 2^\circ\text{C}$

3.3 Solubility Study

Solubility study was performed; from that study it was observed that ATN-Ca is freely soluble in methanol, soluble in Phosphate Buffer pH 7.4, acid buffer pH 1.2, and phosphate buffer pH 6.8, slightly soluble in distilled water.

3.4 UV Spectroscopy Study

Preparation of Phosphate Buffer Ph 6.8

Dissolve 28.8g of disodium hydrogen phosphate and 11.45g of potassium dihydrogen phosphate in sufficient water to produce 1000 ml volumetric flask.

Estimation of ATN-Ca Using UV Spectrophotometric Method

ATN-Ca was estimated using UV spectrophotometry measured at 246 nm using phosphate buffer solution (pH 6.8). Standard curve was plotted by taking absorption of diluted stock solutions (0.5, 1, 1.5, 2, and 2.5) at wavelength 246 nm.

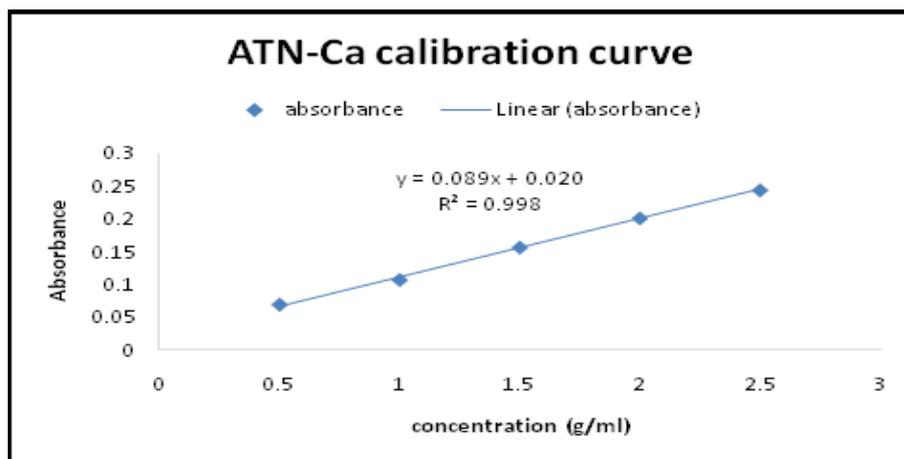


Fig.2: Atorvastatin Calcium Calibration Curve

DISCUSSION

Calibration curve of ATN-Ca was estimated in phosphate buffer 6.8. Absorbance of different solution (0.5-2.5 $\mu\text{g/ml}$) observed on UV spectrophotometer. The maximum absorbance of ATN-Ca was found at 246nm wavelength. The R^2 value was found to be 0.998 hence; it obeys Beers-Lamberts law.

3.5 FTIR Study

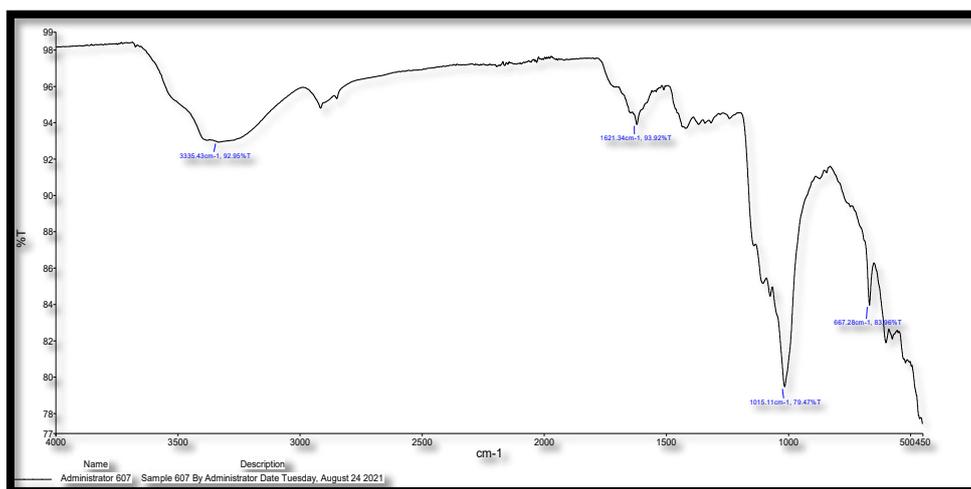


Fig.3: FTIR spectra of ATN-Ca + All Excipients

Interpretation of IR Spectra

Table 2: Interpretation of IR Spectrum of ATN-Ca with All Excipients

Sr. no.	Functional group	Standard frequency (1/cm)	Observed peak for pure drug (1/cm)	Observed peak for formulation (1/cm)
01	N-H stretch (amide)	3300-3500	3339.80	3335.43
02	C-F stretch(alkyl halide)	1000-1450	1411.24	1421.34
03	C-O stretch (ether)	1000-1300	1015.13	1015.11
04	C-Cl stretch (halide)	500-800	667.84	667.28

DISCUSSION

From IR spectra there was no appearance or disappearance of any characteristic peak of the drug, which confirms the absence of chemical interaction between drug and carrier.

Hence the excipients sodium alginate, xanthum gum, pectin which was observed to be compatible with ATN-Ca was selected for further development of the formulation.

3.6 Physical Appearance

All parameters of physical appearance were checked simply by naked eyes and by feel or touch.

From physical appearance study the observation suggests that the Orodispersible films of all formulations are non tacky, transparent Appearance, smooth Surface texture, for handling thin and easy to peel.

3.7 Study of Weight Variation, Thickness, Folding Endurance, Surface pH, Drug Content Uniformity (%) of F1-F8 formulation:

Table 3: Result of Weight variation, Thickness, Folding endurance, Surface pH, % Drug content Uniformity of F1-F8 Formulation code

Formulation Code	Weight Variation	Thickness	Folding Endurance	Surface pH	Drug Content (%)
F1	14.31	0.42	96	6.7	92%
F2	15.01	0.43	153	6.7	87%
F3	15.56	0.50	227	6.7	90%
F4	15.13	0.51	220	6.7	94%
F5	14.81	0.44	150	6.7	91%
F6	15.73	0.42	198	6.7	89%
F7	15.54	0.43	239	6.7	95%
F8	16.02	0.41	182	6.7	93%

DISCUSSION

Weight variation study was determined by using digital balance. All formulations F1-F8 shows weight variation within the limit of 14.31-16.02

Thickness was measured by using screw gauge. Thickness of F1-F8 was found to be 0.41-0.51mm. The surface pH of was tested by using digital pH meter. All batches shows pH near about 6.7. Hence all batches are safe to use

Each patch was folded at one point and the number of folding was measured. Folding endurance was found to be in range 96-239 of hence all formulation shows good folding endurance except F1, F2, F5.

The percent drug content of 2x2 cm sized film was performed by dissolving in methanol. From the obtained % drug release F1-F8 formulations shows 87-95 % of drug content. Hence F1, F4, F5, F7, F8 batches shows highest drug content

3.8 In-Vitro Dissolution Study

Percent of drug release study was performed by dissolution apparatus of type II

Table 4: In-Vitro Dissolution Study of ATN-Ca within Time 9 min.

Time (min)	% Drug Release							
	F1	F2	F3	F4	F5	F6	F7	F8
01	36.50	23.31	26.23	32.85	22.46	34.22	37.41	35.56
02	48.32	30.34	33.45	44.25	31.89	41.71	45.72	41.63
03	59.70	38.73	40.12	51.54	39.62	52.32	59.99	50.96
04	66.89	46.25	48.41	59.63	45.25	64.15	71.23	58.87
05	76.99	50.99	55.98	74.29	52.63	70.56	85.65	67.52
06	82.63	62.59	67.28	76.98	60.64	79.41	89.13	77.23
07	87.12	73.25	72.56	82.78	76.98	84.67	91.56	86.17
08	90.45	85.79	80.32	88.64	84.53	87.59	92.36	89.52
09	91.98	92.23	90.45	90.12	91.11	90.24	94.21	92.42

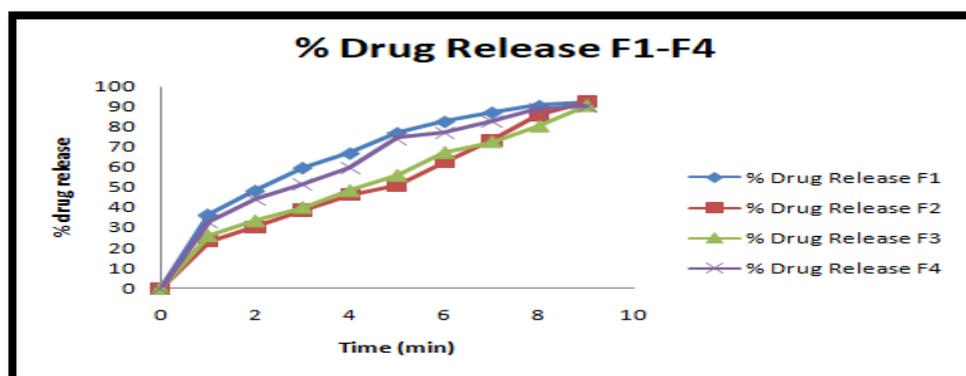


Fig.4: In-vitro dissolution study profile of ATN-Ca of F1-F4 batches

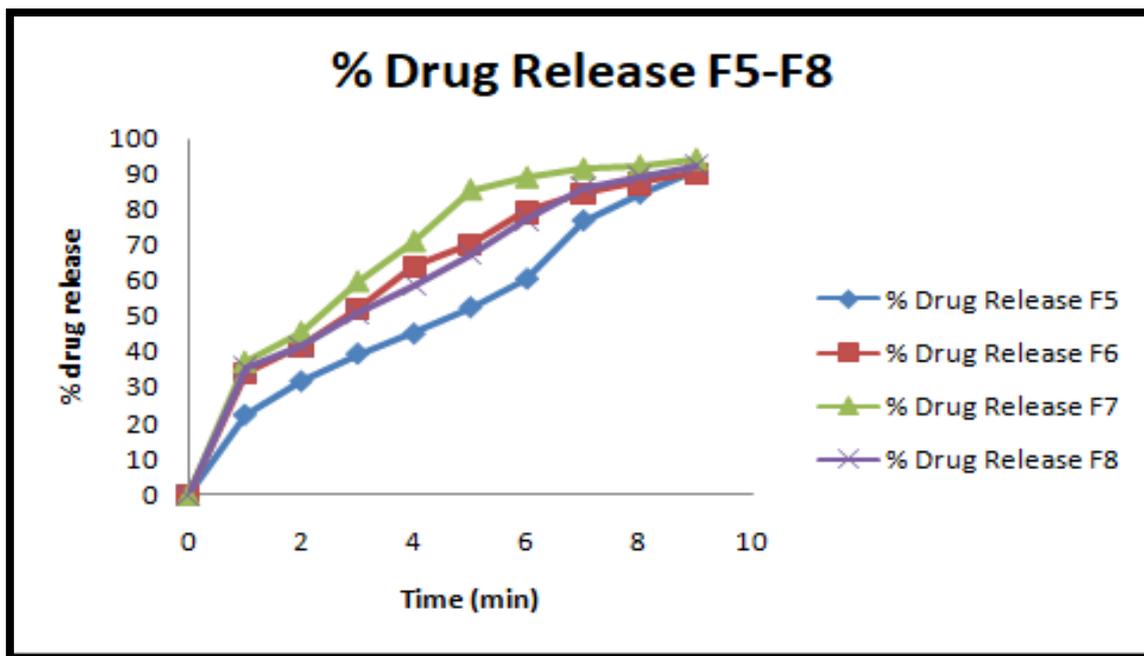


Fig.5: In-vitro dissolution study profile of ATN-Ca of F5-F8 batches

DISCUSSION

In-vitro dissolution study was performed and % cumulative drug release was calculated. From the above calculated results F1, F4, F6, F7, F8 formulation shows highest drug release within 1min. after 5min. F7 formulated batch shows maximum drug release therefore, F7 batch selected for further stability study.

7.7 Stability Study

Final optimized formulated batch were kept in stability chamber, at $40\pm 2^\circ\text{C}$ temperature and $75\pm 5\%$ relative humidity for 3 month. After 3 month film were further evaluated for various parameters.

From the stability study we can conclude that optimized batch F7 shows no changes in their various test and %cumulative drug release.

Table 5: Stability study for optimized formulated batch F7

Parameters	Initial	3 month
	F7	F7
Physical appearance	Non tacky, transparent	No changes
Thickness (mm)	0.43	0.42
Weight variation (mg)	15.54	15.52
Folding endurance	224	226
Surface pH	6.7 ± 2	No changes
% Drug content	95%	94%

In-Vitro %Drug Release Study of Optimized Batch:

Table 6: In-vitro dissolution study of optimized formulated batch F7

Time (min.)	Initial	3 Month
	F7	F7
1	37.41	38.79
2	45.72	47.21
3	59.99	60.53
4	71.23	73.95
5	85.65	87.21
6	89.13	90.03
7	91.56	91.18
8	92.36	92.36
9	94.21	93.71

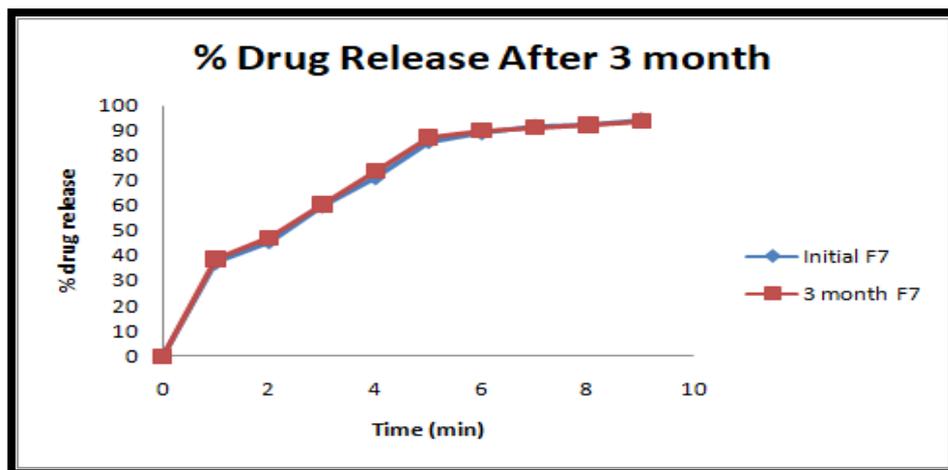


Fig.6: Cumulative % Drug Release Profile of Optimized Formulated Batch F7

DISCUSSION

From the stability study; the optimized F7 batch shows no variation in thickness, weight variation, pH and Cumulative % drug release profile.



Fig 7: Image of Petri plate with solvent casting and formulated films

CONCLUSION

All formulated batches of film was prepared by using different concentration of water soluble polymer that evaluated shows good physicochemical properties with respect to their thickness, weight variation, folding endurance and optimum cumulative % drug release from orodispersible film of Atorvastatin calcium. Conventional dosage form shows poor bioavailability and first pass metabolism to overcome these parameters this study is performed.

From all evaluated batches F7 batch shows better result as compared to other batches. Hence, It could be concluded that suitability of such formulation, still through experiment will be required based on animal studies.

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Formulation and Evaluation of Tephrosia Purpurea Loaded Nanosponge as Hepatoprotectant

Kulkarni Renuka P, Vijayendra Swamy S. M*, Nagoba Shivappa N and Jaishatte Arti A

Department of Pharmaceutics, Channabasweshwar Pharmacy College (Degree), Latur, Maharashtra, India

ABSTRACT

The Nanosponge is about the size of a virus, and a naturally degradable polyester providing a backbone to a substance (a scaffolding structure). In solution, the long polyester threads are combined with small molecules, called cross-linkers, The objective of the present research was to tailor the drug release profile by altering **Tephrosia Purpurea** solubility. This was achieved by loading the Tephrosia Purpurea into Nanosponges. colloidal Nanosponges were prepared using **Emulsion solvent diffusion method**. The prepared Nanosponges were characterized by FTIR, UV spectroscopy, The FTIR results obtained indicated polymer-drug compatibility. Tephrosia Purpurea is incorporated in to Nanosponge having advantage of dose reduction, reduced frequency of administration and avoid systemic side effects. Various applications of NSs such as recovering bioavailability of active ingredient molecule and delivery of active ingredient into oral, topical, parenteral, and nasal route make them a superior candidate for targeted delivery of drugs. It can be used as a shipper for biocatalysts in the transport and release of enzymes, proteins, vaccines, and antibodies. They can be prepared by different methods such as emulsion solvent diffusion method, melt method, ultrasound-assisted method, Quasi emulsion solvent diffusion method. This analysis is focusing on the advantages, formulation, evaluation, application, and patent report of the NSs.

Keywords: Tephrosia Purpurea, Emulsion solvent diffusion method, targeted delivery of drug

INTRODUCTION

Nanosponges are tiny mesh – like nanoporous particular structure in which a large variety of substances can be encapsulated or suspended, and then be incorporated into a dosage form. They have a proven spherical colloidal nature, reported to have a very high solubilization capacity for poorly soluble drugs by their inclusion and non-inclusion behavior. Nanosponges have recently been developed and proposed for drug delivery. Nanosponges can solubilize poorly water-soluble drug and provide prolonged release as well as improving drugs bioavailability. Nanosponges are able to load both hydrophilic and hydrophobic drug molecules because of their inner hydrophobic cavities and external hydrophilic branching, thereby offering unparalleled flexibility.

Nanosponges are more like a three- dimensional network or scaffold The backbone is a long length of polyester which is mixed in solution with small molecules called crosslinkers that act like tiny grappling hooks to fasten different parts of the polymer together. backbone is a long length of polyester which is mixed in solution with small molecules called crosslinkers that act like tiny grappling hooks to fasten different parts of the polymer together. The sponges are very small sized, which is a non-collapsible material with an average range of about 1 μm merged inside to a porous surface . They are capable of circulating through the direction of blood flow. Since they are specific in targeting on receptors and adhesive in nature and capable for better release.

MATERIALS AND METHODS

The herbal drug Tephrosia Purpurea obtained from ‘Vital Herbs’. PVA (Polyvinyl Alcohol), Ethyl Cellulose, were received from Loba chemie laboratory, Hi media Laboratories, Ozone international Mumbai, Molychem, Mumbai respectively. All other ingredients used were of analytical grade.

PREFORMULATION STUDY

Organoleptic Characteristics

Drug were tested visually for its physical appearance.

Solubility Study

Solubility of drug was tested in the various solvents (water, methanol, ethanol, etc) at room temperature by adding additional amount of drugs in solvent till supersaturation.

Spectroscopic Study

Drug have been subjected to UV calibration on UV spectroscopy to find out its lambda max which will further used to quantify %drug content as well as % drug release.

FTIR Study

Drug excipient compatibility study was conducted using FTIR. Combination of all drug and excipients was taken in 1:1 ratio and tested twice taking 1 month gap in between. Results were observed for any interaction.

Formulation of Herbal Nanosponge

Eight different batches of herbal nanosponge formulations were prepared by solvent method. Tephrosia Purpurea extract gifted by 'Vital Herbs' used as API in which PVA and Ethyl cellulose is used as polymers. Other excipients dichloromethane, used as crosslinker. Polyvinyl alcohol is dissolved in solvent stirred for 1000rpm on magnetic stirrer. After that solution of ethyl cellulose dissolved in dichloromethane and addition of drug is done. Then this solution is slowly added in to the PVA solution stirred for 2hrs on magnetic stirrer until nanosponge formed and filtered.

Table 1: Formulation Table

Ingredients	Formulation quantity in mg							
	N1	N2	N3	N4	N5	N6	N7	N8
Tephrosia Purpurea	100	100	100	100	100	100	100	100
EC	15	30	45	60	75	90	115	130
PVA	100	100	100	100	100	100	100	100
DCM	20	20	20	20	40	40	40	40
Distilled Water	q. s.	q. s.	q. s.	q. s.	q. s.	q. s.	q. s.	q. s.

Evaluation of Nanosponges

Angle of repose, Bulk density, tapped density, Hausner's ratio and Carr's index were determined to assess the flow ability of the prepared nanosponges powder.

Determination of Percentage Yield

It was calculated accurately by using the weight of final product after drying with respect to the initial total weight of the drug and polymer used for preparation of nanosponges.

$$\% \text{ yield} = \frac{\text{Practical weight of nanosponges obtained}}{\text{Theoretical weight (drug + polymers)}}$$

Determination of Entrapment Efficiency

Nanosponges equivalent to 100 mg of the drug were taken and then crushed into powder followed by transferred into a 100 ml volumetric flask consist of 10ml of methanol and the volume was made up with simulated gastric fluid of pH 1.2. After 24 h, the solution was filtered through Whatmann filter paper and the absorbance was measured spectrophotometrically after suitable dilutions.

Zeta Potential Determination

The zeta potential was measured for the determination of the movement velocity of the particles in an electric field and the particle charge. In the present work, the nanosponges was diluted 10 times with distilled water and analysed by Zetasizer using Laser Doppler Micro electrophoresis (Zetasizer nano ZS, Malvern instruments Ltd., UK)

In-Vitro Dissolution Studies

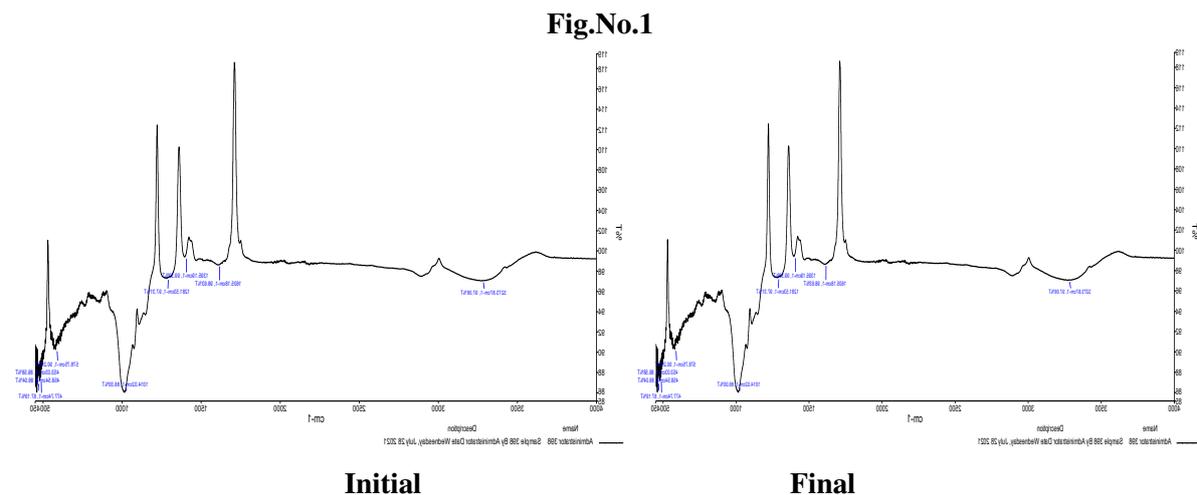
In vitro drug release was carried out by diffusion method using phosphate buffer pH 6.8 as dissolution media. Required quantity of sample (100 mg) was taken and then suspended in required media and then kept in the open-ended apparatus. One end of the tube was kept open and the dialysis bag was tied (molecular weight cut off: 12–14kDa, surface area of 22.5cm²) at the other end which was then submerged in a beaker containing 100ml of the phosphate buffer pH 7.2. Temperature of the media was kept at 37±2°C and 100 rpm speed. The samples were withdrawn at predetermined intervals and replaced by fresh medium simultaneously. Aliquots withdrawn were assayed at each time interval for the drug released at λ max of 236 nm using UV-Visible spectrophotometer.

Stability Studies

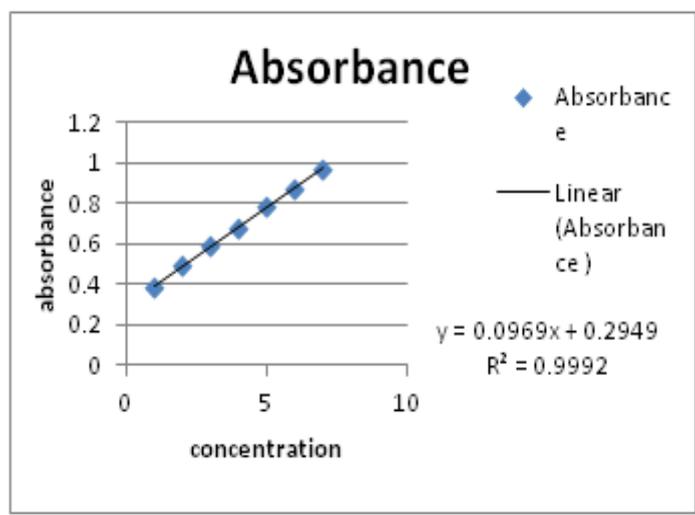
Accelerated stability studies: $-40\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C} / 75\% \text{RH} \pm 5\% \text{RH}$. As per ICH guidelines, the samples for stability analysis must be exposed to an environment of $40\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C} / 75\% \text{RH} \pm 5\% \text{RH}$ for a period of 6 mo. As per the standard protocol, the samples must be analysed at 0, 1, 2, 3-and 6-months' time points. Accelerated stability studies were performed for the final optimized formulation. Samples were analysed at 1,2 Mo' time points

RESULTS AND DISCUSSIONS

Herbal drug was obtained was appeared as brown fine powder. Solubility study shows drug were soluble in ethanol and poorly soluble in water. Drug were calibrated using UV spectroscopy. FTIR study confirmed that there were no significant change and hence it can be concluded that the drug and excipients are compatible results shown in fig 1.



FTIR of Drug with All Excipients



Concentration ($\mu\text{g/ml}$)	Absorbance
1	0.387
2	0.491
4	0.592
6	0.676
8	0.787
10	0.871
12	0.973

UV Spectroscopy

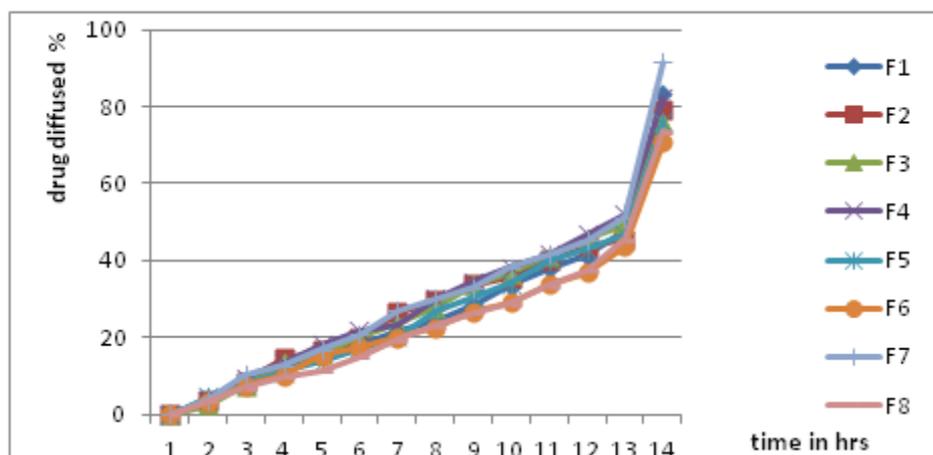
Entrapment Efficiency – Batch N4 gives the maximum entrapment efficiency.

Batch	Entrapment Efficiency
N1	73.45%
N2	77.21%
N3	72.28%
N4	80.71%
N5	72.61%
N6	70.23%

IN-VITRO Drug Release of Nanosponges

Time Cumulative Tephrosia Purpurea Permeated through dialysis membrane (%)

Time (hr)	N1	N2	N3	N4	N5	N6	N7	N8
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	3.7	3.6	2.5	3.7	4.6	3.3	3.9	3.6
2	8.0	8.5	7.6	9.5	7.7	7.6	10.4	7.0
3	12.7	14.6	13.5	13.5	11.0	10.3	12.6	9.8
4	15.5	16.6	18.1	18.1	13.7	15.2	16.9	11.3
5	17.8	19.8	21.9	21.9	17.2	17.5	20.7	15.1
6	21.6	26.4	23.4	23.4	20.3	19.9	27.0	19.4
7	24.4	29.7	30.1	30.1	26.9	22.6	30.2	23.0



Stability Studies

Optimized formulation was subjected to stability studies as per ICH guidelines. Various parameters such as drug content, and in vitro drug release were measured before and after 30, 60, days of stability. Results of stability studies showed there is no significant change in the above mentioned parameter after elevated temperature and humidity conditions during stability studies. Thus, it can be proved from the stability studies that the prepared formulation is stable and not much affected by elevated humidity and temperature conditions Stability studies.

Time (day)	Drug content (%)	In vitro drug release (%)
0	98.86±0.68	99.85%
30	98.20±0.99	99.74%
60	98.30±1.50	99.51%

CONCLUSION

From the executed experimental results it could be concluded that emulsion solvent diffusion technique is a useful method for the successful incorporation of drug. From the executed experimental results that the Tephrosia Purpurea can be converted in to Nanosponges using Polyvinyl alcohol, dichloromethane ethyl cellulose and are suitable for preparation of Tephrosia Purpurea containing Nanosponges formulation. The prolong drug release of nanosponge loaded are suitable for dose reduction, reduced frequency of administration and avoid systemic side effect.

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Formulation and Evaluation of Transferosomal Gel Containing Anti-Inflammatory Drug

Sayyed Simakousar N¹, Vijayendra Swamy S. M^{2*}, Giram Padmaja S³, Nagoba Shivappa N⁴, Ashika Sanganalu Mattha⁵, Sayyad Firdos J⁶, Dande Pradnyarani A⁷ and Waghmare Kanchan R⁸

^{1,2,4,6,7,8}Department of Pharmaceutics, Channabasweshwar Pharmacy College (Degree), Latur, Maharashtra, India

³Department of Pharmacology, Channabasweshwar Pharmacy College (Degree), Latur, Maharashtra, India

⁵Spartan Health Sciences University, School of Medicine, Saint Lucia

ABSTRACT

The aim of the present research work is to formulate and evaluate a transferosomal gel of Etoricoxib for better transdermal permeation and to produce sustained release of drug for anti-inflammatory activity. Transferosomes were prepared by thin film hydration method by using different concentrations of soya lecithin, edge activator with drug. The edge activators used in the formulation are span 60, span 40. The prepared formulation was evaluated for microscopic determination, % entrapment efficiency, drug content, in-vitro drug release. On the basis of evaluation study F3 batch was found to be optimized, hence selected for further gel formulation. The formulated gels were evaluated for visual appearance, pH, drug content, in-vitro drug release and stability study. Transferosomal gel G2 batch obtained as optimized with highest drug release.

Keywords: Transferosomes, Etoricoxib, Edge activator, in-vitro drug release, stability study

1. INTRODUCTION

Vesicular drug delivery system is one of the system that can improve the bioavailability of the drug, and also improve drug permeation. Transferosomes have been found as one of the superior drug delivery systems for topical application as compared to the conventional topical systems, due to its better penetration activity. Transferosomes are the ultra-deformable vesicles for the topical application consisting of a lipid bilayer with phospholipid and an edge activator. Transferosomes have the ability to overcome the permeation difficulty by squeezing themselves along the intercellular sealing lipid of the stratum corneum. The resulting flexibility of transferosome membranes minimizes the risk of complete vesicle rupture in the skin and allows transferosomes to follow the natural water gradient across the epidermis, after application on the skin.

Etoricoxib is a non-steroidal anti-inflammatory drug (NSAID) used for the treatment of osteoarthritis. Etoricoxib selectively binds and inhibits the enzyme COX-2, resulting in inhibition of the conversion of arachidonic acid into prostaglandins. Etoricoxib has a higher COX-1 to COX-2 selectivity ratio (ratio of 344) than any other COX-2-selective NSAIDs. Therefore, the administration of therapeutic doses of etoricoxib to healthy subjects lowers the affects of COX-1 activity in circulating platelets or gastric prostaglandin synthesis. Etoricoxib is currently approved in several countries for various indications including the treatment of acute pain, acute gouty arthritis, chronic low back pain, primary dysmenorrhea, and chronic treatment for the signs and symptoms of osteoarthritis and rheumatoid arthritis. Oral administration of etoricoxib causes gastrointestinal irritation. To overcome this problem topical drug delivery should be developed which reduce the drug dosing frequency along with sustained release of medicament as well reduce systemic side effects.

2. MATERIALS AND METHODS

A) Materials:

Etoricoxib was obtained as gift sample from PharmaZell (India) Private Limited, Visakhapatnam, Andhra Pradesh, India. Soya Lecithin, Span 60, Span 40, Chloroform and Methanol were used are of analytical grade.

B) Methods:

Formulation of transferosomes:

Etoricoxib transferosomes were prepared by thin film hydration method. Soya lecithin, Edge activator and drug were dissolved in 20 ml of chloroform and methanol (3:1) in a 100 ml RBF. Organic solvent is then evaporated using rotatry evaporater and lipid film was deposited on the walls of the flask. The flask was left in vacuum desiccators overnight to ensure complete removal of the residual solvent. The deposited film is then hydrated with phosphate buffer pH (7.4) by rotation at 60 rpm for 1 hour at room temperature. The flask is removed and the transferosomes were transferred to a container and subjected to sonication in a bath container for 15 minutes.

Table 1: Formulation of Transferosomes

Formulation	Drug (mg)	Soya Lecithin (mg)	Span 60 (mg)	Span 40 (mg)	Solvent (ml)
F1	50	95	5	-	20
F2	50	90	10	-	20
F3	50	85	15	-	20
F4	50	95	-	5	20
F5	50	90	-	10	20
F6	50	85	-	15	20

Formulation of Transferosomal Gel:

Accurately weighed amount of polymers in different ratios was placed in known amount of distilled water. After complete dispersion, the polymer solution was kept aside for 24 hr for complete swelling. Based on evaluation results optimized transferosomal dispersion was added slowly to the aqueous dispersion of polymer with continuous stirring. Finally, the remaining ingredients were added to obtain homogenous gel.

Table 2: Formulation of Transferosomal Gel

Formulation	Transferosomal dispersion (ml)	Carbopol 934 (gm)	DMSO (ml)	Methyl paraben (gm)	Triethanolamine (ml)	Water
G1	10	0.5	5	0.20	0.5	q.s.
G2	10	1	5	0.20	0.5	q.s.
G3	10	1.5	5	0.20	0.5	q.s.

EVALUATION PARAMETERS

A. Drug Characterization:

1. Physical appearance

The physical appearance of Etoricoxib was observed i.e., colour, odour, nature etc.

2. Determination of melting point

Melting point of Etoricoxib was determined by melting point apparatus. The drug was incorporated in glass capillary tube which was sealed previously at one end. The capillary tube was then subjected to melting point apparatus and the temperature at which drug start melting was noted.

3. Solubility study

The solubility studies were performed in distilled water, ethanol, methanol.

4. Estimation of Etoricoxib by UV- spectroscopy method:

Accurately weighed (10 mg) Etoricoxib was dissolved in minimum quantity of phosphate buffer pH7.4 in 100 ml volumetric flask. Then the volume was made up to 100 ml with phosphate buffer 7.4. resulting in standard stock solution (100 µg/ml). A set of standard dilutions of 2, 4, 6, 8, 10, 12 µg/ml was prepared by transferring 0.2,0.4, 0.6, 0.8,1.0,1.2 ml aliquots of stock solution (100 µg/ml) to series of 10 ml of volumetric flasks and volume was made up with phosphate buffer pH7.4. The absorbance of each dilution was measured in UV spectrophotometer at 284 nm. Graph of concentration vs absorbance intensity was plotted.

5. Fourier Transforms Infra-Red Spectroscopy:

FTIR study was done on drug and excipients to find out the compatibility between them in the range of 4000-400 cm⁻¹ in FTIR spectrophotometer. The FTIR study was performed using Perkin Elmer FTIR

B. Evaluation of Transferosomes

1. Microscopic Determination

To ensure the formation of transferosome vesicles, small amount of transferosome dispersion were subjected to simple optical microscopic detection.

2. Entrapment Efficiency:

Entrapment Efficiency of Etoricoxib transferosomal formulation was determined by centrifugation method. Transferosomal dispersion was subjected to centrifugation on a laboratory refrigerated centrifuge (Dolphin Instrument) at 14,000 rpm for 90 min. at 4°C for 1 hr. The supernatant was collected and the amount of untrapped drug in the supernatant was estimated by shimadzu UV 1800 spectrophotometer at 284 nm. % EE was calculated by following formula:

$$\% \text{ Entrapment Efficiency} = \frac{[\text{Total Drug}] - [\text{Untrapped Drug}]}{[\text{Total Drug}]} \times 100$$

3. Drug Content:

Transferosomes subjected to ultracentrifugation at 14000 rpm at 4°C solid contents separated approx. 75 mg transferosome were dissolved in 5ml ethanol by shaking manually for 2 min. diluted with PBS 7.4 up to 10 ml and then absorbance was recorded by using UV spectrophotometer at 284 nm. Drug content was calculated by using equation of standard calibration curve:

$$\text{Drug content} = \frac{\text{sample absorbance}}{\text{standard absorbance}} \times 100$$

4. In-Vitro Drug Release Study:

In vitro drug release study was carried out by using dialysis membrane employing in two sides open ended cylinder. Transferosomal suspension (4ml) containing known amount of drug was placed in dialysis membrane previously soaked overnight. The two-side open cylinder was placed in 100 ml PBS (7.4) maintained at 37°C ± 2 °C and stirred with help of magnetic stirrer. Samples from PBS (receptor compartment) were withdrawn at different time intervals and replaced with fresh PBS 7.4 to maintain sink condition. Sample withdrawn filtered and analyzed by UV spectrophotometry at 284 nm.

C. Evaluation of Transferosomal Gel

1. Appearance:

The formulations were observed for colour.

2. Homogeneity:

All the developed gels were tested for homogeneity by visual inspection after the gels have been set in the container. They were tested for their appearance and presence of any aggregates.

3. PH:

pH was checked using pH meter. The electrode was submersed into the formulation at room temperature and the readings were noted.

4. Viscosity:

Viscosity was determined by using Brookfield viscometer. Viscosity measurements were carried out at room temperature using a Brookfield viscometer.

5. Drug Content:

Drug content was estimated spectrometrically, where 100mg of formulation was taken and dissolved in methanol and filtered. The volume was made to 100ml with methanol. The resultant solution was suitably diluted with methanol and absorbance was measured at 284nm.

6. In-Vitro Drug Release:

In-vitro drug release studies were performed using modified diffusion apparatus using pH 7.4 buffer as a diffusion medium. The cellophane membrane (previously soaked overnight in the buffer) was tied to one end of a specially designed glass cylinder (open at both ends). The gel sample was applied on membrane and then fixed in between donor and receptor compartment. The temperature of diffusion medium was thermostatically controlled at 37°C ± 2 °C by surrounding water in jacket and the medium was continuously stirred by magnetic stirrer at speed of 600 rpm. The samples at predetermined intervals were withdrawn and replaced by equal volume of freshly prepared fluid. The samples were withdrawn were spectrophotometrically measured at 284 nm against the blank.

RESULT AND DISCUSSION

Drug Characterization

Etoricoxib is white, amorphous powder. Melting point of Etoricoxib found to be 134 -135°C. It is freely soluble in methanol, ethanol, & insoluble in water.

Standard Calibration Curve of Etoricoxib:

The UV absorbance of Etoricoxib standard solutions in the range of 2-12 µg/ml of drug in buffer pH 7.4 showed linearity at λ max 284 nm. The linearity was plotted for absorbance (A) against concentration (C) with R² value 0.998 and with the slope equation y=0.143x + 0.017. The absorbance values and standard curve were in below figure.

Table 3: Absorbance value of Etoricoxib

Concentration (µg/ml)	Absorbance
2	0.289
4	0.605
6	0.869
8	1.190
10	1.464
12	1.721

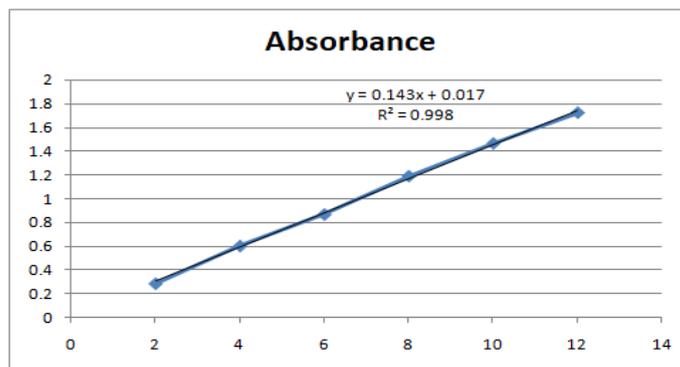


Fig. No. 1: Calibration Curve of Etoricoxib

Drug- Excipient Compatibility study:

The frequencies of Etoricoxib are in the reported range which indicates that obtained sample was pure.

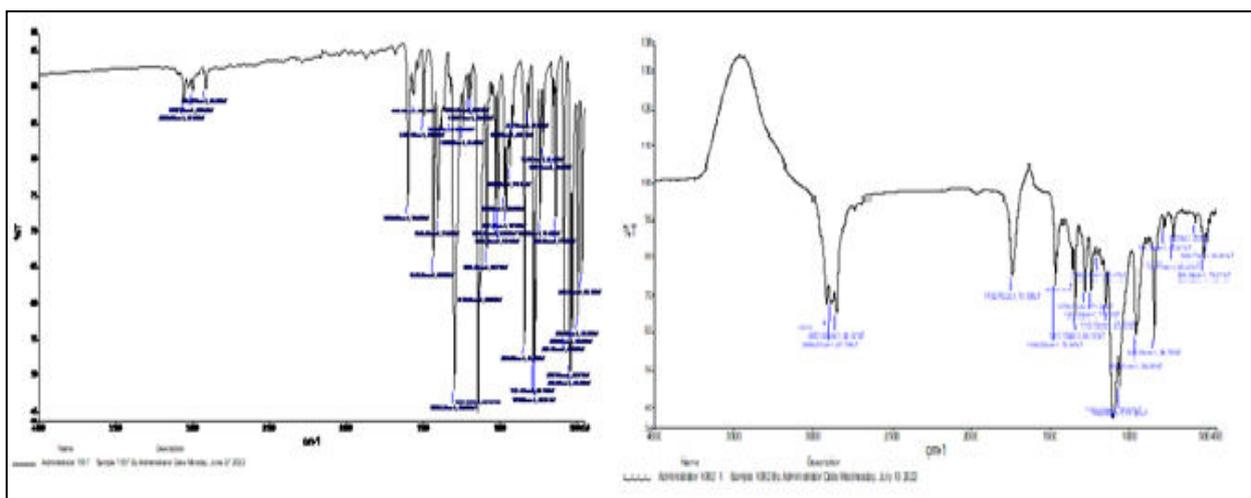


Fig. No. 2 : a) FTIR of pure drug & b) FTIR of Drug+ Excipients

Evaluation of Transferosome

Microscopic Determination

From the microscopic image confirmed vesicle formation of transferosome. Fig. No.3 shows the microscopic image of transferosome seen under light background.



Fig. No. 3: Microscopic image

Physical Appearance, Entrapment Efficiency, Drug Content

All batches were appeared as buff dispersion. % EE and drug content of F3 batch was found highest among all batches as shown in table

Table 4: Physical appearance, % EE, Drug content

Formulation batches	Physical Appearance	% EE	Drug content
F1	Buff dispersion	78.29	81.35
F2	Buff dispersion	80.76	85.81
F3	Buff dispersion	87.34	91.56
F4	Buff dispersion	82.87	87.16
F5	Buff dispersion	74.71	78.52
F6	Buff dispersion	73.45	75.68

In-Vitro drug release:

In-vitro drug release studied by using cellulose dialysis membrane in PBS 7.4 at 37°C. % Cumulative drug release of batches F1 to F6 obtained as shown in table no. 5 From all batches F3 batch shown highest % cumulative drug release hence considered as optimized batch.

Table 5: % cumulative drug release

Time (hrs)	% Cumulative drug release					
	F1	F2	F3	F4	F5	F6
0	0	0	0	0	0	0
1	4.16	4.52	5.25	5.01	6.48	5.21
2	13.02	12.21	13.19	12.98	13.38	13.17
3	18.87	19.24	20.45	20.04	19.41	19.20
4	24.98	25.59	29.65	27.15	22.13	22.01
5	31.95	32.59	37.43	35.83	30.09	29.87
6	38.37	40.26	47.90	46.34	37.19	37.05
7	44.67	45.38	58.94	57.13	43.42	43.21
8	55.43	57.11	65.29	64.25	56.88	56.74
9	63.00	64.22	72.75	71.65	62.04	63.94
10	69.49	70.56	78.55	77.91	70.94	70.78
11	76.27	76.84	83.12	82.48	75.48	75.37
12	83.09	84.34	89.63	87.22	82.25	81.48

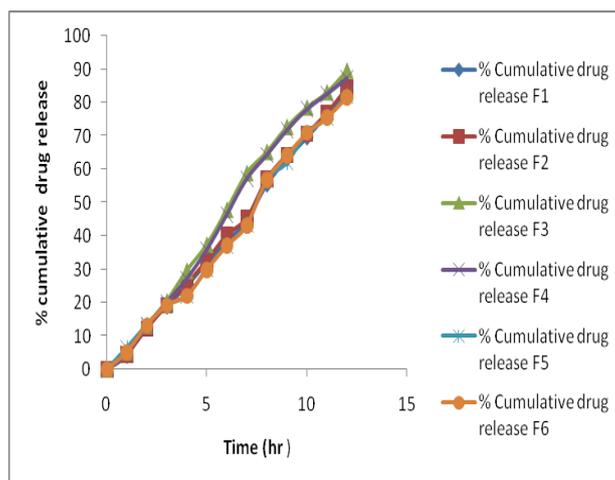


Fig no. 4: % cumulative drug release

EVALUATION OF TRANSFEROSOMAL GEL

Appearance: All the formulation were opaque and white in color.

Homogeneity: All the formulated gel showed good homogeneity with absence of lumps.

pH: The pH of Transferosomal gels G1, G2, G3 were found to be 6.32, 6.48, & 6.71 respectively.

Viscosity: Viscosity of all the gel formulation were ranged from 8300 -9100 cps.

Table 6: Viscosity of Gel

Transfersomal Gel	At 12 rpm (cps)
G1	8300
G2	8700
G3	9100

Drug Content: The percentage drug content of all prepared gel formulation was found to be in the range of 87.23 %- 91.15%. These results indicate uniform drug distribution in the gel formulation. The results are shown in below table

Table 7: Drug Content

Transfersomal Gel	% Drug Content
G1	88.41
G2	91.15
G3	87.23

In-vitro drug release: *In-vitro* drug release studies were performed using cellophane membrane. Out of three formulations, formulation G2 shows better drug release. From this result, formulation G2 was optimized.

Table 8: % Cumulative Drug Release

Time (Hrs)	% Cumulative Drug release		
	G1	G2	G3
0	0	0	0
1	9.27	10.32	9.11
2	12.98	17.26	12.32
3	19.69	21.54	19.21
4	27.78	28.38	27.01
5	34.78	35.65	34.32
6	41.21	41.87	40.87
7	49.03	49.79	49.12
8	56.71	57.23	56.02
9	65.56	66.98	64.96
10	71.98	72.75	70.43
11	79.57	80.63	79.21
12	86.78	88.45	85.69

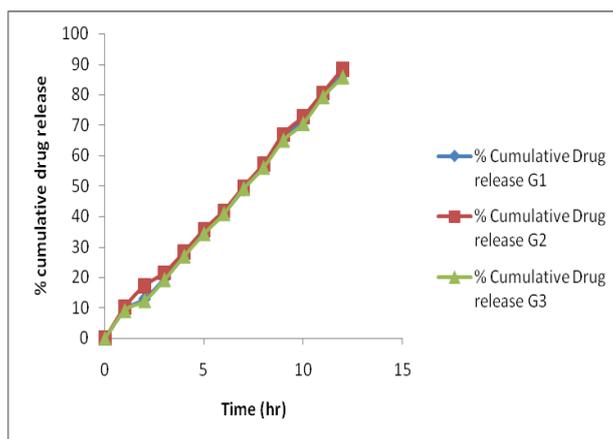


Fig. No. 5: % Cumulative Drug release

Stability Studies: Stability studies were performed as per ICH guidelines at different temperatures for 3 months i.e. 25°C ± 2°C / 60 ± 5 %RH for first 30 days and 40°C ± 2°C / 75 ± 5 % RH upto 90 days. The result indicates that there is not so much change in appearance, pH, drug content, *in-vitro* drug release.

Table 9: Stability study on optimized formulation G2

Days	Temperature and Relative Humidity	Appearance	pH	Drug content	<i>In-vitro</i> drug release
0	25°C±2°C/60±5%RH	Translucent white	6.48	91.15	88.45

15	25°C±2°C/60±5%RH	Translucent white	6.45	91.13	88.39
30	25°C±2°C/60±5%RH	Translucent white	6.44	91.09	88.27
60	40°C±2°C/75±5%RH	Translucent white	6.41	91.07	88.06
90	40°C±2°C/75±5% RH	Translucent white	6.39	91.00	87.82

CONCLUSION

The transferosomal gel containing Etoricoxib were successfully formulated and evaluated for various physicochemical and *in-vitro* characterization. The formulation F3 consisting of soya lecithin (85 mg) and span 60 (15 mg) was optimized on the basis of evaluation parameter like % EE, drug content, in-vitro drug release. Transferosomal gel was prepared from F3 optimized batch of transferosome, which showed in-vitro drug release 86.78%, 88.45%, 85.69% in 12 hrs. From all transferosomal gel batches G2 obtained as optimized batch showed highest *in-vitro* drug release.

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Formulation and Evaluation of Fast Dissolving Oral Film of Promethazine Theoclate

Dhenge Ashwini B, Gaikwad Varsha M*, Nagoba Shivappa N, Giram Padmaja S, Shaikh Nasheer S, Ambad Shruti S, Kamble Sumedh P, Dhenge Abhijeet B and Swami Avinash B

Department of Pharmaceutics, Channabasweshwar Pharmacy College (Degree), Latur, Maharashtra, India

ABSTRACT

Aim of the present study was to develop and evaluate fast dissolving oral film containing Promethazine Theoclate. Fast dissolving oral films deliver drug directly in the vascular system via salivary secretion and bypasses the hepatic first pass metabolism, dose of the drug also reduces significantly. Fast dissolving films were prepared using solvent casting method, hydrophilic polymers were selected as film forming agents such as HPMC-K15, HPMC-E15 and PEG-400 was used as plasticizer to give flexibility to the films. In FTIR study no interaction was observed between drug and the excipients. After preparation of film, the drug loaded films evaluated for weight variation, thickness, pH, disintegration time, dissolution time & in-vitro drug release studies. Among the formulations [F1 – F8], formulations F2 and F5 formulations was selected the best formulation as its maximum drug content, disintegration drug release releases was superior than other formulations. Among F2 and F5 formulations, formulation F2 was found to be best formulation compared to F5 formulations. Drug loaded films with both the polymers were stable under 40°C/75% RH conditions.

Keywords: fast dissolving oral film, Promethazine theoclate, Solvent casting method, motion sickness, BCS class

INTRODUCTION

Oral drug delivery is one of the most preferred and accepted route of drug delivery, due to easy administration, patient compliance and cost effectiveness. Fast dissolving oral film is one of the recent formulations given through oral route. The oral film is a dosage form that employs a water dissolving polymer which allows the dosage form to quickly hydrate by the saliva, adhere to mucosa, and disintegrates within a few seconds, dissolves and releases medication when placed on tongue or oral cavity. Oral film is used for local action in mouth such as toothaches, oral ulcer, sore throat, cold or local anaesthetic etc. Many drugs like cough remedies, antiasthmatics, antihistaminic, erectile dysfunction drugs, motion sickness drugs, gastrointestinal disorders, nausea, pain and CNS drugs can be incorporated in oral film. Paediatric and geriatric patients have difficulty to take tablet orally because of fear of choking, difficulty in swallowing tablets. To overcome the issues related to tablets, a new drug delivery system for the oral delivery of the drugs, was investigated which is known as Fast dissolving films.

Promethazine theoclate is **BCS Class II**, H1 antihistaminic drug mainly used in the treatment of motion sickness and postoperative emesis. It has 25% bioavailability due to its poor aqueous solubility which is the major limiting factor for its absorption and delayed onset of action. Various formulations of Promethazine theoclate are available in the market for oral administration. The development of fast dissolving oral films containing **Promethazine Theoclate** offers an alternative to conventional tablets, syrups and injections for the treatment of emetics.

MATERIALS AND METHOD

Promethazine theoclate was obtained from MBH raw Pharma, mulund, Mumbai. HPMC E15, HPMC K-15 were received from Loba Chemie lab Vikas pharma Goregaon, PEG400, citric acid, aspartame, strawberry flavor and Tween-80 used were of analytical grade.

PREFORMULATION STUDY:

Organoleptic properties: Promethazine theoclate sample which is supplied from MBH raw pharma Pvt. Ltd. Mulund, Mumbai was closely observed for physical appearance.

Solubility study: For the purpose of solubility, additional amount of drug is added in the solvent (methanol, Phosphate buffer, distilled water, ether) at room temperature and kept for 24 hrs with rare shaking. The supernatant was taken and evaluated by using shimadzu UV1800 double beam spectrophotometer.

Fourier transforms Infra-red Spectroscopy (FTIR) study: Compatibility of drug with excipients was determined by FTIR study. Combination of drug and excipients was taken in 1:1 ratio and observed for any interaction.

Table.No.1: Formulation table

Ingredients	Formulation Codes							
	F1	F2	F3	F4	F5	F6	F7	F8
Promethazine Theoclate(mg)	397	397	397	397	397	397	397	397
HPMC K15 (mg)	300	350	400	450	-----	-----	-----	-----
HPMC E15 (mg)	-----	-----	-----	-----	300	350	400	450
PEG-400 (ml)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Citric acid (mg)	45	45	45	45	45	45	45	45
Tween 80 (ml)	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Aspartame (mg)	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
Strawberry (ml)	qs	qs	qs	qs	qs	qs	qs	qs
Distilled Water (ml)	qs	qs	qs	qs	qs	qs	qs	qs

Calibration curve of Promethazine Theoclate by UV spectrophotometer: Accurately weighed 10 mg of promethazine theoclate was dissolved in 10 ml methanol and diluted to 100 ml with 6.8 buffer, the prepared stock solution was subsequently diluted to get the concentrations of 5, 10, 15, 20, 25 µg/ml of promethazine theoclate respectively, absorbance of these solutions was measured at 278 nm using UV spectrometer (shimadzu).

PREPARATION OF PROMETHAZINE THEOCLATE FAST DISSOLVING FILM:

The fast dissolving oral film of Promethazine Theoclate were prepared by the solvent casting technique by using HPMC-K15, HPMC-E15 as film forming polymer and PEG400 as plasticizer tween-80 used as surfactant, citric acid as saliva stimulating agent, aspartame as sweetening agent, and strawberry as flavoring agent. Polymer HPMC-K15 or HPMC-E15 were weight accurately and dispersed in water according to different formulation as shown in Table 1. Then add PEG-400 for different formulation which shown in Table 1 and mixed well till clear solution was obtained. Then the drug was added to the polymeric solution. Remaining ingredient citric acid, strawberry, aspartame was added and then continuously stirred to form a clear viscous solution and finally casted in to the Petri plate and dried.

EVALUATION OF FILM:

Physical Appearance: Film was observed to check its appearance, texture, tackiness etc.

pH of film: The pH was measured by using pH meter in which the electrodes are placed in contact with surface of the oral film which was previously wet with the help of water.

Thickness: Thickness of film is measured by using an electronic micrometer. The thickness of the film measured at five different locations (center and four corners), and the mean thickness is calculated. This is necessary to determine uniformity in the thickness of the film.

Weight Variation: Weight variation is studied by individually weighing 10 randomly selected films and by calculating the average weight of film.

Content uniformity: Content uniformity film is determined by standard assay method described for the Promethazine Theoclate in the standard pharmacopoeia.

Folding endurance: Folding endurance is determined by folding film repeatedly at the same place until it breaks. The number of times without breaking, the film is folded and calculated as value of folding endurance.

Percent Elongation The selected films were cut into 2×2 cm² area and were pulled by two clamps to opposite side, placed over a scale, from both the sides till it cracked. The elongation was determined by checking the increase in length of the film. The percentage elongation of film was calculated by using formula

$$\% \text{ Elongation} = \frac{\text{increase in length} \times 100}{\text{original length}}$$

Disintegration time: Test performed by using disintegration test apparatus.

In Vitro dissolution study

The drug release studies are performed with the help of USP II dissolution test apparatus (Paddle type). The temperature is maintained at 37 ±1°C and stirred at rate of 50 rpm. Each film is fixed on a glass slide. Then the slide is immersed in the vessel containing 500 ml of phosphate buffer pH 6.8. The aliquots of one ml are

withdrawn at predetermined time interval of 2, 4, 6, 8, 10 minutes and replaced with equal volume of fresh buffer. The absorbance is checked by U.V.Spectrophotometer at 278 nm.

Stability Studies: Films are stored in an aluminum foil. Final optimized formulated batch were kept in stability chamber, at $40 \pm 2^\circ\text{C}$ temperature and $75 \pm 5\%$ relative humidity for 3 month. After 1, 2 and 3 month film were further evaluated for various parameters.

RESULT AND DISCUSSION

Physical appearance of Fast dissolving film: All parameters of physical appearance were checked simply by naked eyes and by feel or touch.

Sr.No	Parameters	Observations
1	Appearance	Transparent
2	Surface texture	Smooth
3	Ease of Handling	Thin, Easy to Peel
4	Tact test	Non tacky

Table.No. 2: Physical appearance

Estimation of Promethazine Theoclate by UV-Spectroscopy Method:

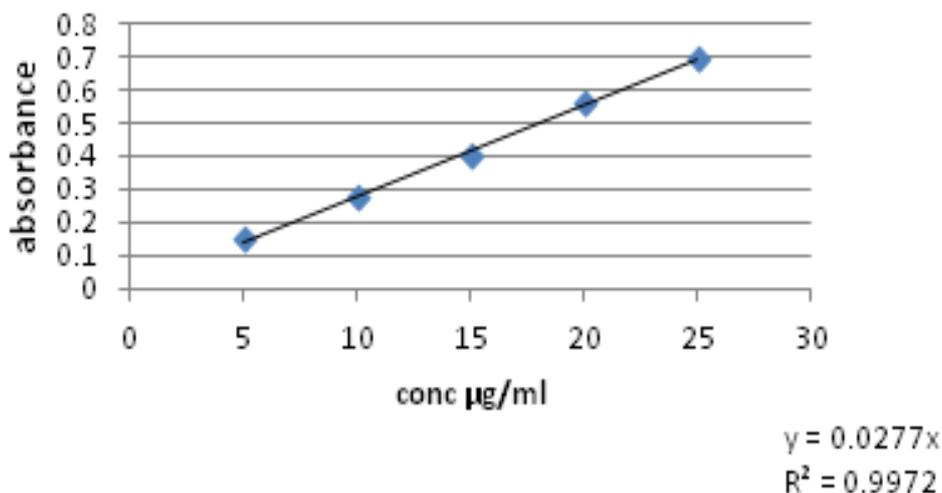


Figure.No:1: The calibration curve of Promethazine theoclate

FTIR STUDY:

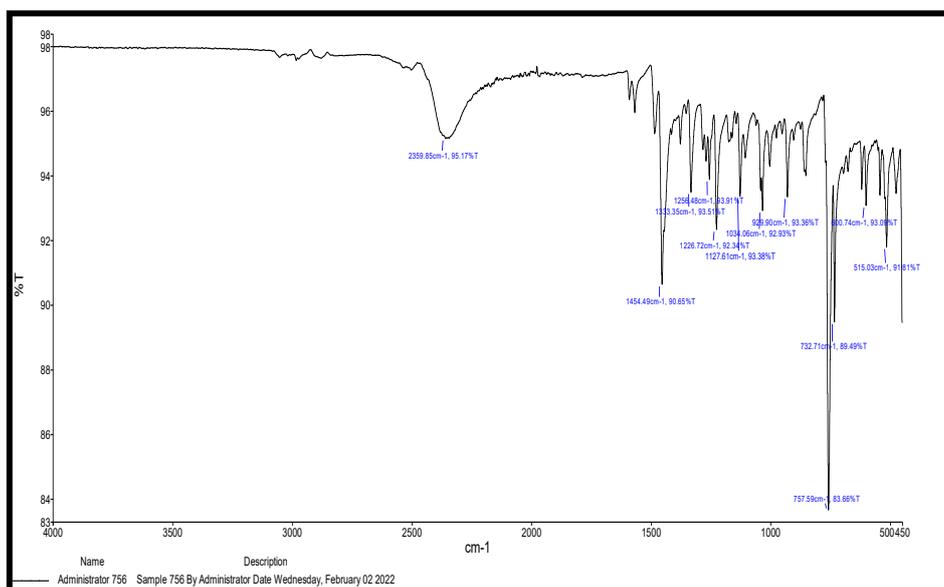


Figure.No.2: FTIR of Promethazine theoclate

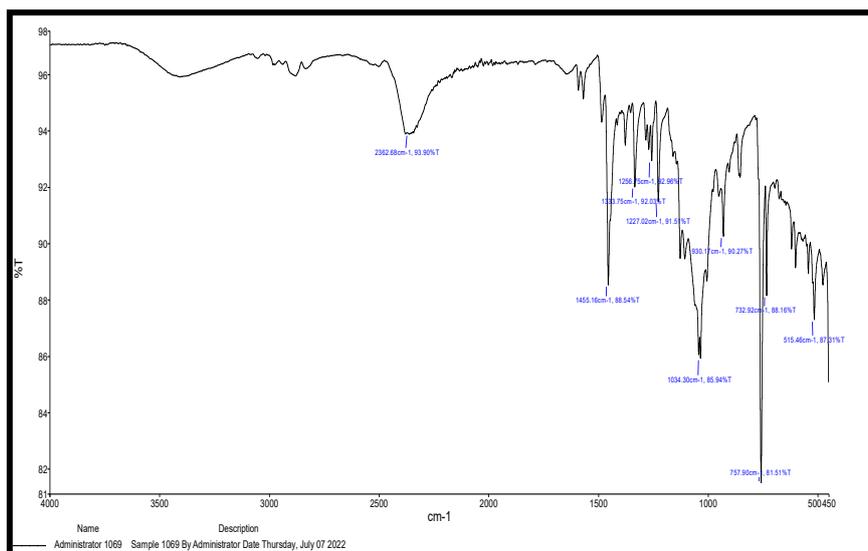


Figure.No.3: Drug+ HPMC k15+ HPMC E15

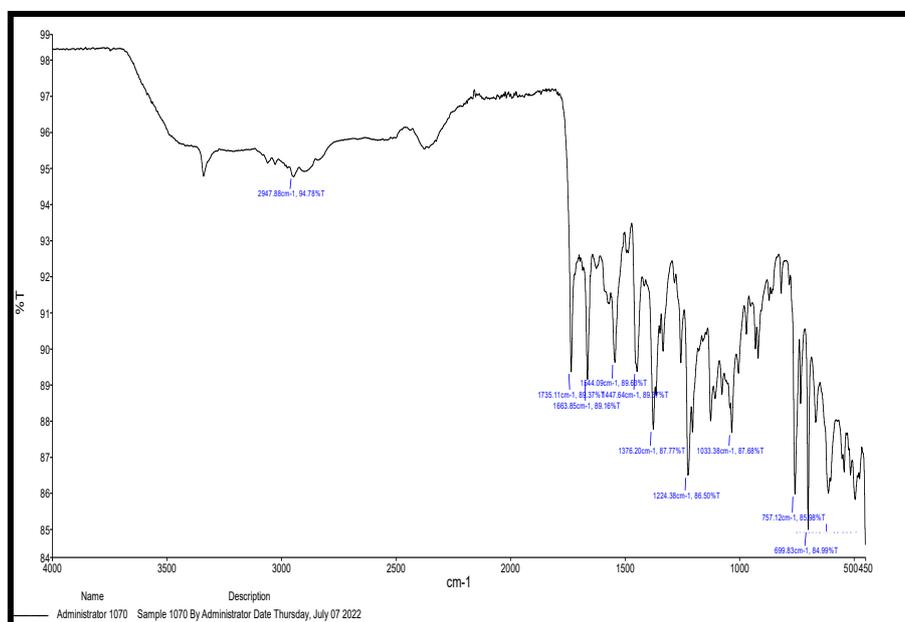


Figure.No.4: FTIR OF Fast dissolving film

The obtained peak frequencies of Promethazine theoclate drug, drug + excipients and F2 formulation was found to be in range of standard FTIR frequencies.

EVALUATION OF FILM:

Table.No.3: Evaluation test results of prepared fast dissolving oral film

Formulation code	Weight variation (mg)	Thickness (mm)	Surface pH	Folding Endurance	Dis-integration Time (sec)	Drug content (%)	%Drug release (within 5min)	% Elongation
F1	16.45	0.32	6.81	151	16	90.23	90.88	14
F2	16.95	0.38	6.83	166	19	91.42	93.46	19
F3	17.28	0.39	6.79	168	25	87.62	86.45	21
F4	17.65	0.40	6.89	179	29	87.03	83.10	23
F5	15.28	0.29	6.78	138	20	89.31	89.96	12
F6	15.76	0.31	6.75	146	23	88.11	87.24	16
F7	16.21	0.34	6.76	152	28	87.76	85.21	19
F8	17.12	0.37	6.83	159	30	85.54	80.02	21

In-Vitro dissolution study:

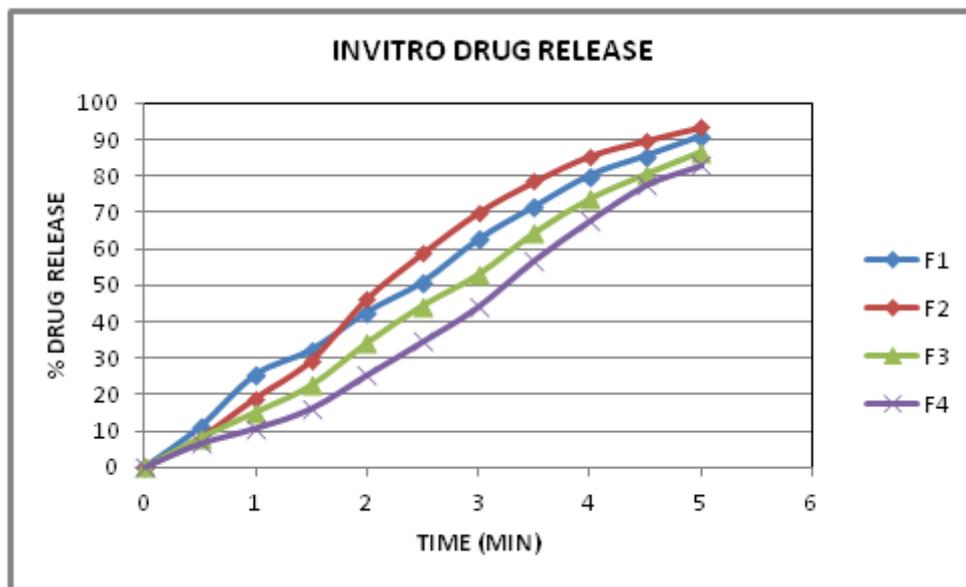


Fig. 5: In-vitro dissolution study of Promethazine Theoclate fast dissolving film (F1-F4 batches)

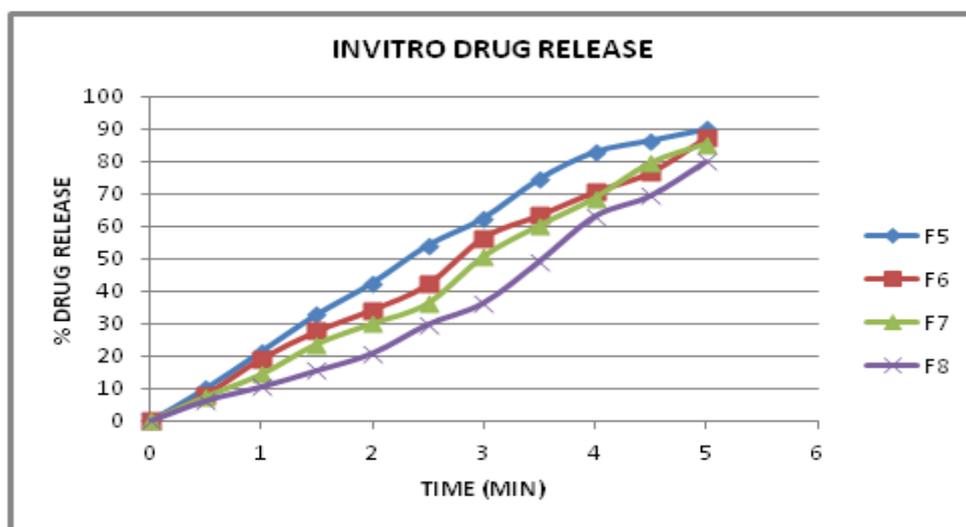


Fig. 6: In-vitro dissolution study of Promethazine Theoclate fast dissolving film (F5-F8 batches)

Stability study:

Table.No.4: Stability study for optimized formulated batch F2

Parameters	Initial	1 month	2 month	3 month
	F2	F2	F2	F2
Physical appearance	Non tacky, transparent	No changes	No changes	No changes
Surface pH	6.8	6.8	6.7	6.7
% Drug content	91.42	91.00	90.63	90.00
In vitro Drug release (%)	93.46	93.10	92.62	91.58

CONCLUSION

In recent year, fast dissolving oral films is more poplar dosage form and will be of great ease to treat diseases like motion sickness, and vomiting, where fast onset of action is required .Fast dissolving oral films are more beneficial in this case and also no need to take water for administration purpose so suitable in travelling. In this study the drug promethazine theoclate, mainly used in the treatment of motion sickness, was incorporated into fast dissolving film by using HPMC-K15, HPMC-E15 polymers. Among all formulations F2 is better than that of other formulations because of better release profile (93.46%) within 5 min and shows good stability. Fast dissolving films are safe and favorable for children’s, elderly and mentally ill patient who generally face problems while swallowing tablets and other dosage forms.

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Challenges and Strategies of Micro Small & Medium Entrepreneurs

Sherly Shubha J. M

Department of Commerce, Maharani's Women's Commerce & Management College, Mysore, India

ABSTRACT

The Micro, Small and Medium Enterprises has emerged as a highly vibrant and dynamic sector of the Indian economy over the last five decades. They contribute significantly in the socioeconomic development of the country by fostering entrepreneurship and generating employment opportunities at comparatively lower cost of capital only next to agriculture. MSMEs are complimentary to large industries as ancillary units and this sector contributes significantly to the industrial development of the country. The MSMEs are widening their domain across the various sectors of the economy by producing diverse range of products and services to meet the demands of domestic as well as global markets.

INTRODUCTION

The importance and potential contribution of the Micro, Small and Medium enterprises are supported by both theoretical arguments and empirical evidence. It has been recognised all over the world that MSMEs are adept in distributing national income in a more efficient manner. This sector also helps the economy by promoting a balanced development of industries across all regions of the nation. The MSMEs stimulates economic growth by providing employment opportunities to those who are unable to be employed in large scale industries. Thus, this sector acts as an essential medium for the efficient utilisation of locally available skills and resources.

LITERATURE REVIEW

Many research studies and projects are published on the different aspects of the micro, small and medium industries. Besides these Khadi and Gramodhyog are publishing regularly the annual reports. These are valuable sources for the academic studies.

CII survey 2010 report titled "Infrastructure Development Key to MSMEs Growth and Development" states that the high cost plays a major role in the development and the growth of the economy.

Dr. Anuradha in the research paper titled, "Problems and Prospects of Micro, Small & Medium Enterprises in India in the area of Globalisation" compares the performances of MSMEs during the pre and post liberalization period in India with the help of four economic diameters namely number of units, production, employment and export.

Jayalakshmi Srikumar in her research paper titled "SME and Global Competitiveness, Strategies for Growth and Survival in the WTO Era" stated that the MSME entrepreneurs had an opinion that the government only frames the schemes and policies but does not know to implement in the right way.

Kalyan Kumar & Gugloth in their research study namely Small & Micro Enterprises in the 21st century focuses on the ongoing changes in the business environment and the analysis of their suggestions for MSMEs.

Sumarjeet Singh and Meenakshi Paliwal (2017) in "Unleashing the Growth Potential of Indian MSME Sector" had concluded that undoubtedly the MSME sector has huge potential for generating innovative entrepreneurship and massive employment. They have identified various problems confronted by MSMEs.

OBJECTIVES OF THE STUDY

1. To highlight the significant role played by the MSMEs
2. To assess the challenges faced and the strategies implemented by the MSMEs
3. To record the role of ministry of MSMEs
4. To give suggestions and conclusions about the study

This sector consists of 63 million units which has a fast growth annually. It provides employment to more than 17 million individuals. More than 6000 products of the MSME sector contributes about 30.5% of the GDP.

MAJOR CHALLENGES FACED BY MSMEs ARE

1. **Scanty Credit Assistance:** The micro, small and medium enterprises always used to face the problems of scanty and timely supply of credit. This is because of the weak credit worthiness of these small borrowers and therefore they are forced to pay exorbitant rate of interest.
2. **Uneven and Poor Quality of Raw Materials:** These units always face the problems in procurement of raw materials either from local or national market. This is because of the shortage of finance to purchase

qualitative raw materials. In addition to it they have lack of knowledge about its availability. The large-scale industries enjoy economies of large-scale operation hence can procure the qualitative raw material at a reasonable price.

3. **Inadequate Infrastructure:** Most of the MSME units face inadequate infrastructure as they are located in rural, semi urban and urban areas. They are not able to run the heavy machines as they commonly face power cut off. This leads to the underutilization of technology, machineries and equipment.
4. **Corruption:** Smaller firms are affected by larger corruptions. This is according to a report by United Nations Industrial Development Organisation. In order to avail many facilities including finance they will pay high percentage of annual revenues by bribing to public officials. It is worth to mention here, bribery starts from the stage of registration and licensing systems.
5. **Unorganised Marketing Process:** Micro and small and medium scale units are suffering from organised marketing process. They can not compete with the products and services of the large-scale industries. They tie up with trading agencies to know the recent trends in the market. The process of marketing differs from business to business. They are purely unable to access the advertising agencies as there is shortage of finance. The Government has launched many schemes to market the products of these units but they suffer competitive drawbacks in comparison to the large-scale industries.
6. **Absence of Modern Machinery and Technology:** The machineries and technologies used by most of the MSME are purely old and outdated. In the absence of modern machinery and technology whatever the work taken by these units are in vain. This is like vicious circle in order to acquire better thing there are series of necessary things to be followed. But it is unfortunate that these units are unable to acquire these at a low cost.
7. **Lack of Information Awareness:** Most of the MSMEs are not aware of the availability of loan facility, training institutions which are struggling to promote these sectors in a better way to run their business. In the Union Budget 2014, initial sum of 100 crore is assigned for Start Up Village Entrepreneurship Programme for encouraging rural youth to take up local entrepreneurship programmes. It is because of this lack of proper information the majority MSMEs entrepreneurs are unaware about the benefits.
8. **Competition:** MSME's are generally facing lack of competitiveness in terms of innovation, procurement of finance, business operation and good management which are necessary to run their business effectively. The large enterprises have the capacity of enjoying large scale operation. They also spend a formidable amount in marketing their brand through advertising campaigns. The MSMEs are unable to do such extensive marketing due to shortage of finance which renders them less competitive. MSMEs also face competition from other developing countries due to globalisation.
9. **Research and Development:** With globalisation, there is an urgent need of a dynamic and self-sustaining culture of innovation. In order to compete in the world wide markets the firms need to continuously depend on research and development process. According to a report by FICCI, in India there are only 19% of innovating firms are existing. It is ranked 62nd place on the Global Innovation Index and 8th in the income group after China, Moldova, Jordan, Thailand, Vietnam, Ukraine and Guyana (FICCI MSME Summit 2012). Now, the problem is that most of the MSME owners do not aware of the importance of R&D department. It is mainly because of the lack of knowledge, education, availability of capital and most of the times incapability to drive the R&D department.
10. **Government Regulations:** To start a private limited company one has to get various licenses such as service Tax Regulations, Tax Collection and Deduction Account Number (TAN), VAT/GST Registration. Shops & Establishment License, Central Excise License, Import Export Code, Professional Tax, Employee Provident Fund Registration, ESI (Employee State Insurance), construction permits from the Municipal Corporation. The owners come to know about these regulations only when finally has to face the barrier. Study of MSMEs/ Centre for Civil Society

Strategies to be adopted by Entrepreneurs to Overcome the Risks in Business:

Jospeh Schumpeter brought a new dimension to the definition of entrepreneurship. He introduced the concept of 'creative destruction' in which he defined an entrepreneur as an individual who introduced new factors of production. He rejected the views of entrepreneurs being risk bearers. Instead, he argued who carries out any one of the five risks:

1. Creation of a new product of service
2. A new method of production
3. Creation of a new market
4. New source of raw market
5. Creation of a new organisation or an industry

Schumpeter elaborate that one who achieves one of these as a director of the organisation or as an individual is an entrepreneur. Creative destruction meant that the innovation replaced the old and destroyed the equilibrium.

According to Ludwig Von Mises the entrepreneur is termed as an agent who has explanation to the changes that occurs in the market, he reasons out the factors of change that affects the market.

Mises considered entrepreneurial action as the game of an individual who holds talents and skills to turn a raw material into a usable form. It is the power of an individual to see more and creates an opportunity for others by applying the new techniques by using the same raw materials in many ways. According to Mises the entrepreneur is driven by his thoughts and past experiences.

David C Mc Clelland stated that individuals with high need of achievement and strong personality traits are more likely to behave entrepreneurially.

According to him the following are the distinctive characteristics which are needed by such individuals:

- To work with propensity by taking high risks.
- A strong belief in sheer hard work and determination to attain goals.
- A tendency to believe that the probability of success in attaining goal which is high.
- A continuous mechanism of feedback in terms of success or failure of one's effort.

Shawn Wang & Peng Chau describes in simple words, to be an entrepreneur, a person needs sheer courage to fight all odds, be a risk bearer and have the strength to do things for the first time.

Table 1: State wise Distribution of Estimated Number of MSMEs (in lakhs)

State	Micro	Small	Medium	MSME
Andhra Pradesh	33.74	0.11	0	33.87
Arunachal Pradesh	0.22	0.00	0	0.23
Assam	12.1	0.04	0	12.14
Bihar	34.41	0.00	0	34.46
Chattisghad	8.45	0.03	0	8.48
Delhi	9.25	0.11	0	9.36
Goa	0.7	0.00	0	0.7
Gujarat	32.67	0.50	0	33.16
Haryana	9.53	0.17	0	9.7
Himachal Pradesh	3.86	0.06	0	3.92
Jammu & Kashmir	7.06	0.03	0	7.09
Jharkhand	15.78	0.10	0	15.88
Karnataka	38.25	0.09	0	38.74
Kerala	23.58	0.21	0	23.79
Madhya Pradesh	26.42	0.31	0.01	26.74
Maharashtra	47.6	0.17	0	47.78
Manipur	1.8	0.00	0	1.8
Meghalaya	1.12	0.00	0	1.12
Mizoram	0.35	0.00	0	0.35
Nagaland	0.91	0.00	0	0.91
Odisha	19.8	0.04	0	19.84
Punjab	14.56	0.09	0	14.65
Rajasthan	26.66	0.20	0.01	26.87
Sikkim	0.26	0.00	0	0.26

Tamil Nadu	49.27	0.21	0	49.48
Telangana	25.94	0.10	0.01	26.05
Tripura	2.1	0.01	0.00	2.11
Uttar Pradesh	89.64	0.36	0.00	90
Uttarakhand	4.14	0.02	0.00	4.16
West Bengal	88.41	0.26	0.01	88.67
A & N Island	0.19	0.00	0.00	0.19
Chandigarh	0.56	0.00	0.00	0.56
Dadra & Nagar Haveli	0.15	0.01	0.00	0.16
Daman & Diu	0.08	0.00	0.00	0.08
Lakshadweep	0.02	0.00	0.00	0.02
Puducherry	0.96	0.00	0.00	0.96
ALL	630.52	3.31	0.05	633.88

Strategies to be Implemented by the Entrepreneurs:

Entrepreneurial strategy is the means through which an organisation establishes its fundamental set of relationships with its environments. It is characterised by widespread and simultaneous change in the pattern of decision taken by the organisation.

The following strategies should be implemented by the successful entrepreneurs:

- Study the Competition: As an entrepreneur, it is important to know who are the competitors in the market and also about the rival products or the services being offered by the competitors. It is very important to use the competitor's weakness.
- Conservation of Cash: Conservative use of money will help an entrepreneur to deal any tough situation that arises. This will help an individual to survive most unforeseen circumstances.
- Research of Emerging Products & Services: Continuous research in the emerging products and services could improve the company operations. This could help enterprises to manage time more efficiently by delegating ordinary tasks to free up more time for priority projects.
- Never Tackle Huge Market at First: Never step into large markets in the initial stages. Niche marketing can be extremely cost effective if these two things are kept in mind.

They are:

1. Meet the market's unique needs by offering something new and innovative.
 2. Speak the market's language and understand its needs.
- **Customers feedback to Adopt Requirements:** Entrepreneurs can evolve and expand their business only when they are listening to customers feedback. Entrepreneurs always need to be adoptive depending upon the needs of the customers.
 - **Respond to Change:** Being flexible, accepting the change, adopting to business operations are the essential qualities of an entrepreneur. Lack of adoptability can result in loss and even business failure.
 - **Growth Orientation:** Courage plays a very key role in the growth of any business.
 - **Adequate Firm Resources:** Resources include financial as well as human. The responsibility of the market is not just finding new customers but finding the gap that can be filled in an economically viable way. It should not only find out a solution to the customer but also taken care of their preferences.
 - **Develop New Connection with the Customers:** To connect more closely to the customers, it is important for MSMEs to leverage the branding. It builds reliability among the customers. It also creates good will and enhances the position in the market.
 - **Marketing Strategy:** Internet is a vast marketing tool. Customer Relationship Management (CRM), Digital Advertising, Information & Communication Technology & e-Marketing focus on fresh ideas and innovations and cluster approach. Advertisements and promotional channels will be used completely depending upon the product or service and the customers.

Table: 2 Top 10 States in terms of number of MSME establishments (in lakhs)

Ranking	State	Number of Establishments
1	West Bengal	5269814
2	Uttar Pradesh	5238568
3	Maharashtra	4545581
4	Tamil Nadu	3282197
5	Andhra Pradesh	2781291
6	Kerala	2364085
7	Rajasthan	2270936
8	Gujarat	2218464
9	Karnataka	2188860
10	Madhya Pradesh	1958550
	Total	32118346
	All_India	45363786

CONCLUSION

The study concludes that availability of finance is a major obstacle to the growth of micro, small and medium enterprises. Many entrepreneurs are ambitious and active in taking up new ventures and starting business but most of the ideas are nipped in the bud itself for the reason of lack of capital. The lack of finance is the greatest hurdle in technological upgradation, hiring of skilled labour etc. Most of the MSME owners have to spend initial four to five years of their entrepreneurial life to gain quality contacts and to find their place in the market. Even later they lag behind the larger enterprises due to lack of knowledge in packaging and advertising their products and services.

MSMEs are considered to be one of the major segments of the Indian economy. They play a major role in employment generation, regional development, increasing exports and GDP. It is the responsibility of the government to create friendly atmosphere to these entrepreneurs. Government may take proper steps to solve the loopholes in the system of entrepreneurial promotion.

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Preparation, Characterization and Evaluation of Carbon Nanotubes Containing Fluconazole for Topical Drug Delivery

Sakhare Raghunath S¹, NagobaShivappa N^{2*}, Thorat Sanket G³, Shaikh Ismail Y⁴, Patil Vishnavi D⁵, Panchal Shital P⁶ and Swami Avinash B⁷

^{1,2,6}Department of Pharmaceutics, Channabasweshwar Pharmacy College, Latur, Maharashtra, India

^{3,4}Department of Pharmaceutical Chemistry, Latur College of Pharmacy, Hasegaon, Latur, Maharashtra, India

⁵Department of Pharmaceutical Quality Assurance, Godavari Institute of Pharmacy, Kolpa

⁶Department of Pharmaceutics, Godavari Institute of Pharmacy, Kolpa

ABSTRACT

Carbon nanotubes (CNTs) have emerged worldwide because of their remarkable properties enlarging their field of applications and having an innovative platform for controlled and targeted drug release in several biomedical applications. Carbon nanotube is one of the most efficient dispersed nano-systems with narrow size distribution ranges from 10-240 nm. Carbon nanotubes possess the remarkable electrical, mechanical, thermal conductivity which enables carbon nanotubes to be functionalized to enhance the solubility as well as biocompatibility of poorly bioavailable drugs. Further it can be converted to normal conventional system which is easy to use such as nanotube based gel. The purpose of this study is to formulate a stable carbon nanotube based topical gel containing Fluconazole; having low solubility and high permeability (BCS Class-II), to improve its solubility and hence cutaneous deposition to give local effect. Initially the functionalization of pristine nanotubes was done using PEG-400. Ten batches (F1-F10) of drug loaded functionalized nanotubes was prepared using ethanol and water (1:1) which was tested for % drug loading and high drug loaded batch was selected for conversion to gel (NTG1-NTG7) with carbopol 934 and HPMC-E50 as gelling agent in a various concentrations. Formulations were evaluated for FTIR studies, % drug loading. From the result obtained, F10 formula shows better drug loading and considered as optimized, which is converted to nanotube based gel and evaluated for appearance, pH, spreadability, viscosity, in vitro drug release study etc. Results of gel formulation are obtained as bluish black gel with pH 6.3 - 6.6, spreadability 37.18– 69.52 gm.cm/sec, viscosity 14800-18942 cps & NTG5 shows highest 89.88% drug diffused while NTG3 shows lowest 70.23% drug diffused. Optimized formulation was subjected for stability studies as per ICH guidelines. Nanotube gel have the potential applications in pharmaceutical industries because of high surface area, the higher rate of absorption; diffusion/ dissolution.

Key words: Fluconazole, Pristine nanotubes, PEG-400, % Drug loading, % Drug diffusion, stability study etc.

INTRODUCTION

Topical drug delivery means an application of drug through skin to treat or cure the skin ailments. These types of system are generally used for local skin infections like fungal infections. Topical preparations are used for the localized effects at the target site of their application by morality of drug penetration into the underlying layers of skin or mucous membranes. Various topical formulations are to be administered like powders, cream, solutions, gel, and even medicated adhesive tapes. The topical drug delivery system usually used for protect the drug holding preparation to the skin to directly treat cutaneous disorders or the cutaneous signs of a common ailment or disease with the intent of sequestering the pharmacological action or other effect of drug to the surface of the skin or within the skin. Topical activities may or may not require intracutaneous penetration or deposition. Topical delivery refers to the transfer of bioactive ingredients across the skin and into the systemic circulation. Dermatological products applied to skin is diverse in formulation and range in consistency from liquid to powder but the most popular products are semisolid preparation. Within the major group of semisolid preparations, the use of gels has expanded in pharmaceutical preparations. These are superior in terms of use and patient acceptability. In unkindness of many advantages of gels, a major limitation is in the delivery of hydrophobic drugs. So to overcome this limitation, carbon nanotube gels are prepared and used so that even a hydrophobic therapeutic moiety can enjoy the unique properties of gels.

The choice of different novel drug delivery system has been used in which carbon nanotube plays an essential role in delivering the active pharmaceutical ingredient at the target organ or site. Carbon nanotubes (CNTs) are made up of graphite sheets rolled up into cylindrical tubes with a nanometre diameter, are relatively new allotrope since its first discovered in 1991 by Sumiolijima a Japanese scientist. Carbon nanotubes (CNTs) possess remarkable electrical, mechanical, optical, thermal and chemical properties. In order to solve the problem of solubility and to improve the biocompatibility, by using functionalization techniques the surface

properties of carbon nanotubes (CNTs) are modified. The functionalization to carbon nanotubes will help an API to enclose within it and carry towards desired site without degrading by in vivo environment of body. These properties make carbon nanotube unique providing positive advantage in market as new drug delivery system.

MATERIALS AND METHODS

Fluconazole is received as gift sample from Yarrow Chem products. Pvt.Ltd., Carbon nanotubes purchased from Adnano Technologies Pvt. Ltd., Shimoga-577222, Karnataka, India, PEG 400, Oleic acid, Carbopol 934, HPMC E50, Glycerin, Methyl paraben, and Triethanolamine; all chemicals and solvents are of analytical grade A.

Functionalization of Pristine Nanotubes:

500 mg of pristine Carbon nanotubes were dispersed in 100ml PEG solution(5mg/ml) with the aid of a fast clean ultrasonic bath. Sonicate for 15 mins. Removal of unbound PEG and agglomerated Carbon Nanotubes was done by centrifugation process at 7000 RPM for 5 Mins. Therefore, the supernatant was retained. Agglomerates and unbound PEG-400 was separated by centrifugation and vacuum filtration followed by drying.

Preparation of Drug loaded nanotubes

A stock solution of fluconazole was prepared in ethanol and water (1:1), respectively, at a concentration of 1 mg/ml. The drug was loaded by incorporating the required weight of the functionalized nanotubes composite into the required volume of drug solution by sonication for 10 minutes and stirred for 16 hours at room temperature. The Drug loaded nanotubes were collected by centrifugation at 3000 rpm, on 4°C for 10 minutes by removing clear supernatant, sediment of drug loaded nanotubes carefully collected, dried and stored. These drug loaded nanotubes were evaluated for % drug loading and on that basis high drug loaded batch was selected for further studies.

Table 1: Drug loading into Functionalized CNTs

Batch	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
Drug(mg)	50	50	50	50	50	50	50	50	50	50
PEG-NT(mg)	10	20	30	40	50	60	70	80	90	100

Formulation of Nanotube Gel:

Nanotube based gel was prepared as per table no. 2 by dispersing the weighed amount of the Carbopol-934 and HPMC E50 in a sufficient quantity of distilled water. After complete dispersion, the solution was kept in dark for 24 hrs for complete swelling of carbopol-934. The Carbopol and HPMC E50 dispersion was mixed with selected formulations containing 100 mg of drug loaded carbon nanotubes in excipients. The mixture was stirred well to get homogenous solution so that concentration of Carbopol 934 will become half. If necessary triethanolamine was added to maintain the pH with continuous stirring to get homogenous gel.

Table 2: Formulation of Nanotube Gel

Batch code	Drug loaded Nanotubes (mg)	Gelling agent		Water (ml)	Methyl Paraben (ml)	Glycerin (ml)	Triethanol amine
		Carbopol 934 (mg)	HPMC E-50 (mg)				
NG1	100	0.5	0.5	50	0.1	5	q.s.
NG2	100	0.5	1	50	0.1	5	q.s.
NG3	100	0.5	1.5	50	0.1	5	q.s.
NG4	100	0.5	2	50	0.1	5	q.s.
NG5	100	0.5	2.5	50	0.1	5	q.s.
NG6	100	0.5	3	50	0.1	5	q.s.
NG7	100	0.5	3.5	50	0.1	5	q.s.

EVALUATION PARAMETERS:

A. Drug Characterization

a) Physical appearance:

Fluconazole sample which was supplied from Yarrow Chem products. Pvt. Ltd was observed for physical appearance i.e. colour, odor, nature, etc.

b) Determination of Melting point:

The drug was characterized for melting point. The melting point was resolved by filling a small amount of fluconazole substance in the capillary tube then it attached to thermometer and continuous heat was applied with assembly suspended in the Thiel's tube including paraffin bath. The temperature at which the drug melts was noted as melting point.

c) Solubility study:

For the purpose of solubility, additional amount of drug is added in the solvent in the (water, methanol, ethanol, chloroform, etc.) at room temperature and kept for 24 hrs with rare shaking. The supernatant was taken and evaluated by using Shimadzu UV 1800 double beam spectrophotometer.

d) Estimation of Fluconazole by UV-spectroscopy method:

Accurately weighed 50 mg of Fluconazole was dissolved in 50 ml of methanol in 50 ml volumetric flask to get the stock solution of 1000 µg/ml. From stock solution 5 ml was pipetted out and further diluted up to 50ml with buffer to get 100 µg/ml solutions. From 100µg/ml solution take 5ml and diluted to 50ml to get 10µg/ml solution from these aliquots of 2, 4, 6, 8, 10 ml were withdrawn and diluted to 10 ml with buffer to obtain a concentration range of 2-10µg/ml. The absorbance of the solutions was measured at 212 nm by using UV-spectrophotometer. A graph of Concentration vs. Absorbance was plotted.

e) Fourier transforms Infra-red Spectroscopy (FTIR):

The FTIR study was performed on drug as well as excipients and formulation to find out the compatibility in between them, over the range of 4000-400 cm⁻¹ in FTIR spectrometer. The FTIR study performed using Perkin Elmer FTIR.

B. Nanotube:

1. Organoleptic properties:

The drug loaded nanotubes was evaluated for colour and appearance.

2. DSC:

3. Drug entrapment efficiency (EF%) in Carbon Nanotubes:

10mg of fluconazole loaded functionalized carbon nanotubes was mixed with 100 ml of phosphate buffer (pH7.4), followed by centrifugation at 10000 rpm for 1 hour. To remove the entrapped drug from nanotubes 1ml of supernatant solution is diluted as required and calculate the concentration of drug by using UV spectrophotometer at 210nm. The percentage entrapment efficiency (EE %) was calculated using the following equation:

$$\text{Drug Entrapment Efficiency (EF\%)} = \frac{\text{Weight of loaded drug}}{\text{Weight of feeding drug}} \times 100$$

C. Nanotube Gel:

1. Appearance:

The formulations were observed for the presence of any particulate matter. Clarity is one of the most important features of topical preparations. The appearance and clarity is determined by visual testing.

2. pH:

The pH of carbon nanotube gel formulation is determined by using digital pH meter.

3. Drug content:

2 gm of carbon nanotube gel from each formulation were taken in 100 ml volumetric flask having 10ml methanol and stirred by magnetic stirrer for 5 minutes. The solutions were filtered by using Whatmann filter paper. The absorbance of the solution was estimated by UV spectrophotometer (UV 1800, Shimadzu) at 210 nm using standard curve against blank.

4. Determination of viscosity:

Viscosity of drug containing carbon nanotube gel was determined by using Brookfield viscometer. 20 gm of nanotube gel was filled in a 50 ml beaker and the viscosity was measured by using Spindle number 6 at 10 rpm.

5. Spreadability:

It is determined by apparatus which consists of a wooden block, which is provided by a pulley at one end. The spreadability is measured on the basis of 'Slip' and 'Drag' characteristics of carbon nanotube containing gel. A ground glass slide is fixed on this block. An excess of nanotube gel (about 2 g) under study is placed on this

ground slide. The nanotube gel is then sandwiched between this slide and another glass slide. A 1 g weight is placed on the top of the two slides for 5 minutes to expel air and to provide a uniform film of the nanotube gel between the slides. By putting weight of 1g, the time (in seconds) required by the top slide to cover a distance of 7.5 cm with the help of string attached to the hook is noted.

A shorter interval indicates better spreadability, which is calculated by the formula:

$$S = \frac{ML}{T}$$

Where,

S=Spreadability,

M=Weight tied to upper slide,

L=Length of glass slides,

T=Time taken to separate the slides completely from each other.

6. In vitro drug diffusion study:

The diffusion studies of the prepared nanotube gel were carried out in franz diffusion cell through a cellophane membrane. Gel sample (0.5gm) was taken in cellophane membrane and the diffusion studies were carried out at $37 \pm 1\text{ }^{\circ}\text{C}$ using 250 ml of (25%) methanolic phosphate buffer (pH 7.4) as the dissolution medium. 5ml of each sample was withdrawn periodically at 1, 2, 3, 4, 5, 6, 7 and 8 hrs and each sample was replaced with equal volume of fresh dissolution medium in order to maintain sink condition. Samples were analyzed by UV-visible spectrophotometer at 210nm for drug diffused.

7. Stability study:

Formulations of drug loaded nanotube gel are filled in glass container with proper aluminium foiling and placed for a short term accelerated stability study for 3 months at $40 \pm 2^{\circ}\text{C}$ temperature and $75 \pm 5\%$ relative humidity as per ICH Guidelines. After particular period of interval, the formulation was withdrawn and wasevaluated for appearance, pH, drug content and in vitro drug release.

RESULTS AND DISCUSSIONS:

A. Drug Characterization:

Drug was observed for organoleptic characteristics such as color, odor and nature; it complies specifications of IP tabulated in table no. 3.

Table 3: Organoleptic Characteristics

Properties	Specification as per IP 2010	Result
Colour	White	White
Odor	Odorless	Odorless
Nature	Amorphous	Amorphous

Melting point of drug was found to be in a range of 136-141 $^{\circ}\text{C}$.

Solubility of Fluconazole in various solvents was found as in table no. 4.

Table 4: Solubility Study

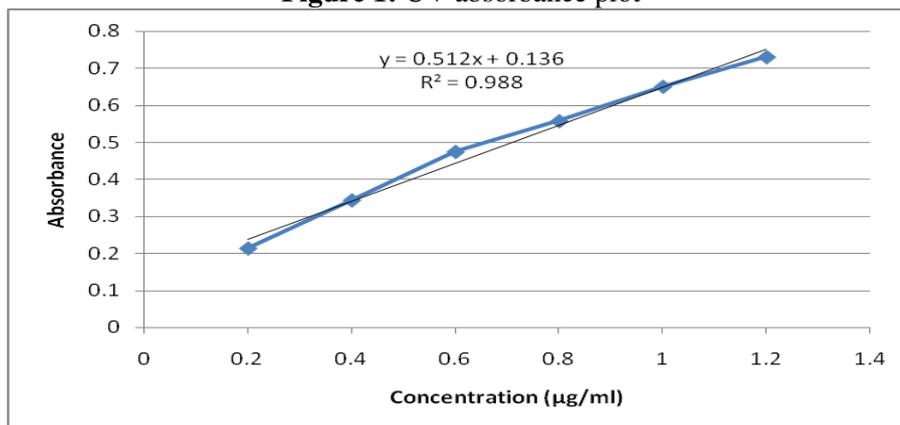
Sr. No.	Solvent system	Result
1	Ethanol	Freely soluble
2	Methanol	Freely Soluble
3	Water	Slightly soluble
4	Chloroform	Insoluble
5	Ether	Insoluble

The UV absorbance's of fluconazole standard solutions in the range of 0.2-1.2 $\mu\text{g/ml}$ of drug in buffer pH 7.4 showed linearity at λ_{max} 210nm. The linearity was plotted for absorbance (A) against concentration (C) with R^2 value 0.988 and with the slope equation $y = 0.512x + 0.136$. The absorbance values and standard curve were in below table 5 and figure 1.

Table 5: Standard calibration curve of Fluconazole

Concentration (µg/ml)	Absorbance
0.2	0.214
0.4	0.344
0.6	0.475
0.8	0.558
1	0.651
1.2	0.731

Figure 1: UV absorbance plot



The IR spectrum of the pure drug sample recorded by FTIR spectrometer was compared with standard peaks of Fluconazole as specified in IP. Results showed that frequencies of functional group of Fluconazole were in the reported range which indicates that the obtained sample was of Fluconazole and was pure. Results of FTIR peaks of drug were tabulated in table 6 as below.

Table 6: FTIR peaks of drug

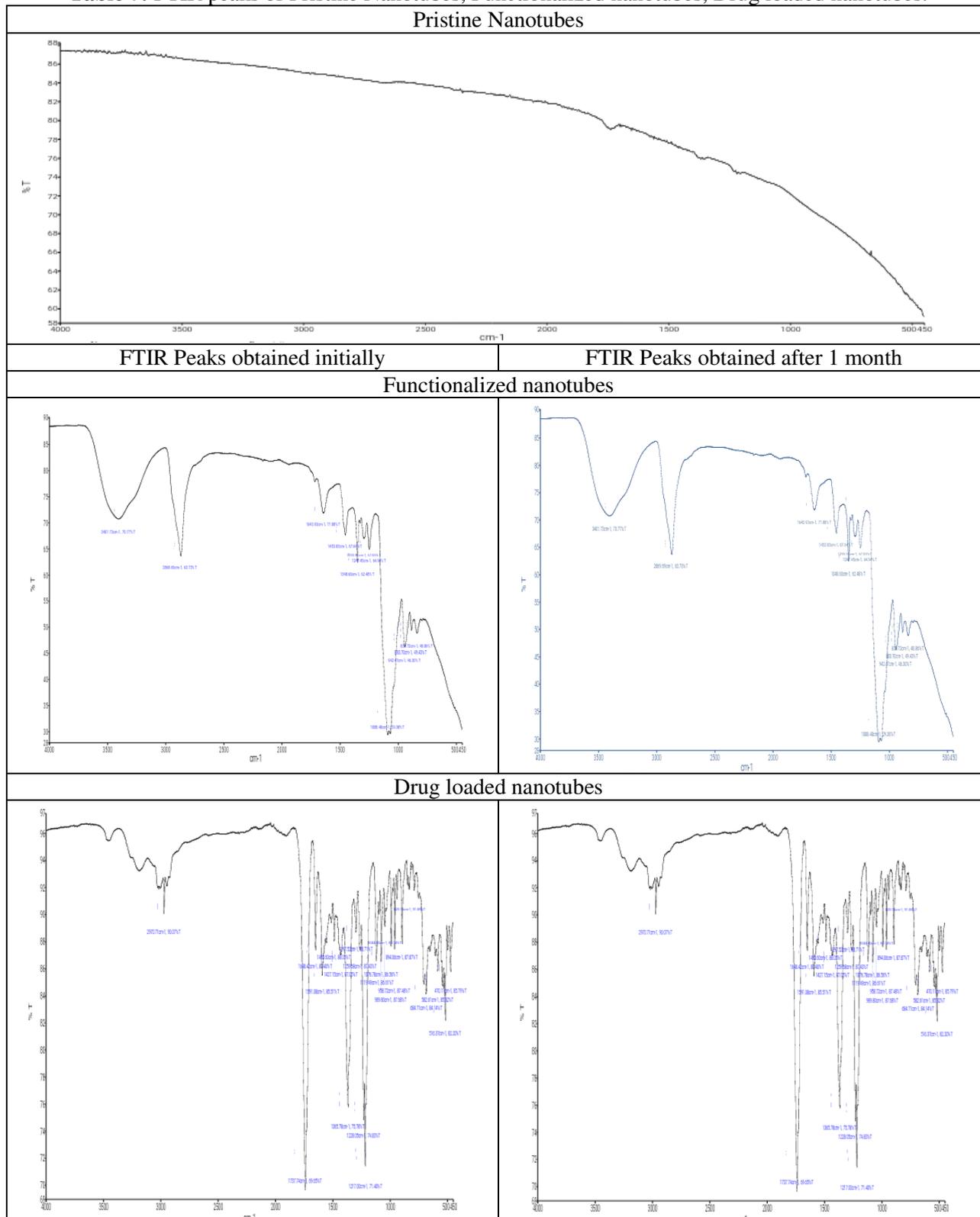
FTIR Peaks obtained for Std. Fluconazole	FTIR Peaks of Fluconazole supplied by Yarrow chem. Products pvt. Ltd.

B. Evaluation of Nanotube:

FTIR spectrum of plain NT does not show any peaks in comparison with functionalized NT which showed 11 peaks that confirmed functionalization of plain NT was successfully done.

FTIR spectra of Functionalized nanotubes and drug loaded nanotubes, was obtained twice by taking interval of 1 month in between two testing; the results of two tests were confirmed that there were no significant change and hence it can be concluded that the drug and excipients are compatible.

Table 7: FTIR peaks of Pristine Nanotubes, Functionalized nanotubes, Drug loaded nanotubes.



The nanotube formulation was bluish-black, in colour. The % drug loading of all formulation was found to be 18-93%. Among all the formulation F10 shows highest drug loading efficiency. The drug content of F10 was found to 93%. The results are shown in the table no.8.

Table no.8: % drug loading into the PEG-NT

Batch	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
% Drug Loading	17%	28%	33%	37%	43%	49%	61%	76%	89%	93%

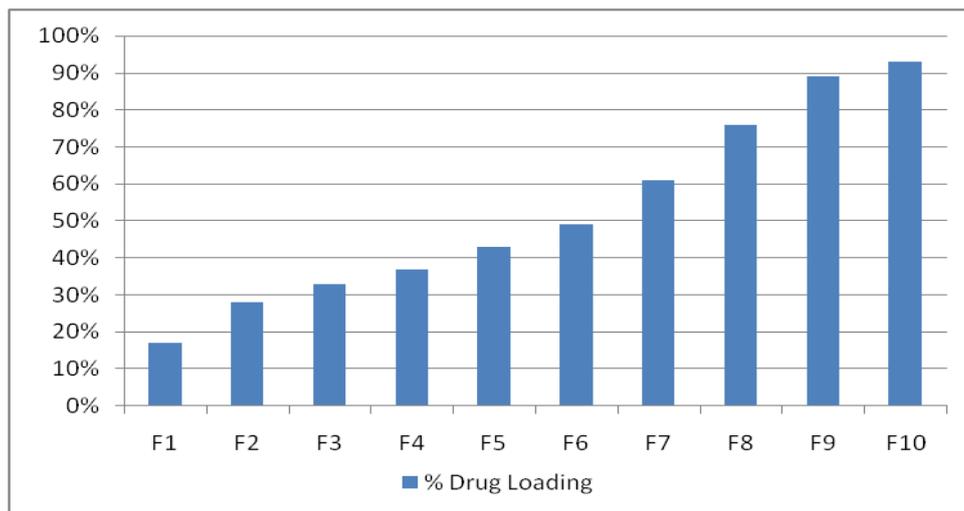
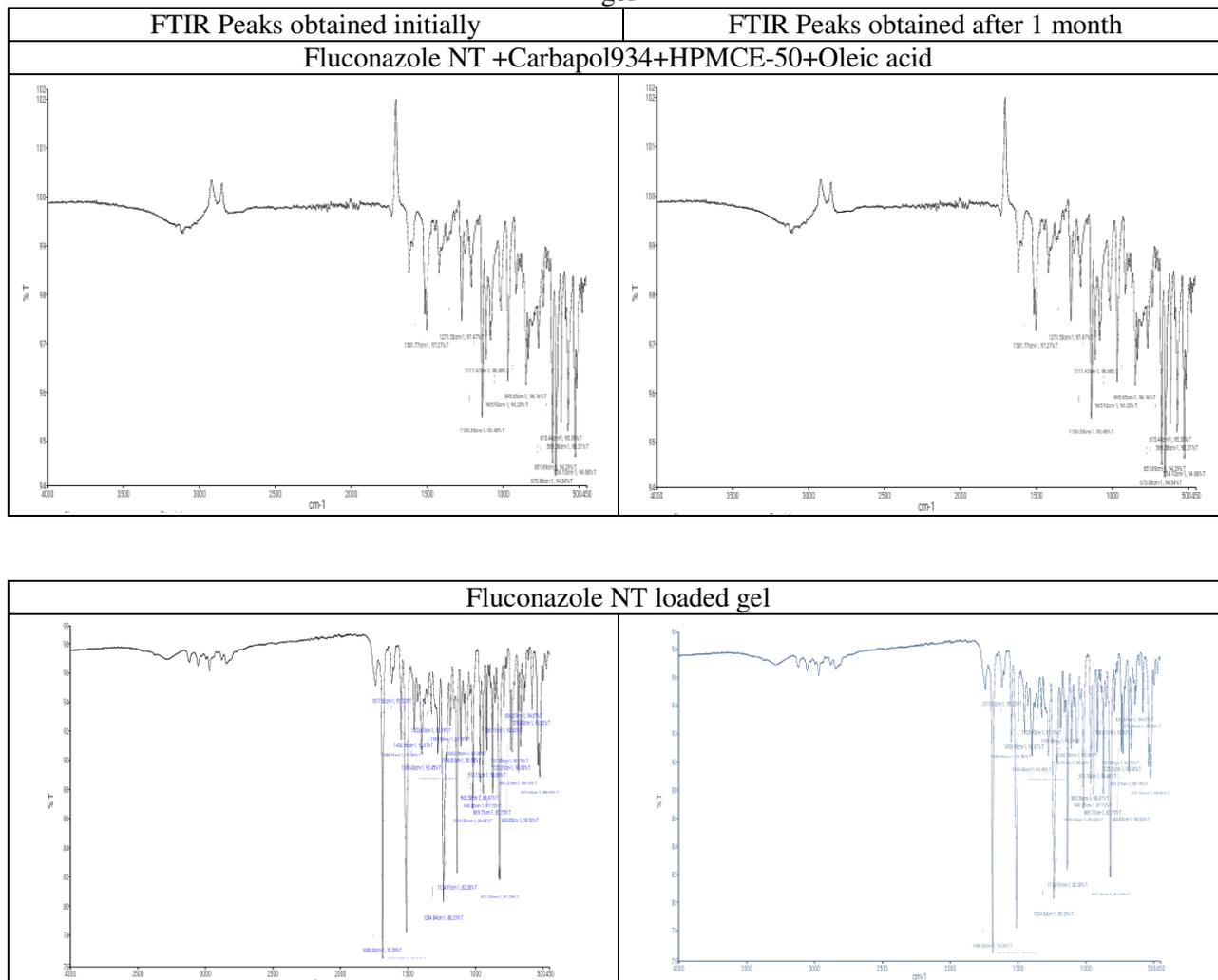


Figure no.2 % Drug loading into PEG-NT

C. Evaluation of Nanotube gel:

FTIR evaluations of Fluconazole NT+Carbopol 934+HPMC E-50+Oleic acid, and Fluconazole NT loaded gel was obtained twice by taking interval of 1 month in between two testing; the results of two tests were confirmed that there were no significant change and hence it can be concluded that the drug and excipients are compatible.

Table no.9: FTIR evaluations of Fluconazole NT +Carbopol+HPMC+Oleic acid, and Fluconazole NT loaded gel



The nanotube gel was bluish-black in colour, homogeneous in nature and pH of nanotube gel was found to be in between 6.3 - 6.6, which lies in between normal pH range of skin which may not produce skin irritation.

The nanotube gel was analyzed for drug content spectrophotometrically at 212 nm. The drug content was found to be in the range of 70.23 to 89.88%. Drug content of NTG5 is highest i.e. 89.88% and hence it was considered as best one.

Depends on the concentration of gelling agent nanotube gel has viscosity ranging from 12700-18942 cps and spreadability from 37.18 – 69.52 gm.cm/sec. As the concentration of gelling agent increases the viscosity also increases and spreadability decreases simultaneously.

Table 10: Evaluation results of nanotube gel

Batch code	Appearance	pH	% Drug content	Viscosity (Cps)	Spreadability (gm.cm/sec)
NTG1	Bluish-black gel	6.5	78.88	12700	69.52
NTG2		6.4	82.90	14800	67.85
NTG3		6.5	70.23	15400	60.18
NTG4		6.3	79.45	16400	57.46
NTG5		6.5	89.88	17800	54.52
NTG6		6.3	87.90	18720	42.85
NTG7		6.6	85.23	18942	37.18

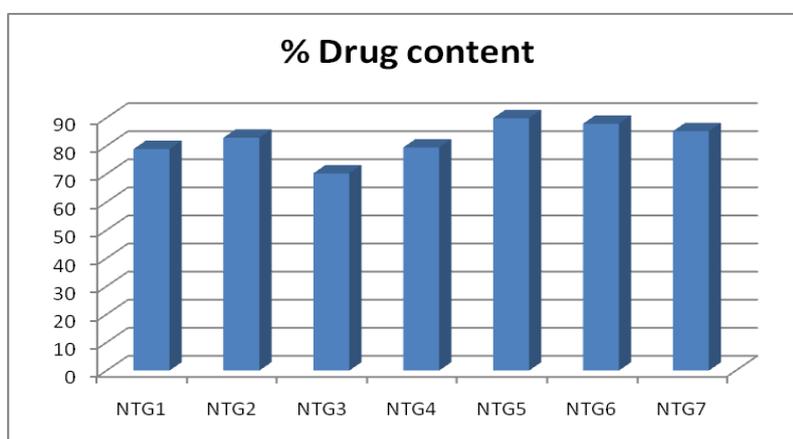


Figure 3: % Drug content studies

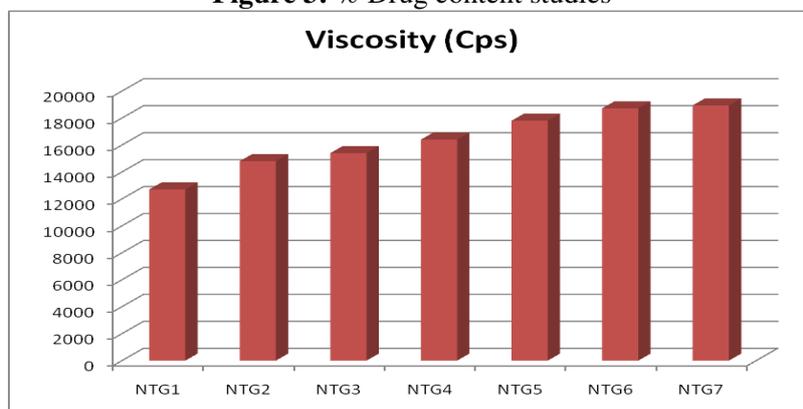


Figure 4: Viscosity (Cps) studies

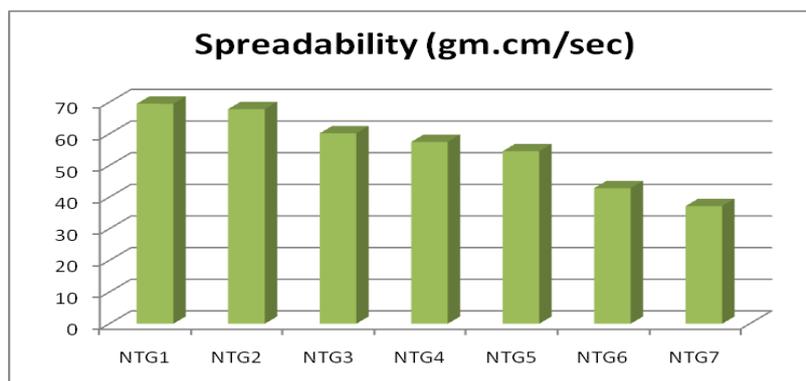


Figure 5: Spreadability studies

The in vitro diffusion of Fluconazole from the nanotube gel was varied in amount according to concentration of PEG-CNT used in formulation. Comparative in- vitro drug release study of gel are tabulated in table no.11. From the study it was concluded that nanotube gel NTG3 showed highest diffusion of Fluconazole within 8 hr. which is optimized batch, further subjected to stability study.

Table 11: Comparative in- vitro drug release study of gel

Time in (hr)	In- vitro drug release (%)							
	NTG1	NTG2	NTG3	NTG4	NTG5	NTG6	NTG7	Conventional gel
0	0	0	0	0	0	0	0	0
0.5	5.17	5.82	6.54	5.66	7.43	6.89	5.32	3.32
1	10.83	10.70	10.88	9.79	11.32	10.01	10.12	5.85
2	15.68	14.50	15.89	14.77	16.54	14.63	14.89	10.86
3	20.89	19.86	20.52	21.60	23.86	20.34	19.66	15.56
4	39.75	40.69	39.91	38.43	42.60	38.69	40.56	22.37
5	50.51	53.39	53.98	54.12	57.73	55.01	53.11	35.84
6	61.72	60.55	61.01	60.05	65.23	59.98	58.61	42.21
7	79.25	71.15	80.32	75.17	86.57	81.35	69.88	49.20
8	81.37	83.95	84.15	85.63	91.93	89.88	88.76	54.23

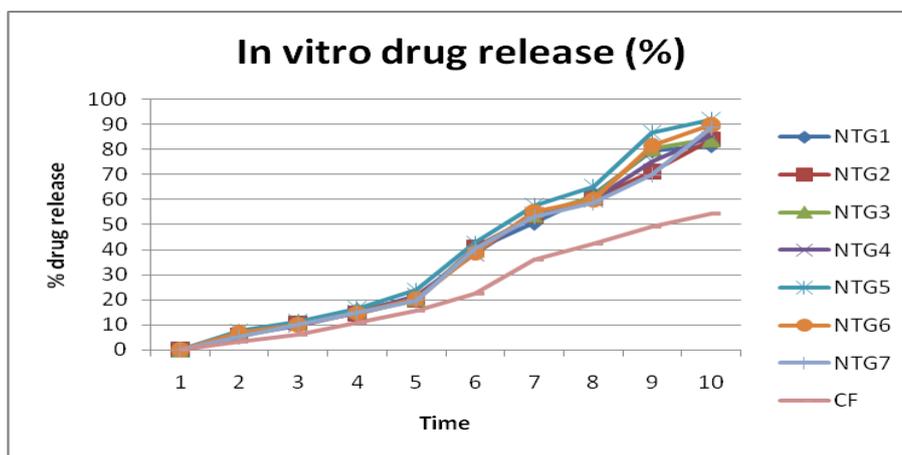


Figure 6: % In vitro drug release

The accelerated stability study of nanotube gel NTG5 was carried out; there is no significant change in pH, drug content and % drug release in NTG5 formulation at 40°C temperature and 75% RH. Results of stability study are given in table no.12, 13 and figure 5.

Table 12: Stability study of optimized nanotube gel

Formulation code	Month 1		Month 2		Month 3	
	pH	% Drug content	pH	% Drug content	pH	% Drug content
NTG5	6.5	90.13	6.5	89.83	6.4	88.44

Table 13: % Drug release after accelerated stability study of optimized formulation (NTG3)

Times (hrs)	% Drug release	
	Initial	Final
0	0	0
0.5	7.43	5.74
1	11.32	10.43
2	16.54	14.68
3	23.86	21.67
4	42.60	39.31
5	57.73	52.43

6	65.23	61.22
7	86.57	78.15
8	91.93	83.57

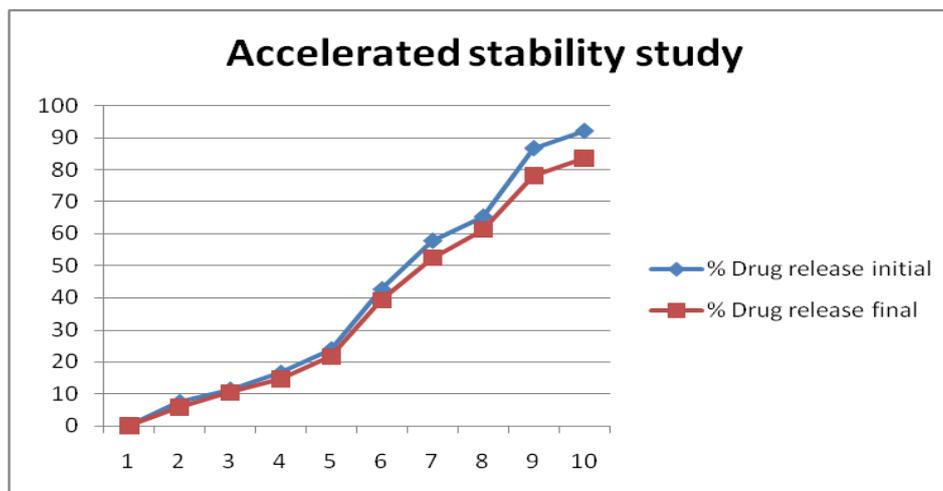


Figure 7: Accelerated stability study

CONCLUSION

The research conducted can be concluded that, Fluconazole drug which belongs to BCS class-II can be encapsulated into nanotube drug delivery system for topical application by the enhancement of its bio-permeability and solubility. The research conducted has successfully encapsulated poorly bioavailable drug fluconazole into functionalized carbon nanotubes with high drug loading ability(93%) which is further formulated as topical gel. Result has showed maximum drug release within 8 hrs (91.93%) with good drug content (89.88%) which can be achievable with nanotube's topical gel. Additionally nanotubes require only small amount of drug to get therapeutic action, hence it does not give any side effect, by directing drug to specific site. Although if nanotube's has better results; no one can predict its efficacy hence clinical studies are needed to understand its biological metabolism.

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Formulation and Evaluation of Polyherbal Transdermal Patch for Joint-Pain

Varsharani A. Jadhav*, Nagoba Shivappa N, Shruti Ambad, Rohit Kombade and Rupesh Choure
Department of Pharmaceutics, Channabasweshwar Pharmacy College (Degree), Latur, Maharashtra, India

ABSTRACT

The main aim of this study is to formulate & evaluate the polyherbal transdermal patch for the management of joint pain by the use of herbal extracts i.e., Curcuma longa & Pongamia pinnata which having anti-inflammatory activity. In Ayurveda two principles are used for drug formulation viz., single herb or more than one herb i.e., PHF (Polyherbal Formulation) Moreover PHF used to archive extra therapeutic effectiveness with reduced toxic effects. In traditional system of Indian medicine combined extract of individual plants rather than individual ones to achieve maximum theuraputic efficacy. The polyherbal extracts having anti-inflammatory activity, Transdermal patch was initiated using PVA as backing membrane as well as polymer & HPMC (K4M) as matrix controlling polymer for matrix type of transdermal patch. PEG was selected as plastisizer. Preformulation study was performed to check the drug-excipient compatability. The IR spectra of drug & final formulation found satisfactory. There are no any interaction between extracts & excipients. Further linearity curve was developed in UV for method of analysis. Trials F1-F6 was initiated using different concentration of polymers in formulation. The all evaluation parameters such as thickness, weight uniformity, folding endurance, moisture content, drug content, ph, invitro diffusion, accelerated stability was found within a suitable range. According to Drug release study F5 batch was the most satisfactory batch due to this it can be concluded that the combination of two polymers gives sustain release most satisfactory than single polymer.

Keywords:-Transdermal patch, Anti-inflammatory, P.pinnara, C.longa, accelerated stability etc.

INTRODUCTION

The joint-pain is most common disorder affecting large population. The joint-pain may be occurs due to degenerative joint disease or due to autoimmune disorders like Rheumatoid arthritis in older peoples. Generally, RA is developed from the mid of the fourth decade in life to the last of the fifth .Medications and lifestyle changes are considered as treatment for RA. Current treatment provides nonsteroidal anti-inflammatory drugs (NSAIDs), for example, salicylic acid and steroids. Though these drugs ease the pain, they are incapable of repairing damaged tissues. Although a broad range of drugs are prescribed for managing the pain and slowing the progression of RA, no drug is known to cure the disease completely. A recent survey indicates that people suffering from chronic pain in RA and those dissatisfied with allopathic treatment are more prone to seek alternative medicine, where 60–90% of arthritic patients use CAM Therefore; it is highly desirable to find out a potential alternative to eradicate the drawbacks of present allopathic treatment. Natural products from plants have played a remarkable role to cure and avert different diseases from ancient times. A study conducted by World Health Organization (WHO) has reported that about 80% of world's population relies on traditional medicine. In USA, nearly 121 drugs are prescribed today, where 90 of them come from the natural sources particularly from plants in a direct or indirect manner. Herbal remedies can form an alternative source to relieve inflammation in joints as well as to address the drawbacks associated with present treatment methods with allopathic drugs. Among all investigated plants, it is scientifically palpable that Pongamia pinnata (Fabaceae) and Curcuma longa (Zingiberaceae) has a pivotal role to lessen the unbearable pain and inflammation. The most common route of drug administration is the oral route. It has the different advantage such as easy administration, but it also provide significant problems such as poor bioavailability due to hepatic first pass metabolism and the tendency to create rapid increase or decrease in plasma drug level, which ultimately leads to change dose frequency and higher doses, which can be both cost prohibition and inconvenient. To overcome these problems there was a need for the development of new drug delivery system.

Ayurveda	Allopathy
Known as science of natural healing	Commonly called as drug therapy
Scope of side effects is rare and nil	Result in minor to major side effects & adverse effects
Ayurveda naturally focuses on herbs , natural elements and other Phytoconstituents	Allopathy majorly focuses on chemical compositions

MATERIALS & METHODS

Plant materials:- Taxonomically identified leaves of Pongamia pinnata, Rhizomes of Curcuma longa were collected from the medicinal garden of Channabasweshwar Pharmacy College, Latur. The collected plants were

identified and authenticated at Rasa Shastra Evum Bhaishajya Kalpana Dept. Ayurved Medical College & Hospital Latur.

Preparation of plant extract:- The shade dried leaves of *P. pinnata* & Rhizomes of *C. longa* were powdered and powder were Extracted with ethanol(80%) using soxlet apparatus for 7hr. The extract was evaporated to dryness using hotplate.

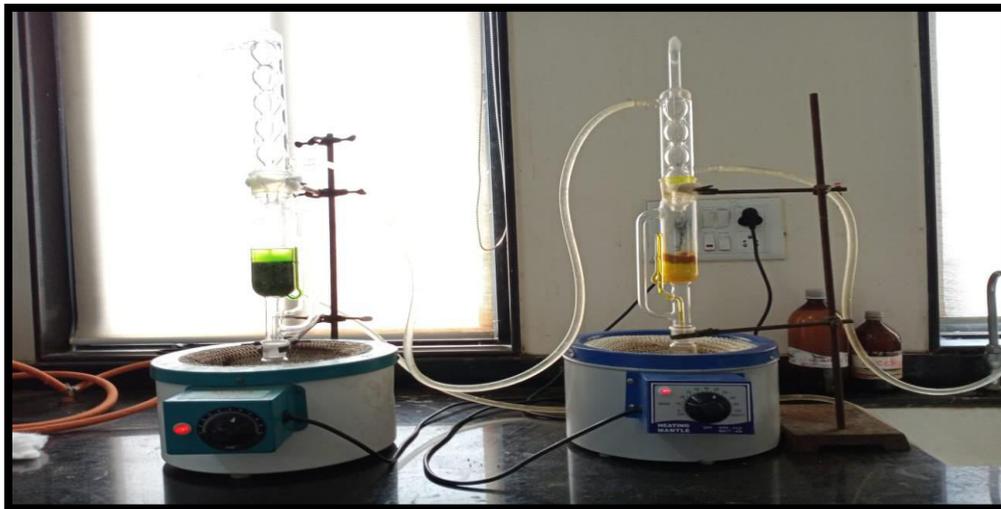


Fig. Soxlet extraction assembly for *P. pinnata* & *C. longa*



Fig., Extract of *p. pinnata*



Fig., Extract of *c. longa*

Phytochemical evaluation:- Ethanolic extract of *P. pinnata* & *C. longa* were tested for presence of carbohydrates, proteins, sterols, alkaloids, tannins, glycosides, flavonoids, phenolic compounds and saponins.

Preparation of Polyherbal Patch:- For polymer solution preparation, the PVA and HPMC were dissolved in distilled water in a concentration of 10 and 10% w/v, respectively with continues stirring at 60°c temp. The PVA and HPMC polymer solutions were homogeneously mixed with PEG as a plasticizer to which the crude polyherbal extracts were slowly added in the mixture. They were transferred into a Petri dish keep a side for 24 hr.



Fig., Polyherbal Transdermal Patch

Table 1. Formulation table to design polyherbal patch

Ingredients	Formulation Batches					
	F1	F2	F3	F4	F5	F6
P. pinnata leaves extract (mg)	20	20	20	20	20	20
C. longa extract (mg)	20	20	20	20	20	20
HPMC (mg)	-	-	100	150	200	250
PVA (mg)	250	200	-	-	150	-
PEG (mg)	6	6	6	6	6	6
Dist. Water	q.s.	q.s.	q.s.	q.s.	q.s.	q.s.

Evaluation of Polyherbal Patch:- All patches were even & smooth in texture. Yellow coloration seen on the films & No spotting was observed.

- 1) Thickness:** - The thickness of patch was measured by using vernier calipers, the thickness uniformity was measured at three different sites and average of three readings was taken with standard deviation.
- 2) Weight uniformity:** - All formulation batches were weighed separately by using a digital balance to calculate the average weights of patches.
- 3) Folding Endurance:** - The folding endurances of all patches were measured manually by the procedure of repetitively folding at the same position until the breakages of the tested patches. The number of folding times for tested patches folded up the same position without breakages of the patches was taken as the measure of folding endurance. Folding endurance evaluation test involves the determination of folding capacity of the films that subjected to folding at the frequent extreme conditions which also an indicative of brittleness.
- 4) Moisture Content:-** Patches were weighed correctly and then kept inside a desiccators contained with calcium chloride (anhydrous). After completion of 3 days, patches kept within the desiccators were removed and then weighed using an digital balance. The moisture content (%) of patches was computed by the formula:

$$\text{Moisture content (\%)} = \frac{\text{Initial weight} - \text{Final weight}}{\text{Initial weight}} \times 100$$

- 5) Drug Content:-** Drug contents within each prepared patch were measured via dissolving 1 cm² of patches in the 100 ml of phosphate bufer (pH 6.8) using a magnetic stirrer set at a speed of 600 rpm for 24 h at the room temperature. The solutions obtained after dissolving prepared patches were filtered through the Whatman filter paper (No. 42). Drug contents in the solutions were measured spectrophotometrically by

UV–VIS spectrophotometer at 275 nm wavelength (λ_{\max}) against the blank sample.

- 6) **Surface pH:-** The surface pH of prepared transdermal patch was determined using pH meter. Patch was slightly wet with the help of dist. water. The pH was measured by bringing the electrode in contact with the surface of the patch. The surface pH was reported.
- 7) **In-vitro Diffusion Study:-** In vitro release of drug from Patch was studied using an apparatus similar to that of the diffusion cell. The drug preparation was kept in a glass tube having a both sides open. The open end was tied with semipermeable membrane and then preparation was inserted into it. The tube was tied to a stand and fixed to such a level so that the surface of membrane touches the brim of dissolution medium in beaker (receptor compartment). The dissolution medium used was phosphate buffer of pH 7.4. The medium in the receptor compartment was agitated using a magnetic stirrer at 50rpm maintaining a temperature at $37^{\circ}\text{C} \pm 10$ after specified intervals of time; 3 ml of the sample was taken and replaced with fresh dissolution medium. Then after suitable dilution the absorbance of the sample was taken against blank at 208 nm for p. pinnata (Beta-sitosterol) & 425nm for curcumin in UV visible spectrophotometer.
- 8) **Stability:-** Stability study was carried out for optimized patch formulation at 40°C temperature in a humidity chamber having 75 % RH for 3 months. After 3 months samples were withdrawn and evaluated for physicochemical properties and in-vitro diffusion study.

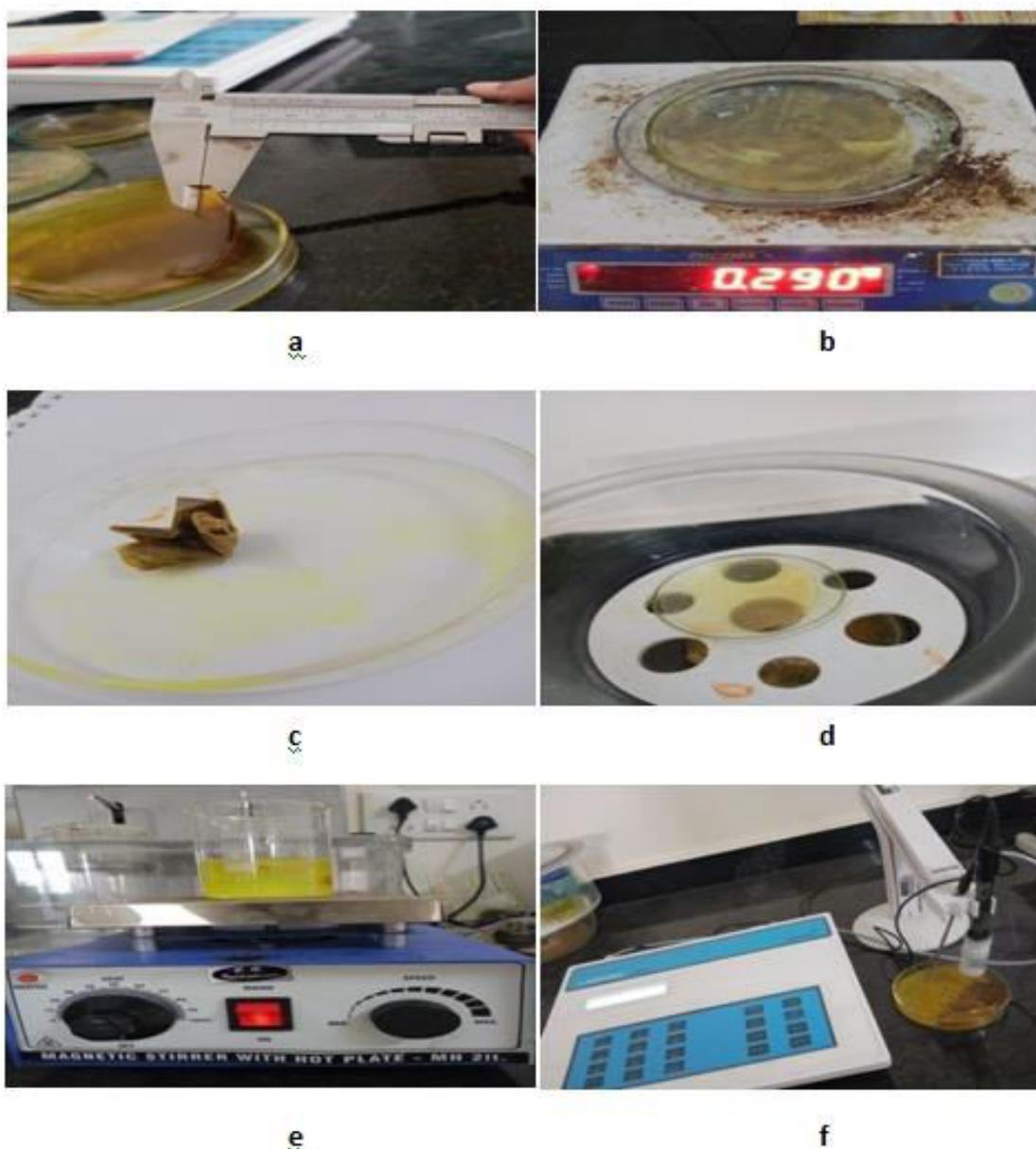


Fig., a. Thickness, b. Weight uniformity, c. Folding endurance, d. Moisture content, e. Drug content, f. pH

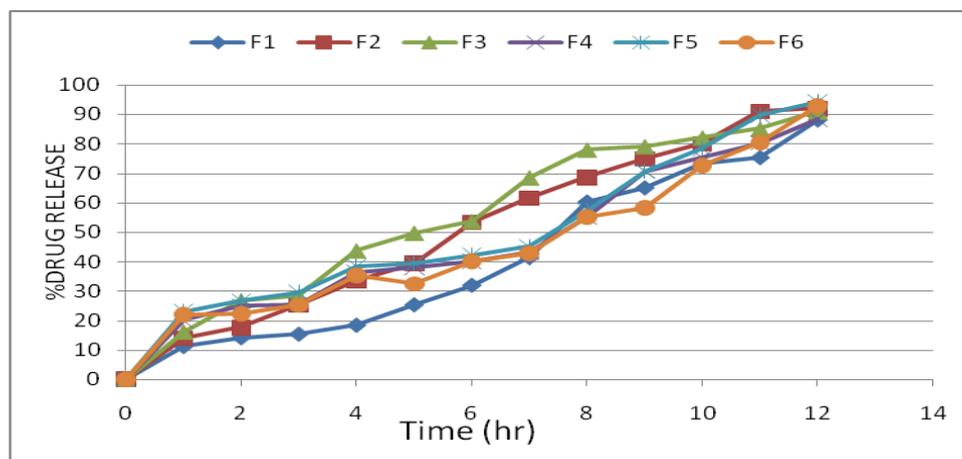
Table 2. Evaluation of Polyherbal Patch

Parameters	F1	F2	F3	F4	F5	F6
Thickness	0.29±0.01	0.25±0.01	0.30±0.04	0.33±0.05	0.40±0.05	0.042±0.01
Weight variation (mg)	11.6±0.31	11.12±0.38	10.23±0.32	11.21±0.39	10.23±0.37	11.21±0.23
Folding endurance	20±5	21±6	22±10	23±7	26±6	22±8
Moisture content (%)	2.43±0.57	2.92±0.68	4.02±0.89	1.96±0.32	1.78±0.31	1.64±0.33
Drug content (%)	95.7±2.42	97.9±2.45	96.9±2.32	96.2±2.41	98.2±2.21	95.8±2.42
pH	6.8±0.1	6.8±0.2	7.0±0.4	7.1±0.1	7.0±0.2	6.9±0.1

A) Curcumin release from patch

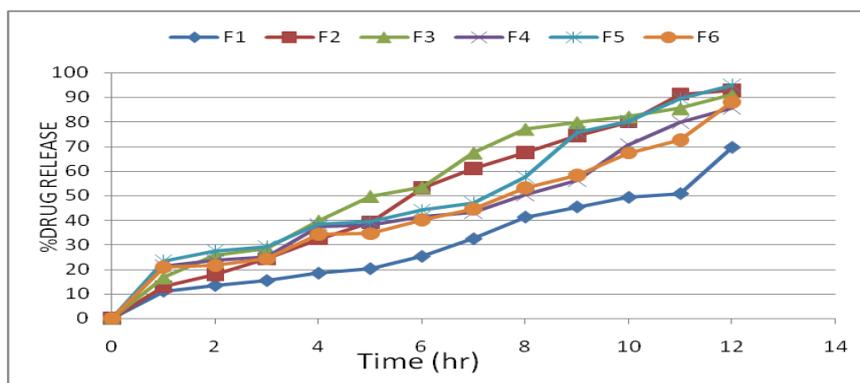
B) Table3. In-vitro drug diffusion of Polyherbal Patch

Time (Hr.)	F1	F2	F3	F4	F5	F6
1	11.21	13.92	16.12	20.12	22.89	21.98
2	14.22	17.64	26.71	24.85	26.56	22.36
3	15.41	25.22	28.32	25.2	29.52	25.23
4	18.43	33.42	43.71	36.32	38.33	35.32
5	25.4	39.41	49.71	38.01	39.32	32.52
6	32.01	53.42	53.7	40.12	42.19	40.19
7	41.44	61.62	68.54	43.08	45.08	42.81
8	60.34	68.58	78.03	55.23	57.25	55.32
9	65.12	75.04	79.11	70.71	70.73	58.33
10	73.41	80.11	82.12	75.23	78.3	72.73
11	75.41	91.01	85.05	80.34	89.63	80.62
12	88.21	92.01	91	88.42	94.21	93.01



C) β -sitosterol release from patch

Time (Hr.)	F1	F2	F3	F4	F5	F6
0	0	0	0	0	0	0
1	11.12	12.92	16.62	21.21	23.28	20.89
2	13.42	17.94	25.61	23.48	27.61	21.62
3	15.41	24.25	28.31	25.12	29.25	24.21
4	18.4	32.42	39.71	37.31	38.33	34.21
5	20.24	39.2	49.72	38.01	39.32	34.52
6	25.24	53.21	53.42	41.31	44.12	40.12
7	32.4	61.01	67.42	43.08	47.08	44.51
8	41.21	67.54	77.08	50.21	57.52	53.12
9	45.34	74.41	79.81	56.12	75.83	58.31
10	49.23	80.12	82.12	70.51	80.12	67.31
11	50.75	91.41	85.51	79.84	89.61	72.62
12	69.52	93.01	91	85.62	95.01	88.12



Based on drug release data, it was observed that the F5 batch with respect to drug release & other parameters too. So that, it can be concluded that the combination of two polymer i.e, HPMC & PVA are taken & found the better result in sustain drug release than single polymer.

Stability study:-

The stability study conducts by ICH (International Conference on Harmonization) guideline. It showed No significance change in properties of the optimized formulation & the drug release. Short term stability performed in a Stability chamber over a period of 4 weeks (30 days) on the promising nail patch formulation F9. Sufficient number of patch formulation were packed in stability container and kept in a Stability chamber at Temperature 40°C & RH 75%.

CONCLUSION

The aim of the present investigation was to develop & evaluate the polyherbal transdermal patch for joint pain management i.e, to relieve the inflammation in the joint. The formulation development of polyherbal extracts having anti-inflammatory activity, Transdermal patch was initiated using PVA as backing membrane as well as polymer & HPMC (K4M) as matrix controlling polymer for matrix type of transdermal patch. PEG was selected as plastisizer. Preformulation study was performed to check the drug-excipient compatibility. The IR spectra of drug & final formulation found satisfactory. There are no any interaction between extracts & excipients. Further linearity curve was developed in UV for method of analysis. Trials F1-F6 was initiated using different concentration of polymers in formulation.

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Formulation and Evaluation of Oral Liposomal Powder Containing Ferric Pyrophosphate

Vattamwar Gauri S¹, Nagoba Shivappa N^{2*}, Ladde S. S³, Swami A. B⁴, Mundhe Renuka M⁵,
Awale Sumit R⁶, Jadhav Pawan P⁷, Patil Shraddha P⁸, Salunke Sonal S⁹ and Mane Sayali D¹⁰
^{1,2,4,5,6,7,8}Department of Pharmaceutics, Channabasweshwar Pharmacy College (Degree), Latur, MS, India
³Department of Pharmacology, Channabashweshwar Pharmacy College (Degree), Latur, MS, India
⁹Department of Pharmaceutics, Government College of Pharmacy, Karad, MS, India
¹⁰Department of Pharmaceutics, Dayanand College of Pharmacy, Latur, MS, India

ABSTRACT

The aim of the present study is to formulate and evaluate liposomal oral powder containing ferric pyrophosphate for the treatment of Iron deficiency anemia. Ferric pyrophosphate is a mixed-ligand iron complex in which iron is bound to pyrophosphate and citrate. There are various conventional formulations for treating IDA but resulting in various side-effects and leads to patients inconvenience. Hence liposomal oral powder was prepared to minimize the side effects and provide good result. The objective of the study is to prepare Ferric pyrophosphate liposomal powder (BCS II) which provide targeted delivery of drug. Firstly 6 batches of liposomes were prepared using HSPC and cholesterol and organic solvent by modified thin film hydration method from this on basis of entrapment efficiency, drug content and % in vitro drug release batch F6 was optimized for liposomal powder preparation. Liposomal powder was prepared by using manitol 25C, sucralose and granules were formed by using hot air oven, it was evaluated by % entrapment efficiency, in vitro drug release, zeta potential, X-ray diffraction, stability studies.

Keywords: Ferric pyrophosphate (FPP), Liposomes, in vitro drug release, zeta potential, Stability

INTRODUCTION

Liposomes are concentric spherical vesicles of phospholipid bilayers having size 20- 1000 nm that are formed spontaneously in aqueous solution. Lipid bilayered membrane encloses a central aqueous core of hydrophilic drugs while lipophilic drugs are entrapped within the bilayered membrane. Liposome bi-membrane is composed of natural and synthetic lipids, which are relatively biocompatible, biodegradable and non-immunogenic material. Because of amphipathic bilayer structure properties, liposomes are used as carriers for both lipophilic and water-soluble molecules. Liposomes have good biological properties of biocompatibility and biodegradability. Powder are the solid dosage forms, supplied either in the bulk or as an individual dose in the fine state of subdivision of drug or drugs with or without the diluents, intended for internal or external use. Anemia is one of the most leading problems in the patients who are being under going sever disorders i.e. cancer, chronic kidney diseases, inflammatory bowel disease, iron deficiency in pregnant women and many more while treating these diseases there in reduction in HB that causes anemia. So various high conventional doses of iron supplement that may be oral or IV are given to these patients in order to treat anemia but these causes various side effects e.g. nausea, vomiting, epigastria discomfort, sensation of heaviness, poor gastrointestinal tolerability, constipation, discoloration of mucous & feces that are again leading to problem. Ferric Pyrophosphate is the usual form of iron used for liposomal iron delivery belongs to BCS class II. The United States Food and Drugs Administration (USFDA) Code of Federal Regulations states that ferric pyrophosphate is generally recognized as safe (GRAS) when used in accordance with good manufacturing or feeding practice. European Food Safety Authority (EFSA) also suggests that ferric pyrophosphate is safe for use as food additive. Also on current clinical evidences suggests that there are no major untoward effects in pregnant and non-pregnant women.

MATERIALS AND METHODS:

Materials:

Ferric pyrophosphate was received from Pharoses Remedies Pvt.Ltd. , HSPC (lipoid 90H) was gifted by Lipidome Life sciences, Gujarat. Cholesterol was purchased from Research Lab Fine Chem Industries, Mumbai. Other chemical ,reagent and solvents used are sodium chloride, citric acid ,chloroform and ethanol are of analytical reagent grade. Manitol 25 C was received from Pharoses Remedies Pvt. Ltd, sucralose, aspartum, flavor receive from laboratory.

Methods:

Formulation of liposomes by thin film hydration method:

Six batches of liposomes were prepared using Ferric Pyrophosphate (API), lipid 90 H, PEG 2000 (cryo protectant), tween 80 (surfactant), cholesterol and organic solvent (chloroform and methanol) as shown in table no.1; by modified thin film hydration technique. In this method, the various amount of lipid phase (Phospholipid : Cholesterol) was dissolved in a 3ml of organic solvent (Chloroform: Methanol, 2:1) in a 250 ml RBF. The organic solvent was evaporated under vacuum using rota evaporator at 125 rpm, which allows lipid to form a thin dry film on the walls of RBF. This system was maintained at vacuum and 60°C 15 min, for complete removal of organic solvent. There is formation of complete dry transparent film on the wall of RBF. The dry film was hydrated with 10 ml of hydrating media i.e. citrate buffer of pH 6.8 containing ferric pyrophosphate drug at 35°C with continuous rotation on the rota evaporator at 125 rpm. While developing the liposomes the amount of PEG and tween 80 was dissolved in the remaining buffer and was added the formulation. The flask was continuously rotated till all the substances present in it completely gets dissolved and there is formation of transparent clear buff liquid suspension resulting complete formation of liposomes. The resultant time taken was 45 min to develop the formulation. Liposomes formed were ultrasonicated for 15 min at different sonication strength as mentioned in the formulation table above to reduce the size of the vesicles and kept at 4°C for overnight to mature the liposomes. The formed liposomal dispersions were centrifuged at 13,500 rpm for 90 min to separate supernatant liquid and to form dry liposomes for better stability and for further evaluation test.

Table 1. Formulation of liposomes

Batch	Ingredients			
	Drug(mg)	HSPC (mg)	Cholesterol (mg)	Chloroform: methanol (2:1)ml
F1	56	60	15	3
F2	56	55	10	3
F3	56	60	10	3
F4	56	55	20	3
F5	56	55	15	3
F6	56	65	15	3

Preparation of Liposomal Dry Powder Formulations:

From the liposomal batches the F5 batch was optimized and selected for liposomal dry powder. The liposomal dispersion 10ml was slowly added in the manitol 25 C and formed wet dough mass passed through 20 mesh sieve and granules were spray dried using a Buchi B-191 mini spray flow rate 600L/h & 100% aspirator setting. The inlet temperature (100, 110 & 120°C), pump rate (1.15, 2.3 & 3.45 ml/min), The sucralose, aspartum, citric acid & flavor were added in the dried granules and mixed properly passed through 40 mesh sieve.

EVALUATION PARAMETERS:

A. Drug Characterization:

1. Physical appearance:

The physical appearance of Ferric pyrophosphate was observed i.e., Colour, odor, nature etc.

2. Determination of Melting point:

Melting point of Ferric pyrophosphate was determined by melting point apparatus. The drug is was incorporated in glass capillary tube which was sealed previously on one end. The capillary tube was then subjected to melting point apparatus and the temperature at which drug start melting was noted.

4. Estimation of Ferric pyrophosphate by UV-spectroscopy method:

Accurately weighed (10 mg) Ferric pyrophosphate was dissolved in minimum quantity of citrate buffer pH 6.8 in 100 ml volumetric flask. Then the volume was made up to 100 ml with citrate buffer 6.8. resulting in standard stock solution (100 µg/ml). A set of standard dilutions of 2,4,6,8,10,12 µg/ml was prepared by transferring 0.2,0.4,0.6,0.8,1.0,1.2 ml aliquots of stock solution (100 µg/ml) to series of 10 ml of volumetric flasks and volume was made up with phosphate buffer pH 6.8 The absorbance of each dilution was measured in UV spectrophotometer at 246 nm. Graph of concentration vs absorbance was plotted.

5. Fourier Transforms Infra-red Spectroscopy (FTIR):

FTIR study was done on drug and drug excipients mixture to find out the compatibility between them. The FTIR study was performed using Perkin Elmer FTIR in the range of 4000-400 cm⁻¹

B. Liposomal Formulation:

1. Physical appearance:

The physical appearance of liposomes was observed for physical appearance.

2. % Entrapment Efficiency:

Entrapment efficiency of liposomes was determined by centrifugation method. Aliquots (1ml) liposomal dispersion were subjected to centrifugation on a laboratory refrigerated Centrifuge (Dolphin Instrument) at 14,000 rpm for 30 min at 4°C. The clear supernatant was removed to separate non-entrapped Ferric pyrophosphate and absorbance was recorded at 246nm. The sediment in the centrifugation tube was diluted to 100 ml with PBS 6.8 and the absorbance of this solution was recorded at 246 nm. Amount of Ferric pyrophosphate in supernatant and sediment gives a total amount of Ferric pyrophosphate in 1 ml dispersion. The entrapment efficiency was calculated by using the formula.

$$\text{Entrapment Efficiency} = \frac{\text{total drug-free drug}}{\text{total drug}} \times 100$$

3. In vitro drug release:

In vitro drug release from the liposomal formulation was carried out by using dialysis membrane employing in two sides open ended cylinder. Liposomal suspension (4ml) containing known amount of drug was placed in dialysis membrane previously soaked overnight. The two side open cylinder was placed in 100 ml citrate buffer (6.8) maintained at 37°C and stirred with help of magnetic stirrer at 1500 rpm/min. Aliquots (4ml) of release medium were withdrawn at different time interval and the sample was replaced with fresh citrate buffer (6.8) to maintain constant volume. 1 ml acetonitrile was added to precipitate lipids and dissolve the entrapped Ferric pyrophosphate and sample was analyzed by UV spectrophotometry at 246 nm.

3. Drug Content:

Liposomes were centrifuged at 15,000 rpm for 40 min at 25°C after centrifugation separate drugs in the supernatant. The free drug concentration in the supernatant can be determined by using UV-Vis spectroscopic after suitable dilution.

4. Zeta Potential:

Zeta potential based on electrophoretic mobility of optimized liposomal formulation was determined by using Zetasizer.

C. Liposomal powder formulation:

1. Flow behavior:

The bulk density and the angle of repose as the most frequently used index for evaluating powder characteristics were measured. The bulk density could be obtained from the following formula. As the bulk density should be within the range of 0.1- 0.4 mg/cm³, the powders can be used orally. The flow ability of powders is considered to be good when the repose is less than 40°. Polydispersity index is the dispersing ability of agglomerated particles on application of pressure. A higher polydispersity index is expected to get a higher deposition.

2. Particle size and distribution: Instruments based on laser light scattering and the photon correlation principle are mainly used to determine the particle size of the powders.

3. Moisture content determination:

Stability and flow properties mainly depends on the amount of moisture present in the LPs. A higher amount of moisture causes powder aggregation, leading to poor deposition. The moisture content LP is accurately determined by the Karl Fischer titration method for abrupt idea loss on drying (LOD) moisture balance can be used.

4. X- ray diffraction measurement:

X- ray diffraction of liposomal powder is to be carried out with a Siemens D 5000 (Siemens AG, Berlin, Germany). The diffraction intensity is to be recorded with an angle 2Θ from 5° to 80°. The voltage and current is to set at 40Kv and 40mA, respectively. Each sample examined in triplicate. The data is to be analyzed by Evaluation (EVA) software in triplicate. The data is to be analyzed by Evaluation (EVA) software.

4. Surface Morphology By SEM:

Surface morphology and size of optimized liposomal powder formulation was determined by using scanning electron microscopy.

5. In Vitro Drug Release Study:

The invitro drug release study of the LP was conducted similarly as that of the liposomal dispersion mentioned in above evaluation.

6. Stability studies:

As per ICH guidelines, the stability study was conducted to monitor physical and chemical stability of Ferric pyrophosphate liposomal formulations at 4⁰ C, 40⁰ C and room temperature for up to 60 days. The stability parameter, such as physical appearance, pH, drug content, entrapment efficiency & *in vitro* drug release was determined as function of the storage time.

RESULT AND DISCUSSION:

A. Drug Characterization:

Drug obtained from Pharoses Remedies was found off white yellow, odorless and crystalline powder. Melting point of drug was found 355°C which is near to standard i.e.,350°C. Ferric pyrophosphate is insoluble in organic solvents like ethanol, methanol and chloroform and it is soluble in mineral acids.

The UV absorbance of Ferric pyrophosphate standard solutions in the range of 2-12 µg/ml of drug in citrate buffer pH 6.8 showed linearity at λ max 246 nm. The linearity was plotted for absorbance (A) against concentration (C) with R² value 0.9987 and with the slope equation $y=0.0186x + 0.0066$. The absorbance values and standard curve were in below fig.no.1

The FTIR frequencies of FPP are in reported range which indicate that obtained sample was pure. fig no.2

Table 2: Absorbance value of FPP

Sr. No.	Concentration (µg/ml)	Absorbance at 262 nm
1.	10	0.202
2.	20	0.363
3.	30	0.572
4.	40	0.745
5.	50	0.941

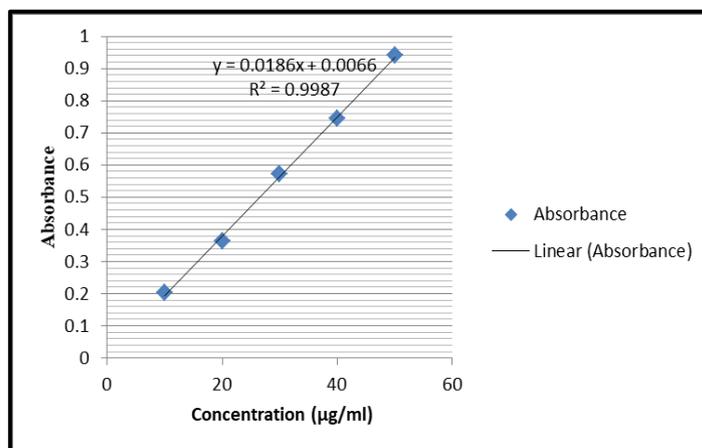


Fig no1: Calibration curve of Ferric pyrophosphate

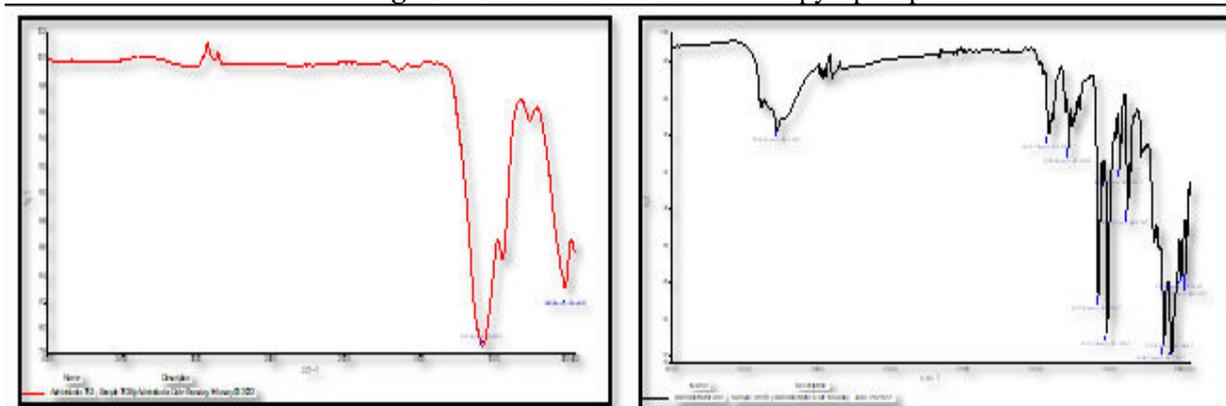


Fig. No.2 FTIR spectra of a) drug and b) liposomal powder

B. Evaluation of Liposomes:

Liposomes are Greenish white dispersion. Entrapment efficiency of F5 batch was high i.e., 88.487% and drug content was 92.45 % (table 3). The *in vitro* release of FPP liposomal formulations were performed and measured the release at 1 hr, 2 hr., 3 hr upto 12 hrs. The formulation F5 shows highest *in vitro* drug release i.e., 86.45% (table 4) & fig no 3. From the all liposomal formulations, F5 shows high drug content, entrapment efficiency and *in vitro* drug release and on the basis of that it was optimized for liposomal powder formulations. Zeta potential of liposomes was shown in fig no.4 Zeta potential values in the range of -30 mV to +30 mV of either charge characterize stable formulations. Stability study of liposomes shows that they are stable at 4 °C.

Table.3 Evaluation of liposomes

Formulations	%Entrapment efficiency	%Drug content
F1	87.317	89.18
F2	85.496	86.49
F3	85.533	86.21
F4	81.680	83.28
F5	88.487	92.45
F6	86.407	88.31

Table No.4 % In Vitro drug release of liposomes

Time (hr)	Cumulative % release of formulation					
	F1	F2	F3	F4	F5	F6
0	0	0	0	0	0	0
1	4.61	5.51	8.71	9.07	11.76	8.66
2	6.11	8.91	12.90	13.65	17.83	15.93
3	11.55	10.11	15.71	18.07	24.07	24.36
4	21.40	22.15	20.61	25.78	27.09	30.65
5	28.66	29.87	26.78	32.40	38.11	37.04
6	36.11	37.98	32.71	40.79	46.76	40.65
7	42.65	44.66	38.90	47.87	52.19	48.96
8	50.82	52.77	45.62	55.89	65.61	56.18
9	56.86	58.92	52.38	60.97	70.74	68.76
10	60.65	62.89	55.90	65.60	74.76	70.13
11	65.51	69.32	62.09	70.63	79.65	76.89
12	70.11	71.51	73.80	81.05	86.45	81.90

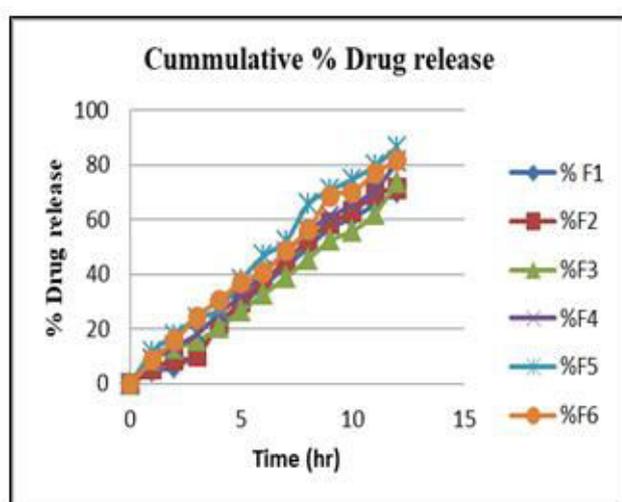


Fig.no.3. % *In Vitro* release of liposomes

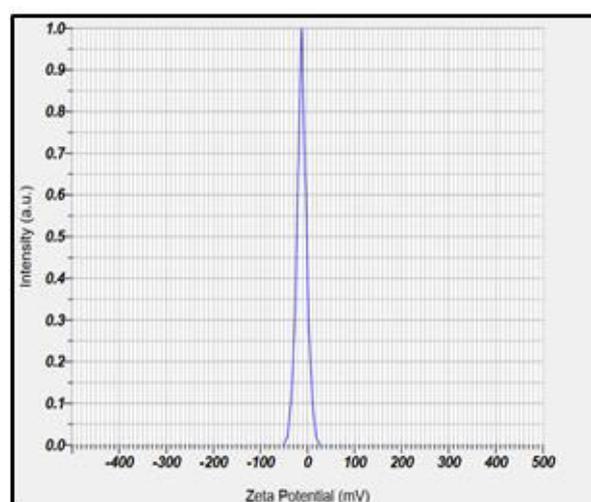


Fig no.4 Zeta potential of F5 -12.7mV

C. Evaluation of FPP Liposomal Powder:

FPP liposomal powder of optimized batch F5 were yellowish white dispersion. Flow properties of liposomal powder was determined by angle of repose, Carr's index, Hausners ratio and moisture content as shown in table no 5. Shape and surface morphology of FPP liposomal powder was determined by using SEM showed the intact nature of liposome fig. no.5. No crystal diffraction of formulation was shown in X-ray Diffraction fig no

6. The polydispersity index (PDI) which measures the width of the size distributions was used to monitor the quality of the data. The formulation F5 showed lowest particle size that is 216.3 nm. The polydispersity indices was 0.318 ± 1.4 which indicate that the liposomes were monodispersed to polydispersed fig no 7 *In vitro* drug release was 88.54% upto 12 hr (table 6) fig.no 8. Stability study of FPP liposomal powder shows that they were stable at 4 °C drug entrapment(table 7) and *in vitro* was found 83.21% and 89.91 % as shown in (table 8) fig.no 9 and

Table.no 5: Flow properties of FPP liposomal powder

Formulation	Appearance	Angle of repose (o)	Carr's Index (%)	Hausner ratio	Moisture content
F5	Fine Off-white powder	24.2 Excellent	10.51 Excellent	1.09	2.8±0.5

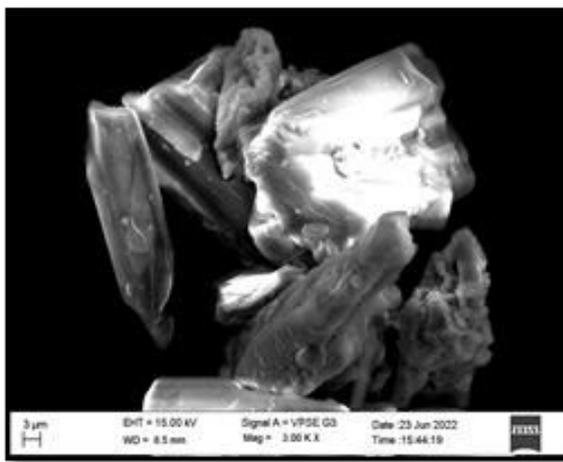
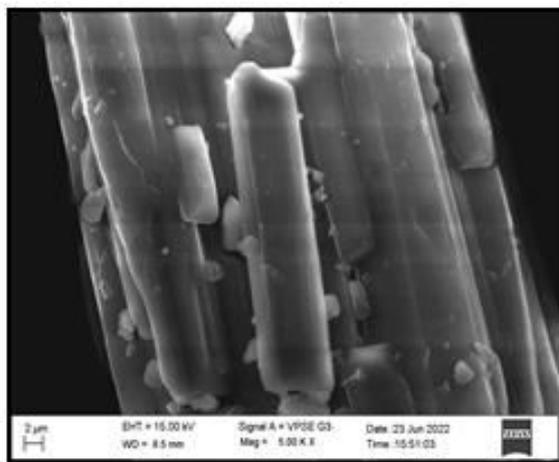


Fig no.5: Scanning electron microscopic images of FPP liposomal powder

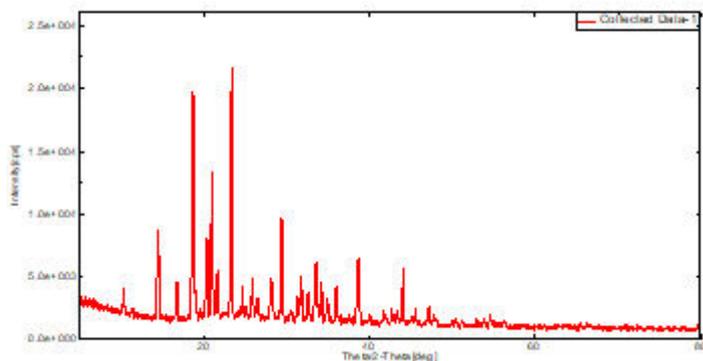


Fig. no 6: XRD of liposomal powder

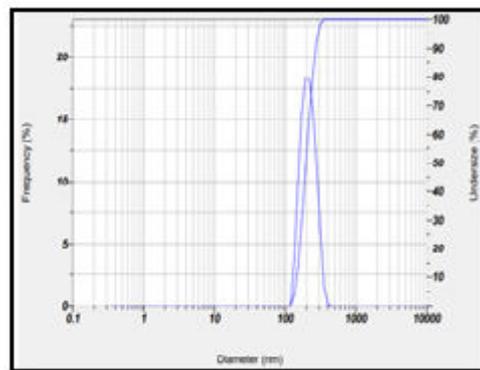


Fig.no 7: Particle size of liposomal powder

Table no 6: Cumulative % drug release of formulation F5

Time (hr)	Cumulative % drug release of formulation F5
0	0
1	10.76
2	17.53
3	24.07
4	30.09
5	38.51
6	45.56
7	52.19
8	60.61
9	69.74
10	75.76
11	79.65
12	88.54

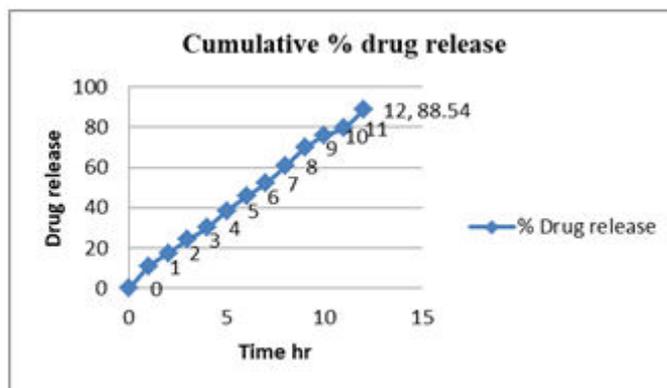


Fig. no.8: % drug release of formulation F5

Table no 7: Stability study of Liposomal powder

Number of days	% Drug Entrapment efficiency		
	At 4 °C	Room Temperature	At 40 °C
Initial	84.41	84.41	84.41
15	84.36	84.11	83.15
30	84.33	83.86	82.96
45	84.28	82.16	80.62
60	84.21	80.23	77.89
75	84.15	78.12	74.48
90	83.98	76.89	72.68

Table no 8: % Cumulative drug release after stability

Time (Hr)	% Cumulative drug release after stability			
	Initial	1 month	2 month	3 month
0	0	0	0	0
1	10.48	9.74	9.50	8.50
2	17.38	16.18	15.41	15.23
3	24.45	23.36	22.65	22.23
4	30.29	28.13	27.43	26.16
5	36.52	35.12	33.55	32.65
6	42.91	40.45	39.91	39.28
7	50.65	48.12	47.48	46.26
8	56.81	54.85	53.15	52.12
9	62.55	60.12	59.75	58.23
10	70.54	69.18	68.48	66.65
11	77.92	76.81	75.01	72.96
12	85.75	84.26	82.14	79.61

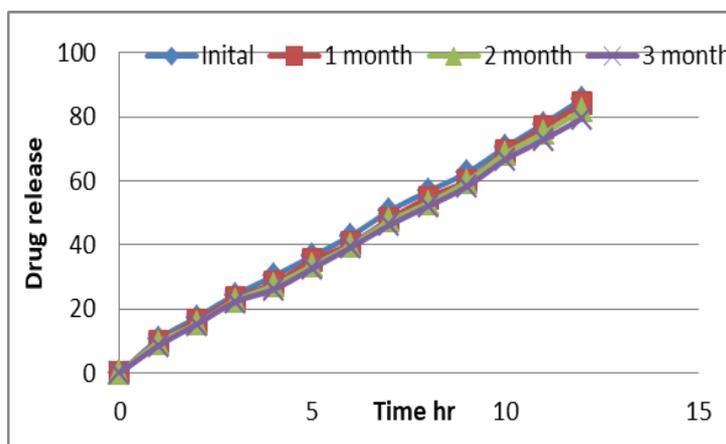


Fig. no.9: % Cumulative drug release after stability

CONCLUSION

The research conducted can be concluded that, Ferric pyrophosphate drug which belong to BCS class II can be encapsulated into liposomal drug delivery system. This research conducted successfully encapsulate FPP into liposomal powder with maximum drug release of 88.54% upto 12 hr. Conventional iron preparations are often associated with various GI side effects resulting in non-adherence to the therapy by substantial no. of patients. Liposomal iron a new generation oral iron preparations, technologically engineered and formulated in liposomal oral powder helps to overcome the limitation associated with the conventional iron preparations. Liposomal iron significantly increases Hb, ferritin levels in pregnant as well as in women of reproductive potential & it is an effective & safe alternative to parenteral iron in chronic inflammatory conditions associated with IDA.

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Formulation and Evaluation of Antifungal Medistick

Zunjare Prashant G, Moholkar Aparark V*, Khadkutkar Vijayananda K, Kombade Rohit R, Kazi Wasim B and Kamble Sumedh P

Department of Pharmaceutics, Channabasweshwar Pharmacy College (Degree), Latur, Maharashtra, India

ABSTRACT

Main objective to formulate medistick is to cure topical infections with beauty purposes by using combination of natural and synthetic ingredients. The medistick is combination of drug and cosmetics i.e. it is cosmeceuticals formulations. Drug used in this medistick is clotrimazole which is used for antifungal treatment. Pre-formulation studies indicate drug and excipients found to be compatible. We studied drug solubility, castor oil found to be as a blending agent. This selection is done by concentration of bees wax, wool fat, candelilla wax, hard paraffin wax and castor oil. Evaluation parameters like pH, melting point, breaking load test, thixotropy, spreadability, in vitro drug release and antifungal activity etc were performed on finalized formulation. Optimized formulations shows more compatible results like pH, melting point, braking load test, thixotropy and peroxide number. Optimized formulation shows the maximum in vitro drug release as compared to marketed formulation.

Keyword: Medistick; Cosmeceuticals; Clotrimazole; Castor oil; Bees wax.

INTRODUCTION

Medistick is a cosmeceutical preparation. Then one question arises what is cosmeceuticals? Cosmeceuticals are blend of naturally dynamic mixing which have medication like advantages which also help for beautification of the skin.

Topical drug delivery can be defined as a topical drug delivery system is a path to deliver medication onto a particular area of the body, typically the skin, to treat various ailments. There are many common forms of topical formulations such as sprays, oils, patches, and powders, but they are mainly formulated as creams or ointments. Topical formulations are used for the localized effect at the target site of their application by drug penetration into the underlying layers of skin or mucous membrane.

Lipsticks are cosmetic formulations for the modification or accentuation of lip color and are prepared by molding a dispersion of colors in a waxy base, in the form of stick/crayon. When these preparations contain active ingredients, they are also known as medicated lipsticks or medistick which may contain synthetic drugs or herbal dugs.

Clotrimazole is chemically 1-[(2-Chlorophenyl)(diphenyl)methyl]-1H-imidazole broad spectrum antifungal agent active against a wide variety of fungi and yeasts. Clotrimazole is a synthetic antifungal drug used to prevent and cure fungal skin infection. Topical application of antifungal is intended to accomplish maximum local drug concentrations and to avoid the adverse effects of systemically administered preparations. To achieve desirable therapeutic effect, topical drug delivery for clotrimazole needs to reside at the sites of infections for prolonged period. Hence there is a need to formulate more effective drug delivery system that should prolong the contact of drug with infected part.

The formulation of medicated stick containing clotrimazole drug is intended for the purpose of curing lip with fungal infections. For this rational it was formulate one cannot go outside applying clotrimazole cream on lip but applying clotrimazole medistick is better. Transparent medistick can also use for other body organ which are infected from fungal like eyebrows, neck, ear back side this type site it is apply. Clotrimazole is very safer drug it is not harmful even if people or child eats.

MATERIALS AND METHODS:

For formulating antifungal medistick, clotrimazole is received from as a gift sample from Cosmo Chem products Pvt. Ltd. Pune. Bees wax, lanolin, candelilla wax, castor oil and hard paraffin wax purchased from Genuine Chemical Company, Mumbai. Iso-propyl myristate (IPM), titanium dioxide, propyl paraben, citric acid purchased from Loba chemie Pvt, Ltd., Mumbai.

Procedure for formulating medistick:

1. Weight wax mixture, oil mixture, solvent, antioxidant, preservative, TiO₂, Flavor and all ingredients.
2. Take wax mixture in a china dish and put on the water bath till wax mixture dissolve and take a beaker into other water bath for warming oil mixture.

3. Dissolve drug in oil mixture using magnetic stirrer then add wax mixture into it with continues stirring.
4. Take the solvent IPM, flavors, antioxidant, preservative, opacity agent and surfactant in another beaker and mix properly.
5. Pour the 4 into 3 with continuously stirring and then mould it in medistick moulder. First cool it at room temp then freeze and scrap it out.

Formulation Table

Table no.1 Formulation table for Antifungal medistick (Quantities in %)

Batch	F1	F2	F3	F4	F5	F6	F7	F8	F9
API(Clotrimazole)	1	1	1	1	1	1	1	1	1
Bees wax	16	18	20	16	18	20	16	18	20
Lanolin	10	8	6	10	8	6	10	8	6
Candelilla wax	9	9	9	-	-	-	9	9	9
Hard Paraffin	-	-	-	9	9	9	9	9	9
Castor oil	50	50	50	50	50	50	45	45	45
IPM	8	8	8	8	8	8	8	8	8
Titanium dioxide	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Propyl paraben	0.1	0.1	0.1	0.1	0.	0.1	0.1	0.1	0.1
Citric acid	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Flavor	QS								

EVALUATION PARAMETER:

A. Drug Characterization

a) Organoleptic properties:

Clotrimazole sample which is supplied from Cosmo Chem Pvt. Ltd. Pune was closely observed for physical appearance.

b) Determination of Melting point:

The melting point was resolve by leading small amount of clotrimazole substance in the capillary tube then it placed into melting point apparatus along with thermometer, then switch on the apparatus then start the heater and light. Gradually increases the temperature. Note down the temperature at which clotrimazole is melt.

c) Solubility study:

For the purpose of solubility, additional amount of drug is added in the solvent in the (water, methanol, ethanol, chloroform, ether, castor oil, iso-propyl myristate) at room temperature and kept for 24 hrs with rare shaking. The supernatant was taken and evaluated by using shimadzu UV1800 double beam spectrophotometer.

d) Estimation of drug by Fourier transforms Infra-red Spectroscopy(FTIR):

For the estimation of compatibility of drug with excipients FTIR will performe. The FTIR study was performed by scanned drug, over the range of 1700-400 cm⁻¹ in FTIR spectrometer. FTIR spectrum of clotrimazole showed the presence of the peaks which complies with the reference spectra.

e) Estimation of clotrimazole by UV-spectroscopy method:

Place 250 ml of 0.2M potassium dihydrogen orthophosphate in 1000 ml volumetric flask, add 195.5ml 0.2M sodium hydroxide and made up to the volume 1000 ml using distilled water. Preparation of standard calibration curve: Accurately weighed 50 mg of clotrimazole was dissolved in 25 ml of methanol and made up to 50 ml with phosphate buffer pH 7.4 in 50 ml volumetric flask to get the stock solution of 1000 µg/ml. From stock solution 5 ml was pipetted out and further diluted up to 50ml with buffer to get 100 µg/ml solutions. From 100µg/ml solution take 5ml and diluted to 50ml to get 10µg/ml solution from these aliquots of 2, 4, 6, 8, 10 ml were withdrawn and diluted to 10 ml with buffer to obtain a concentration range of 2-10µg/ml. The absorbance of the solutions was measured at 263 nm by using UV-spectrophotometer. A graph of concentration vs. absorbance was plotted.

B. Evaluation of Medistick:

a) **Color:** Visual technique.

b) **PH parameter:** The pH resolves using a computerized pH meter.

c) **Perfume test:** The medistick were tested after 30 days, to record scent.

d) Melting point:

The resolve of melting point is done in order to decide the storage characteristics of the product. The method of determination is called as capillary tube method. In this method, about 50 mg medistick is taken and is placed into a glass capillary tube open at both ends. The capillary tube is ice cooled for about hours and then placed in a melting point apparatus along with thermometer. The temperature at which, material start moving through the capillary is said to be the melting point of medistick. The ideal melting point of medistick base should be 60 to 65°C.

e) Breaking load test:

Breaking load test is done to determine the strength of medistick. The medistick is placed horizontal position. 1 inch from the base of socket, the weight has been continuously expanded by a specific value (5 gm) at a specific interval of 30 second and weight at which medistick breaks is considered as the breaking point.

f) Stability Studies:

The purpose of stability study is to provide evidence on how the quality of drug substance or drug product varies with time under the influence of a variety of environmental factor such as temp., Humidity, light and enables recommended storage conditions, re-test periods or shelf life to be established in any rational drug design and evaluation of dosage form for the drug.

g) Permeability Study:

Cellophane membrane has been soaked in ethanol and allowed to evaporate. 50 mg of medistick mass has been applied on the membrane and it has been placed on the diffusion cell. 7.4 Phosphate buffer has been used as receptor media. This has been magnetically stirred (600rpm). The experimental temperature has been kept up at 32 °C by circulating thermostatic water inside the cell jacket. Sampling does at 1hr interval and analyzed under UV at 263 nm for 5hrs.

h) Penetration test:

It is a sign of thixotropic quality and is done by utilizing a penetrometer. A standard needle of specific diameter is allowed to penetrate for 5 seconds under a 50 gm load at 25 °C. Measure the penetration it should be 10.5mm. A product of high droop point with soft thixotropic structure assures good application characteristics.

i) Antifungal activity:

Standard (Drug dissolved in DMSO) was determined by using candida albicans as a representative fungus; by the Agar well plate diffusion method. It determines antifungal activity in term of diameter of inhibition zone.

j) Surface anomalies:

It is the study of surface defects, such as development of crystals on the surface, contagion by fungus etc. No surface anomalies must be recorded in the prepared medistick.

k) Rancidity:

Rancidification is the decay of fats, oils and other lipids by hydrolysis or oxidation. It leads to flamboyant odor, bad taste and sticky product and sometimes changes of color of the product. By determining peroxide number rancidity test is done.

Procedure: weigh 2.5 ± 0.05 gm medistick sample place in 250 ml conical flask and dissolve in 30 ml of acetic acid- chloroform mixture (3:2). Heat if necessary to dissolve the sample. Add 0.5 ml of freshly prepared saturated potassium iodide solution. Shake and after two minutes add 30 ml of distilled water and then titrate with 0.01 N sodium thiosulphate solution using starch as an indicator.

Calculation: peroxide number = $A \times N \times 100 \div \text{mass of sample}$

Here A=Volume in ml of sodium thiosulphate

B= normality of sodium thiosulphate solution

l) Spreadability:

Medistick spread over transparent glass at an angle of 45°. Then the surface is observed and the picture is taken with a dark background.

RESULT AND DISCUSSION

A. Drug characterization

a) Organoleptic properties

The organoleptic properties of clotrimazole were studied

Table no. 2 Organoleptic properties of API

Properties	Specification as per IP 1996	Result
Color	white	white
Odor	odorless	odorless
Nature	amorphous	amorphous

Determination of melting point

Melting point of clotrimazole was found to be 145-149⁰c using a melting point apparatus.

b) Solubility study

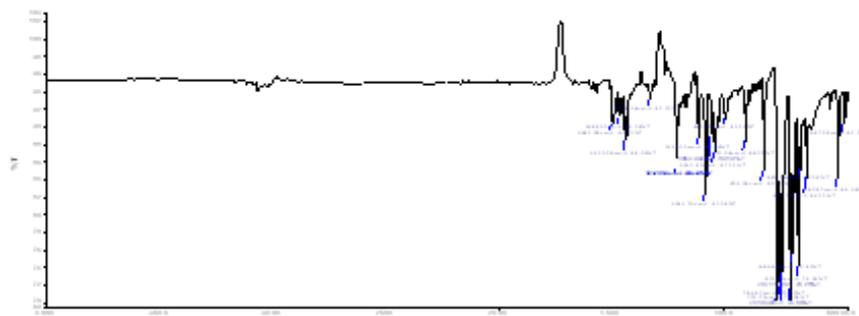
The solubility of clotrimazole was found to be as per following table no 3

Table no. 3 Solubility of API in different solvent

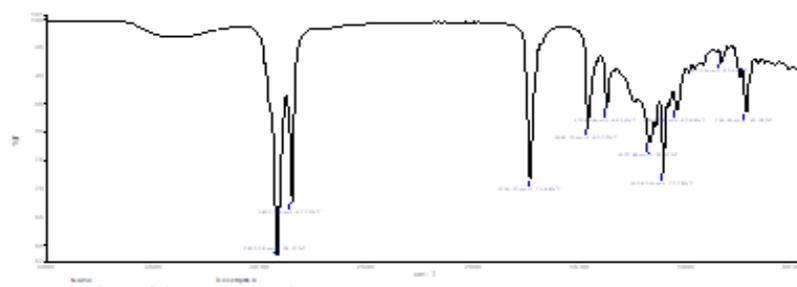
Solvent system	Specification as Per IP 1996	Result
Ethanol	Soluble	Soluble
Castor oil	Soluble	Soluble
PEG400	Soluble	Soluble
Methanol	Soluble	Soluble
Water	Slightly soluble	Slightly soluble
Chloroform	Soluble	Soluble

c) Estimation of drug by Fourier transforms Infra-red Spectroscopy(FTIR)

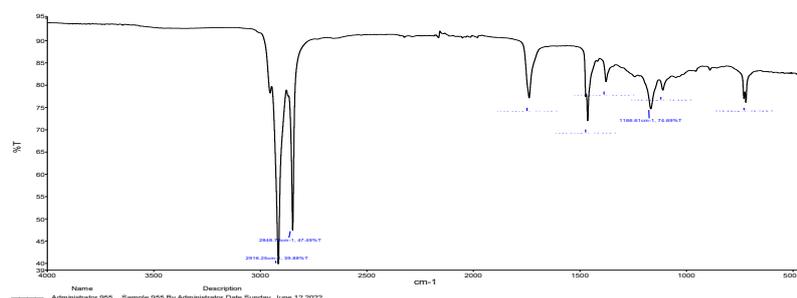
The IR spectrum of the pure clotrimazole sample recorded by FTIR spectrometer is shown as following



FTIR Spectrum Pure clotrimazole Drug



FTIR of Drug + Excipients



FTIR of F8 Formulation

The obtained peak frequencies of clotrimazole drug, drug+ excipients and F8 formulation was found to be in range of standard FTIR frequencies.

d) Estimation of clotrimazole by UV-spectroscopy method

Clotrimazole shows maximum absorption at wavelength 264 nm in phosphate buffer solution of pH 7.4, standard curve was plotted by taking absorption of diluted stock solutions (2, 4, 6, 8, and 10) µg/ml at wavelength 263 nm. The calibration curve of clotrimazole is given in fig. 1

Table no.4 concentration and absorbance of calibration curve

Conc. (µg/ml)	Absorbance
2	0.085
4	0.137
6	0.174
8	0.264
10	0.286

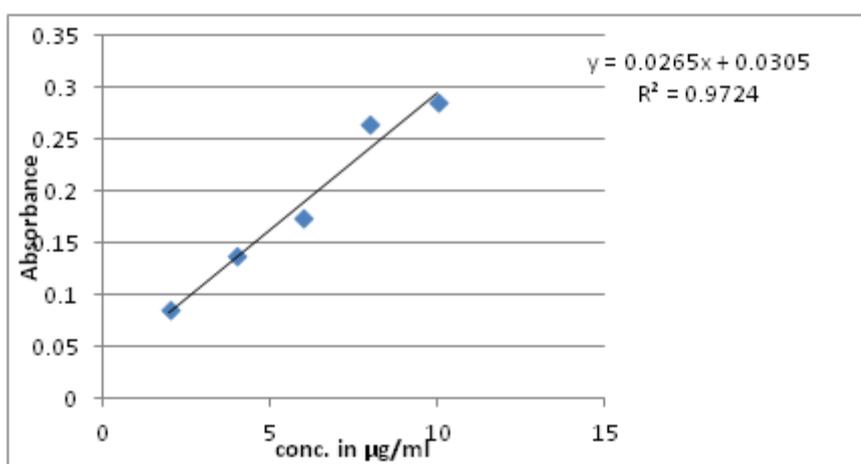


Fig.1 Standard calibration curve of clotrimazole

B. EVALUATION PARAMETER OF MEDISTICK

a. Appearance and pH

The medistick formulation was whitish in nature and pH found to be 6.0 to 6.5 as shown in table no. 5

b. Melting point

Melting point was done by use of melting point apparatus. Melting point was found to be 56 to 65⁰ C as shown in table no.5. As concentration of waxes increases melting point of medistick also increases with decrease in amount in castor oil.

Table no. 5 Result of evaluation a and b

F. Code	F1	F2	F3	F4	F5	F6	F7	F8	F9	ML
Appearance	W	W	W	W	W	W	W	W	W	Red
pH	6.1	6.1	6.0	6.3	6.4	6.3	6.4	6.4	6.5	6.4
M.P.	56	58	59	58	56	56	62	62	65	62

(ML= marketed lipstick, MP= melting point in degree celcius, W- whitish)

c. Breaking load test

The medistick is placed horizontal position 1 inch from the base of socket. The weight has been continuously expanded by a specific value (5 gm) at a specific interval of 30 second and weight at which medistick breaks is considered as the breaking point. It was found to be 20 gram to 30 gram. When we used more waxes with more concentration, breaking point was also increased. Hence it conclude that waxes increases the hardness of medistick

d. Penetration test

It was done by utilizing a penetrometer. A standard needle of specific diameter is allowed to penetrate for 5 seconds under a 50 gm load at 25 °C. it was found to be 9.2 mm to 11.9mm

e. Peroxide number

By determining peroxide number, rancidity test was done. It was found to be 8 to 10

Table no. 6 result of evaluation parameter no. c, d and e

Evaluation test	F1	F2	F3	F4	F5	F6	F7	F8	F9	marketed
Breaking load test (gm)	25	25	25	20	20	20	30	30	30	30
Thixotropic Character (mm)	10.2	10.1	10.3	11.9	11.8	12	9.5	9.4	9.2	9.5
Peroxide no.	8.8	8.4	9.2	8.8	8	8	9.6	9.6	10	9.4

f. Perfume test

The perfume was recorded after 30 days of medistick formulation it was found to be poor to good.

g. Surface anomalies

Surface defects such as cracking, crystal production on medistick surface was observed for 30 days after the formulation of medistick. No any surface anomalies seen on all medistick formulation.

h. Spreadability

Spreadability test for medistick was done by using glass slide by applying medistick at 45° angle, good spreadability was seen. It was done by using three parameters.

Excellent (E) No fragments, smooth and uniform surface application without deformation of medistick.

Intermediate (I) few fragments, uniform application with little deformation of medistick.

Unsatisfactory (U) Many fragments, not uniform application with intense deformation of medistick.

Table no.7 Result of evaluation parameter no. f, g and h

Evaluation test	F1	F2	F3	F4	F5	F6	F7	F8	F9
Perfume test	++	++	++	+	+	+	+++	+++	++
Surface anomalies	no	no	no						
Spreadability	I	I	I	U	U	U	I	I	I

i. Permeability study (in vitro drug release)

On the basis of above evaluation test F7, F8 and F9 was selected for in vitro drug release study and compared with marketed cream. Following table no.8 shows cumulative % drug release.

Table no. 8 cumulative % drug release

Time in hours	F7	F8	F9	Marketed cream
1	5.8	6.4	0.8	6.6
2	12.8	17	14	13.8
3	25.4	30.4	26.8	21.6
4	41.8	50.6	41	29
5	64.8	72.6	55	34.4

Formulation no.F8 and F7 shows the maximum drug release as compared to 1% clotrimazole cream

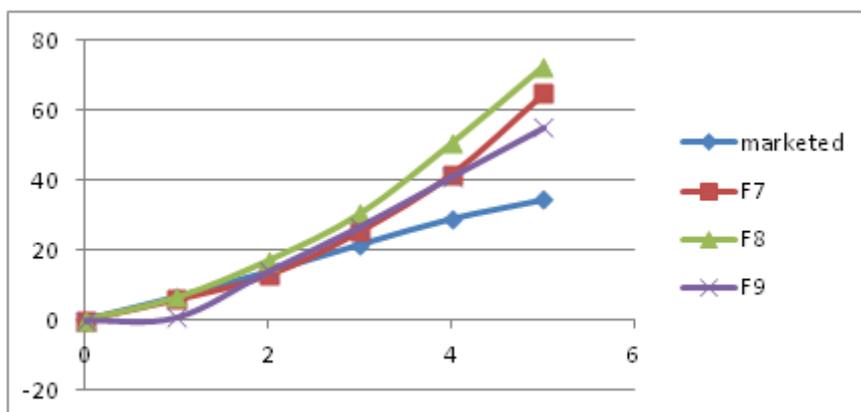


Fig.2 In vitro drug release of F7, F8, F9 and marketed clotrimazole 1% cream

Orders of drug diffusion:

Table no. 9 Regression coefficient of F7, F8 and marketed formulation

formulations	Zero order	First order	Higuchi model	Korsmayer Peppas model
F7	0.938	0.246	0.747	0.862
F8	0.957	0.200	0.776	0.849
Marketed	0.997	0.358	0.912	0.766

On the basis of regression coefficient; F7, F8, and marketed formulation shows zero order of drug diffusion.

j. Antifungal activity

Standard (Drug dissolved in DMSO) was determined using candida albicans as a representative fungus; by the agar well plate diffusion methods. It determines antifungal activity in term of the inhibition zone, as shown in fig. no 3.



Fig. 3 Antifungal activity of F8

Table no. 10- Zone in diameter

	SAMPLES	CONC. (mg/ml)	ZONE IN DIAMETER(mm) against Candida albicans
	Control	-	00
	Standard (fluconazole)	1	30
1	Sample -PF8	5mg	16
2	Sample -PF8	10mg	26

Conclusion of antifungal activity: The antifungal activity of the Sample F8 studied on Candida albicans, in which Sample F8 showed good activity.

k. Stability study:

The accelerated stability study of medistick F8 was carried out; there is no significant change in pH, %drug release and melting point in F8 formulation at 40°C temperature and 75% RH. Results of stability studies are given in table no 10, 11 and figure 4.

Table no. 11: Stability study of optimized formulation (F8)

Parameter	After 1 month	After 2 month	After 3 month
pH	6.4	6.4	6.4
Appearance	Whitish	whitish	whitish
Melting point	62	62	63
Breaking load test	30	30	30
Thixotropy	9.4	9.2	9.2
Peroxide number	9.8	9.8	9.8
Perfume test	+++	+++	+++
Spreadability	I	I	I
Surface anomalies	No	No	No

Table no. 12: %drug release after accelerated stability study of optimized formulation (F8)

Time (hrs)	% drug release			
	0 month	After 1 month	After 2 month	After 3 month
1	6.4	6.46	6.46	6.36
2	17	16.98	16.92	16.78
3	30.4	30.38	30.22	30.17
4	50.6	50.6	50.3	50.27
5	72.6	72.52	72.06	71.91

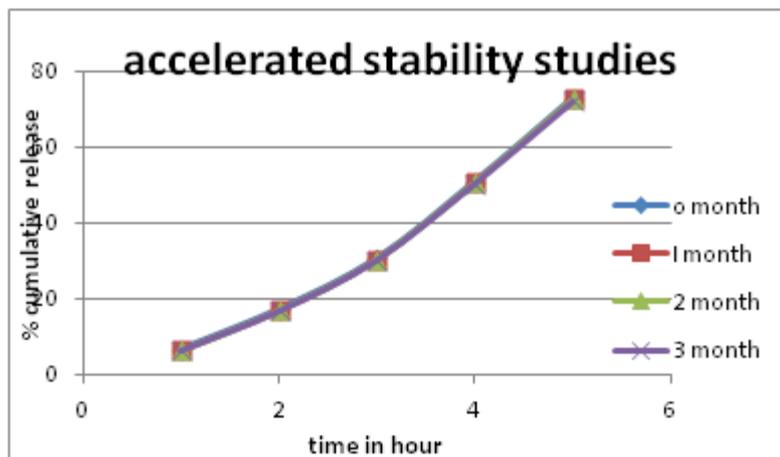


Fig.4 Comparative in vitro release of F8

CONCLUSION

The objective of developing the medistick formulation was achieved to promote the enhanced pharmacological response of clotrimazole over the other formulation like clotrimazole cream. Prepared F8 medistick showed good results as per the evaluation parameters studied. Formulation F8 shows the highest drug release among all formulations and also as compared to marketed clotrimazole cream. It was concluded that cost effective and more potent products can be formulated.

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Mucormycosis: A Concise Review

Diksha Vibhute¹, Shital Dhage², Snehalata Tawani³, Sachin Kabade⁴, Shruti Sarda⁵ and Anant Deshpande*⁶

^{1,2,3,4,5}Department of Pharmaceutical Quality Assurance, Channabasweshwar Pharmacy College (Degree), Latur, Maharashtra, India

⁶Department of Pharmaceutical Chemistry, Channabasweshwar Pharmacy College (Degree), Latur, Maharashtra, India

ABSTRACT

The fungus Mucorales causes mucormycosis, also referred to as zygomycosis. Despite being a rare illness, immunocompromised people are more likely to develop it. In addition to the rhino-orbito-cerebral and cutaneous varieties, it can be classified into cutaneous, disseminated, gastrointestinal, and pulmonary variants. For a successful course of treatment, early identification, correction of underlying issues, and the beginning of antifungal therapy are required. Amphotericin is the first line medication for the treatment of mucormycosis. The main aims and objectives of this study were to give a general overview of mucormycosis, its etiopathogenesis, distinct forms of mucormycosis, risk factors, different diagnostic tests, and mucormycosis management.

Keywords: Mucormycosis, Etiopathogenesis, Diagnosis, Treatment, Risk factor

INTRODUCTION

Phycomycotic is another name for mucormycosis or zygomycosis. Mucormycosis is a serious illness is a deadly infection brought on by fungi from the Mucoraceae family. Patients with this illness are disabled by immunological or metabolic disorders. Patients with AIDS, severe malnutrition, severe burns, cytotoxic therapy, infectious acidosis, uncontrolled diabetic mellitus, leukaemia, lymphoma, and immunological suppression from corticosteroid use. Patients witnessed dialysis, liver issues, and renal failure. patients receiving deferoxamine treatment. Age, race, or sex are not known risk factors for the disease. A fungal condition known as mucormycosis is brought on by filamentous fungi in the the Mucorales family. Mucormycosis is a widespread saprophyte that develops from solids or decayed waste. Mucormycosis of the central nervous system (CNS) is widely published. The population is a key factor in CNS mucormycosis. Mucormycosis of the central nervous system (CNS) typically results from the spread of the illness from the sinuses to the brain and eyes. Rare cases observe in CNS Mucormycosis. High risk of mucormycosis in those with the following diseases^[1]

1. Haematologic And Solid Malignancies.
2. Malnourished Individuals Especially Children.
3. BM Transplant Recipients.
4. Persons In Renal Failure.
5. Intravenous Drug Abusers.
6. Deferoxamine Therapy And All Causes Of Iron Overload
7. Diabetes Mellitus especially With Ketoacidosis.
8. Steroid Therapy.
9. Neutropenic Patients.
10. HIV Patients

An aggressive fungus infection is mucormycosis. Patients' immune systems are changing. Most people who contract sporangiospore infections do so either direct skin or mucosal inoculation or airborne dispersion of the spores. A component of cell growth and development is iron. providing numerous crucial procedures for collecting iron from the host. Patients with DSK mucormycosis have unbound iron in their serum, which is significant. A wound-related infection is mucormycosis. Radiation therapy for the lipid metabolic issue caused by continuous corticosteroids in that condition, etc. An opportunistic, fulminant fungal infection is mucormycosis. This mainly affects those with impaired immune systems.^{[2][3][4][5]} 11 genera and 27 species from the order Mucorales are associated with mucormycosis among which *Rhizopus arrhizus* is the most

common agent. The other agents known to cause mucormycosis include Lichtermann, *Aphophysomyces*, *Rhizomorph*, *Mucor* and *Cunninghamella* [6].

In 2019, coronavirus-infected individuals are more likely to develop rhino-orbital mucormycosis despite the prevalence of COVID-19-associated pulmonary aspergillosis (COVID-19). Extreme COVID-19 might become worse if an uncommon but harmful illness called mucormycosis occurs. Systemic glucocorticoids are currently employed to treat severe coronavirus illness (COVID-19). The use of glucocorticoids in this treatment for mucormycosis is likely to result in an increase in the disease [7].

RISK FACTOR

Malignancies like lymphoma and leukaemia, neutropenia, poorly controlled diabetes mellitus with or without ketoacidosis, prolonged corticosteroid use, renal failure, organ transplant, long-term immunosuppressive therapy, cirrhosis, trauma, burns, protein energy malnutrition, and acquired immunodeficiency syndrome are all predisposing factors for mucormycosis. [8][9] Nosocomial mucormycosis develops after being exposed to fungi through contaminated air filters or medical treatments including infected bandages, intravenous catheters, tongue depressors, and even allopurinol pills [10].

ETIOPATHOGENESIS

Mucorales use spore ingestion, inhalation, or percutaneous injection to target deep tissues. The initial line of defence mononuclear and polynuclear phagocytes come into contact with the spores as soon as they enter lung or skin tissues and are capable of killing them via oxidative metabolites and cationic peptides. risk elements Uncontrolled diabetic mellitus with or without ketoacidosis, steroid use, elderly people, neutropenia, AIDS, renal failure, organ or stem cell transplantation, iron skin injuries, broad-spectrum antibiotics, and intravenous drug misuse are all risk factors for mucormycosis. Diabetes patients have a higher risk of having any sort of mucormycosis. Diabetes patients have a higher chance of having any form of mucormycosis. Possible causes include [11]

- i) A decline in serum inhibitory activity
- (ii) A decrease in PH level and an increase in blood iron concentration
- (iii) The inability of patients with diabetes mellitus' pulmonary macrophages to inhibit *Rhizopus* species.

The presence of iron overload in serum is another risk factor for mucormycosis. Due to the fact that deferoxamine delivers iron to the mucorales, patients using this iron chelator have a higher risk of developing mucormycosis. If the spores evade phagocytosis, they cling to endothelial cells to enter the blood arteries. [12]

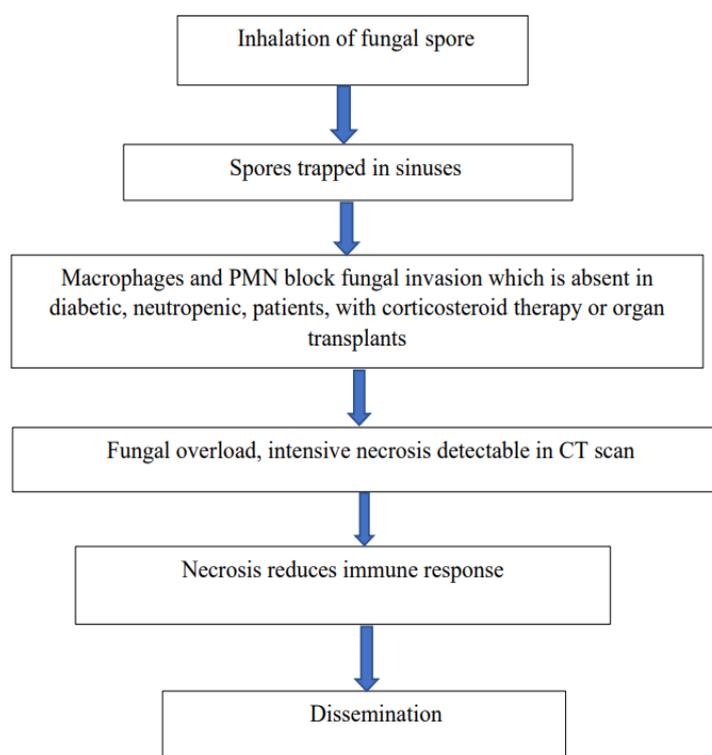


Fig.1 Pathogenesis of mucormycosis [13]

TYPES OF MUCORMYCOSIS [14,15,16,17,18,19]

1. Gastrointestinal mucormycosis
2. Disseminated mucormycosis
3. Rhino cerebral mucormycosis.
4. Pulmonary mucormycosis
5. Cutaneous mucormycosis

1. Gastrointestinal Mucormycosis

Premature and low birth weight infants under one month of age are more common among young children than adults. who have undergone surgery or taken drugs that reduce their body's ability to fight off infection and disease.



Fig.2 Gastrointestinal mucormycosis

2. Disseminated Mucormycosis

When a section of the body becomes infected with dispersed mucormycosis, it spreads through the blood. Although the illness mostly affects the brain, it can also harm the spleen, heart, and skin.

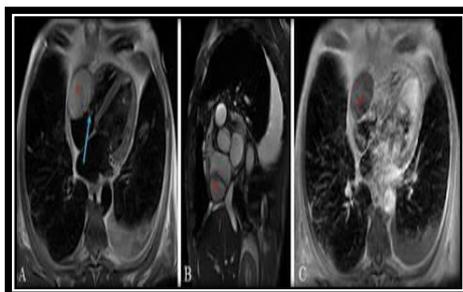


Fig.3 Disseminated mucormycosis

3. Rhino Cerebral Mucormycosis.

Rhino cerebralmycosis is an aggressive infection of the brain, sinuses, nasal passages, and oral cavity brought on by sparsephytic fungi. Death from the virus may occur suddenly. Diabetes patients and those with injured immune systems are usually affected by rhino cerebral mycosis.

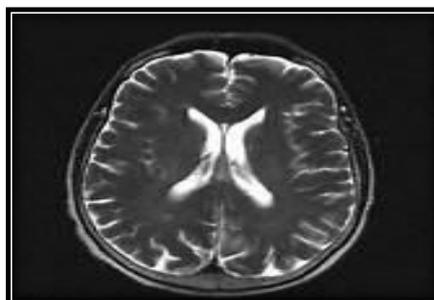


Fig.4 Rhino cerebral mucormycosis

4. Pulmonary mucormycosis.

An unusual fungus infection known as pulmonary mucormycosis is most frequently seen in immunocompromised patients. The fungus thrives on bad food, contaminated soil, and animal waste. In most cases, spores inhaled by patients cause infection.

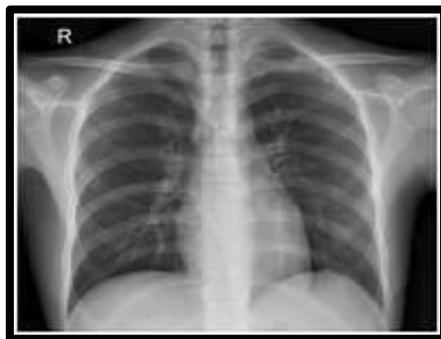


Fig 5 Pulmonary mucormycosis

5. Cutaneous mucormycosis

Cutaneous mucormycosis occurs when the fungus enters the body through a skin break, such as following surgery, a burn, or other skin trauma. Among those without weakened immunity, this kind of mucormycosis occurs the most frequently.



Fig.6 Cutaneous mucormycosis

DIAGNOSIS

Early detection of mucormycosis is essential for the effectiveness of antifungal therapy. Since the indications, symptoms, and radiological features are nonspecific, identification of the causal organism is necessary for a conclusive diagnosis^{[20][21][22]}.

- i. **Cytopathology:** A potassium hydroxide wet mount can be used to see hyphal components using chitin-binding dyes like Calcofluor, Fungi flour, or Blanford flour.
- ii. **Histopathology:** Periodic acid schiff and Gomori methenamine silver stains provide the organism's whole distinctive look. Identification of the genus and species of mucorales is aided by microscopic characterization of hyphae, columellae, sporangiospores, and sporangia.
- iii. **Culture:** The specimens are injected into the proper medium and incubated at 37°C. Colonies develop within 24-48 hours unless antifungal medications are administered to slow growth. Mucorales can be identified by their growth pattern and colonial appearance.
- iv. **Radiographic/Imaging techniques:** The degree of the disease can be determined with a computed tomography (CT) scan. Determining the extent of disease in the intradural and intracranial regions using magnetic resonance imaging (MRI).
- v. **Molecular methods:** The degree of the disease can be determined with a computed tomography (CT) scan. Determining the extent of disease in the intradural and intracranial regions using magnetic resonance imaging (MRI).
- vi. **Serology:** These include IgG test, Enzyme-linked immunosorbent assay (ELISA)
- vii. **A CT scan:** can be used in the diagnosis of pulmonary mucormycosis. The following changes are observed in a CT scan of a pulmonary mucormycosis patient
 1. Reversed halosign
 2. Consolidation or module or mass with halosign
 3. Central necrosis.

How to prevent Mucormycosis?

- 1) Use masks when going outdoors
- 2) Use gloves while handling soil(gardening).
- 3) Maintain personal hygiene.
- 4) Controlling underlying conditions like diabetes, discontinuing immunomodulating drugs, using steroids judiciously.

TREATMENT

Four steps in the successful treatment of mucormycosis are:

a. Early diagnosis

b. Reversal of underlying predisposing factor if possible

c. If needed surgical debridement

d. Prompt antifungal therapy^[23]

There are antifungal medications available that work against mucorales outside of living things. Posaconazole, a lipid formulation of amphotericin B, is an antifungal medication. With the development of isavuconazole, the antifungal toolbox has grown. Liposomal amphotericin B or L-Amphotericin Band amphotericin lipid complexes are the first-line antifungal agents. A study in mice suggested that the dose of the L-Amphotericin Band amphotericin B lipid complex is what determines its effectiveness, with 10 mg/kg producing the greatest outcomes. Efficacy and tolerance of high dose L-Amphotericin Bis (10 mg/kg/day) combined with surgery when necessary for the treatment of 34 mucormycosis were investigated in a phase II multicancer research. The entire report mentions that ECMM/ESCMIP and ECH-6 guidelines recommend using L-Amphotericin B with a daily dosage of at least 5 mg/kg/day for mucormycosis and the dose supplied 10 mg/kg/day for cerebral infection. After oral or intravenous injection, the water-soluble pro-drug isavuconazonium sulphate quickly hydrolyzes to the triazole isavuconazole. The best oral bioavailability, linear pharmacokinetics, and broad antifungal spectrum are all attributes of isavuconazole. Isavuconazole has a minimum inhibitory concentration of 0.125 to 4 mg for the *L. ramosa* *R. arrhizus* and a maximum inhibitory dosage of 1 to 16 mg/kg for *mucor Circenelloides*. Posaconazole has been found to be active against mucorales both within and outside of living things, but there isn't any evidence that it should be used as a first-line treatment. Posaconazole for prevention or consolidation following induction therapy in conjunction with L-Amphotericin Tablet and injectable formulations of Posaconazole are both available^[24,25].

CONCLUSION

Mucormycosis is a life-threatening fungal infection. If mucormycosis is not treated in a timely manner, the prognosis is poor and fatality rates may be high. Currently, mucormycosis is being seen in Covid 19. The most prevalent types are pulmonary mucormycosis and rhino-orbito cerebral. By wearing a mask when going outside, using gloves when handling soil, and maintaining personal hygiene, it avoids. We can diagnose mucormycosis utilising a number of diagnostic procedures like cytopathology, histopathology CT scan, serology etc. When treating mucormycosis, liposomal amphotericin B is the first line of defence. The likelihood of survival can be increased if mucormycosis is suspected based on risk factors and enhanced lab diagnostics.

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The Issues of Tribal Education in India

Prashant Kumar Baghel and Shivakant Prajapati
Department of Law, MATS Law School, Raipur, Chattishgarh, India

ABSTRACT

Education is the mainstream of the development of any society. In India particularly with reference to tribal education is not fully achieved Its goal in providing education to the tribal population. Since ancient times tribal population of India is struggling for their educational dreams. However, the constitution of India contains specific provisions for the tribal community but it has not yet achieved its mandates. A large number of tribal people are not properly achieving their education of various levels. The time to consider tribal education and inclusive growth has come. This paper seeks to achieve the educational right of the tribal people through information from various sources.

INTRODUCTION

After the African continent India has the second largest number of tribal populations. It is more than Britain, France and four times greater than the total population of Australia. The geographical location of tribal population leaves near hilly areas and isolated places, near forests, seas and island, they depend upon the natural resources for their daily routine. Their life style is totally different from the non-tribal in relation to language, dialects physical characteristics and population size. “ The tribes are a social group within a definite area. The Indian imperial gazetteer in 1911 defined tribe as a” Collection of families which retains a common identity, common language, a common area and is not usually matrimonial though initially it might have been so. They were one of the most depressed class of the Indian society until 1919, later on in 1919 the Indian franchise community granted them separate identity. By the order of 1951 they were known as scheduled tribes. During the British colonial period the tribal regions in India were under control to impose their income collection and to impose a uniform legal and administrative structure. Prime minister Shri Jawaharlal Nehru endeavoured for their development in the post independence era without forcing any outside for maintaining tradition and practice through panchsheel policy.

EDUCATIONAL STATUS OF TRIBALS

Education is the necessary element for the nation building and human progress. It is agreed that economically and socially disadvantaged group must come out of poverty and they should participate completely as citizens. Many global human rights treaties like UNESCO, convention against Discrimination in education (1960), the international covenant on economic, social and cultural rights (1966) and CEDAW (1981) have confirmed this. Through out the constitutional umbrella different constitutional provisions are provided public and private sectors provide these ties education at each and every level. Vocational education institutions have been set up to meet the need of education. The inner strength of tribal communities are education and literacy as important indicators of social and economic development. It has been the significant concern of the government, voluntary organization, NGOs and social reforms for the development of tribal community. The recognized elementary schools are managed or funded by the government . In terms of literacy the tribes lag behind the general population and schedule caste population.

CHALLENGING ISSUES OF TRIBAL EDUCATION

On account of economically backwardness, tribal societies are static and their social progress is very moderate. The government of all developing nations pays special focus for the upliftment of the tribal population of the region. National policy on education education¹⁵Have made several sincere alternate by government and non-government organization for boosting the educational and economic performance of the tribal people. Many tribal welfare programs in the nation could be structured into these main areas as follows 1. Protective 2.Mobilazition and 3. Development creation of more primary schools and residential schools for the tribal areas are one of the main initiatives of the national educational policy, 1986. The adoption of local administration system at planning level is one of the significant constraints of tribal education. It is observed that the tribal children due to the language barrier could not establish a communication line with the teacher, which concludes in the termination education of that child at some point as another. The 2002 Pratiche committee report identified that the main barriers to tribal education are lack of inspection, schooling expenses, lack of motivation from teacher and increasing dependence on private teacher decrease in enrollment were noted immediately after primary education the school dropout rates are the high, because the children were required to assist in cultivation with their family members.

The economic hardship is considered to be another critical factor for the drop out rate. Due to the lack of information facilities and transport facilities are the problems of treble education in the interior areas. In the rainy weather the problem becomes more miserable. Due to academic and social deprivation of indigenous households tribal families are unable to take advantage of the minimum educational facilities in the villages. India has a rich brilliant legacy, yet a sizeable piece of Indian populace is yet to receive benefits in return. They are as yet ancestral networks which are unrefined and live in remote areas. The IGI, 1911 characterizes clan as a "assortment of families having a normal identity, talking a typical argot, contains or pronounce to contain a certain area and isn't generally matrimonial however finally it could have been so."

D.N.Majumdar focused that "A clan is a group with regional grouping, endogamous with no class of capabilities, rule by old officials, innate etc. Joined in lingo and parlance, considering social distance with different clans or on the other hand rank with next to no friendly invective joining to them, as it does in the standing characteristic, following old practices, stance and habitude, narrow-minded of acculturation of reasoning, from other derivation, most seminal aware of similitude of ethnic and regional joining". The clans in India generally live in slope regions, timberlands, close to the oceans, and in islands. Their way of life is very unique in relation to non-tribes.

It is not that their social application are changeless, yet the stamina of social change in lineal society is highly lifeless. Since they are genuinely and fiscal in reverse, endeavors have been created by the Government to nourish them. In modern times, all nations are really focusing on advancement of the clans.

The British got the greater part of the ancestral districts India under their influence for upgrading income assortment and forcing uniform lawful and authoritative design across the settlement. The more clever non-tribal's tracked down a valuable chance to infringe into the ancestral terrains for the sake of advancement programs.

The non-tribal's at the appointed time ousted the tribals from their property and turned into the land holders of the similar too, made the tribal people work for them as reengaged horticultural works. Once the tribal groups became aware of their disapproval, they began revolted for the pieces land they had been impoverished from.

This undeniable position started the struggle and revolt in a few old areas. The strong expansion unhandy the english directors to present to some degree or totally neglected areas of organization in english Period. Following the territorial programme, the British kept the community in constraint and away from the public excellence.

Under Janasala programme, numerous good intercessions were attempted to focus on excellent instruction of ancestral youngsters. This suggests that as the ancestral youngsters have intellectual valour, a reasonable educational program and showing methods need to developed. At long last, that non-ancestral training has highly restricted dignity in ancestral social atmosphere since it doesn't fit with the manner of life of people and the requirement of the old local region.

There is an urgent need to connecting school methods with life and the needs of the ancestral networks. India advocates comprehensive development, however attributable to absence of school and ability development, the depressed groups are not transform out to be imperative for the expanded progress. To guarantee wider development, the Constitution has enacted the in upset classes with reservations in vocation and business.

For this reason, the Constitution of India has made special equipping to empower the SCs and STs to get them trained. These unique arrangements were made by the revision of the Constitution in 1951, and an special provision was added to article 15(4).

This provision empowers the state to make required provisions for the better development of the SCs and STs. These exceptional arrangements also amazingly affect their education level as numerous tribals have their own impossible to miss and idiomatic language specific in relation to the simple languages used in the state where they live. It's noticable that upwards of 22% of ancestral families have under 100 population, and more than 40% have between 100 to 300 individuals, while other families have under 500 individual.

CONCLUSION AND SUGGESTIONS

In India tribal population constitute a large population. But they are lagging behind in different spares of life like good hygienic, health, education, improvement and employment and so on. Provably instruction in a fundamental need of the tribal society. Entrap consideration for their need of elementary education. The central and state governments are paying special attention for improving their educational status. But the actual insult in for away from the expectation hence the time for considering seriously about the educational and inclusive

growth of the tribal people. Tribals live in remote woods are inaccessible and difficult to reach. Besides, the ancestral life and job is straightforwardly connected to the backwoods assets. Because of this, their relations with outside world are either manufactured or cut off contingent upon conditions.

During the British rule, their areas were made open for income assortment for the most part for the purpose of advancement. Also, the peasant arrangement eliminated the tribal community from their own belongings that were changed to the hands of new property holders and capitalists. This gave force to far reaching contentment among the tribes who revolted against the English rule on a few events. Because of this, the Englishmen opted the method of peace building, as it had long trail pilgrim interest in India.

The core point was to authorize the clans to live in their own specific manner as long as they didn't cause inconvenience, and kept up with the norm. After the sovereignty, the Indian Government followed a mode of confined immersion through Pt. Jawahar Lal Nehru's Panchcheel policy which over and over confined the organizers from acquiring revolutionary changes social and customary life.

The strategy creators have made focuses without understanding the low down of their social and conventional life. Apparently improvement is conceivable just with the association of neighborhood individuals. In view of this perception, the direction of arranging should be tweaked, i.e., the organizers should study the issues of tribals and plan in like manner.

Schooling is a significant road for overhauling the financial and economic wellbeing of minimized networks in the general public. It's actual fundamental for in reverse networks like SCs and STs. In view of the conversation in the paper, the public authority needs to do a great deal to work on their academic status.

In fact, even after the attainment of Sarva Siksha Abhiyan, just 88.46 percent of ST families are renowned under grade schools in an orbit of 1 km. There is reduction in the level of school dropouts and out of school youngsters among the tribes, however to spare abate the number, the educational program ought to be ready in their first language. There can be late morning dinner, night school, grown-up training communities and so on. Additionally, the public authority should delegate a few ancestral individuals as educators at every possible opportunity.

This will positively bring certainty and furthermore incite the lineal understudies to get selected for the schooling and to continue for proceeding. Apace with this, more Ashram schools ought to be opened in their region, and the public authority rules are to be loose so an ever-increasing number of kids can get into the school system. The centres like IITs and IIMs are to join with tribals believing that they disregard to turn up.

There should not be any underprivileged treatment at such establishments, regardless of whether they joined. Considering this multitude of conditions, need should consider and its working for the growth of the hereditary youngsters.

The private schools ought to be set up explicitly for travelling clans. The essential standards ought to be: (a) The schools ought to be where the weather conditions is least unforgiving; (b) there ought to be unique security for the kids, counting young lady kids for whom there ought to be ladies superintendents; (c) the guardians of understudies ought to be educated regarding the educational plan and exercises of their youngsters; (d) there ought to be proactive endeavours by officials on Tribal. Undertakings to move toward each family and to assist them with settling on an educated thinking to send their boys and girls to the schools; (e) during gaps, youngsters should be allowed to come back home and spend time with their near and dears; (f) and gather at groups, i.e. town fair, marriages, and so forth kids ought to be authorized to unite, if acceptable, with their families. There appears an incontestable downfall of standard schooling schools in affiliated regions. The states should endeavour for the establishment of more private schools like Jawahar Navodaya Vidyalaya up to intermediate standard within the vicinity of the students. These schools should give complete quality training including medical services furthermore, get ready kids for serious tests to inspire the underestimated youngsters. This, at the appropriate time, will bring significant and wanted changes.

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Impact of Fund Flow on Leverages of Micro Entreprises of Greater Mumbai

Hitesh G. Suthar

GNVS Institute of Management, Mumbai, India

ABSTRACT

Working Capital is life blood of the business. Human body can't survive without blood likewise business also can't survive without working capital. p values for all variable i.e. operating leverages, financial leverages, working capital leverages and working capital are greater than critical p value 0.05. Working capital is insignificantly negatively correlated with Operating Leverages ($r = -0.214$, $p = 0.135$). Working capital is significantly positively correlated with Financial Leverages ($r = 0.414$, $p = 0.003$). Working capital is significantly positively correlated with Working capital leverages ($r = 0.475$, $p = 0.000$).

Keyword: Operating Leverage, Financial Leverage, Working Capital Leverage & Working Capital

INTRODUCTION

The study of working capital management occupied an important place in financial management. It has never received so much attention as in recent years. Working capital management is an integral part of overall financial management. The management of working capital is synonymous with the management of short term financial liquidity. The importance of short term liquidity can best be gauged by examining the repercussions which stem from a lack of ability to meet short term obligations.

Efficient management of working capital involves careful determination of working capital requirements and formulation of plans for meeting them. A large number of factors influence the working capital needs of firms. The most important of these are: the nature and size of the business, manufacturing cycle, business fluctuations, production policy, dividend policy, credit policy, credit availability, growth and expansion activities, profit level changes and operating efficiency.

Fund Flow Analysis is an effective management tools to study how funds have been procured for the business and how they have been employed. This technique helps to analyze changes in working capital components between two periods.

In spite of its use for owners and creditors in financial decision making, it does not clarify the importance of movements in the working capital structure. Further this technique can be used only by the internal management in its control of working capital and does not throw light in the questions whether the capital is being used most efficiently (or) whether the current financial position of the Firm has improved (or) not.

Leverage Analysis helps to know changes in operating leverages, financial leverage and working capital leverage due to change in working capital of micro enterprises, leverage analysis gives true picture of risk involved in business.

REVIEW OF LITERATURE

According to **Akkihah (1984)** examined the working capital management of 94 small scale industrial units in Hubli-Dharwad Corporation area in the state of Karnataka. In this study the efficiency of working capital was evaluated through analysis and interpretation of some selected ratios, such as current ratio, inventory turnover ratio, fixed assets turnover ratio, total assets turnover ratio, gross profit ratio etc. This study revealed that the performance of working capital management of the selected firms was highly dissatisfactory and their liquidity position was also alarming.

According to **Panda (1986)** carried out a study on working capital management of 50 small scale units in the state of Orissa to investigate the pattern of current assets financing with some other related issues relating to working capital management. The study exhibited that the selected firms possessed a low level of current ratio during the study period. The study also revealed that most of the sample units incurred huge losses during the period of study. There was a scarcity of long term funds in the selected units. Thus, they were absolutely dependent on their short term funds to liquidate their claims and to meet their working capital requirements.

According to **Prasad and Eresi (1990)** conducted an empirical study on working capital management of Small Scale Industries in the state of Karnataka during the period 1986-87 to 1988-89. The study was made by using data from primary as well as secondary sources. The study revealed that more than fifty percent of the total assets of the selected units were in the form of current assets. However, another notable finding of the study was that excessive investment of funds in inventories and debtors which was responsible for the poor performance of liquidity management of SSI units.

PROBLEM OF THE STUDY

No study on leverages and working capital of ME is carried out till date in the area selected.

OBJECTIVE OF THE STUDY

To understand the impact of changes in working capital on different leverages.

HYPOTHESIS

Null Hypothesis (H₀): Changes in working capital does not significantly affect leverages of the Micro enterprises.

Alternative Hypothesis (H₁): Changes in working capital significantly affect leverages of the Micro enterprises.

For testing null hypothesis researcher used secondary data related to Operating Leverages, Financial Leverages, working capital leverages and working capital and it's gathered from Micro enterprises. The details of which are given in table.

Table: Details of Scores, variables and Normality test

Variable	Null for Normality test	Normality test	P value	Result of normality test
Operating Leverages	The distribution of Operating Leverages is normal with mean 127.029 and S.D. 26.32	One sample kolmogorov-smimov test	0.766	Retain null hypothesis
Financial Leverages	The distribution of Financial Leverages is normal with mean 94.795 and S.D. 9.03	One sample kolmogorov-smimov test	0.053	Retain null hypothesis
Working capital leverages	The distribution of Working capital leverages is normal with mean 121.225 and S.D. 17.23	One sample kolmogorov-smimov test	0.557	Retain null hypothesis
Working capital	The distribution of Working capital is normal with mean 158.775 and S.D. 37.79	One sample kolmogorov-smimov test	0.438	Retain null hypothesis

Observations and Interpretations

From the above table, it is observed that, p values for all variable i.e. operating leverages, financial leverages, working capital leverages and working capital are greater than critical p value 0.05. Hence researcher retained null hypothesis and data is normally distributed.

Further Researcher Used Parametric Pearson's Test for Testing Significance of These Variables.

Table: Correlations

		Working capital
Working capital	Pearson Correlation	1
	Sig. (2-tailed)	
	N	50
Operating Leverages	Pearson Correlation	-0.214
	Sig. (2-tailed)	0.135
	N	50
Financial Leverages	Pearson Correlation	0.414**
	Sig. (2-tailed)	0.003
	N	50
Working capital leverages	Pearson Correlation	0.475**
	Sig. (2-tailed)	0.000
	N	50
*. Correlation is significant at the 0.05 level (2-tailed).		
**. Correlation is significant at the 0.01 level (2-tailed).		

From the above table, it is observed that,

- Working Capital** is insignificantly negatively correlated with **Operating Leverages** ($r = -0.214$, $p = 0.135$)
- Working Capital** is significantly positively correlated with **Financial Leverages**

($r = 0.414$, $p = 0.003$)

3. Working Capital is significantly positively correlated with **Working capital leverages**

($r = 0.475$, $p = 0.000$)

REGRESSION ANALYSIS

Table: Model summary

Model	Dependent variable	Independent variable	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	Operating Leverages	Working capital	.214	.046	.026	25.97787
2	Financial Leverages	Working capital	.414	.171	.154	8.30397
3	Working capital leverages	Working capital	.475	.226	.210	15.31798

From above table, it is observed that

1. R Square for **model 1** is 0.046 and Adjusted R Square is 0.026. These values not close to 1 and difference between is also large indicates this model is not good fit.
2. R Square for **model 2** is 0.171 and Adjusted R Square is 0.154. These values not very close to 1 but difference between is small indicates this model is good fit.
3. R Square for **model 3** is 0.226 and Adjusted R Square is 0.210. These values not very close to 1 but difference between is small indicates this model is good fit.

ANOVA Table

Table: Anova table for operating leverage, financial leverage, working capital leverage

Model	Dependent variable	Independent variable		Sum of Squares	Df	Mean Square	F	Sig.
1	Operating Leverages	Working capital	Regression	1556.568	1	1556.568	2.307	0.135 ^b
			Residual	32392.784	48	674.850		
			Total	33949.352	49			
2	Financial Leverages	Working capital	Regression	684.666	1	684.666	9.929	0.003 ^b
			Residual	3309.884	48	68.956		
			Total	3994.550	49			
3	Working capital leverages	Working capital	Regression	3286.799	1	3286.799	14.008	0.000 ^b
			Residual	11262.746	48	234.641		
			Total	14549.545	49			

From the Above Table, It is observed That

1. P value for model 1 is 0.135 is greater than critical value 0.05 indicates that this model 1 is insignificant.
2. P value for model 2 is 0.003 is less than critical value 0.05 indicates that this model 2 is significant.
3. P value for model 3 is 0.000 is less than critical value 0.05 indicates that this model 3 is significant.

Regression Coefficients

Table: Regression coefficients table for operating leverage, financial leverage, working capital leverage and working capital

Model	Dependent variable	Independent variable		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
				B	Std. Error	Beta		
1	Operating Leverages	Working capital	(Constant)	150.711	16.020		9.41	0.00
			Working capital	-0.149	.098	-.214	-1.52	0.135
2	Financial Leverages	Working capital	(Constant)	79.089	5.121		15.44	.000
			Working capital	0.099	.031	.414	3.151	0.003
3	Working capital leverages	Working capital	(Constant)	86.812	9.446		9.190	.000
			Working capital	.217	0.058	.475	3.743	.000

From Above Table, It is observed That

1. P value for **model 1** for coefficient of independent variable **Working capital** (Unstandardized Coefficients value -0.149) is 0.135. This value is greater than critical value 0.05. This indicates that insignificance of variable.
2. P value for **model 2** for coefficient of independent variable **Working capital** (Unstandardized Coefficients value 0.099) is 0.003. This value is less than critical value 0.05. This indicates that significance of variable.
3. P value for **model 3** for coefficient of independent variable **Working capital** (Unstandardized Coefficients value 0.058) is 0.000. This value is less than critical value 0.05. This indicates that significance of variable.

FINDING BASED ON OBJECTIVE

A) Based on Primary Data

Third objective was to understand the impact of changes in working capital on different leverages. Following are findings based on this objective.

1. Fund flow Analysis is technique used to ascertain changes in working capital of Micro enterprise.
2. Operating leverage, financial leverage and working capital leverage are ratios used to calculate leverages.
3. Increase in working capital highly affects operating leverage.
4. Increase in working capital affects financial leverage at very low extent.
5. Increase in working capital highly affects working capital leverage.

B) Based on Secondary Data

Objective was to understand the impact of changes in working capital on different leverages. Following are findings based on this objective.

- 1) As per trend analysis technique researcher further classified changes of working capital and leverages in different category.
- 2) Due to changes in working capital less than 100%, only two sample has reported under change in operating cycle between 111% to 120% and 141% to 150% respectively. Due to this change no impact on other leverages.
- 3) Due to changes in working capital between 101% to 110%, total 5 samples has reported under said category. It shows impact on operating leverage of 5 respondents sample, impact on financial leverage of 4 respondents sample and impact on WCL of 2 respondents sample in to different percentage category given under table no. 3.86.
- 4) Due to changes in working capital between 110% to 120%, only one respondents sample reported under said category and it has impact on all leverages shown under table no. 3.87.
- 5) Due to changes in working capital between 121% to 130%, total 7 samples has reported under said category. It shows impact on operating leverage of 7 respondents sample, impact on financial leverage of 7 respondents sample and impact on WCL of 3 respondents sample in to different percentage category as per table no. 3.88.
- 6) Due to changes in working capital between 131% to 140%, total 3 samples has reported under said category. It shows impact on all leverages under different percentage category given in table no. 3.89.
- 7) Due to changes in working capital between 141% to 150%, only one sample has reported under said category and it shows impact on all different leverages in to different percentage category given under table no. 3.90.
- 8) Due to changes in working capital more than 150%, total 31 respondents samples reported under said category. It shows impact on operating leverage of 27 respondents sample, impact on financial leverage and WCL of 31 respondents sample in to different percentage category given under table no. 3.91.
- 9) From the study it is cleared that changes in working capital has impact on different leverages. Positive or negative relation between changes in working capital and different leverages explained by researcher under finding based on hypothesis as per secondary data.

FINDING BASED ON HYPOTHESIS

A) Based on Primary Data

Hypothesis was that changes in working capital does not significantly affect leverages of the Micro enterprises. This null hypothesis was tested using relevant data gathered by researcher from owners. Initially data was tested for normality using one sample kolmogorov-smimov test. 'p' value for test was 0.000 (<0.05) indicates that data is not normally distributed. Hence non-parametric Wilcoxon test was used for testing significance of the variable changes in working capital. Here p' value for variable changes in working capital was 0.000 (< 0.01). Therefore median score for variable changes in working capital was significantly greater than hypothesized value 3. Hence on the basis of testing researcher revealed that changes in working capital significantly affect the leverages of the ME. Therefore alternative hypothesis (H_1) is accepted.

B) Based on Secondary Data

Hypothesis was that changes in working capital does not significantly affect leverages of the Micro enterprises. This null hypothesis was tested using relevant data gathered by researcher from owners. Initially data was tested for normality using one sample kolmogorov-smimov test. 'p' value for test was 0.000 (<0.05) indicates that data is not normally distributed. Hence non-parametric Wilcoxon test was used for testing significance of the variable changes in working capital. Here p' value for variable changes in working capital was 0.000 (< 0.01). Therefore median score for variable changes in working capital was significantly greater than hypothesized value 3. Hence on the basis of testing researcher revealed that changes in working capital significantly affect the leverages of the ME. Therefore alternative hypothesis (H_1) is accepted.

Third hypothesis was that three types of leverages (OL, FL, and WCL) are independent of changes in working capital. This null hypothesis was tested using relevant data gathered by researcher from owners. Initially data was tested for normality using one sample kolmogorov-smimov test. 'p' value for test was 0.766 for OL, 0.053 for FL, 0.557 for WCL and 0.438 for WC are (>0.05) indicates that data is normally distributed. Hence parametric pearson's test was used for testing significance of these variable. Here p' value for variable OL was 0.135 (>0.05), for FL was 0.003 (<0.05), for WCL was 0.000 (<0.05). Therefore working capital was insignificantly negatively correlated with operating leverages ($r = -0.214$), working capital was significantly positively correlated with financial leverages ($r = 0.414$) and working capital was significantly positively correlated with working capital leverages ($r = 0.475$).

CONCLUSIONS WITH RESPECT TO LEVERAGES & CHANGES IN WORKING CAPITAL

Researcher concluded that operating leverage, financial leverage and working capital leverage associated with changes in working capital. Changes in working capital having negative correlation with operating leverage but positive correlation with financial leverage & working capital leverage. In short, changes in working capital significantly affect leverages of the Micro Enterprises.

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Second Wife – To Be or Not To Be

Shani Mishra and Deepika Dhand
Department of English, MATS University, India

“And she was happy. She was getting married...”

ABSTRACT

Marriage in any society is an important part of life. In the Indian society, it is no different. In fact, it is the most important aspect of life which has to be fulfilled as a duty by the parents and the children have to get married as a responsibility. Love and affection and all other emotions can be acquired later on in the course of living together. When it is the marriage of a girl, the parents start looking for a match as early as infancy. And if the parents are unable to find a proper match, it could even be a marriage with a person who was already married, sometimes a number of times. Even in African American women, marriages were a forced affair and most often women became second, third or fourth wives.

Keywords: Marriage, fourth, responsibility, sacrifice, step mom

“It will be a simple wedding as it is the second time for the groom.”

In the Indian society, a girl is taught that after the age of 18 she should be ready to get married and that she should pray that she should get a good husband and this should be her everyday prayer. She is expected to fast on Mondays so that her husband is just like Lord Shiva, the epitome of a husband. The girl does exactly that as she has no choice. She gets ready to accept whoever comes her way, rather whoever decides to have a life with her. She looks forward to matches where the husband has grown up children and she tends to their every need and in return she gets no thanks instead she gets beaten up and the husband says that it is what she should be used to and she would like and it becomes a habit for her. Coming back to the Indian context, the women try not to get into alliances where the man was already married. But sometimes poverty leads to such situations. And as for the young lady, she waits eagerly with dreams of a loving husband and family. But does she get a husband like Shiva...? Does she even get a husband...?

The girl attains puberty and when she undergoes menarche, the family is informed. There is a party for all. The girl is decked up as a bride. It is to inform everyone that she is now ready for child bearing. The family gets together and bring gifts and ornaments. It is a mini marriage. Only the groom wouldn't be there. And that is the time when the parents convey to all the friends and relatives present to search for a good match. The parents also, try their hand. They are the ones who search sincerely and with utmost care as the match is for their own daughter. When the parents are unable to get a match, they decide to tell the family members. They all get together and if the girl is lucky she will be asked her choice. But most often she is not asked. She is not even told that a groom is being searched for her. When she comes to know, it becomes late to object. And the objection is usually due to the fact that she wants to continue her studies. If it is, that is, the objection is due to another boy in her life, there wouldn't be any more social visits on her own. She will be house arrested and all her movements will be thoroughly monitored and she will always be chaperoned.

If the father happens to be poor or worse if he is a drunkard or a drug addict, it becomes hell for the girl. There will be no match for her. In the Indian society, it is not a boy and a girl marrying each other. It is two families coming together. The girl is checked about and re checked. The same is done for the boy too. But boys have an advantage, their virginity is never tested. For a girl, it is more of a terrorized state as she shouldn't have any close relationships with anyone. She shouldn't be friendly with the opposite sex. She should remain untouched and save herself for her marriage. The first night should be the first time that a boy should touch her. The search for a groom becomes intense if there are no boys found by the age of twenty-four for the girl. Then, people even resort to looking for matches with already married guys. Now for the girl, it is the first marriage and for the boy it is the second marriage. Sometimes, it is the third or the fourth marriage for the guy and still the first one for the girl. The bride in the Indian society puts up a brave front. She marches ahead with all the ceremonies keeping at bay every negative thought and never giving heed to the most important thing which troubles most people – what will people say.

If there is an issue from any of the previous marriage or marriages, then it becomes a problem. It requires plenty of adjustment from both the sides. The loser is the child or the children – if the step mom is cruel. And even if she is not it takes a super human effort to accept another female in their mother's place. The step mom steps into her husband's life with an agenda. If she is treated right, she tries to bond with her husband's children. If

she has the complex of her lower status as the second or third or fourth wife, then she is in for a troubled married life and it will be the same for her husband and his children too. The society and its rules also make it difficult for such marriages to work smoothly. If any of the real characters get something into their heads, they will act petty. And it is a red flag for everyone in the family.

When it is a girl who is born into a poor family and her father is a drug addict, life becomes a drag for the girl. She lived most part of her life, being protected by her mother and somehow managing with her studies and generally enjoying life. When she turns into a young woman, the talks about marriage start making rounds. She still manages to live a carefree life. And within no time she crosses twenty-one years and it is a mad search for a groom by everyone in the family. And if she crosses 25, it becomes an emergency like situation. Any groom would be fine is the message which does the rounds in the society. The groom is finally found – only he is not a brand new one. He is a thrice married guy with a child. But the girl and the family adjust to the situation and they start preparation for the marriage. She makes up her mind that at least she will be out of the hell in the village and the constant fear that her father might get her married to another drug addict or maybe worse she might be sold. She tries to make up her mind by devising devilish ways. She might do it unknowingly. But it takes a toll on the lives of everyone. When she is pointed out she is not being soft to the kid, she becomes all the more, harsh. She tries to justify her actions. And if her husband supports his child, she loses it altogether and makes the life of the child very difficult. So much so that it leads to everyday fights and the child gets beaten up. If there is a strong support for the child, then the child will be saved. If not, the child does not grow up mentally strong. He or she will be twisted for life.

In her youthful idealism, she imagines a life wherein she is the woman of the house and everything and everyone revolves around her. When she faces the reality of her husband who has to think of his own mother and his daughter too, the second or the fourth wife feels cornered – which she is definitely not. However, she doesn't make any adjustments and continues to be belligerent and causes agony to self and others. The thoughts of ending her own life and everyone else's lives reigns supreme. If she gets support from any relative or neighbor she would get them and fight for her ways always and there will be constant tiffs for everything in the house. Peaceful co-existence flies out of the window. She thinks of getting financially independent. She might not even be qualified to get a respectful job. She would be taunted and maybe said pointblank that she can be allowed to work only if her job was at par with their status. This might not be possible. This miffs her and she starts creating more trouble.

The female comes unprepared for marriage because it is a safe belief with she comes that they will live happily ever-after. She wouldn't even dream that she will walk out of the marriage. She is so unprepared that she doesn't realize that she might become pregnant. The husband should take it on himself that he takes precautions so that his new wife is not in the family way immediately. But he never does that. He sleeps with her and she gets knocked up. Here, it is not the husband alone, the wife too could have discussed all the new arrangements even before the wedding. The transparency should be there between them. Then the troubles can be avoided. But intimate relationships are not so easy to plan. They happen in the course of time and come totally unplanned. Exciting things or for that matter the things which they had thought would be exciting become mundane things. There are many aspects of marriage which can be mundane yet perfectly blissful. Again, this realization can happen if both the husband and the wife are into it together. One person in the marriage cannot pull the carriage on his own. The passengers have to be if not fully disciplined, be at least well behaved.

"It is the first for her, so she keeps the gnawing thoughts away and gears up to go full on into it."

The second or the third wife got into the alliance knowing fully well what she was getting into. She can be very practical as she was already practical when she had decided to get married and be called the second or the third or the fourth wife. After marriage if she is not practical, it can be excruciatingly painful and everything will end up in an ugly manner. Here again, if things or relationships are going to end, there is at least light at the end of the tunnel. But if the relationships which have gone sour is prolonged, then it actually becomes a drag and the chances of anyone growing mentally and leading a peaceful life just vanishes. There are still subtle ways to get things done. She can be sublime. Even the daughter from the first marriage can be sublime and soft and can have the thought that it is for a limited number of years that she will have to bear with her step mom. The definition and meaning of marriage for each person is different and after experiencing it once or twice or even a third and a fourth time, the person can very easily coin his own meanings and speak out his expectations.

But the man doesn't do that. He tries again to make his new wife happy and the new wife is a bride for the first time and so she thinks that she will be getting all the importance and people in her husband's family will actually be grateful to her for accepting the boy as her husband and that all her wishes would be fulfilled. The

reality when it happens that is the guy and his family treat her as an ordinary wife and she is made to do all the work and she has to tolerate every whims and fancies of her in-laws and none bother about her wishes, she is brought down and she falls with a thud. The primary discussion between the boy and the girl should be as to what marriage means to him at that stage of his life. This discussion never takes place as the girl doesn't talk about the elephant in the room. It remains the elephant and when things start falling apart the blame game starts and then there is no turning around. It goes for the worse and the whole rigmarole starts.

Even his character is not being doubted. Forget about talking about what gives him satisfaction in life. Whether he is happy with how his career has progressed or is he planning to start afresh in his job or a change of job is needed or whether he feels worthless or what he has learnt from his experiences need to be thoroughly talked about and at least once that frankness is expected even if the new relationship will not work – he shouldn't think that if he speaks his mind, he might lose her. For this guy no mathematics will work. He was living forever with the thought that things will work out and he will come across a person with whom he could spend the rest of his life with peacefully and with love.

“The tag of ‘the second wife’ starts to rub in. It is rubbed in by all and sundry.”

The girl finds that she is dissatisfied in every way and that she doesn't want a way out but she wants to live her life as per her wishes. She has a kid now and if the child is a boy and if the husband already has a girl or no children at all, it is a very tempting state for the husband. For a Hindu family the birth of a boy is not just auspicious, it is very important as the boy will light the father's pyre when he dies. The husband would not want the wife to go because of the boy child. The wife also knows this and she doesn't want to stay now. Besides her husband and his daughter or son from his previous marriage or marriages she has a house full of relatives to deal with. Everyone would be judging her on everything she does. If she tries to discipline the children, she would be wrong. If she doesn't, even then she would be wrong. Then the expectations from the children or the relatives that she shouldn't conceive immediately or even not conceive at all. Expecting that she conceive as per the relatives' wishes is something which she would dismiss as rebellious act. If she had already conceived, she wouldn't be the apple of anyone's eyes. She would tie and again be reminded that it was not necessary.

When life turns difficult, the second wife starts questioning. The questions would be about how it was tackled by the first wife and how she is expected to do things differently. She didn't ever want to plug into a role which already existed. She wants to create her own style and life. She expects her husband to address issues with her, and also his mother and to dedicate more time with her and less with his daughter. She is a bother most of the time and the children feel secure when she isn't around. After becoming a mother if she does walk out on the marriage, there is a huge price to be paid. Who will take care of the new child. The husband is also now tired of taking care of children. The child from the previous marriage is still there. As if one was not enough, another one would be there without the mother. The child or children from one marriage can be taken care of but if it becomes a regular affair, then nobody will come forward to help either. If the man earns well and he is satisfied professionally too, he becomes a better husband as at least he is capable of providing his wife the comforts and luxuries of life. However, if the man is struggling to make ends meet and it is his parents who help him out, the wife will never be happy. There is a lot of satisfaction in money - if not, this or that, at least there is money - is the first thought everyone gets even the wife. She would have that fear always that it is a well settled arrangement and if she walks away then she will have to start all over again.

“When the realization happens, she is in the middle of her relationship and her life, she turns around and runs.”

Marriages are made in heaven. Sometimes, the universe doesn't listen and we creatures are like puppets and we get pulled and drift away or be blown or even get smashed to smithereens. When the intentions are pure, even the universe conspires to make things easier. If there is biological issue and there is no chance for a female to lead a normal life, it can happen that the lady has to compromise and get married to a person who already is married. In India, the choice factor is not always there. But in most of the foreign countries, it is not a taboo to remain unmarried for life. In India and with African poor women, it is important for the women to get married and it could be with anyone. If the man is loaded, it is an advantage for the woman. Or else, life was already a struggle. It becomes some more when she gets stuck in a difficult marriage. Sometimes, a woman gets married against her wishes and fulfills her duty as a daughter. But she doesn't continue living the shackled life. She gets out and she lives with her father. Due to societal pressures she has to get hitched again. She does so with a guy who knows her past and promises the moon to her. After marriage, it becomes a trauma for her as the whole family brings up the topic of the previous marriage and uses that as a weapon against her. Everyday fights lead to a chaotic life and then she moves out. What was the use of such an alliance when she was not even ready, she

had given in only due to pressures from the family? More power to women and the society should come forward to help. The women who decide to become the second or the third wife should have a clear picture in their mind as to what they are letting themselves into and lead a peaceful life and should let peace reign.

“If it is a second marriage, it should be a second one for both the man and the woman.”

The respect for each other and for the families or children remains. The frequent squabbles do not take place. And never ever a line or word will be uttered about how the first husband or wife had been.

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Urban Water Body Dal Lake Situated In Himachal for Quality and Its Sustainability Using Water Quality Index Model

Mahesh Kumar* and M. R. Sharma

Civil Engineering Department, Career Point University Hamirpur- 176045 (HP), India

ABSTRACT

A Water Quality Assessment study was conducted to see if there was a way to simplify, report, and interpret complex data collected for a given water body i.e., Dal Lake. The extent of water pollution is explained using a simple numeric model construction. Dal Lake's water quality was assessed using a number of key parameters that can serve as a basic measure of water quality. The current research focuses on the seasonal variation of water quality assessment in Dal Lake. The aim of this study was to gain a better understanding of the current state of Dal Lake's water quality by using some key parameters such as pH, TDS, EC, DO, nitrates, and phosphate content. The results of the evaluation will be used to enhance understanding of general water quality problems, communicate water quality status, and demonstrate the need for and efficacy of water conservation practices at national level. The water quality parameters of Dal Lake for all four zones is (104.96, 132.05, 123.17, 206.16) for all seasons summer, winter, and monsoon, suggesting that it is unfit for drinking. The amount of pollution must be tackled to protect the water source before it deteriorates completely. Throughout the year, samples were collected. Temperature, pH, DO, turbidity, BOD, conductivity, TDS, free CO₂, total hardness, chlorides, total alkalinity, nitrates, sulphates, phosphates, calcium hardness, magnesium, sodium, and potassium were analysed in the lab to determine the lake's water quality using standardized methods. The statistical analysis of the experimental data reveals a general upward trend in nitrate and phosphate content, as well as considerable variance. TDS and EC show a decreasing trend, implying that the lake's acidity is increasing, but within the continuum of basicity, with real values approaching neutrality; TDS and EC show a very positive state, but this proves to be a disgrace when all parameters are considered. Since the sample collection sites were well aerated, the dissolved oxygen content showed a growing pattern, and as a result, this parameter proved to be negligible. Overall, the study showed that excessive waste and sewage pollution into the water is degrading its quality, necessitating the introduction of urgent mitigation measures in all high-risk zones before the situation reaches the point of extinction. As a result, the protection and management of this high-altitude lake is critical. The basic data on this lake's water quality is needed for its conservation and management. The water quality of a high altitude lake was also measured using the Water Quality Index. The findings showed that the lake's water quality assessment is generally fine in terms of its portability requirements. Keeping in view of the parameters discussed and assessed there is a need for continuous improvement and sustainability for safeguarding the ecosystem of lakes.

Keywords: Dal Lake, Water quality parameters, vital parameters, Sustainability, Ecosystem, WQI

INTRODUCTION

Dal Lake is seen as a huge expanse of water in a beautiful landscape of baladhar range of mountains where people go to relax and have fun. Boating, camping, fishing, swimming, bird watching, and other outdoor activities are available. When the phrase "urban lakes" is used, however, the image is quickly dispelled. Although urban lakes are not the same as lakes in general, they do have importance and functions, including both ecological and social functions.

The term "lake" is used loosely to refer to a variety of water bodies, including wetlands, which are natural, manmade, or ephemeral. A number of human disturbances are currently threatening the biodiversity of lake and pond habitats, the most serious of which include increased nutrient load, contamination, acidification and invasive species invasion [1]. Water quality has declined, and biological productivity has improved, suggesting the system's ecological stress.

The most noticeable effect of urbanisation is hydrologic transition. Runoff peak flows and overall flow volumes are usually increased as a result of urbanisation, resulting in poor water quality and aesthetics. Pollutants predominantly enter wetlands by runoff. Large amounts of pollutants, such as eroded soil from construction sites, toxic metals and petroleum from roadways, industrial and commercial areas, and nutrients and bacteria from residential areas, are produced in urbanised watersheds. Sedimentation is the most significant non-point pollutant in terms of volume. Urbanization creates vast amounts of contaminants while also reducing water infiltration potential, resulting in more surface runoff. As a result, pollutants from urban land uses are more susceptible to surface runoff transport than pollutants from other land uses.

The organic and inorganic pollutant load in the Dal Lake has accelerated macrophytic development, lowering the water quality and biological oxygen demand (BOD) of the lake and, as a result, lowering the recreational and aesthetic appeal of the lake, resulting in its degradation.

Lake water and sediment chemistry is a product of catchment geology, weathering and erosional cycles, as well as anthropogenic inputs. Dissolution, hydrolysis, oxidation, and reduction are some of the chemical processes that degrade silicate and carbonate minerals [2]. The basic chemical reactions that occur between silicates, carbonates, and rainwater produce various ions and clay minerals, either congruently or incongruently [3].

Dal Lake's surface water composition has been altered by municipal and domestic effluents, resulting in increased eutrophication [4]. Furthermore, excessive sedimentation rates, caused by widespread soil erosion as a consequence of deforestation and encroachment by the local population, have resulted in a substantial reduction in lake volume [5]. The lake provides drinking water, irrigation, fisheries, recreation, and tourism, among other things.

A Water Quality Assessment is a helpful method for simplifying, monitoring, and analysing the data collected from any given water source. A basic measure of water quality can be extracted from a water quality assessment based on a few main parameters. In general, water quality data derived from various water quality parameters would appear to indicate a water body's health status.

STUDY AREA

Dal Lake is situated in Dharamshala, Himachal Pradesh (32°14'47.6"N 76°18'38.9"E [32.246562](#), [76.310794](#), 1,775 m above sea level). Dal Lake is a small mid-altitude lake near TotaRani Village in Kangra district (Himachal Pradesh). The name 'Dal Lake' arises from the Dal Lake in Kashmir.

The lake, which is surrounded by rugged mountains and towering deodar trees, is a wonderful place to visit. The lake is quiet and calm, with greenish water that is home to several different species of fish. According to many well-known stories and myths, these fish are never caught or eaten because of a curse that the lake is said to bear. Surprisingly, many people regard the lake as a holy site, as there is a small temple dedicated to Lord Shiva on the lake's shores. If you're trekking up to Naddi, which is also known as the Sunset Point, the Dal Lake is a great place to rest and relax. The lake, with its lush greenery and blossoming flowers, is an ideal place for relaxing with loved ones and enjoying a carefree day in nature. This is why the Dal Lake is considered one of Mcleodganj's most important and beautiful tourist attractions.

On the banks of the Dal Lake, a grand fair is also held. This grand festival, which takes place in September, is held to commemorate Lord Shiva's presence and is attended by a large number of Gaddi Tribe members. The many different ways that people use the lake, as well as the various pollutant-producing practises, have put a strain on the lake environment in a variety of ways. The lake is primarily fed by Telbal nala, a large perennial inflow channel that drains the largest subcatchment area of about 145 square kilometre and contributes around 80% of the total inflow to the lake [6,7,8], as well as a number of small streams along the shore line, such as Peshpaw nala, Shalimar nala, Merakhs. There are a number of springs [9] within the lake basin that serve as a permanent water supply for the lake. The Gagribal basin is the shallowest, while the Nageen basin is the deepest. 4.1 km² of the lake's total area is under floating garden or agriculture, 1.51 km² is submerged land, and 2.25 km² is marshy.

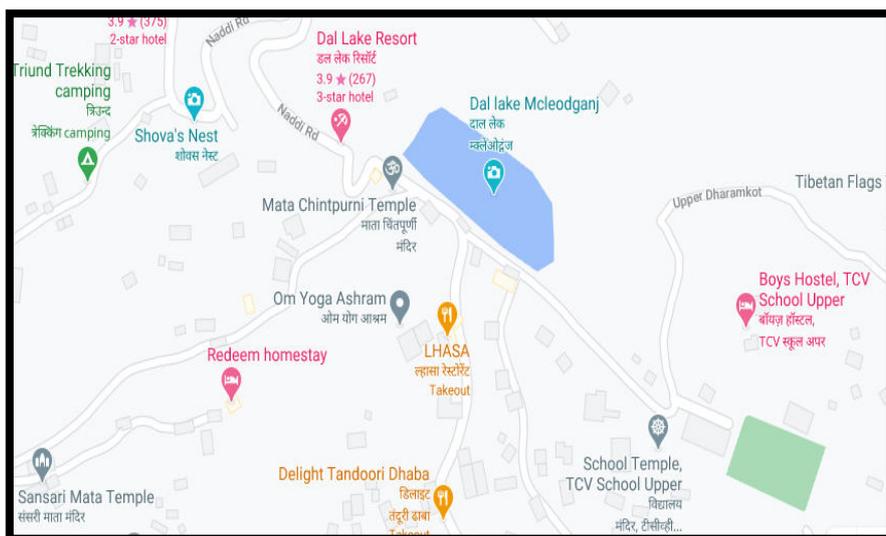


Figure 1: Geographical Map of the Location of the site showing the study site



Figure 2: Aerial view of the site showing the water body for quality Assessment



Figure 3: Study Site showing the zones where the samples are collected periodically for assessing the water quality parameters and index

MATERIALS AND METHODS

The lake and its catchment area are surveyed to establish sampling locations/sites in the lake's three sub-basins. The sampling sites are depicted on the map (Fig2 and 3). pH, conductivity, Hardness, DO, BOD, TDS, Total Alkalinity, Nitrite, Sulphate, Chlorides, Calcium, and Magnesium are among the 12 parameters that were used

to collect data from these sites and were examined in the laboratory. pH (Digital pH metre DPH 504), Electrical conductivity (EC), and dissolved oxygen (DO) were among the physico-chemical parameters examined in water and sediment samples (Digital EC metre DEM900). The oven dry method was used to calculate the total dissolved solid (TDS). The Azide modification of the Winkler equation was used to calculate the biological oxygen demand (BOD). Normal titrimetry was used to calculate total alkalinity (TA) as HCO₃⁻, calcium (Ca²⁺), magnesium (Mg²⁺), total hardness (TH), and chloride (Cl). Sulphate (SO₄²⁻) was measured using turbidometry, and nitrate (NO₃²⁻) was measured using the Brucine process, both with an LABINDIA UV-VIS spectrophotometer (ALPHA AWWA).

Table.1 The description of the zones where the samples were collected periodically.

Sr.No	ZONE	Description
1	ZONE-1	North East Region
2	ZONE-2	East West Region
3	ZONE-3	South East Region
4	ZONE-4	DEEP SE Region

Twenty Nine significant parameters were chosen for the calculation of water quality assessment in this report. The parameters used were recommended by the Bureau of Indian Standards (BIS) for drinking water quality.

Table 2: The Various Analytical methods adopted as per BIS desirable standards and Permissible limits

Sl.No.	Characteristics	Analytical method	Unit	BIS limits (2016)	
				Desirable	Permissible
1.	pH	Electrode	-	6.5-8.5	6.5-8.5
2.	Electrical conductivity (EC)	Conductivity meter	µS/cm	2,000	3,000
3.	Total dissolved solids (TDS)	Conductivity-TDS meter	mg/L	1,000	2,000
4.	Total Alkalinity (TA)	Titrimetric	mg/L	200	600
5.	Total hardness (TH)	EDTA titrimetric	mg/L	300	600
6.	Dissolved Oxygen (DO)	Modified Winder's method	mg/L	6.0	NA
7.	Biochemical oxygen demand (BOD)	Modified Winder's method	mg/L	3.0	6.0
8.	Chemical oxygen demand (COD)	Closed reflux method	mg/L	NA	NA
9.	Calcium (as Ca ²⁺)	EDTA Titrimetric	mg/L	75	200
10.	Magnesium (as Mg ²⁺)	EDTA Titrimetric	mg/L	20	100
11.	Potassium (as K ⁺)	Flame photometric	mg/L	10	10
12.	Chlorides (Cl ⁻)	Argentometric titration	mg/L	250	1,000
13.	Nitrates (as NO ₃ ⁻)	Ion selective electrode (ISE)	mg/L	45	45
14.	Fluoride (as F ⁻)	Ion selective electrode (ISE)	mg/L	1.0	1.5
15.	Phosphates (as PO ₄ ³⁻)	Stannous chloride	mg/L	0.3	0.3
16.	Sulphates (as SO ₄ ²⁻)	Barium chloride	mg/L	200	400

Table 3: Standard Water quality parameters with their permissible limits as per BIS for assessing water quality index.

Sr.No	Parameters	Standard permissible value
1	pH	8.5
2	Electrical Conductivity	300
3	Total Dissolved Solids	500
4	Total alkalinity	120
5	Total hardness	300
6	Calcium	75
7	Magnesium	30
8	Chlorides	250
9	Nitrate	45
10	Sulphate	150
11	Dissolved oxygen	5
12	Biological oxygen demand	5

Table 4: The Parameter based assessment of Water quality status based on water quality index

Water Quality Index	Water Quality Status
WQI<50	Excellent Water Quality
50>WQI<100	Good Water Quality
100>WQI<200	Poor Water Quality
200>WQI<300	Very Poor Water Quality
WQI>300	Unfit for drinking

Table.5: The various Physico-chemical Characteristics of sampling sites in all seasons collected and estimated using Zone wise.

S.No	Parameter	Zone1	Zone-2	Zone-3	Zone-4
1.	pH	8.103	8.108	7.92	7.710
2.	Ms/cm	0.128	0.118	0.137	0.125
3.	Turbidity-NTU	101.592	132.990	73.970	98.200
4.	Dissolved Oxygen-mg/l	4.444	3.746	3.470	3.400
5.	Total dissolved solids g/l (TDS)	0.082	0.077	0.089	0.081
6.	BOD mg/l 5 days	11.020	5.100	15.000	53.820
7.	COD mg/l	63.000	80.000	48.000	59.000
8.	Total Chlorine mg/l (Cl ₂)	0.220	0.290	0.180	0.260
9.	Fluoride (HR) (F) mg/l	2.110	3.100	0.160	5.300
10.	Magnesium (Mg) mg/l	2.100	1.110	31.000	1.700
11.	Nitrate (No ₃) mg/l	0.180	3.800	18.100	4.600

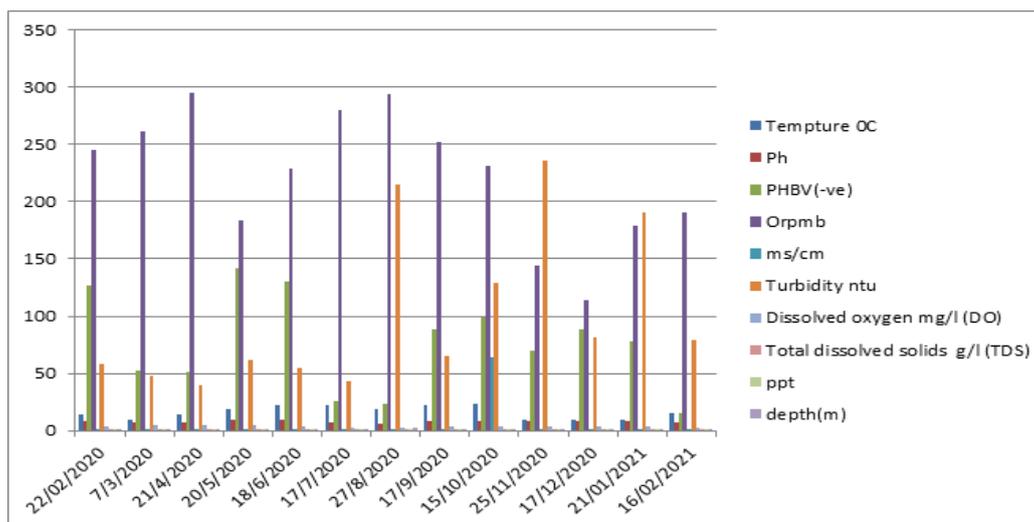


Figure 4: Study Site samples are collected periodically zone wise along with different seasons for assessing the water quality parameters and index

Table 6: Water Quality Rating Calculation using various parameters zone wise in Dal Lake.

S.No.	Parameter	Zone 1	Zone 2	Zone 3	Zone 4
1	pH	7.33	7.33	6.13	4.70
2	EC-Ms/cm	0.01	0.01	0.01	0.01
3	Turbidity-NTU	20.32	26.60	14.79	19.64
4	Dissolved Oxygen-mg/l	7.04	6.24	5.78	5.67
5	Total dissolved solids g/l (TDS)	0.02	0.02	0.02	0.02
6	BOD mg/l 5 days	220.40	102.00	300.00	1076.40
7	COD mg/l	25.20	32.00	19.20	23.60
8	Total Chlorine mg/l (Cl ₂)	73.33	96.67	60.00	86.67
9	Fluoride (HR) (F) mg/l	211.00	310.00	16.00	530.00
10	Magnesium (Mg) mg/l	70.00	37.00	1033.33	56.67
11	Nitrate (No ₃) mg/l	0.40	8.44	40.22	10.22
	ΣQn	767.75	748.17	1602.71	1906.89

Table 7: Water Quality Index formation based on zone wise determination using model.

S.No.	Parameter	Zone 1	Zone 2	Zone 3	Zone 4
1	pH	1.6573	1.66	1.39	1.07
2	EC-Ms/cm	0.07	0.05	0.04	0.04
3	Turbidity-NTU	0.0078	0.01	0.01	0.01
4	Dissolved Oxygen-mg/l	2.3822	2.01	1.86	1.82
5	Total dissolved solids g/l (TDS)	0.0000	0.00	0.00	0.00
6	BOD mg/l 5 days	8.5060	3.94	11.58	41.54
7	COD mg/l	0.0195	0.02	0.01	0.02
8	Total Chlorine mg/l (Cl ₂)	47.1700	62.18	38.59	55.75
9	Fluoride (HR) (F) mg/l	40.7163	59.82	3.09	102.27
10	Magnesium (Mg) mg/l	4.5026	2.38	66.47	3.64
11	Nitrate (No ₃) mg/l	0.0017	0.04	0.17	0.04
	$\Sigma W_n Q_n$	104.9633	132.05	123.17	206.16

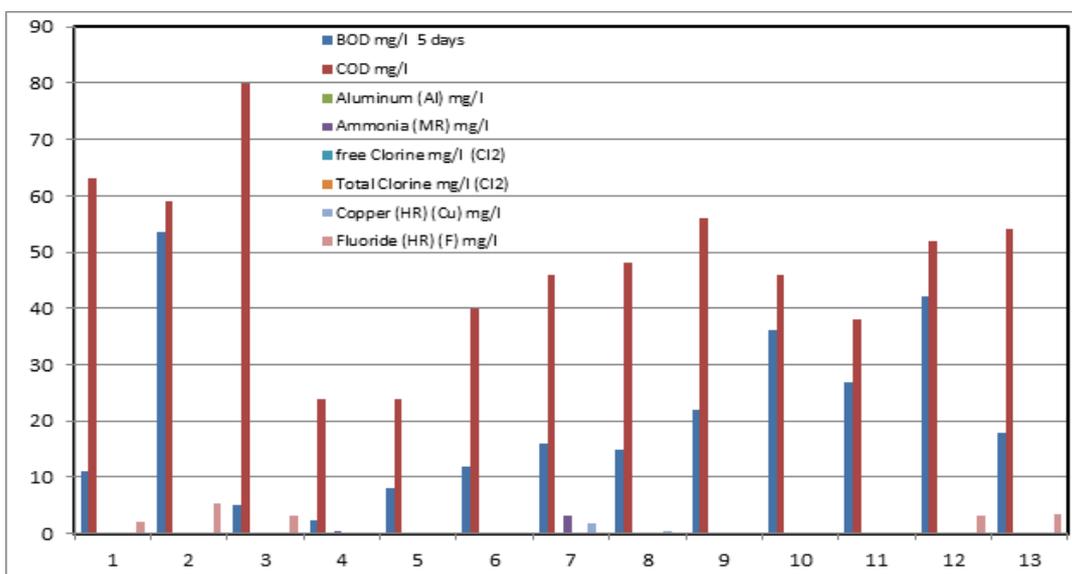


Figure 5: Graphical Representation of Seasonal Variation of Water Quality parameters in Dal Lake

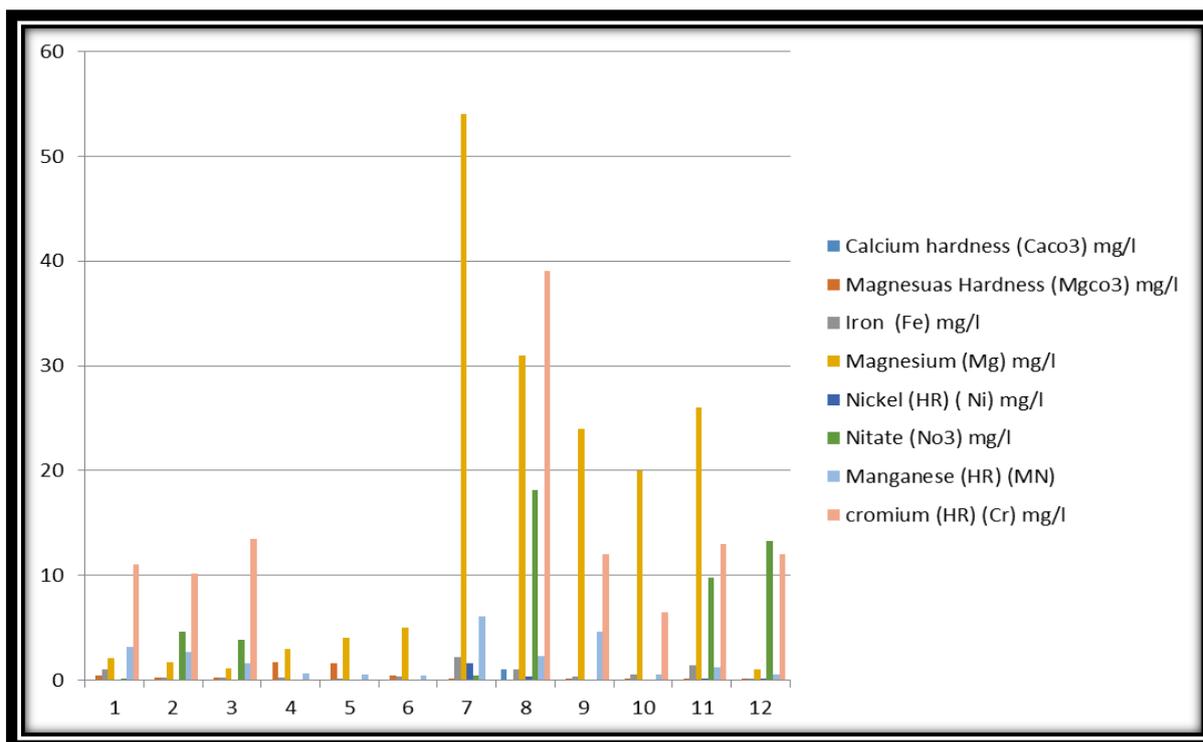


Figure 6: Graphical Representation of Seasonal Variation of Water Quality parameters in Dal Lake

The weighted arithmetic index method (Brown et. al.,) has been used for the calculation of WQI of the waterbody. Further, quality rating or sub index (qn) was calculated using the following expression.

(Let there be n water quality parameters and quality rating or subindex (qn) corresponding to n th parameter is a number reflecting the relative value of this parameter in the polluted water with respect to its standard permissible value.)

qn = Quality rating for the n th Water quality parameter

V_n = Estimated value of the n th parameter at a given sampling station.

S_n = Standard permissible value of the n th parameter.

V_{io} = Ideal value of n th parameter in pure water. (i.e., 0 for all other parameters except the parameter pH and Dissolved oxygen (7.0 and 14.6 mg/L respectively)

Unit weight was calculated by a value inversely proportional to the recommended standard value S_n of the corresponding parameter.

$$W_n = K / S_n$$

W_n = unit weight for the n th parameters.

S_n = Standard value for n th parameters

The overall Water Quality Index was calculated by aggregating the quality rating with the unit weight linearly.

$$WQI = \frac{\sum q_n W_n}{\sum W_n}$$

The WQI of the waterbody was calculated using the weighted arithmetic index method (Brown et al.,). The following expression was used to measure the quality ranking or sub index (qn).

$$q_n = 100 * [V_n - V_{io}] / [S_n - V_{io}] \quad q_n = 100 * [V_n - V_{io}] \quad q_n = 100 * [V_n - V_{io}] \quad q_n$$

(Let's say there are n water quality parameters, and the quality rating or subindex (qn) corresponding to the n th parameter is a number representing the parameter's relative value in contaminated water in comparison to its normal permissible value.)

qn = The n th quality ranking a criterion for water quality

V_n = At a given sampling station, the estimated value of the n th parameter.

S_n = The n th parameter's normal permissible value.

V_{io} = In pure water, the perfect value of the n th parameter. (i.e., 0 for all other parameters except pH and dissolved oxygen (14.6 mg/L and 7.0 mg/L, respectively)

A value inversely proportional to the recommended standard value S_n of the corresponding parameter was used to measure unit weight.

$$W_n = K / S_n \quad W_n = K / S_n \quad W_n = K / S_n$$

W_n is the n th parameter's unit weight.

S_n = n th parameter standard value

K is the proportionality constant.

By linearly aggregating the quality rating with the unit weight, the overall Water Quality Index was determined.

$$WQI = \sum q_n W_n / \sum W_n$$

Table7: Average Water Quality Index of Sampling Sites

Sr.No	Sampling Site	Water Quality Index Values
1	Zone-1	104.96
2	Zone-2	132.05
3	Zone-3	123.17
4	Zone-4	206.16

RESULTS & DISCUSSION

The Dal Lake's water quality index is determined for all seasons, including rainy, winter, and summer. The values of different water-related physico-chemical parameters used in the estimation of the Water quality index were tabulated in table 5. Tables 6, and 7 display the Water Quality Index calculations by season along with zone wise.

The Water Quality Index for the four sites is 104.96, 132.05, 123.17, and 206.16, respectively, as shown in Table. 8. As a consequence, it can be stated the assessed water is not suitable for drinking purpose (12).

One of the 12 characteristics used to create the Water Quality Index for Dal Lake is pH, which is a critical characteristic that impacts the usefulness of water for various applications. The pH in this study ranged from 7.7 to 8.1. The waterbody is somewhat alkaline when average values from three seasons are taken into account. In their research on several water bodies, Shardendu and Ambasht (1988) came to similar conclusions.

The conductivity of a material or solution determines its ability to conduct electric current. Conductivity determines the total dissolved solids in water. With the exception of Nageen, where the Conductivity can be attributed to high salinity and mineral content, the range of Electro Conductivity is typical of the other lakes.

According to BIS, the maximum permitted amount of alkalinity is 120 mg/L. The typical total alkalinity value was in the range of 160-390 mg/l, with the exception of. The total alkalinity values found in the study indicate that the water was quite harsh. The presence of an excess of free CO₂ product as a result of decomposition, together with the mixing of sewage and residential waste, could explain the increased alkalinity values reported throughout the summer. The decreased alkalinity during the wet season could be due to dilution. Jain et al. (1996) have also reported similar results in their study of the Halali Reservoir.

Chloride is one of the most important factors to consider when determining water quality. Higher chloride concentrations, according to Munawar (1970), indicate a higher level of organic pollution. The chloride concentrations in this investigation ranged from 73 mg/l to 96 mg/l..In the lake, nitrogen is an essential nutrient for plant and algae growth. Surface runoff and groundwater sources may also add nitrogen to a lake. Sediments allow nitrogen to shift in a variety of ways. Algae growth is regulated by nitrogen rather than phosphorus.

The measurement of DO is a key parameter in water quality research since it shows whether biological processes in water bodies are aerobic or anaerobic (Trivedi, 1995).The dissolved oxygen concentration is a good indicator of water quality since it is affected by physical, chemical, and biochemical processes in the water body. According to the results, dissolved oxygen concentrations ranged between 7.4 mg/L and 6.2 mg/L. Dissolved oxygen concentrations were highest during the monsoon and lowest during the season. As a result, dissolved oxygen levels differ with temperature and water supply quantity. Reddy et al., (1982), Ghosh and George (1989), Swarnalatha and Narasingarao (1993), and Venkateswarlu (1993) all have made similar observations.

The bio-chemical oxygen demand is a metric for determining the amount of organic matter in a body of water. The BOD concentration of 5 days in the water body ranged from 220 to 1076 mg/l, suggesting that it is eutrophic. It was at its highest during the summer, as predicted by Chatterer's observations (1992). Both of the above findings of physico-chemical parameters lead to the conclusion that the water body exhibits eutrophication characteristics. Low dissolved oxygen, high biochemical oxygen demand, and high nitrate concentrations indicate that the Dal Lake is in a highly eutrophic state.

The average calcium concentration was between 22 to 40 mg/l, which was lower than the BIS's standard permitted level of 75 mg/l. Geology and the types of rock found in the watershed have an impact on calcium levels in natural water. The magnesium concentration in the water was determined to be between 4 and 66 mg/l

on average. Magnesium hardness has a laxative impact on persons who aren't used to it, especially when combined with the sulphate ion (Khursid, 1998).

The main sources of sulphate in lake water are mineral forms found in the watershed and acid rain. Industries and utilities that burn coal release sulphur compounds into the environment, which are then carried into lakes by rainfall. In oxygen-depleted water (anaerobic water), sulphate can be converted to hydrogen sulphide (H₂S). The amounts of sulphate in the water range from 4.85 mg/l to 19.9 mg/l.

Dal Lake has a hardness than is permitted. A dense population of plankton, particularly Cyanophyceae, has been related to a high concentration of hardness in Kashmir Valley freshwater bodies (Bhatt and Pandit, 2003). At a certain time of year, the range in this study was 300 to 400 mg/l. From summer to winter, the total hardness values alter substantially. Both of these actions are designed to aid in the restoration of the lake's former grandeur by lowering the nutrient load, which is currently quite high. Maintaining Kashmir's water bodies is a major challenge for the administration. A considerable number of money is required for this reason due to the escalating cost of innovative technology and people. The Lakes and Waterways Development Authority (LAWDA), as an approved organisation, is expected to take on this challenge and provide the following services. Conducting surveys of various water sources and determining the various forms of contaminants that reach them.

CONCLUSION

The study begins by stating unequivocally that the water in the lake is unsafe for human consumption. Before it can be consumed, it must first be handled. As a result, we can use the Water Quality Index (WQI) to determine whether the lake water is suitable for its intended use. In this procedure, we take a more complete method that allows us to compare the water quality of sampling stations inside a water body. The Water Quality Index is an important instrument in many sectors of water quality management, as well as for the general public to think about water quality.

Due to recreational activities, the water pollution level in Dal Lake rises, posing a threat to aquatic life and the overall aquatic ecosystem. During the festival season, when idols are immersed in these natural aquatic environments, pollution has a far bigger impact, upsetting the entire ecological equilibrium. Water quality metrics such as TSS, TDS, TS, turbidity, conductivity, hardness, DO, BOD, and COD increased significantly during and after idol immersion and then decreased afterward. The addition of biodegradable and non-biodegradable compounds lowers the lake's water quality and increases the silt load. Increasing public awareness about the importance of decreasing pollution caused by festival garbage will aid in the conservation of these water bodies' ecosystems. (Lakes). These findings are crucial in order for local governments to take precautionary measures to limit the dangers of home and industrial discharges, as well as discharges from agricultural activities, and to track the land use trend in the Dal watershed.

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Accuracy and Performance Enhancement of Machine Learning System for IDs

Manju Bala and Rajinder Singh Sodhi

CSE Department, OM Sterling Global University, Hisar, India

ABSTRACT

The usage of intrusion detection systems is a critical component of information security. The fundamental technique can rapidly and accurately identify all types of network attacks. Monitoring traffic volume, external IP addresses, ports, and protocols may be done with network-dependent systems. Many components were used in the development of the intrusion detection system. Sensors have an important role in generating security incidents. The system has sounded the alarm on the possibility of an intrusion. The console is yet another part. What we call a "burglar alarm" is an ID that may be activated. Burglars cannot get into your house if you have a good lock system. An alarm will ring if the lock system is tampered with and an intruder tries to enter the residence, alerting the owner. Observation suggests that predictive operations should be viable in an industrial context. Automated devices may be trained to recognize aberrant behavior by analyzing data from a variety of sensors attached to them. There have been previous studies that have provided a framework for training and predicting intrusion detection, but such studies required a long period. Aside from that, there was a lack of precision. The goal of this research study is to develop an intelligent system that can rapidly and accurately identify and categorize intrusions so that they may be dealt with swiftly and efficiently. A neural network technique was used to train and evaluate IDS data sets and identify the attack type that they were meant to be used against.

Keywords: IDS, Machine Learning, Accuracy, Performance

[1] INTRODUCTION

Since the invention of the machine, there has been a pressing need to connect these devices and improve communication between them. Since its improvement, these devices' security and long-term viability have become increasingly important considerations. For the sake of the future, we must strengthen our systems. A security information and event management system often alert an administrator to a number of potentially harmful activities or violations. As the usage of web-based services and apps grows, so does the potential for cyber assaults. Users' data can be attacked by both internal and external attackers while travelling via a network.

1.1 Intrusion Detection System

As a program that can monitor the network for any malicious activity or violation of set rules, it has been defined [1]. Information security relies heavily on the use of intrusion detection systems. Network assaults of all kinds may be quickly and precisely detected using the basic approach. With network-dependent systems, it has been established that it is feasible to monitor traffic volume, external IP addresses, ports, and protocols used. [2]

An Intrusion Detection System (IDS) is a system that analyses network traffic for unusual activity [3]. It also sends out alerts if it senses any movement. Network monitoring software is the term for this. It also keeps an eye out for any policy infractions [4]. To create the intrusion detection system, many components were employed. In order to produce security events, sensors play a role. Detection of an intrusion has been raised by the system. Another component is the console. [5] Intrusion-detection systems can work by checking for indications of previously known attacks/differences in typical operations. Anomalies and deviations of this nature are thoroughly investigated at both the protocol and application levels. If you're looking for a way to keep track of what's happening on your network, you'll find a variety of different types of intruder detection systems (IDS). [6] To put it simply, an IDS stands for Intrusion Capture Model, which is basically an IDS. Known as the Intrusion Detection Model, this model was created by a team of researchers.

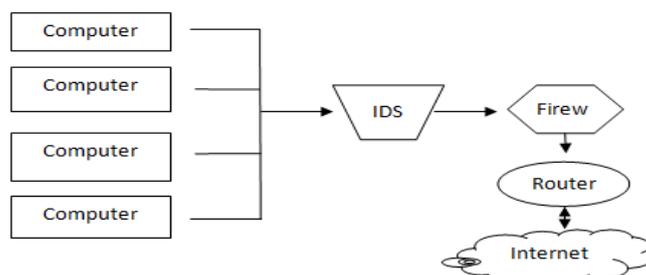


Fig 1.1 Intrusion Detection Systems

Systems like this are employed for the identification and classification of breaches and other types of data theft. Both the network and the host level are utilised by this system, and it conducts its tasks automatically. NIDS and HIDS are the two types of intrusion detection systems, with NIDS being the least intrusive and HIDS being the most intrusive.

The word "burglar alarm" refers to an ID. If you have a decent lock system, burglars can't get into your home. However, if the lock system is tampered with and someone tries to get into the house, the burglar alarm will sound an alarm to alert the owner. Additional to this, firewalls are outstanding in their ability to screen incoming Internet traffic so that it can get past the firewall.

1.2 Types of IDS

1. Host based IDS
2. Network based IDS
3. Application based IDS

Host-based IDS detects intrusions into the local system. They use the host system's logs and other data for their study. The host-based handler is referred to as a sensor. System and other logs made by operating system processes, as well as the contents of objects that aren't logged by standard operating system audit and log systems, may be collected by host-based sensors. A host-based system relies heavily on the audit trail. Intrusion detection systems may be able to uncover previously unseen patterns of misuse thanks to the aid of information. Denning's revolutionary work in anomalous HIDS research is the foundation for even the most fundamental ideas, such as the Network Based Intrusion Detection System (NBIDS).

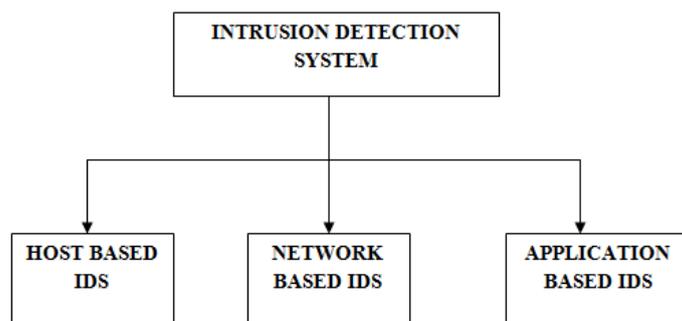


Fig 1.2 Intrusion Detection Systems

Host-based IDs, network-based IDs, and application identification are depicted in the diagram above.

In contrast to network-based IDS, host-based IDS provides far more actionable data. It is possible for HIDS to show exactly what the attacker did and which commands he used, and which files he accessed, rather than a general claim or a dangerous command. HIDS is a useful instrument for assessing network attacks. In comparison to setting up a brand-new system, the process of customizing is far less risky.

1.3 Host & Network-Based IDSs

IDS systems can be deployed on a host, a network, or a combination of the two. Each monitoring location has advantages and downsides. For network monitoring to work, sensors must be deployed on the monitored network.

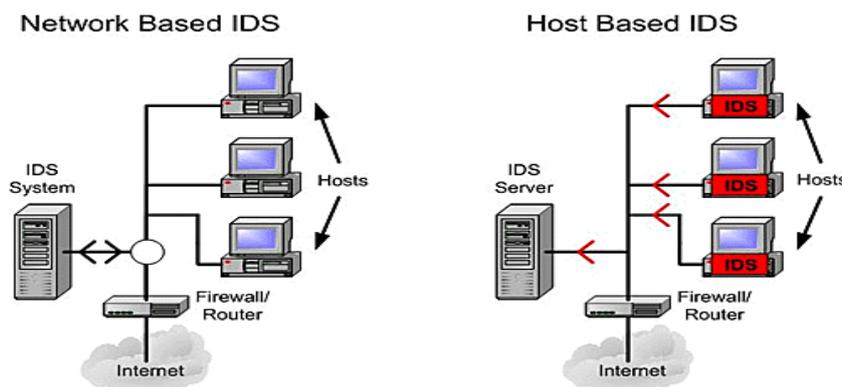


Fig 1.3: Host & Network-Based IDSs

It's best illustrated using the diagram above. A range of system and network sources are analyzed by intrusion detection systems to search for activity that might suggest an attack or incursion. Systems and administrators are better prepared to withstand attacks on their networks as a consequence of this information.

The installation of monitoring software on each host system is required for host-based monitoring. There is a central location where all of the alarms and events are relayed from the two types of IDS.

1.4 Host-Based Detection

A software agent is installed on every host to monitor all network traffic, log files, and system activities. The host operating system (OS), system calls, audit logs, and error messages can also be monitored by host-based systems. Only host-based systems were able to identify if an assault had been effective. In contrast, host-based systems may retain track of an attacker's activities on a compromised host in some cases.

Many assaults these days are carried out through a network, but not all of them. An intruder who gets physical access to a computer system can conduct attacks on computer systems or data without generating any network traffic. Once they have physical access, an intruder who knows about IDSs may quickly disable any detection software on host-based systems, allowing them to carry out their assaults as usual.

Both host-based and network-based intrusion detection systems fail to improve physical security.

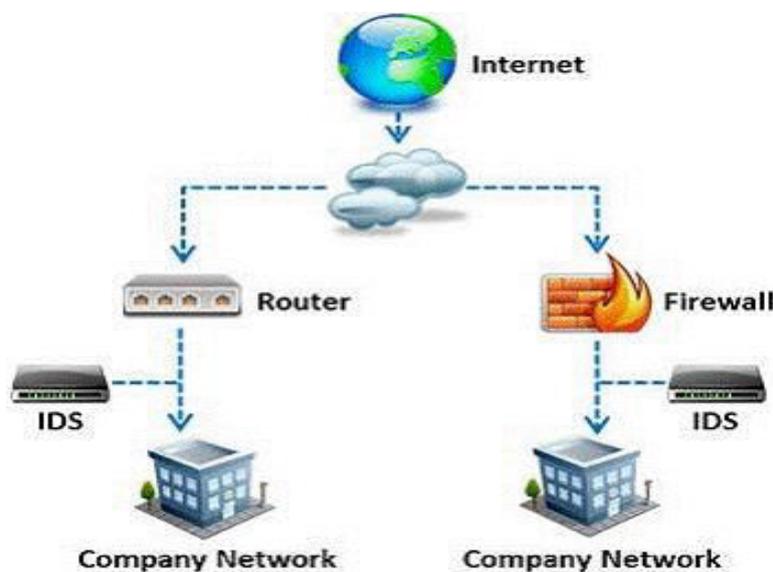


Fig 1.4: Host-Based Detection

It's best illustrated using the diagram above. A network ID identifies the subnet on which a certain host is situated in the context of TCP/IP addresses. Network mask and IP address are used to identify the computer's subnet. The subnet mask is the first element of an IP address, and it is the same for subnet addresses.

There is no public or monitored network for "out-of-band" communication and access. Common out-of-band access methods include private networks, console connections, and RS232 serial connections between two or more hosts.

1.5 Network-Based IDSs

Network-based Sensors and probes dispersed throughout the network serve as the backbone of an IDS designed to detect network intrusions. Using a predetermined profile or signature, these probes search the network. Sensors are used to detect and analyse traffic in real time. The probe transmits an alarm to the management platform when a traffic pattern or signature is discovered, which may be programmed to take action to prevent further network access. Packet processing at a network interface frequently has as its objective an IP address or a broadcast address. Putting the interface in Promiscuous mode allowed it to accept and analyse any network communication, independent of its Layer 2 or Layer 3 address. Manager and director computers can communicate with one other via a command-and-control interface (CCI).

There are Four Major Weaknesses in Network Intrusion Detection

- Bandwidth
- Fragmentation and reassembly of packets.

- Manipulation of the TTL
- Encryption

In network-based intrusion detection, the bandwidth restriction is one of the most difficult difficulties to overcome. In order for network probes to do their analysis, all data must be received, reconstructed, and analyzed.

1.6 Hybrid IDSs

The goal of a hybrid IDS is to maximise the benefits of many IDS types while minimising their drawbacks. In a hybrid system, the director platform manages all the sensors and hosts. Data from network-based sensors and host-based software may be challenging to display in hybrid IDS systems. The more information you have, the more difficult it can be to keep track of and understand all the numerous sources of information. Hybrid system designs that merge network and host-based systems can make use of both signature-based and anomaly triggering methodologies. Detection mechanisms for an IDS system will be detailed in the next section.

1.7 Functions of IDS

Data gathering, feature selection, analysis, and action are the four main activities of the IDS. The functionalities of IDS as shown in the diagram ahead. The functions of IDS are Data collection, Feature selection, Analysis of Data and perform suitable action.

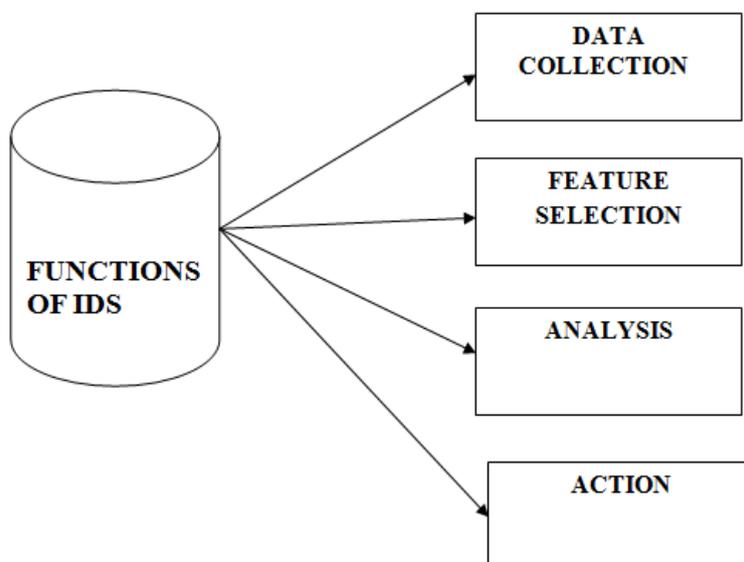


Fig 1.5 Functions of Ids

- A. Data Collection:** This module sends information to an IDS. Once the data has been gathered, it is analysed. Both network-monitoring IDS and host-monitoring IDS are forms of intrusion detection systems (IDS).
- B. Feature Selection:** It's necessary to access large amounts of network data in order to select a certain feature, and this data is frequently examined for any incursions. For example, the source and target systems' Internet Protocol (IP) addresses, protocol type, header length, and size might all be used as intrusion keys.
- C. Analysis:** Evaluation of the data is done to verify if it is correct Rule-based IDS examines incoming traffic against a predefined signature or pattern. While anomaly-based IDS relies on the observation of system behavior, it also uses mathematical models.
- D. Action:** It outlines how the system reacts in the event of a breach. One option is to notify the system administrator through email or an alert symbol; the other is to actively engage in the system by deleting packets or closing ports.

1.8 Machine Learning

Predictive operations should be possible in an industrial setting, according to observation. Data from several sensors associated with machines can be recorded and abnormal actions discovered using machine learning approaches for learning that is too advanced for machines [20]. Machine learning is the most extensively utilised artificial intelligence approach. The term "artificial intelligence" (AI) refers to the concept of a computer programme that can think for itself [18, 19]. In this article, the topic of adopting the clustered concept was discussed. With this technique, it is possible to save both time and space in reinforcement learning contexts

[21, 22]. Machine learning is an important AI application [23, 24]. System growth and development are possible because of this. It grows through experimenting and not following a predetermined path. Research shows that machine learning tends to focus on developing software that can run programmes and be utilised by a single user. Artificial Intelligence is all about creating computers that can experience for themselves [25]. In instances like these, no human aid is necessary. Machine Learning has a number of advantages, including the following:

- ✓ When it comes to retail and retail as well as healthcare, banking and finance, journalism, social media, and the media in general.
- ✓ Devices are able to reduce their time cycle and enhance their resource usage because of this.
- ✓ Adverts on social media sites are often targeted to users depending on what they've previously liked.
- ✓ It is possible to apply machine learning to improve the quality of a big and complex process system. [26]

[2] LITERATURE REVIEW

Before initiating this research work, many past studies and research articles were studied by us. Especially those pertaining to IDS, ML, accuracy and performance. Brief description of some them is given ahead:

Proposals by Peisong Li and Ying Zhang [1] for an improved DBN and GA-based security warning have been discussed. Establishing a scalable DBN network that may be used concurrently will help prevent a variety of attacks. Security alarms can be supported by the DBN's network settings. When GA is applied, these layers that are not immediately visible from system and nervous system input and output tend to be the most numerous. It lessens the difficulty level of the network to a significant extent. The pace of its decision-making also remains high. The detection speed of systems that monitor suspicious behavior may be boosted as a result of this method.

It was Yin CHUANLONG [2] who proposed the repeated-neuron system concept for IDS. This technique was also put into practice, as illustrated by the authors. In both a dual and multiclass environment, the model presented here has been tested by them. Aside from these considerations, the researchers also examined how varied learning rates and neuron counts influenced accuracy. An NSL-KDD collection of data was employed in this instance. It has been demonstrated that RNN-IDS is a valuable tool in the support of exceptionally precise organizational design. Additionally, research has demonstrated that RNN-IDS outperforms the more common machine learning organization strategy in the organization of dual and multiclass data.

Many strategies for coordinating network traffic were examined by researchers such as Xue Wang [3] and Bo Dong [4]. An open data collection that they had chosen to work with was subjected to a number of different analysis methods. Experiments were undertaken to find the best effective methods of disguising incursions from detection using these strategies. Deep learning has assumed a prominent role in the present scene because of its potential. In the past, deep learning techniques have been used to identify certain groupings and arrangements. In order to check the location of a network in order to identify intrusions, safety operations monitoring gives the information required. SVM, decision trees, random forests, and an IoTID20 dataset were employed by ImtiazUllah(B) [4] in their research. Using IoTID20 as a starting point for developing new IDS methods is a good idea. This research focuses on the identification of IoT networks.

In order to develop IDS logical records tied to obsurg-intrusion detection, they employed Sara A. Althubiti [5]. After that, they utilized LSTM in addition to deep learning methods. This type of task yields a degree of accuracy of eight-and-a-half percent. They made a comparison between their LSTM findings and other prevalent methodologies in order to evaluate whether they were on the right road. They employed a range of metrics to perform this comparison.

The most current intrusion detection system has been studied by researchers W. Li [6]. It was the organizational strategies of KNN that determined the Sac type of systems that were implemented. In order to accept sensor networks that do not use cable technology, preparations have been made. An increasing number of businesses, including defense, business, and climate control, are using the Internet of Things to their advantage. In addition, the ubiquity of electronic communication and inadequate deployment circumstances put at risk the security of such sensor networks that do not require a cable. As a result, the market for these systems is somewhat small. Networks like these are used to protect the Internet of Things (IoT) against a variety of threats. New approaches for identifying intrusions in free-from-cable sensing element networks have been developed based on nearest neighbor organization. Those are the nearest neighbors, according to KNN. Outlier nodes can be separated from the rest of the network by using this approach. The unusual patterns of their behavior were explored in order to accomplish this. With the help of this technique, the detection system and its model may be fully constructed.

This method improved wireless ODV for certain uses by making it easier to detect faults. It has been found that the method shown here was able to swiftly and successfully find concepts.

In the studies of E. Guven and A. L. Buczak [7], information accumulation and computer technology are interwoven. The Internet safety alarm system shifts its attention to the detection of Internet invasions. Intrusion detection was carried out using machine learning and data mining in conjunction with the methods. In order to complement digital analytic techniques for recognizing incursion, a targeted documentary study connected to information collecting and computer technology was developed. The above-mentioned methods are described in academic detail. A number of reference and need-offish methodologies were used to evaluate each solution in this research. As it becomes an increasingly significant component of ML/DM, a slew of cyber-connected information is described here.

A. Javaid argues in favour of in-depth education. The researchers evaluated these systems, which are used to detect network breaches. In order to help system administrators, find weaknesses in network security, these systems are quite useful. When hackers carried out unknown external attacks using a slew of powerful NIDS, a slew of problems arose. To create this type of NIDS, they came up with an approach that relies on deep learning. They concluded that their method was superior by comparing their performance in the middle of their methodology to that of earlier investigations. [8]

T.A. Tang [9] came up with the idea of deep learning. Detecting network intrusions is the purpose of this method. The inquiry focused on SDN. In recent years, the Internet of the future has begun to emerge. They were able to do flow-based debugging in an SDN environment thanks to deep learning. They designed a DN network architecture so that an intrusion detection system could be implemented. NSL-KDD knowledge helped train this design. Only a few of the 41 NSL-KDD information group characteristics were used in this example. SDN provides all six of the qualities outlined above.

M. Sheikhan demonstrated that intrusion detection is possible [10]. They employed a smaller RNN for this purpose. In order for the mechanism to function, all of its components must be gathered together. The most well-known and crucial aspect of ICT security is the detection of intrusions. The findings assessment led to the introduction of a system based on inconsistency and exploitation-dependent IDS. Repetitive NN was constructed as a three-layer structure, with inputs and outputs derived from structured properties of inputs and attack types of RNN. It is now possible to categorize input attributes based on their most fundamental characteristics. Organizational DoS, R2L and U2R attacks are now possible. Each link was given a unique set of 41 attributes using global information detection and information extraction. An incomplete link may be believed to exist between RNN hidden-layer nodes in the center of the graph. Organizational speed in R2L attacks, in particular, has been improved by the method provided here. Sample identification speed and cost per sample are both faster and cheaper than before. As far as machine learning goes, the FARconnected to design introduced here does not fall far behind.

M Tavallae[11] examined the KDD CUP 99 dataset. In recent years, academics have become interested in the notion of leveraging inconsistent identification to circumvent the shortcomings of signature-based IDS. For analyzing this type of technology, KDDCUP'99 is a well-known information source. The statistical study of this data set uncovered two critical concerns. One's perception of the system's efficiency was greatly influenced by this concern. Bad evaluation results are the result of inconsistencies in identifying processes. They came up with NSL-KDD to deal with these problems. Groups like this one have emerged in the last few years. Even if all of KDD's data is provided, it fails to solve the issues raised above.

S.Revathi [12] proposed a thorough examination of the NSL-KDD dataset. There are a variety of algorithms for machine learning in use. Detection of intruders was the goal of this. For the past ten years, security alarm evaluations have been a need. Data from several sources is used by researchers to attempt to enhance the system's accuracy. For these NSL-KDD datasets, a specific type of record was examined in depth.

Table 1: Comparison of Features of Previous Researches

Citation	IDS	Machine Learning	Accuracy	Performance
[1]	Yes	No	No	Yes
[2]	Yes	Yes	No	No
[3]	Yes	No	No	No
[4]	No	Yes	No	No
[5]	No	Yes	Yes	No
[6]	No	Yes	No	Yes

[7]	Yes	No	No	No
[8]	No	Yes	No	Yes
[9]	No	Yes	Yes	No
[10]	Yes	Yes	No	No

[3] PROBLEM STATEMENT

IDS has been the topic of several research, many of which have made important contributions. For example, the LSTM model has been utilized in the past in conjunction with fuzzy logic and genetic algorithms. ND-LKDD [12] has also been employed for training in previous research. These studies, however, have issues with their accuracy. Additionally, the amount of time it takes to train a network model is much longer. As a result of these discoveries, a model was created that can be taught much faster than previous models. A two-layer LSTM model with a hidden layer has also emerged as a result of current research, which has resulted in improved accuracy. The proposed study is predicted to produce faster dataset training and more accurate prediction when compared to previous studies.

[4] NEED OF RESEARCH

The effectiveness of an intrusion detection system is critical to network security. Suspicious behavior may now be more easily identified and dealt with thanks to these efforts. An intrusion detection system's primary job is to notify IT personnel when a network assault or intrusion has occurred. It's necessary to use the technique described here to train an IDS system capable of accurate forecasting. MATLAB would be used to train an LSTM-based intrusion detection model. In terms of accuracy, f1, and recall value, past IDS research has only provided a limited quantity. Such an approach is tough to adopt but provides new options for research and development.

[5] MOTIVATION OF RESEARCH

According to the data, Deep LSMT IDS was more accurate. LSTM's scalability and adaptability are demonstrated in the suggested investigation. Using LSTMs, the proposed research has produced a highly efficient network. The number of hidden layers and the minimum batch size affect overall accuracy. The system's accuracy rises as the precision of the concealed layer rises, as expected. Accuracy suffers as the minimum bath is raised, but there comes a point where it stops working. A single LSTM layer was utilized in the previous model, and those studies ignored the importance of hidden layers and batch size. In addition, the earlier study's dataset was constrained in some way. During the preprocessing of the face, a number of extraneous characteristics were left in place. Planned work incorporates all of these concerns. To avoid the problem of being too tight, more dropout layers have been added. The Shapiro-Wilk method was used to limit the number of irrelevant characteristics in the training dataset. Additionally, as part of the preprocessing, only attributes with a single value were kept. The accuracy of a forecast is influenced by the number of characteristics that are taken into account. During testing, decision-making accuracy is greater when normal and abnormal activity must be anticipated in addition to the nine qualities. An improved training process that is more accurate and takes into consideration a variety of factors has been proposed in the proposed study. This has helped make the IDS system more intelligent. Accurately identifying and responding to varied assaults is critical.

[6] FUTURE SCOPE

The study's findings could assist anticipate IDS with a high degree of accuracy. In light of the training model, the recommended work has presented a scalable and adaptable way to conducting IDS detection. Because the recommended model employed a big dataset for training and used the LSTM model with numerous layers, the risk of mistake while assessing overall accuracy would be minimized. Future research could benefit from this project's rapid training. The present study has eliminated a superfluous attribute that has no influence on the training model's accuracy. As a consequence of the provided method, a rapid training mechanism has been presented, which may train the model for future prediction while discarding the features that have a lower effect on the outcomes. The similar method may be applied in future study to produce a better IDS detection system. Also, there may be a unique space for assaults that are considered to be attacks but that IDS is unable to identify correctly, in which case an anomalous tag might be applied. On such attacks, we may strive to organize them even more.

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Initial Public Offering – An Individual Overview

Hitesh G. Suthar and Arpana Kadam
GNVS Institute of Management, India

ABSTRACT

An initial public offering (IPO) is a significant milestone for a company since it allows it to raise significant funds. This increases the company's capacity to expand and grow. The enhanced transparency and legitimacy. The factor affecting the IPO selection decision. The KMO and Bartlett's Test evaluate all available data together. A KMO value is 0.883 (significance level is 0.000) which is greater than 0.50. Therefore, it can be interpreted that Factor Analysis is significant for the data. It is observed that up to 25 age 83.3% faces more refund problem within difficulties of IPO as compared to age 25 to 45. Up to 25 age, 44.4% faces difficulties of ipo in delay in crediting shares to your demat account. It can be observed that 25 to 45 age 55.6% faced problem while delay in crediting shares to your demat account. The age up to 25, 30.8% has no clarity in allotment whereas 25 to 45 age 61.5% faced difficulties i.e., no clarity in allotment. 78.3% age of 25 to 45 faced no problem. Hence 25 to 45 age sample of population faced difficulties in IPO that is 68.3%.

INTRODUCTION

The Indian financial system long-term development prospects remain optimistic, thanks to its young population and low dependency ratio, healthy savings and investment rates, and increasing globalisation and integration into the global economy. Due to the shocks of "demonetisation" in 2016 and the implementation of the Goods and Services Tax in 2017, the economy slowed in 2017. Domestic private consumption accounts for over 70% of India's GDP.

An IPO, also known as a stock launch, is a public offering in which a company's shares are sold to institutional and, in most cases, retail (individual) investors. One or more investment banks normally underwrite an IPO, and they also arrange for the shares to be listed on one or more stock exchanges.

A privately held corporation becomes a public company through this process, which is also known as floating or going public. Initial public offerings (IPOs) can be used to raise additional equity capital for businesses, to monetize the assets of private shareholders such as firm founders or private equity investors, and to make current holdings or future capital raising easier to trade by becoming publicly traded.

REVIEW OF LITERATURE

- Batool K. Asiri and Aalaa J. Haji (2014)** Initial public offers (IPOs) for 194 companies that went public in the six Gulf Cooperation Council (GCC) countries between 2000 and 2013 were underpriced. It looks into elements that could impact abnormal first-day trading returns and focuses on determining the most important determinants of IPO underpricing in the GCC area. The empirical data revealed that firm age and offer size are both adversely connected to underpricing, indicating that there is a linkage between financial and non-financial firms and that there are major disparities between banking and insurance firms.
- Baluja Garima (2013)** a sample of 50 graded IPOs listed on the BSE from 2007 to 2010 was used to assess the efficacy of the IPO grading method. The researcher discovered that the IPO grading system is ineffective at reducing information asymmetry. The results of the One-Way ANOVA reveal no significant differences in the listing price performance of the various graded IPOs. As a result, the listing price performance of different graded IPOs differs due to chance or other factors such as subscription level, Issue size, company age, and so on, but this is true regardless of the IPOs' grade levels.
- Bandgar & Atul Rawal (2012)** studied the impact of pricing of Banks IPOs in long and short run. The researchers also evaluated the effect of size and issue nature (par, premium or at discount) of IPOs on its pricing. A sample of 10 banks were selected randomly which issued their equities through initial public offering (IPO) during the period 2000 – 2010. It was found that the average return in short run was at - 8% and longrun was at - 53%. Further findings from the study revealed that big issue size IPOs got listed with a higher listing price and the small issue size IPOs got listed with a lower listing price. IPOs with lower issue price gave more returns on the listing day than the IPOs with higher issue price. Private sector banks IPO's gave higher return than the public sector banks IPOs during the study period.
- Deb and Marisitty (2011)** examined the IPO grading was an assessment of the quality of initial equity offers. India is the only market in the world that introduced such grading process. They tested the efficiency of this unique certification mechanism with the data of 159 Indian IPOs. They found that IPOs grading

decreased IPO underpricing and influenced demand of retail investors. Post listing, highly graded IPOs attract greater liquidity and exhibit lower risk. IPO grading successfully capture firm size, business group affiliation and firm's quality of corporate governance. Their findings implied that in emerging markets regulator's role to signal the quality of an IPO contributes towards the market welfare.

PROBLEM OF THE STUDY

1. Lack Knowledge of amount to be invested in IPO.
2. Lack Knowledge of Long Trading investment in IPO.

OBJECTIVES OF THE STUDY

1. To understand the amount invested in IPO on income level.
2. To analyse the long trading experience in IPO on income level.

HYPOTHESIS

Hypothesis 1

H0: Amount invested by selected Individuals in IPO does not depend on income level.

H1 = Amount invested by selected in IPO depend on income level.

HYPOTHESIS 2

H0= Trading experience by selected Individuals in IPO does not depend on income level.

H1 = Trading experience by selected Individuals in IPO depend on income level.

INTERPRETATION & ANALYSIS OF DATA

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.883
Bartlett's Test of Sphericity	Approx. Chi-Square	1118.830
	Df	120
	Sig.	.000

INTERPRETATION

From the above, it is interpreted that the factor affecting the IPO selection decision. The KMO and Bartlett's Test evaluate all available data together. A KMO value is 0.883 (significance level is 0.000) which is greater than 0.50. Therefore, it can be interpreted that Factor Analysis is significant for the data.

PRINCIPAL COMPONENT ANALYSIS

Communalities	Initial	Extraction
Company Goodwill	1.000	.640
Market Share	1.000	.642
Corporate Profile	1.000	.615
Board Member	1.000	.706
Historical background	1.000	.600
Legal Matter	1.000	.638
Current Financial Position	1.000	.776
Future Predication & Forecast	1.000	.791
Managerial Quality	1.000	.648
Size of the IPO issued	1.000	.641
Key shareholders	1.000	.559
Broker advice	1.000	.756
Comments in the Media	1.000	.772
Legitimacy	1.000	.721
Corporate Governance Practices	1.000	.695
New Project risk & prospects	1.000	.640
Extraction Method: Principal Component Analysis.		

Rotation Method: Varimax with kaiser Normalization

Rotation converged in 6 iterations.

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% Of Variance	Cumulative %	Total	% Of Variance	Cumulative %	Total	% Of Variance	Cumulative %
1	8.386	52.412	52.412	8.386	52.412	52.412	4.473	27.954	27.954
2	1.386	8.662	61.074	1.386	8.662	61.074	3.271	20.446	48.401
3	1.068	6.677	67.751	1.068	6.677	67.751	3.096	19.350	67.751
4	.865	5.406	73.157						
5	.808	5.053	78.210						
6	.654	4.089	82.299						
7	.490	3.064	85.363						
8	.433	2.707	88.070						
9	.398	2.487	90.557						
10	.329	2.056	92.613						
11	.291	1.820	94.433						
12	.270	1.687	96.120						
13	.207	1.291	97.412						
14	.158	.986	98.398						
15	.134	.840	99.238						
16	.122	.762	100.000						

Extraction Method: Principal Component Analysis.

1 Components Extracted

Interpretation: From the above table, three factors are contributing 67.75% of total variance explained.

Rotated Component Matrix ^a			
	Component		
	1	2	3
Company Goodwill		.770	
Market Share		.723	
Corporate Profile		.629	
Board Member	.587		
Historical background			.664
Legal Matter		.570	
Current Financial Position			.815
Future Predication & Forecast			.857
Managerial Quality			.635
Size of the IPO issued	.701		
Key shareholders	.647		
Broker advice	.813		
Comments in the Media	.811		
Legitimacy	.733		
Corporate Governance Practices	.734		
New Project risk & prospects		.640	

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 6 iterations.

Correlations between Income and Amount Invested			
		Income	Amount Invest
Income	Pearson Correlation	1	.348**
	Sig. (2-tailed)		.000
	N	101	101
Amount Invest	Pearson Correlation	.348**	1
	Sig. (2-tailed)	.000	
	N	101	101
**. Correlation is significant at the 0.01 level (2-tailed).			

Interpretation: From the table, it is observed that Income & Amount Invested have significant relationship, positive in direction and weak in strength. This correlation is significant at 99% confidence level.

Correlations between Income and Long Trading			
		Income	Long trading
Income	Pearson Correlation	1	.373**
	Sig. (2-tailed)		.000
	N	101	101
Long trading	Pearson Correlation	.373**	1
	Sig. (2-tailed)	.000	
	N	101	101
**. Correlation is significant at the 0.01 level (2-tailed).			

INTERPRETATION

From the table, it can be observed that Income & Long trading have significant relationship, positive in direction and weak in strength. This correlation is significant at 99% confidence level.

Difficulties of IPO * Age Cross tabulation							
			Age				Total
			upto 25	25 to 45	46 to 65	65 & above	
Difficulties of IPO	Refund Problem	Count	5	1	0	0	6
		% Within Difficulties of IPO	83.3%	16.7%	0.0%	0.0%	100.0%
	Delay in crediting shares to your Demat Account	Count	4	5	0	0	9
		% Within Difficulties of IPO	44.4%	55.6%	0.0%	0.0%	100.0%
	No clarity in allotment	Count	8	16	2	0	26
		% Within Difficulties of IPO	30.8%	61.5%	7.7%	0.0%	100.0%
None of the above	Count	8	47	4	1	60	
	% Within Difficulties of IPO	13.3%	78.3%	6.7%	1.7%	100.0%	
Total		Count	25	69	6	1	101
		% Within Difficulties of IPO	24.8%	68.3%	5.9%	1.0%	100.0%

INTERPRETATION

From above table, it is observed that up to 25 age 83.3% faces more refund problem within difficulties of IPO as compared to age 25 to 45. Up to 25 age, 44.4% faces difficulties of ipo in delay in crediting shares to your demat account. It can be observed that 25 to 45 age 55.6% faced problem while delay in crediting shares to your demat account. The age up to 25, 30.8% has no clarity in allotment whereas 25 to 45 age 61.5% faced difficulties i.e., no clarity in allotment. 78.3% age of 25 to 45 faced no problem. Hence 25 to 45 age sample of population faced difficulties in IPO that is 68.3%. Up to 25 age faces less difficulties as compared to 25 to 45 ages.

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	18.645 ^a	9	.028
Likelihood Ratio	18.030	9	.035

Linear-by-Linear Association	13.758	1	.000
N of Valid Cases	101		
a. 11 cells (68.8%) have expected count less than 5. The minimum expected count is .06.			

INTERPRETATION

From the table, it is interpreted that significance value is between 0 to 0.06 Therefore, Ho hypothesis reject at 99% confidence level. Therefore, it is concluded that the “There is significant relationship between Income and Amount Invest. Therefore H1 is accepted.

Difficulties of IPO * Gender Crosstabulation					
			Gender		Total
			Male	Female	
Difficulties of IPO	Refund Problem	Count	5	1	6
		% Within Difficulties of IPO	83.3%	16.7%	100.0%
	Delay in crediting shares to your Demat Account	Count	4	5	9
		% Within Difficulties of IPO	44.4%	55.6%	100.0%
	No clarity in allotment	Count	22	4	26
		% Within Difficulties of IPO	84.6%	15.4%	100.0%
	None of the above	Count	35	25	60
		% Within Difficulties of IPO	58.3%	41.7%	100.0%
Total		Count	66	35	101
		% Within Difficulties of IPO	65.3%	34.7%	100.0%

INTERPRETATION

From above table, it is observed that 83.3% Male faces more refund problem as compared to female that is 16.7% within difficulties of IPO. Delay in crediting share to demat account Female faced more difficulties as compared to Male. No clarity in allotment Male faced more difficulties as compared to Female. Overall Male faces more difficulties in IPO.

Chi-Square Tests			
	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	8.160 ^a	3	.043
Likelihood Ratio	8.746	3	.033
Linear-by-Linear Association	1.128	1	.288
N of Valid Cases	101		
a. 3 cells (37.5%) have expected count less than 5. The minimum expected count is 2.08.			

From the above table, it is interpreted that that significance value is between 0 to 0.05. There we can reject H0 at 99% confidence level. There is significant relationship between trading experience in IPO and income level.

FINDINGS AND CONCLUSION

- The researcher interpreted that that the factor affecting the IPO selection decision. The KMO and Bartlett's Test evaluate all available data together. A KMO value is 0.883 (significance level is 0.000) which is greater than 0.50. Therefore, it can be interpreted that Factor Analysis is significant for the data.
- The researcher interpreted that according to Principal component analysis that the 6 iterations which means highest rank in extraction. The first rank is Future Predication & Forecast, second rank is Current Financial Position, third rank is Comments in the Media, Broker advice, Legitimacy and then Board Member.
- The researcher analyzing in extraction method that 2 components extracted the three factors are contributing 67.75% of total variance.
- Rotated Component Matrix 6 iterations are highest Future Predication & Forecast, second rank is Current Financial Position, third rank is Comments in the Media, Broker advice, Legitimacy and then Board Member.
- Correlations between income and amount invested have the significant relationship and is the positive direction.
- Correlations between income and long trading have the significant relationship and is the positive direction.

7. It can observe that up to 25 age 83.3% faces more refund problem within difficulties of IPO as compared to age 25 to 45. Up to 25 age, 44.4% faces difficulties of ipo in delay in crediting shares to your demat account. It can be observed that 25 to 45 age 55.6% faced problem while delay in crediting shares to your demat account. The age up to 25, 30.8% has no clarity in allotment whereas 25 to 45 age 61.5% faced difficulties i.e., no clarity in allotment. 78.3% age of 25 to 45 faced no problem. Hence 25 to 45 age sample of population faced difficulties in IPO that is 68.3%. Up to 25 age faces less difficulties as compared to 25 to 45 ages.
8. It can observe 83.3% Male faces more refund problem as compared to female that is 16.7% within difficulties of IPO. Delay in crediting share to demat account Female faced more difficulties as compared to Male. No clarity in allotment Male faced more difficulties as compared to Female. Overall Male faces more difficulties in IPO.

ANNEXURE

IPO for the Period from January 2021 to February 2022

Date	IPO Name	Issue Size	Issue Price
16-02-2022	Vedant Fashions	3149	866
08-02-2022	Adani Wilmar	3600	230
31-01-2022	AGS Transact	716.87	175
31-12-2021	CMS Info System	1100	216
28-12-2021	Supriya Lifescience	700	274
27-12-2021	HP Adhesives	125.96	274
24-12-2021	Data Patterns	601.2	585
22-12-2021	Metro Brands	1376.63	500
21-12-2021	C. E. Info Syst	1039.61	1033
20-12-2021	Shriram Prop	600	118
17-12-2021	Rategain Travel	1354	425
14-12-2021	Anand Rathi	660	550
13-12-2021	Tega Industries	619.23	453
10-12-2021	Star Health	7318.15	900
26-11-2021	Tarsons Product	1030.22	662
23-11-2021	Latent View	622.11	197
18-11-2021	Sapphire Foods	2073	1180
18-11-2021	One 97 Paytm	18915.9	2150
15-11-2021	PB Fintech	6273.5	980
15-11-2021	SJS Enterprises	816.57	542
15-11-2021	Sigachi Ind	0	163
12-11-2021	Fino Payments	1209	577
10-11-2021	FSN E-Co Nykaa	5375	1125
11-10-2021	ABSL AMC	2768	712
01-10-2021	Paras Defence	181.13	175
24-09-2021	Sansera Eng	1282	744
14-09-2021	Vijaya Diagnost	1895.04	531
14-09-2021	AMI Organics	571.96	610
06-09-2021	APTUS VALUE	2790	353
24-08-2021	CHEMPLAST SANMA	3929.91	541
23-08-2021	Nuvoco Vistas	5089.29	570
20-08-2021	CarTrade Tech	2998	1618
16-08-2021	Windlas Biotech	405.95	460
16-08-2021	Devyani Int	1858	90
16-08-2021	Exxaro Tiles	161.09	120
16-08-2021	Krsnaa Diagnost	1222	954
09-08-2021	Rolex Rings	732.27	900
06-08-2021	Glenmark Life	1513	720
29-07-2021	Tatva Chintan	500	1083

23-07-2021	Zomato	9375	76
19-07-2021	G R Infra	963.28	837
19-07-2021	Clean Science	1546	900
07-07-2021	India Pesticide	800	296
05-07-2021	Krishna Inst.	2146	825
28-06-2021	Dodla Dairy	521	428
24-06-2021	Shyam Metalicss	909	306
24-06-2021	Sona BLW	5550	291
14-05-2021	PowerGrid InvIT	7734.99	100
19-04-2021	Macrotech Dev	2500	486
07-04-2021	Barbeque Nat	453.6	500
30-03-2021	Nazara	582.91	1101
26-03-2021	Suryoday Small	582.34	305
26-03-2021	Kalyan Jeweller	1175	87
25-03-2021	Laxmi Organic	600	130
25-03-2021	Craftsman	823.7	1490
24-03-2021	Anupam Rasayan	760	555
19-03-2021	Easy Trip	510	187
15-03-2021	MTAR Tech	596.41	575
05-03-2021	Heranba	60	627
26-02-2021	Railtel	819.24	94
25-02-2021	Nureca	100	400
05-02-2021	Stove Kraft	412.63	385
03-02-2021	Home First	1153.72	518
02-02-2021	Indigo Paints	1170.56	1490
29-01-2021	IRFC	4633	26
01-01-2021	Antony Waste	300.53	315

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Working Capital Policy: A Tool for Working Capital

Hitesh G. Suthar

GNVS Institute of Management, Mumbai, India

ABSTRACT

Conservative investment policy value is 0.028. This value is less than critical p value 0.05. Hence researcher rejected null hypothesis and data is not normally distributed. Therefore researcher used non-parametric one sample Wilcoxon sign test for testing significance of this variable with hypothesized mean value 50. Aggressive Financing Policy value is insignificantly less than hypothesized value 50. Hence Micro enterprises are having Conservative Financing policy. Therefore alternative hypothesis (H_{12}) is accepted. Hence researcher concluded that, Micro enterprises are having Conservative investment policy as well as Conservative Financing policy. Therefore Available policies of Micro enterprises are popular but partially lack applicability.

Keyword: Working Capital, Investment Policy & Financing Policy

INTRODUCTION

Working Capital management is not only concerned with the management of total current assets and the excess of current assets over current liabilities but it is concerned with all kinds of problems that arise in attempting to manage the current assets, current liabilities and inter-relationship that exists between time. The meaning of 'working capital' should not be allowed to limit either the gross or net concept of working capital only. A few other concepts of working capital are circulating, permanent and variable or seasonal working capital. Circulating working capital concept emphasizes the circuit flow of current capital. Circuit flow means the circulation of capital from cash to inventories to receivables and back to cash. Every company and industries needs such excess of current assets over current liabilities as is necessary to keep up the circulation of the capital from cash to inventories to receivables and back to cash. Permanent working capital refers to the amount of investment which is necessary to keep up the circulation of capital from cash to cash, from month to month and year to year. Variable or seasonal working capital refers to the current assets investment required to fill the demands of the seasonal busy periods at stated intervals.

Working capital is the life – blood of all enterprises, manufacturing and trading both. It is constantly required to buy raw materials for payment of wages and other day to day expenses. Without adequate working capital, manufacturing operations will be crippled.

MEANING OF WORKING CAPITAL MANAGEMENT

Working Capital Management means planning, organizing, directing and controlling of working capital. It provided an answer to the following two basic concepts:

a) How Much to Invest in Each Type of Current Assets?

It says what should be the level of cash, receivable and inventory in the enterprise. How much to invest in current assets will depend on operating cycle. The decision about the level of investment in current assets involves a trade off between risk and return or liquidity and profitability.

The Effects of Excessive and Inadequate Investment in Current Assets are Shown Below:

Situation	Effect on Profitability	Effect on Liquidity
1) Excessive investment in Current Assets	It results in low profitability because excess investment in current assets remain idle and hence earns nothing.	It result in high liquidity and hence doesnot threaten solvency of the enterprise.
2) In adequate Investment in Current Assets	It results in high profitability	It results in low liquidity.

b) How to Finance Current Assets?

It says what portion of the working capital should be financed with long term sources of funds or short term sources of funds.

Situation	Long term stability	Short term stability
Long term sources of fund	Lower	Higher
Short term sources of fund	Higher	Lower

Investment policy is constituted by current assets and fixed assets. Conservative Investment policy means current assets are more than fixed assets i.e. the value of policy is more than 50% whereas Aggressive Investment policy means current assets are less than fixed assets i.e. the value of policy is more than 50%. Lack of applicability means aggressive investment policy i.e. the value of policy is more than 50%.

Financing Policy is constituted by current liabilities and long term debt. Conservative financing policy means current liabilities are less than long term debt, i.e. the value of policy less than 50% whereas Aggressive Financing Policy means current liabilities are more than long term debt i.e. the value of policy more than 50%. Lack of applicability means conservative financing policy i.e. the value of policy less than 50%

REVIEW OF LITERATURE

According to **Mishra and Khan (1990)** undertook a study on working capital management of Electronic Corporation of India Ltd. (ECIL) for the period 1983-84 to 1985-86. The study exhibited that a major portion (more than 80%) of funds was invested in current assets. The study registered an increasing trend of the current ratio in the enterprise during the study period. It ultimately generated idle liquid funds in the hands of ECIL, which in turn produced low return in the company.

According to **Jain (1993)** undertook a study to analyze the working capital management of seven selected paper companies belonging to both public sector and private sector in India. The study showed that the current ratio of the private sector paper companies registered a declining trend during the study period whereas this ratio was found to be highly fluctuating in the public sector paper companies. The study also revealed that the inventory management in the private sector undertakings was comparatively better as compared to that of, in the public sector undertakings.

According to **Reddy and Rao (1996)** in their study made an attempt to examine the working capital management practices in Hindustan Cables Limited (HCL), a public enterprise on the assumption that working capital policies had a great effect on a firm's liquidity and profitability. The study was based on the data and information obtained from the annual reports of HCL from 1989-90 to 1993-94. The study demonstrated that the company maintained its current ratio and quick ratio above the conventional standard of 2:1 and 1:1 respectively throughout the study period. The study concluded that liquidity status of HCL was satisfactory during the period under study.

PROBLEM OF THE STUDY

Available working capital policy in the existing literature of working capital management lacks practical applicable.

OBJECTIVE OF THE STUDY

To understand investment policy and financing policy of working capital management.

HYPOTHESIS OF THE STUDY

Null hypothesis (H₀): Available Investment Policy and Financing Policy of the Micro enterprises are popular and significantly applicable.

Alternative Hypothesis (H₁): Available Investment Policy and Financing Policy of the Micro enterprises are popular but significantly lacks its applicability.

RESEARCH METHODOLOGY

For the study purpose, researcher has selected 50 Micro Enterprises of Greater Mumbai, these sample having gents garment manufacturing business in Mumbai. Researcher has collected primary data and secondary data for the study purpose.

Null Hypothesis (H₀₁): Micro enterprises are having Conservative investment policy i.e. the value of policy is less than 50%.

Normality Test:

Details of Scores, variables and Normality test

Variable	Null for Normality test	Normality test	P value	Result of normality test
Conservative investment policy value	The distribution of Conservative investment policy value is normal with mean 42.125 and S.D. 12.53	One sample kolmogorov-smimov test	0.028	Reject null hypothesis

From the above table, it is observed that, p value for variable *Conservative investment policy value* is 0.028. This value is less than critical p value 0.05. Hence researcher rejected null hypothesis and data is not normally distributed. *Therefore researcher used non-parametric one sample Wilcoxon sign test for testing significance of this variable with hypothesized mean value 50.*

Results of non-parametric Wilcoxon Signed test for testing significance of variable *Conservative investment policy value* with hypothesized median value 50.

Table: Descriptive statistics for variable Conservative investment policy value

	Conservative investment policy value
N	50
Median	42.525

It is clear that median score value for variable is less than 50. This indicates that respondent's conservative investment policy value is less than 50%

Hypothesis Test Summary of One Sample Non Parametric Wilcoxon Signed Test:

Table: Hypothesis test summary of one sample non parametric Wilcoxon Signed test

Null hypothesis	P value	Decision
The median of Conservative investment policy value equals to 50.00	0.00	Reject null hypothesis

From the above table, it is observed that for the variable *Conservative investment policy value* p value is 0.000. This value is less than 0.01. Therefore null hypothesis for this variable that *Conservative investment policy value* that the median of *Conservative investment policy value* equals to 50.00 is rejected. It means it is different than 50.

Also median score value for variable *Conservative investment policy value* is less than 50. *This indicates that Conservative investment policy value* is significantly less than hypothesized value 50.

FINDING

Hence it is concluded that, Conservative investment policy value is significantly less than hypothesized value 50. Hence micro enterprises are having Conservative investment policy. Therefore null hypothesis (H₀) is accepted.

Null hypothesis (H₀₂): Micro enterprises are having Aggressive Financing Policy i.e. the value of policy more than 50%.

Normality Test

Details of Scores, Variables and Normality Test

Variable	Null for Normality test	Normality test	P value	Result of normality test
Aggressive Financing Policy value	The distribution of Aggressive Financing Policy value is normal with mean 42.771 and S.D. 30.13	One sample kolmogorov-smimov test	0.028	Reject null hypothesis

From the above table, it is observed that, p value for variable *Aggressive Financing Policy value* is 0.000. This value is less than critical p value 0.05. Hence researcher rejected null hypothesis and data is not normally distributed. *Therefore researcher used non-parametric one sample Wilcoxon sign test for testing significance of this variable with hypothesized mean value 50.*

Results of non-parametric Wilcoxon Signed test for testing significance of variable *Aggressive Financing Policy value* with hypothesized median value 50.

Descriptive Statistics

Table: Descriptive statistics for variable Conservative investment policy value

	Aggressive Financing Policy value
N	50
Median	33.325

It is clear that median score value for variable is less than 50. This indicates that respondent's *aggressive financing Policy value* is less than 50%.

Wilcoxon Signed Test

Table: Hypothesis test summary of one sample non parametric Wilcoxon Signed test:

Null hypothesis	P value	Decision
The median of <i>Aggressive Financing Policy value</i> equals to 50.00	0.078	Retain null hypothesis

From the above table, it is observed that for the variable *Aggressive Financing Policy value* p value is 0.078. This value is greater than 0.05. Therefore null hypothesis for this variable that *Aggressive Financing Policy value* that the median of *Aggressive Financing Policy value* equals to 50.00 is retained. It means it is not different than 50.

Also median score value for variable *Aggressive Financing Policy value* is less than 50. *This indicates that Aggressive Financing Policy value* is insignificantly less than hypothesized value 50.

FINDING

Hence it is concluded that *Aggressive Financing Policy value* is insignificantly less than hypothesized value 50. Hence Micro enterprises are having Conservative *Financing policy*. *Therefore alternative hypothesis (H₁₂) is accepted*. Hence researcher concluded that, Micro enterprises are having Conservative *investment policy* as well as Conservative *Financing policy*. *Therefore Available policy of Micro enterprises are popular but partially lack applicability*.

FINDING BASED ON PRIMARY DATA

1) Finding Based on Objective

Objective was to understand investment policy and financing policy of working capital management. Following are findings based on this objective.

1. Majority (66%) of the respondents sample are practicing aggressive investment policies and 34% of the respondents sample are practicing conservative investment policies.
2. Majority (74%) of the respondents sample are practicing conservative financial policies and 26% of the respondents sample are practicing aggressive financial policies.

2) Finding Based on Hypothesis

This null hypothesis was tested using relevant data gathered by researcher from owners. Initially data was tested for normality using one sample kolmogorov-smimov test. 'p' value for test was 0.001 (<0.05) indicates that data is not normally distributed. Hence non-parametric Wilcoxon test was used for testing significance of the variable investment policy and financing policy. Here p' value for variable investment policy and financing policy was 0.000 (< 0.01). Therefore median score for variable investment policy and financing policy was significantly greater than hypothesized value 3. Hence on the basis of testing researcher revealed that available Investment Policy and Financing Policy of the ME are popular but significantly lacks its applicability. Therefore alternative hypothesis (H₁) is accepted.

FINDINGS BASED ON SECONDARY DATA

1) Finding Based on Objective

Objective was to understand investment policy and financing policy of working capital management. Following are findings based on this objective.

Total 17 respondents sample has used conservative investment policy and 33 respondents sample has used aggressive investment policy. Total 37 respondents sample has used conservative financing policy and 13 respondents has aggressive financing policy

Finding Based on Hypothesis

Hypothesis was that available investment policy and financing policy of the Micro enterprises are popular and significantly applicable. Hence to test this null hypothesis researcher has tested two sub hypothesis.

Sub-hypothesis 1 was that Micro enterprises are having conservative investment policy i.e. value of policy is less than 50%. This null hypothesis was tested using relevant data gathered by researcher from owners. Initially data was tested for normality using one sample kolmogorov-smimov test. 'p' value for test was 0.028 (<0.05)

indicates that data is not normally distributed. Hence non-parametric one sample Wilcoxon sign test was used for testing significance of the variable conservative investment policy value. Here p' value for variable conservative investment policy value was 0.000 (< 0.01). Therefore median score for variable conservative investment policy value was significantly less than hypothesized value 50. Hence on the basis of testing researcher revealed that conservative investment policy value was significantly less than hypothesized value 50. Therefore null hypothesis (H_{01}) is accepted.

Sub-hypothesis 2 was that Micro enterprises are having aggressive financing policy i.e. value of policy is more than 50%. This null hypothesis was tested using relevant data gathered by researcher from owners. Initially data was tested for normality using one sample kolmogorov-smimov test. 'p' value for test was 0.028 (<0.05) indicates that data is not normally distributed. Hence non-parametric one sample Wilcoxon sign test was used for testing significance of the variable aggressive financing policy value. Here p' value for variable aggressive financing policy value was 0.078 (>0.05). Therefore median score for variable aggressive financing policy value was significantly less than hypothesized value 50. Hence on the basis of testing researcher revealed that aggressive financing policy value was significantly less than hypothesized value 50. Therefore alternative hypothesis (H_{12}) is accepted.

Hence, researcher found that, Micro enterprises having conservative investment policy and conservative financing policy. Therefore available policy of Micro enterprises are popular but partially lack applicability.

Conclusions with Respect to Investment Policy & Financing Policy of the Micro Enterprises:

Researcher concluded that respondents sample having conservative policy as well as conservative financing policy. Therefore available policy of micro enterprises are popular but lack applicability.

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Role of Deep Learning for Clustering Mechanism used for Nutrition Prescription System

Sunaina and Rajinder Singh Sodhi

CSE Department, Om Sterling Global University, Hisar, India

ABSTRACT

In the health care industry, a Nutrition Prescription System (NSO) has been suggested. Enhanced K-Mean clustering was utilized in Map Reduce model. Map reduction procedure yields the frequency dataset and the health care centre dataset, both of which are represented by rectangular boxes. Elongated boxes depict the original data flow, and are used to explain each step. If the patients are logged in via this method, they will have the ability to access only the most specialized medical facilities. As a result, they'll be able to obtain the best service possible. As a result of the system's backup capabilities, patients would have safe and secure access. Because there are no side effects to it, it is superior than pharmaceutical this system. The patient selects the symptoms in recommended this system. Patient is informed about their nutritional deficiencies and needs, as well as the best way to meet those needs. Additionally, the patient is provided extra dietary information that is recorded in unstructured dataset. Answer was extracted from dataset and is now available for viewing. The result also indicates the millisecond-by-millisecond difference in time spent on conventional and current tasks.

Keywords: Clustering, big data, Nutrition Prescription System, data mining, Dataset, Enhanced K Mean clustering.

[1] INTRODUCTION

In scenario, Big Data is important field in the IT. It is highly trending due to the substantial advancement in use of internet. Clustering a data mining technique, has been used for the management of provided data in the medical and biology field. The cause is that the amount of data accumulated is high and not structured. The data has been gathered to the different physical and machine language form. For the management of these datasets, a lot of algorithms. Such algorithms that may be used are Map Reduce dependent on the K-mean clustering algorithm. Here datasets has been arranged and an entity has been developed for the determination of the similarity between objects. Map Reduce has been known as a potentially labeled calculating paradigm applied in large-scale execution of data in cloud computing. The deal with big data has been made for decrease the complexity and got the transparency. The quantity of information which is produced in the entire world is discharge on daily basis. The use of digital as well as the social media in internet of things is proving that such are adding fuel to it. The speed by which information are grown is massive. It happens because it comes from different devices. It contains the knowledge wealth that is able to be a key in gaining an edge in competitive environment. Research also focused on classification operation in area of healthcare that are based on machine learning.

1.1BIG Data

The term "big data" was coined in the early 1990s. It has gained a following and a level of significance that is only going to rise in the coming years. Big data is now an essential part of every company's overall strategy. The MGI has articulated Big Data in the form of datasets, according to its report. There is no particular database program that can handle the scale of this data set.

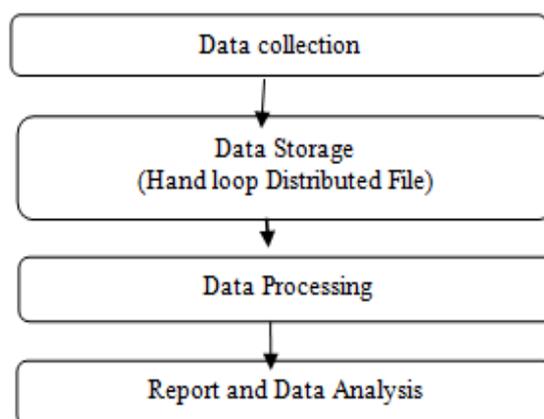


Fig 1: Big Data Processing

More information is being released into the world each and every day. Digital, social, and internet media use adds a layer of complexity and firepower. The rate at which new information may be gleaned is astoundingly quick these days. A variety of information is available since it comes from diverse sources and might be an important differentiator in today's competitive environment. Data from the same group or cluster are more similar than data from different groups or clusters. This is a major data issue. With big data, applications may be leveraged for anything from health care to marketing to city planning to seismic research to online document classification.

1.2 Data Processing

Data mining means that the removal of attractive, important, conversant data from huge databases. On the basis of present data it forecast the formation of group and metrics together and its association in order to identify its events. It occurs together or in a sequence. At last it detects the outliers not follows the required desired behavior.

1.2.1 Data Cleaning

The process to remove the noise as well as the inconsistency has been know as data cleaning, this data has been removed from the database. In this step, one tries to fill in the missing values, identify as well as to remove outliers. Here the inconsistencies are also resolved.

1.2.2 Data Integration

Data have been merged and generated in this stage for various servers. Some of the problems that may arise here include schema integration, redundancy, conflicts in data value detection and resolution.

1.2.3 Data Selection

Data selection is also essential step in the preprocessing of data. Data relevant to evaluation job has been achieved to the database.

1.2.4 Transformation of Data

Data has been transformed or consolidated into forms suitable to mining. Smoothing, Aggregation, Generalization are included in Data transformation. As well as the normalization as well as the attribute construction is considered here.

1.2.5 Data Mining

The process of it is analysis of data from different viewpoints. Process of scanning in order is using pattern recognition technology and statistical and mathematical methods to identify significant new connections, patterns and trends.

1.3 Clustering

Clustering is a process of data that is termed clustering in a collection of relevant subclasses. Used either as an autonomous tool for understanding the distribution of data or as a preprocessing step for other algorithms. Cluster analysis is job of combination items in cluster of the same kind. [8]

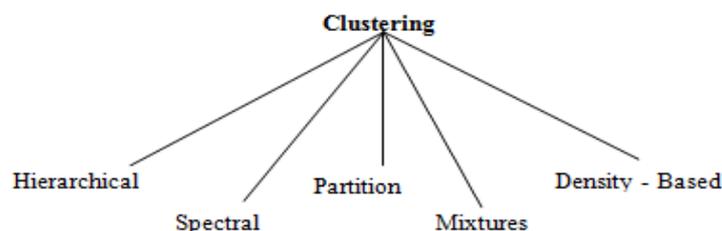


Fig 2: Clustering

1.3.1 Requirements of Clustering

Scalability

To deal within large databases, highly scalable clustering algorithms are required.

High Dimensionality

The Clustering algorithms are able to handle low-dimensional data. Along with this such provides the high dimensional space.

Dealing with noise data – Databases includes the noise, missing etc. Some algorithms are not insensitive to this data and provide poor quality clustering.

Interpretability

The results got after the Clustering, should be interpretable, comprehensible. It should be usable.

1.3.2 Clustering Methods

Clustering technique has been divided into below given categories:

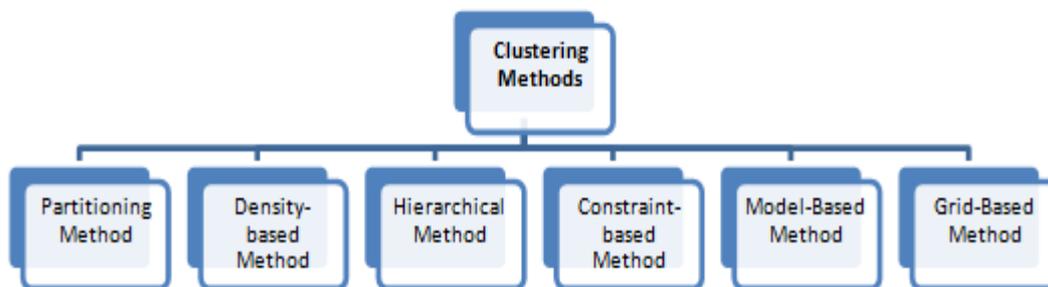


Fig 3: Clustering methods

1.4 Machine Learning

Observation has shown that an industrial setup should be able to undertake predictive operations. That which is too sophisticated for machines may be learned by machine learning methods by recording data from several sensors that are linked to machines, and then discovering anomalous operations. The most widely used artificial intelligence technique is machine learning. An artificial intelligence (AI) is a specific intellect that is used by machines. The idea of incorporating the clustered notion has been put up in this article. Reinforcement learning environments may save time and space by using this method. A significant AI application is machine learning. As a result, the system is able to grow and develop. Experimenting and not being entirely programmed helps it grow. It has been discovered that machine learning tends to concentrate on creating computer software that can execute program and be used by a single user. To put it another way, AI is all about making machines capable of experiencing for themselves. Machine learning has long been acknowledged as a frequent application of artificial intelligence. One of the most prominent terms used to describe artificial intelligence is "AI," which stands for "Artificial Intelligence." Here, the clustering concept has been provided for consideration. This tool may save both time and space in reinforcement learn contexts. Machine learning is an important AI application. It allows the system to grow and improve. When it's not completely programmed, it's able to expand. Machine learning focuses on computer programs that can be run and utilized by a single human. The basic objective of artificial intelligence is to allow computers to experience things on their own, without the assistance of a human. These scenarios do not need human intervention. There are several benefits to using machine learning, including the following:

1. As well as retail and wholesale, it's found in the financial services industry as a whole as well as the healthcare industry in general.
2. Devices are able to reduce their time cycle, which improves their resource efficiency.
3. This strategy is often used by social media platforms like Google and Facebook to push advertisements depending on the preferences of its users.
4. Quality can be improved in big and intricate process systems using a variety of machine learning technologies.

1.5 Deep Learning

Deep learning is one of the many sub domains of machine learning. It is able to learn from well-structured and manageable data and provide valuable and knowledge-rich output. Deep neural learning is a term for this kind of learning. The term "deep neural network" was coined by a single researcher. Algorithms fall within the topic of machine learning. Large amount of data is taken into consideration in deep learning. An investigation has shown that machine learning systems must be supervised. The programmer is responsible for defining his instructions. For example, if someone wants to find a picture of a dog, he must describe his search to the computer in great detail. Autonomous software with an extensive knowledge base produces better results for every search. Simple machine learning isn't as good as deep learning since it's slower and less precise.

It's a well-known fact that learning may be very effectively structured. Another term for it is "hierarchical learning." Machine learning methods are being investigated in a bigger context. These methods rely heavily on artificial neural networks.

1.6 RNN

It is possible to construct a directed or undirected graph out of the connections between the nodes in an RNN. As a result, it's possible to show changes in behaviour over time. For example, feed forward neural networks (FNNs), which are evolved from RNNs, can accommodate any length of input sequence. Aside from handwriting recognition, they may also be used for voice detection. As far as theoretical Turing completeness goes, recurrent neural networks may execute arbitrary programmes to handle arbitrary sequences of input.

Networks with infinite impulse response are known as a "recurrent neural network" while those with finite impulse response are known as a "convolutional neural network". Both kinds of networks have a tendency to fluctuate throughout time. Unrolling and replacing a directed acyclic graph with a feedforward neural network is possible in the case of a finite impulse recurrent network, but this is not possible in the case of an infinite impulse recurrent network.

An infinite impulse recurrent network may contain extra stored states, & storage can be manipulated by a neural network. If a network or graph features time delays or feedback loops, the storage may be replaced by that network. LSTM and gated-recurrent memory both use gated states and GRUs to govern the flow of information in and out of their systems.

1.7 LSTM

Hochreiter and Schmidhuber created LSTM networks in 1997, and they have since established accuracy records across a wide range of application sectors.

When LSTM started revolutionising speech recognition in 2007, it was able to outperform previous models in a variety of speech applications. For the first time in 2009, a CTC-trained LSTM network won three connected handwriting recognition contests. Baidu's CTC-trained RNNs beat the 2S09 Switchboard Hub5'00 speech recognition dataset benchmark in 2014 without using any typical speech processing methods.

Text-to-speech synthesis and large-vocabulary voice recognition were both enhanced using LSTM. Google's voice recognition is improved by 49% in 2015 due to CTC-trained LSTM. Language Modeling and Multilingual Language Processing were enhanced by LSTM. The automated captioning of images was enhanced by combining LSTM with convolutional neural networks (CNNs).

1.8 Working of LSTM Model for Classification Operation in Health Care

In healthcare communities, people seek advice from medical specialists through symptom description or the suggested hospital and department. Medical care may be made more efficient and the distribution of medical resources optimised by using a deep learning system to categorise illness symptom text. NLP researchers have long struggled with the task of categorising text (NLP). We came up with the notion of utilising an upgraded LSTM model to classify medical consultation text in order to get an accurate diagnosis. SVM, Decision Tree, and Naive Bayes are the most often used classification algorithms. Classifying text has proven to be a challenging job for machine learning systems. For jobs requiring text categorization, researchers have discovered that deep learning and RNN perform very well. The medical industry has also offered certain types of Chinese question and response. Using a rule-based approach, Jain and Dodiya have presented a medical question-answering system. Scientists came up with an algorithm for grouping and similarity assessment of questions and replies that might help improve online healthcare consultation. Question and answer matching in the medical industry might benefit from an end-to-end word embedding multiscale CNN model, according to the research.

In addition to a novel Double Channel LSTM model, termed DC-LSTM, we also add a hybrid attention mechanism to LSTM that can learn extended sequences and build deep neural networks in each training batch. Model learning and expression capabilities may be improved, and overfitting can be avoided by using this suggested model. Experiments have shown that the DC-LSTM model is superior than RNN models in terms of accuracy. An outpatient department's ability to provide more efficient care may be boosted by using this paradigm, especially when it comes to the categorization of medical diagnoses.

[2] LITERATURE REVIEW

The written information that examines the key aspects of current knowledge on a certain subject is a literary review. The literature review typically includes a section on study suggestions, methodologies and results. There has been a lot of effort in field of big data. After reviewing different research papers, journals and publications, this chapter presents the literature overview.

Amato, F., Cozzolino, G., Moscato, F., Moscato, V., Picariello, A., & Sperli, G. (2019). [1] offered the application of data mining. In order to enhance the efficiency, name node stores the whole metadata of HDFS in its main memory. It is made with several small files, name node that are running out of memory.

In 2018, Andreas Holzinger et al. [2] were at the beginning of a new AI era. In spite of all of this, there are still a number of issues that need to be addressed, including the fact that the highest performing models are considered black boxes.

Bhardwaj, A., Singh, V. K., Vanraj, & Narayan, Y. (2016). [3] did research on Analyzing Big Data with Hadoop cluster in hd insight azure Cloud. Presently Cloud dependent Hadoop is gaining huge interest. It is offering ready to use Hadoop cluster environment in order to process Big Data. It has been excluding the operational issues in case of on-site hardware investment, IT support, and installing, configuring of Hadoop components such as HDFS and Map Reduce.

Bhandarkar, M. (2010). [4] wrote on Map Reduce programming with apache Hadoop. The researcher has explained the solutions of general issues that are encountered in maximizing Hadoop application performance.

Chen, G., & Islam, M. (2019). [5] Implemented big data analytics for healthcare. Big data analytics has been applied to aid process of care delivery along with exploration of disease. Author considered the utilization of huge volumes of data set that is related to medical field.

Com, K. M. R. B. (2016). [6] has explained the method of data mining. A cluster of data objects is used as a group. To do the cluster evaluation, first partition is to arrange the data into groups. It is done on the base of data similarity.

Diwate, R. B., & Sahu, A. (2014). [7] This research on data mining techniques. Their research has provided a feature classification technique using association rule. The major objective of research has to consider various data mining techniques. Research has considered percentage of the most widely data mining techniques which are found useful for normal life.

Dheeraj Kumar et al. [8] demonstrated in 2015 that clusiVAT creates genuine SL clusters in compact-separated data. We conducted tests to show that k-means and its modified algorithms have initialization problems that result in a high number of failures.

Gupta, M. K., & Chandra, P. (2020). [9] This research to consider challenges and issues in area of data mining research. Research work has performed the survey in area of data mining. Author presented systematic view for different data mining tasks as well as mechanism.

Gupta, M. K., & Chandra, P. (2019). [10] did research on K-means clustering. They proposed modified partition based cluster initialization method for k-means algorithm.

Hassan Ismail Fawaz, 2019 [11] studied by doing an empirical investigation of the most recent DNN designs for TSC. The most effective deep learning applications in diverse time series domains are summarised under a single taxonomy of DNNs for TSC. Open source deep learning framework is made available to the TSC community, where we deployed each of the comparison algorithms, as well as assessed them on the UCR/UEA archive and 12 multivariate time series datasets. We provide the most comprehensive research of DNNs for TSC to date, by training 8730 models on 97 time series datasets.

In 2018, Inés Sittón Candanedo et al. [12] would be the focus of this study for Using of machine learning methods. Predictive models for the Industry 4.0 environment will be developed utilising machine learning methods and the aforementioned dataset, as detailed in this article.

Kaur, J., Sachdeva, K., & Singh, G. (2018). [13] presented the Image processing on multimode Hadoop cluster. Research represents that data produced over internet is increasing day by day at exponential rate. The classical methods are insufficient for processing is termed as 'Big Data'. There are various tools in Hadoop to analyze the textual data such as Pig, base, etc.

Lin, C. Y., Yu, K. M., Ouyang, W., & Zhou, J. (2011). [14] proposed research work on open candidate slicing frequent pattern mining algorithm. They proposed on Hadoop acceleration in an open flow-based cluster. This paper presents details of their preliminary study of how Hadoop can control its network resources using Reduces get delayed because of inadequate bandwidth among them. It degrades the cluster performance.

In 2016, Lathiya Piyush and Rinkle Rani [15] used Apache Hadoop to construct the CURE clustering method in a distributed setting. Mapreduce has been a popular paradigm for dealing with big stores and enormous

amounts of data in recent years. The CURE algorithm requires Mapper and Reducer routines. We've also spoken about how different factors impact cluster quality by eliminating outliers.

Mohammed, A. Q., & Bharati, R. (2018). [16] Proposed research in order to improve resource utilization during big data processing in heterogeneous network. Research has make use of Hadoop MapReduce in order to achieve objective. Simulation concludes that there is increment in resources utilization and decrement in job running time by 10-30 %

Merla, P. R., & Liang, Y. (2017). [17] presented the Data analysis using Hadoop map reduce environment. The research work has provided the evaluation of YouTube data. They have done this with the use of Hadoop map reduce system on the base of cloud platform AWS.

Mohammad Hesam Hesamian, 2018, [18] gave a thorough evaluation of common algorithms for medical picture segmentation that use deep-learning techniques. In addition, they provide an overview of the most typical problems encountered and their remedies.

Niall O'Mahony, 2020, [19] would examined the advantages and disadvantages of each method in this study. It is the goal of this article to encourage a debate on the importance of retaining a working understanding of classic computer vision methods. The article will also look at how computer vision may be coupled with other aspects of computer science. Recent hybrid approaches have proved their capacity to increase computer vision performance and to handle difficulties that Deep Learning cannot address. When it comes to growing fields like Panoramic Vision and 3D vision, where Deep Learning models haven't yet been optimised, it's common practice to combine classic computer vision approaches with the newer Deep Learning methods.

Omran, M. G. H., Engelbrecht, A. P., & Salman, A. (2007). [20] Provided an overview on clustering methods. They discussed that Cluster is known as a group of objects. In a cluster the objects are of same class. In the different words, it can be said that the similar kind of objects have been grouped in a cluster. Similarly the mismatched objects are grouped in a separate cluster.

Padhy, N., Mishra, P., & Panigrahi, R. (2012). [21] Offered the review of the Applications of Data Mining with its future Scope. It has been considered and applied in the implementation. In the research work the issues related to empty cluster in K-mean

Patel, A. B., Birla, M., & Nair, U. (2012). [22] reviewed the Addressing of big data problem using Hadoop and Map Reduce. Hadoop cluster has been required to execute and analyze big data. It has map reduce engine for distributing data to each node in cluster. Compression is required as it is not just increasing space of storage. It also improves performance to calculate job.

Raj, B., & Paul, A. (2013). [23] Presented paper on clustering algorithms. Clustering analysis is applied in several applications. It has been used in market research, pattern recognition, data analysis, and image processing. To assist the marketers, the clustering has been used. It is applicable to discover the different groups at the base of user.

Ramesh, V., Parkavi, P., & Yasodha, P. (2011). [24] analyzed the presentation evaluation of DM methods. There will be less risk. Cluster in big data has been known as a group of objects. In a cluster the objects are of same class. In the different words, it can be said that the similar kind of objects have been grouped in a cluster. Similarly the mismatched objects have been grouped in a separate cluster.

Ryan C. Sartor et al. 2019 [25] were transcribed and are designated the filtered gene set (FGS). Our trained random forest method was accurate and depended exclusively on histone modifications or DNA methylation patterns inside the gene body; promoter methylation was not relevant.. FGS is recognised to be unique to B73, as shown by the transcription patterns of other inbred lines. Using inbred specific DNA methylation patterns, we were able to reliably classify the sets of transcribed genes in additional inbred lines. This method shows how chromatin information may be used to enhance gene annotations.

Rattanaopas, K., & Kaewkeeree, S. (2017). [26] wrote on Improving Hadoop Map Reduce performance with data compression: A study using word count job. It has map reduce engine for distributing data to each node in cluster. Research has discussed some famous Hadoop's compression codecs for example; deflate, gzip, bzip2 and snappy. An over-all compression in map reduce, Hadoop uses a compressed input file which is gzip and bzip2. This research goal is to improve a computing performance of word count job using a different Hadoop compression option.

Sarada, W., & Kumar, P. V. (2013). [27] Reviewed clustering techniques and performed comparative study of those techniques. Clustering is determined as a process in which a group of abstract objects has been converted into classes of similar objects.

Srivastava, S., & Joshi, N. (2014). [28] has proposed the clustering method evaluation for microarray data international. Clustering allows the dealer of seller of goods to improve the client's base and work on the target sectors. They also discussed that Clustering assists to identify the groups of houses on the basis of defined factors. Such factors may be their value, type as well as the geographical locations also.

Singh, D. A. A. G., Fernando, A. E., & Leavline, E. J. (2016). [29] proposed the research work on efficiency evaluation on different clustering concepts. Clustering is determined as a process in which a group of abstract objects is converted into classes of similar objects. Several methods clustering methods are there such as Partitioning technique, Hierarchical technique, Density-based technique, Grid-Based technique, Model-dependent technique, and constraint-based technique.

Siretskiy, A., & Spjuth, O. (2014). [30] stated the HTSEQ -Hadoop with Extending HTSEQ for massively parallel sequencing data analysis using Hadoop. Hadoop has been considered as convenient framework. It has been enabling scalable distributed data analysis. The researcher of this research used Hadoop-streaming library. It enables the components to run in both Hadoop as well as in regular Linux models.

Vorapongkitipun, C., & Nupairoj, N. (2014). [31] wrote on improving performance of small-file accessing in Hadoop. This research work has proposed a mechanism in which Hadoop Archive (HAR) is used. It is also known as New Hadoop Archive (NHAR).. In addition to this it is able to enhance the efficiency related to big data in HDFS.

Verma, C., & Pandey, R. (2016). [32] discussed the big Data representation for grade analysis through Hadoop framework. Big Data is well known dataset. It is displaying volume, velocity features. It also considers variety in an OR relationship. They are enabling capturing, storing and subsequently analysis of Big Data.

Zafar, M. H., & Ilyas, M. (2015). [33] has offered the clustering dependent review of categorization algorithms. Clustering is applied to review the earth-quake. On the base of sector hit by an earthquake, clustering is able to assist to know and analyze the next possible location. The possible location where earthquake may be occurred, is shown using clustering.

Table1: Literature survey

SNO.	AUTHOR/YEAR	TITLE	METHODOLOGY	LIMITATION
[1]	Amato /2019	Data mining in social network	Machine learning	Scope of this research is very less
[2]	A. Holzinger/2018	Current advances, trends and challenges of machine learning and knowledge extraction: From machine learning to explainable AI	Machine learning, AI	There is no implication in future
[3]	Bhardwaj /2016	Analyzing Big Data with Hadoop cluster in HDInsight azure Cloud	Big Data, Hadoop, cluster	There is no security in this system
[4]	Bhandarkar/2010	MapReduce programming with apache Hadoop	MapReduce, apache Hadoop	Lack of technical work
[5]	Chen /2019	Big Data Analytics in Healthcare	Big Data	Performance of this research is very low
[6]	K. M. R. B. /2016	Data mining techniques	Data mining	There is no security in this system
[7]	Diwate/2014	Data Mining Techniques in Association Rule: A Review.	Data mining	Lack of accuracy
[8]	Gupta /2020	A comprehensive survey of data mining	Data mining	Lack of security
[9]	Gupta /2019	MP-K-Means: Modified Partition Based Cluster Initialization Method for K-Means Algorithm	Cluster	Lack of accuracy
[10]	H. Ismail Fawaz /2019	Deep learning for time series classification: a review.	Deep learning	There is lack of performance

[3] Problem Statement

There have been several researches in field of big data and health care. It has been observed that previous research did limited work in clustering. Moreover these researches have faced performance and accuracy issues. It is observed that previous research need to be more scalable, flexible and efficient. In other words Clustering research in the past has been found to be sparse. Furthermore, these investigations have run into problems with speed and precision. Previous studies have shown a need for increased scalability, flexibility, and efficiency. The present problem entitled “**Managing Big Data in Health Care using Enhanced Clustering Mechanism**”, firstly arrives due the lack of accurate clustering technique as data has been gathered in huge volume. It is coming from un-trusted sources on different websites. These systems are using various clustering methods to handle the BIG Data. Due to ignorant behavior of medical teams people are suffering from several side effects that are caused due to prescribed medicine.

Table 2: Comparative analysis of Features

Citation	Clustering	Big Data	Multinode Hadoop Cluster	Data Mining	Machine Learning	Deep Learning
[1]	No	No	No	Yes	No	No
[2]	No	No	No	No	Yes	No
[3]	Yes	Yes	Yes	No	No	No
[4]	No	No	Yes	Yes	No	No
[5]	No	Yes	No	No	No	No
[6]	No	No	No	Yes	No	No
[7]	No	No	No	Yes	No	No
[8]	No	No	No	Yes	No	No
[9]	Yes	No	No	No	No	No
[10]	No	No	No	Yes	No	Yes
[11]	No	No	No	No	Yes	No
[12]	No	No	Yes	No	No	No
[13]	Yes	Yes	No	No	No	No
[14]	No	No	No	Yes	No	No
[15]	Yes	Yes	Yes	No	No	No
[16]	No	No	Yes	No	No	No
[17]	Yes	No	Yes	No	No	No
[18]	No	No	No	No	No	Yes
[19]	No	No	No	No	No	Yes
[20]	Yes	No	No	No	No	No

It has been observed that more than 70% of health related issues exists due to lack of nutrition. Also, the clustering mechanism used in various research papers does not provide the efficient real time processing in order to resolve the queries of the patient. Thus there is need to introduce a Nutrition prescription system that would focus on nutritional deficiency. Moreover there is need to improve accuracy and performance of AI based classification process.

[4] Proposed Work

In proposed model healthcare Dataset has been considered for training and Attributes are eliminated consider ship algorithm. Some attributes are eliminated that have single value in all cases. Data set after filtering the feature selection mechanism is applied. Then, 70% of the data is used for training, and 30% is used to test. Finally, each of the following layers is applied: the LSTM, fully linked, and softmax layers. Predicting the onset of illness necessitates the use of classification. Once the predicted value has been obtained, a confusion matrix is generated that takes into account both the expected and actual values in order to arrive at the four possible outcomes: true positive, false positive, true negative, and false negative. Overall accuracy is determined by calculating the accuracy, precision, recall, and fscore of the results.

Flow Chart

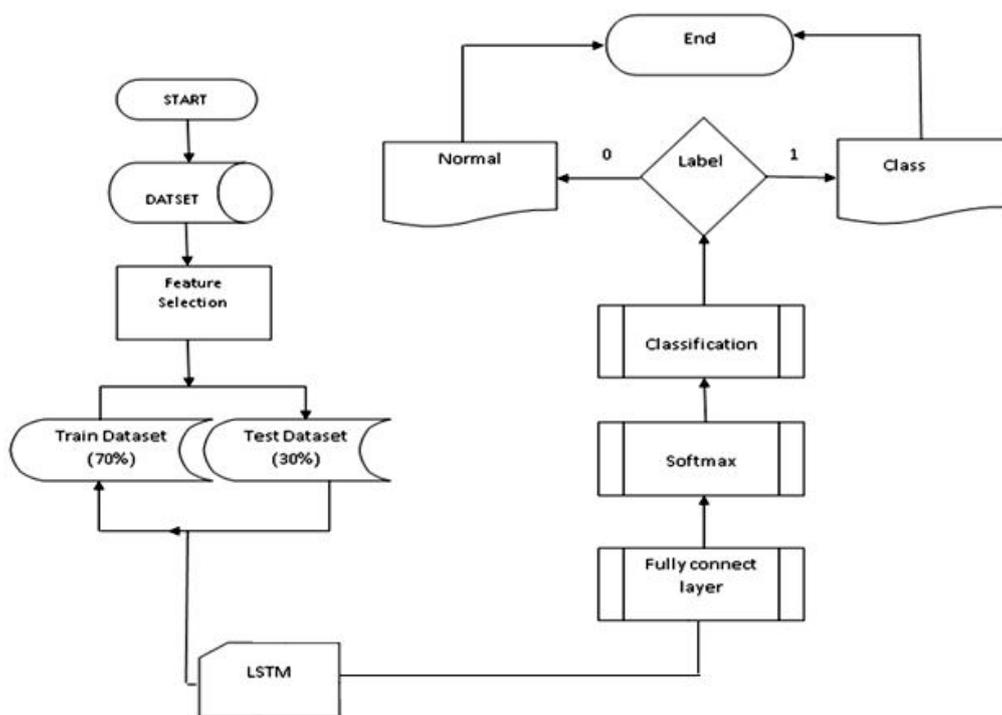


Fig 4: Flow chart of proposed Model for classification of health care dataset

This section has presented the issues in existing researches with proposed work. Then the objectives of research are presented. LSTM mechanism applied in research has been explained and the two model developed in proposed implementation are also discussed. Data set used for training the categories, sub categories used in research are explained here. Proposed work has made use of LSTM mechanism. LSTM has been considered as artificial recurrent neural network architecture. An LSTM is having similar control flow like recurrent neural network. This is processing information and transferring it for further propagation. Operations within the LSTM's cells are allowing LSTM to keep or forget data. LSTM is giving most Control-ability as well as better results. But it is more complex and costly. LSTM is used for Time Series Forecasting and is good for time series. Such model is developed for Sequence Prediction problems and time-series forecasting. The health care dataset consists of 180 network features and three label features. This script used 70% of the data set for training and 30% of the data set for testing. It is saved in the system for subsequent testing of the trained network "network". Two separate models of the LSTM have been used to create two distinct trained networks. The first model uses a single LSTM layer, whereas the second model uses two LSTM layers and a drop-out layer to get better results.

Algorithm for Model 1

1. Get the dataset of health care
2. Select the features in order to train the dataset
3. Set the ratio of training to 70% and testing to 30%.
4. Apply LSTM layer
5. Apply fully connected layer
6. Apply softmax layer
7. Perform classification
8. Perform decision making for classification.

The data flow diagram as shown in figure 4.4 for the present work uses two types of boxes. The rectangular boxes are used to describe the actual datasets including health care center dataset & frequency dataset which is obtained after the map reduce process. The elliptical boxes are used to describe the processes involved in the original data flow. There are various processes involved in the above shown data flow diagram. Firstly two parallel processes are there to get the keywords and queries respectively from the health care center dataset. The

map reduce process is then applied on the obtained keywords and queries in order to obtain the frequency. The get frequency process is used to draw the frequency of the keywords and queries after the map reduce process. The frequency data set is used to store the obtained frequency. After that clustering mechanism is followed to make the clusters.

Dataset

These are the centralized location where information regarding cure and cause is stored in unstructured format. The centralized dataset holds the whole information about the disease and their symptoms, the deficiency of which factor causing that disease, but all this information is stored in unstructured manner.

Queries

Query is the portion of dataset where the views of patient and doctors are considered. When dealing with an unstructured dataset, the map-reduce algorithm is used to determine the frequency of a certain keyword in a query.

Keywords

These are the frequently used words that have been used in dataset. In the present research work the various disease like weakness, ugliness, Constipation, chills, backache, dizziness, fever, muscle pain, fainting etc. and the deficient nutrient such as calcium, iodine, zinc, copper, selenium are considered as keywords

Map Reduce

Mechanism is to obtain keyword frequency in the dataset. Map Reduce programmes may run large datasets. It is done using low-cost computers called clusters. In general, individual systems are characterized as nodes in a cluster. Map Reduce covers the two major phases of computing. It was applied sequentially to large quantities of data.

Enhanced K Mean Clustering

K mean is simplest unmonitored learning methods to tackle famous issue of clustering. Method follows straightforward & quick approach to classify certain data collection. It is done via a no. of clusters which assume k clusters with a fixed apriority. Main key is k centres to specify. These centres must be positioned in an intelligent way. There are various places where the results are varied. Therefore, it is preferable to distance them from one other. Another stage is to examine each item that is part of a certain data collection. Then the closest centre is linked. If there is no point left outstanding, the first stage is finished. This is the method to get early group age. At this time k new centroids must be re-calculated as a baricenter of clusters arising from traditional stage. Once new bond must be made b/w similar data sets & closest new centre. There is a loop formed. Due to this loop it may be seen that k centres progressively change their position. It will be done until changes are made or, in other words, centres no longer move.

Optimization

In order to take decision there is need of optimized data that has been retrieved from K mean clustering module. Prescription logic is used on clustered data, which is the important information gleaned from the whole dataset, to arrive at a choice.

[5] RESULT AND DISCUSSION

The proposed work has been found significant for the processing of the big data. The proposed work has categorized the contents in order to increase the performance. The content retrieval has been found fast as compare to traditional work. The MATLAB simulation represents that the keywords have been clustered according to their frequency. In this way it is clear to the system, how much content are available corresponding to particular keyword. The symptoms have been mapped to the nutrition keywords. These nutrition keywords are mapped to the source and description. The MATLAB simulation also represented the dynamic curve that is showing the performance comparison of traditional & current work. Map reduce mechanism has played significant role in extracting the contents frequency from the given dataset. Proposed work has provided more efficient, accurate and high performance solution.

The most popular method of grouping data is to break it down into smaller groups that are more closely linked. Data may be clustered before running a learning algorithm, or it can be used as a statistical tool to identify interesting patterns in the data. The clustering technique is used in a range of applications, such as market research, customer segmentation, biomedical imaging, search result clustering, recommendation engines and pattern recognition, as well as image processing. Clustering is a typical strategy used by retail firms to identify similar groups of families.

1. Partitioning-Based Clustering

Data is divided into k clusters by partitioning the objects, with each partition forming/representing a single cluster. Each cluster comprises at least one data item, and each data object must be allocated to a single cluster.

2. Hierarchical-Based Clustering

Clusters with a tree-like structure are produced applying these clustering techniques depending on the hierarchical structure of the data.

3. Density-Based Clustering

These clustering algorithms discover dense regions with some similarity and separate them from the less dense portions of the space they are compared to. The accuracy and combinatorial power of these technologies make it possible to integrate two clusters.

4. Grid-Based Clustering

To create a grid structure, data is grouped into a limited number of cells using a manner that resembles a grid. Fast and non-dependent on the quantity of data items at any one moment make these grids ideal for clustering operations.

5. Model-Based Clustering

According to these methods, a mathematical model is used to fit and then optimise the data. Conventional statistics is then used to determine how many groups there are.

The Comparative chart of cluster size has been shown in figure 6 that has been simulated using MATLAB. After getting the frequency of cluster 1, cluster 2, cluster the data is graphically simulated using MATLAB script. AS shown in following figure the x coordinate is representing the cluster. The y axis is representing the maximum frequency of keyword in corresponding cluster. Research has provided more flexible, scalable and efficient solution.

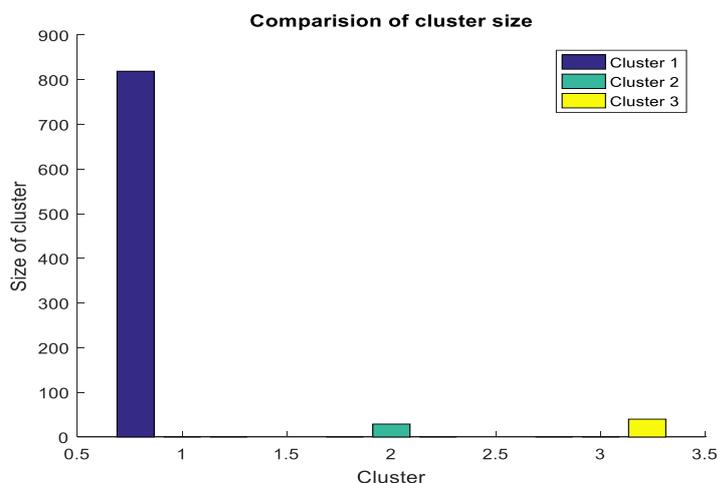


Fig 5; Evaluation chart for clusters size

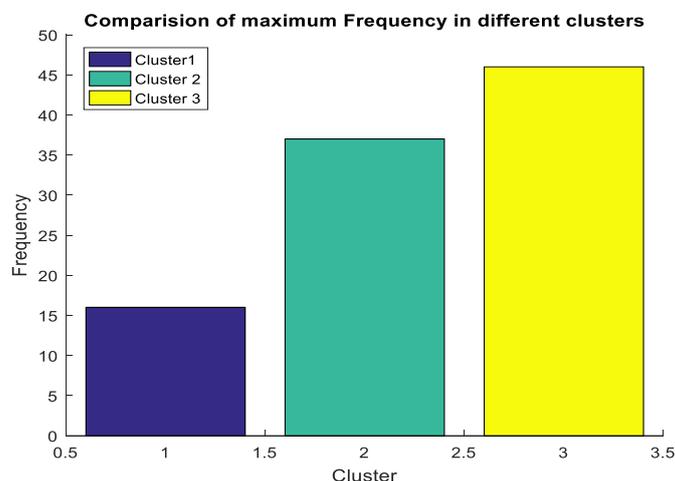


Fig 6: Evaluation chart for maximum frequency

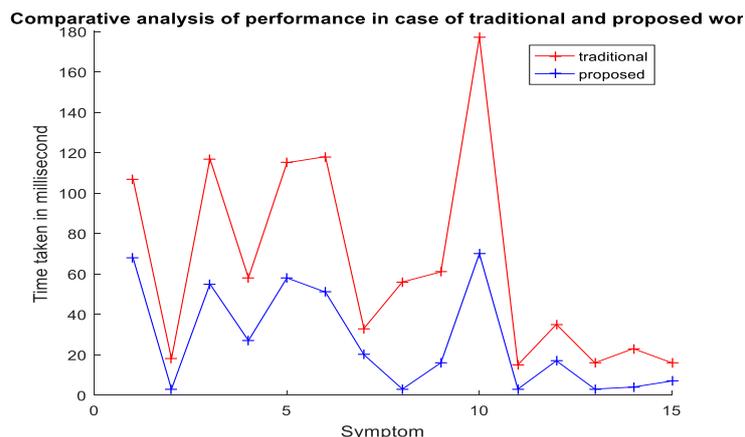


Fig 7: Evaluation chart for time taken

Figure 7 shows, variation between times required to set particular nutrition by traditional model is always more in case of 15 symptoms considered. Graph compares time difference of both the models. Red train is time taken in milliseconds by traditional work and blue train for time taken by proposed model. The graph concludes that time required by proposed model is much lesser than the old model. The proposed work has been proven useful for its system. Concept of this system is better as compare to medicine prescription system as the diagnose causes no side effects. The key concepts such as dealing with unstructured data, use of map reduce, kmean clustering, performance comparison between tradition and proposed work has made the research more effective.

Simulation of Classification

The training process of proposed model is shown below. Here the dataset has been trained using LSTM in order to classify considering trained set. The validation accuracy is 89.73% in this case. The accuracy is influenced by LSTM layer, dataset, number of hidden layers and batch size.

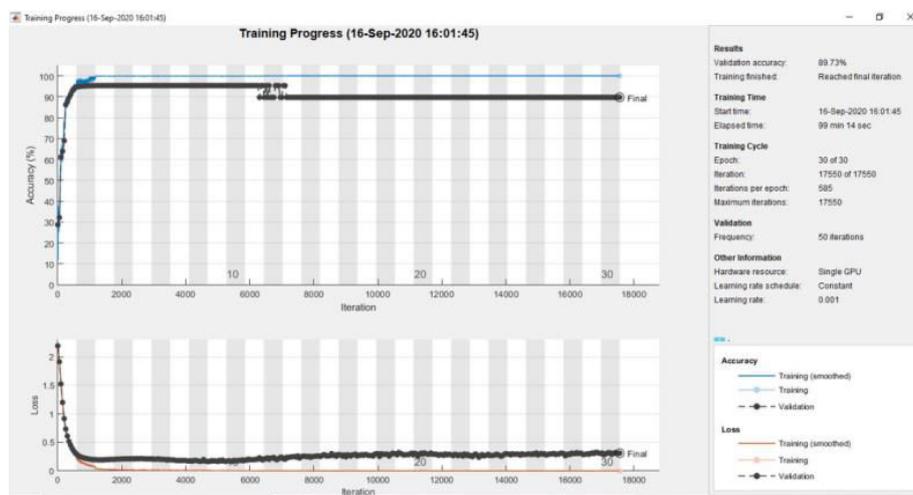


Fig 8: Proposed Training implementation

During testing operation when data is passed to test the accuracy of trained network then following confusion matrix appears. This confusion matrix would play significant role in finding the overall accuracy, precision, Fscore, recall value.

4.6 Confusion Matrix

This is used to derive results where Accuracy shows the degree about correctness of results. Recall measures the sensitivity or completeness of a classifier. Precision calculate the exactness of measurements. F1-score is measure of test's accuracy.

TP: aTrue apositive

TN: aTrue aNegative

FP: aFalse apositive

FN: aFalse aNegative i

Accuracy $a = \frac{a(TP + iTN)}{a(TP + aTN + iFP + iFN)}$

Precision $= \frac{TP}{TP + FP}$

Recall $a = \frac{TP}{TP + FN}$

F-Measure $a = \frac{2 \cdot a \cdot iPrecision \cdot a \cdot iRecall}{a(Precision + iRecall)}$

Confusion Matrix of Previous Work

4059		49	21	29	1489	13	0	14
	3150	102	41	20	33	24		
		4801		189	210	7		
			3598	107	1339	189	25	
				7909	3451	51	0	81
143	62	0	12	50	17008		14	
	49	25	20	51		3601		
				13	90		1998	
104		36						4878

The prior work's calculated chart is provided here. 86.22 percent of the results are correct.

TP: 51002

Class	n (truth)	n (classified)	Accuracy	Precision	Recall	F1 Score
1	4306	5674	96.85%	0.72	0.94	0.81
2	3261	3370	99.44%	0.93	0.97	0.95
3	5013	5207	98.96%	0.92	0.96	0.94
4	3692	5258	97.03%	0.68	0.97	0.80
5	8368	11492	93.17%	0.69	0.95	0.80
6	23620	17289	88.35%	0.98	0.72	0.83
7	3885	3746	99.27%	0.96	0.93	0.94
8	2037	2101	99.76%	0.95	0.98	0.97
9	4973	5018	99.6%	0.97	0.98	0.98

Confusion Matrix of Proposed Work

4246					1428			
	3370							
		5177		30				
			3925		1333			
				8087	3405			
			1		17288			
8				12		3744		
							2101	
								5018

Calculated chart on above this matrix of proposed work is shown. Overall accuracy is 89.51%.

TP: 52956

Class	n (truth)	n (classified)	Accuracy	Precision	Recall	F1 Score
1	4246	5674	97.59%	0.75	1.0	0.86
2	3370	3370	100%	1.0	1.0	1.0
3	5177	5207	99.95%	0.99	1.0	1.0
4	3926	5258	97.75%	0.75	1.0	0.85
5	8129	11492	94.17%	0.70	0.99	0.82
6	23454	17289	89.58%	1.0	0.74	0.85
7	3744	3756	99.98%	1.0	1.0	1.0
8	2101	2101	100%	1.0	1.0	1.0
9	5018	5018	100%	1.0	1.0	1.0

Comparison of Overall Accuracy

Previous model	Proposed Model
86.22%	89.51%

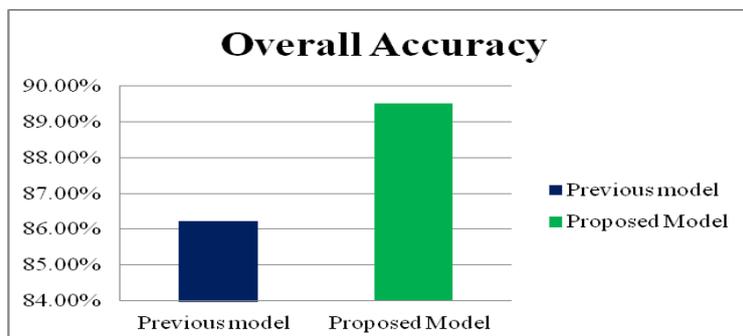


Fig 9: Comparison of overall accuracy

Figure 9 is presenting the comparison of overall Accuracy of previous work and proposed work.

Comparison of traditional work with current model is shown considering accuracy, precision, recall and f1-score value.

1. Accuracy

Previous model	Proposed Model
96.94%	97.67%

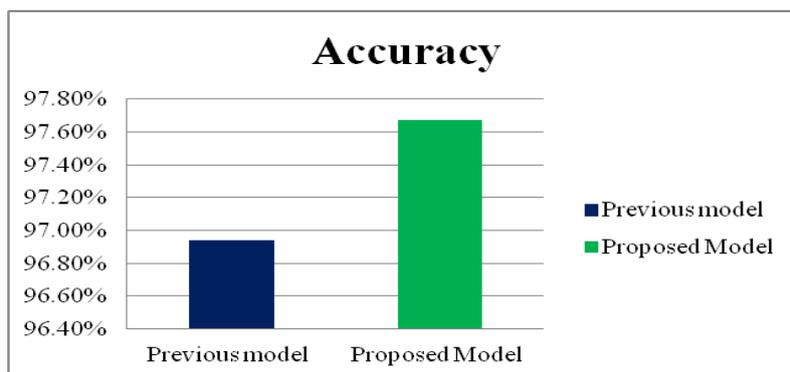


Fig 10 Comparison of Average of Accuracy

Figure 10 is presenting the comparison of average of Accuracy of previous work and proposed work.

2. Precision

Previous model	Proposed Model
0.87	0.91

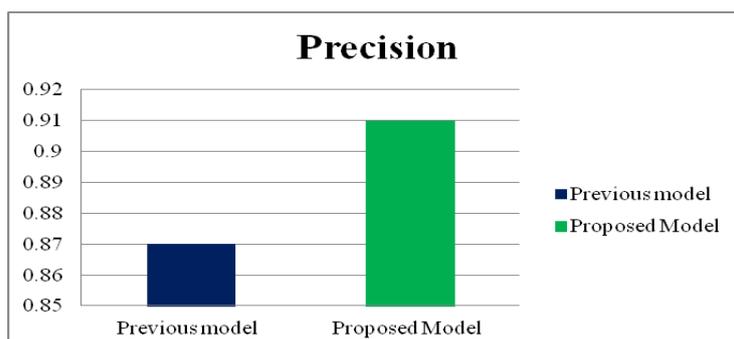


Fig 11: Comparison of Average of Precision

Figure 11 is presenting the comparison of average of Precision of previous work and proposed work.

3. Recall Value

Previous model	Proposed Model
0.93	0.97

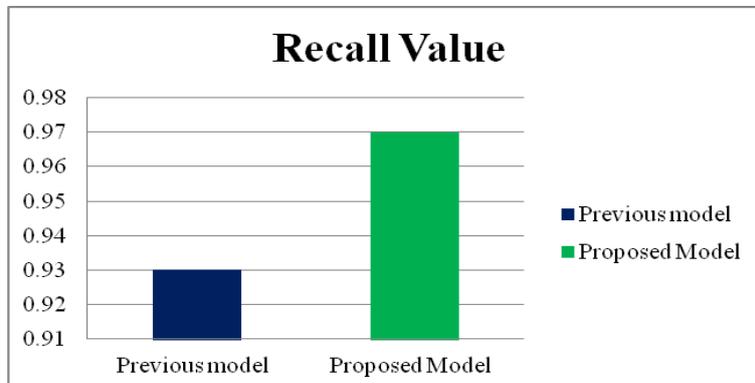


Fig 12: Comparison of Average of Recall Value

Figure 12 is presenting the comparison of average of Recall Value of previous work and proposed work.

4. F1 Score

Previous model	Proposed Model
0.89	0.93

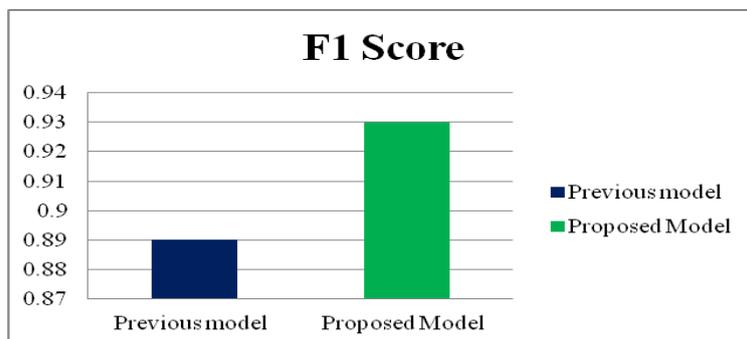


Fig 13: Comparison of Average of F1 Score

Figure 13 is presenting the comparison of average of F1-score of previous work and proposed work.

[6] CONCLUSION

The management of big data at health care center is done through the proper clustering mechanism. It has been concluded that after clustering of complete unstructured healthcare dataset. The material has been broken down into tiny databases and the patient inquiries have been simulated in real time. The amount of time it takes to get a prescription has also dropped. Checking the file size of each cluster yielded the cluster's size. Cluster 1 has a higher keyword density than clusters 2 and 3, according to the most recent analysis. MATLAB has been used to simulate a cluster size comparison chart. MATLAB script is used to create a graphical representation of the data once the frequency of clusters 1, 2, and 3 has been calculated. X coordinate is representing cluster. The y axis is representing the maximum frequency of keyword in corresponding cluster. Research has provided more flexible, scalable and efficient solution.

[7] FUTURE SCOPE

Health care centers consist of huge data sets. Therefore it is necessary to classify this data using best clustering mechanisms. In the proposed research, sets of big data have been stored on a centralized server. After that, the data has been shared between multiple clients. Map Reduce technique is capable to be used for faster data access. It would be helpful for patients from different locations. In order to use this method, patients will be able to connect to a particular and specialised health care facility. In this way they can attain the better services as

per the requirement. As there are the facilities of backup in such system, there would be secure access for patient. In future the keywords and contents length might increase.

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Organic Food Perception: Buying Behaviour of Indian Customers Leading to Sustainable Consumption

Neha Sharma¹ and Sunil Saxena²

¹SNDT University, Mumbai, India

²GNVS Institute of Management, Mumbai, India

ABSTRACT

"The body enjoys health when the stomach is well filled". The purpose of the research is to identify various constructs influencing the behavior intention towards organic food in Mumbai region. Data has been collected from 260 Respondents of Mumbai region and Structural equation model using AMOS was applied to evaluate the significant constructs. It is seen that Subjective norms, Health conscious, Environmental concern, Perceived Behaviour control & Attitude has significant impact on behavioral intention towards organic products. Further studies can be made incorporating moderator & mediator construct in the model.

Keywords: Organic food, TPB, SEM.

INTRODUCTION

The consumption of organic foods is widely spread around the world and most of the customer has changed their intension towards organic foods because of their health and environment friendly nature. Organic foods nothing but a method were the farming are done in compliance with standards of farming so that it can promote sustainability and balance can be maintain between environment and human health. It is produced by natural farming practice and system has been setup without use of any fertilizers and colored chemicals but regulation varies from country to country. The word Organic itself implies that it is free from all chemicals and color additives.

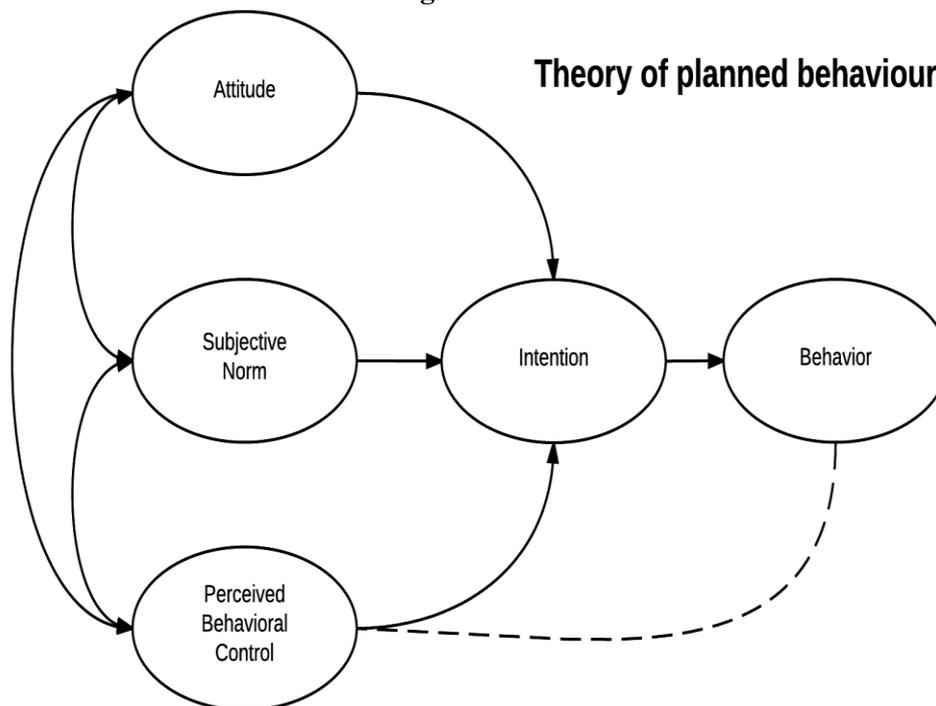
In India organic farming is in introduction stage, means it came in to existence but it alone has future potential. Around 2.7 million lands in India are under organic farming as of 2020 and it accommodates around thirty percent of total organic production in world. The consumption of organic food is increasing day by day due to change in climate and education level about organic food. The supply of organic food in India is limited due to low demand thus price become essential barrier for purchasing particular products. Thus the price makers should focus on prices so as to penetrate the organic food in Market. Organic foods belong to FMCG Industry which is moving fast and they are considered as revolutionary changes in industry as customers are moving towards healthy and dietetics products.

It is fastest growing food industry according to US report as it has conclusive linkage with health. Certain **reasons which influence** buying pattern of customers are rich taste, free form preservatives, freshness of products and care towards environment. Thus it shows increasing trends in consumption of organic products. The gap between demand and supply of organic foods needs to be thoroughly investigated so that market can flourish as India has a capacity to deliver such organic foods when it comes to cultivation methods. According to report customers are divided in to three segments namely "Forwards", "Followers" and "Neutrals". Around three four of crowd follow forwards and followers which show that population have less interest in health and other products.

The **attitude** among customer is changing as environment around them is changing as organic foods are mostly acknowledged with taste and quality. The appearance and smell of products attract the customers most which can change the **buying pattern** irrespective of price factor. Understanding customer Behaviour is essential so that consumption and buying both works simultaneously hand to hand. Customer Behaviour is considered as dependent variable and consumption, buying pattern are nondependent variable.

To understand customer Behaviour and intension "**The theory of planned Behaviour**" can be used. It is a model that helps to determine the Behavioural changes that customer undergoes for each and every product. There are three facets namely "Attitude"(approve or disapprove the product), "Subjective norms"(friends and family pressure) and Perceived Behaviour control" (resources and barriers). It is use to forecast person intension and Behaviour at specific time. Others determinants includes health and environment understanding, availability and requirement. Thus if there is high perceivedness among customer there will be strong intension to purchase that product. In addition to theory of planned Behaviour two new construct environmental concern (basha et al. 2018) and health conscious (testa et al 2018) have been incorporated in the current study.

Figure 1: TPA



The modern customer is much more educated than earlier generation and they understand the importance of health and environment awareness has increased the interest of customer towards organic foods. The factors that influence **consumption** of organic food are pricing decision, knowledge source, health benefits; the benefit provided by organic foods should be high so as to match the price they incurred to pay. Thus it is essential to keep a track of buying Behaviour with the help of feedback to ascertain sustainable consumption in future.

REVIEW OF LITERATURE

The researcher has undertaken various reviews

Cristina Fleseriu et al (2020) has made a study towards values and Behaviour towards customer who prefer natural and organic foods. The study was made because the buying pattern has influence the Romanian customers, however the study restricted to Roman culture and environment. Data collected from customer and concept model were framed to assess the pattern it include determinants such as environment, social norms, foodsecurity, quality, lifestyle and health. The findings reveal that health determinants have positive effect on buying pattern and buying attitude towards purchasing particular products.

Eluiza Alberto de Moraes Watanabe et al (2019) has made a study on trust and intension of purchasing organic foods. The paper attempt to widen the relation between trust and intension among organic foods. Data collected from two hundred and seventy four customers who can be measured in to four aspects namely function, social, economic and emotions however, the study is limited to Brazilian customers and their environment culture. The findings reveal that function and emotions are strongly associated with trust and only emotion aspects relates with intension. Thus results helps to understand the Brazilian market into depth with other dimensions also.

Elizabeth A Minton et al (2018) has made study on reliable norms towards consumption pattern. Certain research has been conducted earlier to explore consumption level and sustainability Behaviour. The research conducted with two elements such as self-enhancing and standard Behaviour. The findings reveal that there are many differences in consumption level and help to maintain relation Behaviour and customer attitude. Market structure also defines consumption and Behaviour which is positively related to ethnicities.

Haroon Qasim et al (2019) has made a study on environment and its consumption pattern towards organic food. The study aims at essential customer Behaviour and theory of consumption values. The study however, restricted to Lahore state. Data collected from four hundred and six customers to understand the consumption pattern. The findings reveal that function, emotion and quality has positive relation with customers. The manufacturer should focus on quality of food as well as environment so as to preserve future generations and create awareness about organic food consumption.

Mansiha Anantharaman (2018) has made a study towards sustainable consumption. The study was made as it increase center focus on each and every individual Behaviour. The recent focus links with social system and eating Behaviour of organic foods. The consumption link with environment and middle class Behaviour, attitude and social interactions. Along with buying Behaviour it enable to explore relation with attitude and perception which is reflected in every social dimension.

Nayana Sharma et al (2018) has made a study towards customer perception and their Behaviour towards natural foods. The study was made since consumption practice was increasing more and changing according to Behaviour. The objective is to provide ground level aspects towards organic foods. Data collected from earlier literature with respect to Indian scenario. The findings reveal that attitude and customer perception differ from person to person as well as age, major influence by advertisement and marketing, nutrition attributes and environment well-being.

Techane Bosona et al (2018) has made a study towards perception towards quality of foods and their sustainability towards consumption. The consumption of natural foods is being increasing as it is locally produced in Sweden. Data collected from hundred Sweden customers to understand the customer perception and quality of food. The findings reveal that women customers has more positive attitude than men towards natural foods, income and family size do not have any relation with food and consumption.

Yogendra Singh kataria et al (2019) has made a study towards customer Behaviour about natural and organic products. The study was made with the help of "Planned Behavior Theory". The study shows that accessibility and availability are important aspects which convert planned purchase towards actual purchase. The study however restricted to Delhi state with two hundred and eight respondents. The findings reveal that subjective norms i.e. society, friends and family pressure has positive relation with buying pattern. Thus with help of pure advertisement it can be promoted to next well which will influence purchasing intension towards organic foods.

OBJECTIVES OF STUDY

1. To evaluate construct influencing behavioral intension towards organic food
2. To give appropriate suggestions to convert non users of organic food into users of organic food.

HYPOTHESIS OF THE STUDY

Null: Environmental concern, health consciousness, perceived behavioral control, subjective norms and attitude has no significant influence on behavioral intention towards organic food.

Alternative: Environmental concern, health consciousness, perceived behavioral control, subjective norms and attitude has significant influence on behavioral intention towards organic food.

MATERIAL AND METHODS

The current study is based on Descriptive research design. Both the primary & secondary data has been collected for the current research .sample size for the current study is 260 (as per Soper, D.S. (2022).at 0.3 effect size, 0.8 statistical power, 6 latent variables, 22 observed variables and probability value 0.05 the minimum required sample size = 161).Non probability purposive sampling (respondents who had purchased organic product at least twice have been selected).Tool used for the current research is AMOS & technique used is SEM.

Figure 2: SEM

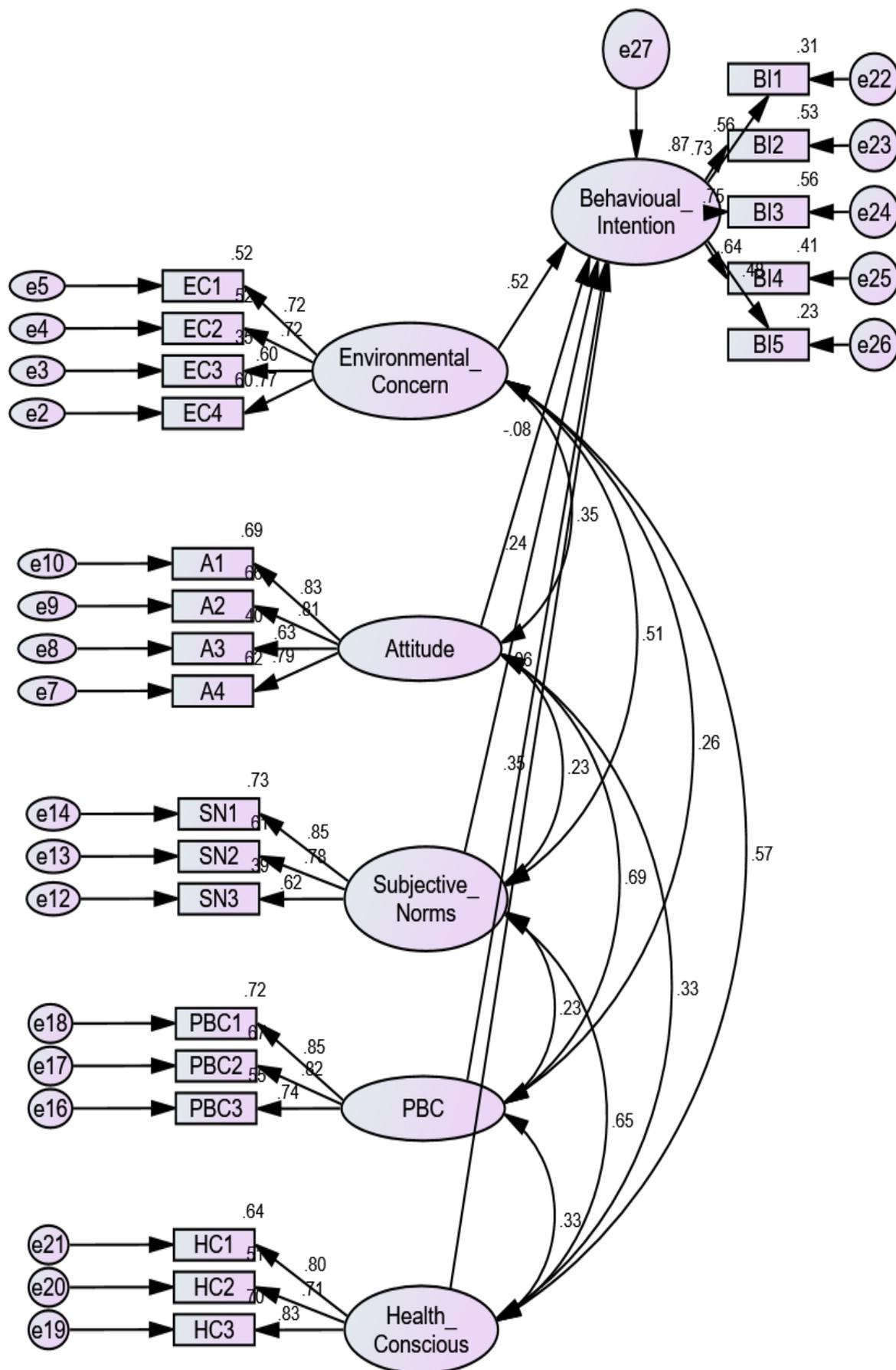


Table 1: model Fit Indices

GOODNESS OF FIT MODEL	RECOMMENDED VALUE	MODEL
CMIN / DF	< 3	2.015
GFI	> 0.8	.870
NFI	> 0.8	.849
TLI	> 0.9	.849
CFI	> 0.9	.916
RMSEA	> 0.08	0.067

As per Table no- 1 all the figures of the default model are adhering with the suggested values as per hair et al. (2010) thus it can be indicated that there is a goodness of fit.

Table 2: Reliability and convergent validity

Construct	Composite reliability	Average variance extracted	Cronbach's alpha
PBC	0.747	0.512	0.733
Environmental Concern	0.800	0.557	0.719
Attitude	0.773	0.502	0.796
Subjective Norms	0.738	0.522	0.812
Health Conscious	0.781	0.504	0.854

As per table no- 2 all the values of Cronbach's Alpha >0.7 indicating adequate reliability .Also Composite reliability >0.7 and AVE>0.5 thus it can be said that items are perfectly representing its construct and their exist a **convergent validity**.

Table 3: Discriminant Validity

	PBC	Environmental Concern	Attitude	Subjective Norms	Health Conscious
PBC	0.697				
Environmental Concern	0.261	0.671			
Attitude	0.691	0.354	0.690		
Subjective Norms	0.234	0.514	0.229	0.668	
Health Conscious	0.332	0.567	0.328	0.652	0.701

As per Table no- 3 Fornell- Larcker criteria as the Square root of AVE > Correlation with other construct indicating **Discriminant validity**.

Table 4: Hypotheses Testing

Hypothesis testing	t – value	p – value	Result
PBC → BI	5.408	***	Significant
Environmental Concern → BI	4.213	***	Significant
Attitude → BI	2.918	.004	Significant
Subjective Norms → BI	3.541	***	Significant
Health Conscious → BI	3.794	***	Significant

As per Table no- 4 it can be seen that, environmental concern, health conscious, subjective norms, PBC and attitude towards organic food significantly influence the behavioral intention as the p (value) < 0.05 and t -value > 1.96

CONCLUSION

The current study revealed the significant construct influencing the buying Behaviour of customers towards organic food are environmental concern, health conscious, subjective norms, PBC and attitude. Thus marketer of organic product must create the awareness of various health benefits of consumption of organic food & side effects of unorganic products. Government must take initiatives to promote organic products. Mouth publicity & reviews by the consumers of organic products will also play a crucial role in attracting the new customers. Health experts can also play a vital role in promoting the organic food to their patients. Advertisement of advantages of organic food by yoga experts can also convert the non-users into users of organic food. It is also seen that respondents having environmental concern prefers Organic food thus Ministry must take appropriate measure by creating Awareness towards conservation of environment.

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A Critical Analysis on the Features of Taila Bindu Pareeksha in Rheumatic Heart Disease Patients And Its Correlation With Severity Grading Of Rheumatic Heart Disease

Deeksha Rana

Department of Vikriti Vigyan, Faculty of Ayurveda, IMS, BHU, Varanasi, U.P. India

ABSTRACT

Rheumatic Heart Disease (RHD), is a critical heart condition, continues unabated among middle-income and low-income countries and in some communities of the industrialized world. It results from one or several episodes of Rheumatic Fever, an inflammatory disease caused by a bacterium named Beta hemolytic Group -A Streptococcus. Permanent damage to the heart valves (particularly Mitral and Aortic valves) is the main characteristic of RHD. Rheumatic Heart Disease is the only long-term consequence of Acute Rheumatic Fever (ARF). Prognostic Judgement is an essential element of medical practice. Predicting the course of disease and determining treatment and outcomes accordingly is the key of treatment. From ancient time predicting prognosis has always been a big challenge to the medical professionals. Taila Bindu Pareeksha is an acquiescence for all these challenges. Prognosis of Rheumatic Heart Disease (RHD) is very exigent and is not evident clearly till now while on the other side, the physician /surgeon along with patients always want to have access to accurate prognostic information. In our study we have tried to give the clear idea of Prognosis of Rheumatic Heart Disease in terms of Good, Bad, Worse and Worst outcomes with the help of Taila Bindu Pareeksha. It is evident from our study that severity grading of Rheumatic Heart Disease is congruent with the prognostic features of Taila Bindu Pareeksha.

Keywords: Acute Rheumatic Fever (ARF), Rheumatic Heart Disease (RHD), Taila Bindu Pareeksha

INTRODUCTION

Rheumatic Heart Disease is a preventable but life-threatening cardiopathy that is still endemic among vulnerable groups in many countries. A minimum of 15 million people are estimated to be tormented by RHD worldwide. After a period of relative neglect, there has been a resurging interest in RHD worldwide over the past decade. RHD is characterized principally by deforming fibrotic valvular disease (particularly mitral and aortic stenosis) producing permanent dysfunction and severe, sometimes fatal, cardiac failure decades later. Rheumatic Heart Disease (RHD), the sole long-term consequence of Acute Rheumatic Fever (ARF), continues unabated among middle-income and low-income countries and in some communities of the industrialized world. The American Heart Association (AHA) has well-established clinical diagnostic criteria for Acute Rheumatic Fever (ARF)-the Jones criteria. No such widely accepted criteria exist for RHD. Traditionally, RHD was diagnosed by auscultating for a cardiac murmur in those with a history of ARF. Until the past decade, the stethoscope was the only non-invasive diagnostic tool available to physicians. But presently Echocardiography has proven to be more sensitive and specific than auscultation. The 2012 World Heart Federation (WHF) criteria for echocardiographic diagnosis of RHD is in main use. There is no cure to RHD and the damage to heart valves is permanent and it gives a need to know the exact prognosis of RHD. The information available in literature is sufficient to yield a general outline of prognosis, but statistically it is far away from accurate. Because of that predicting the fate of RHD has always been a big challenge to the medical profession.

Ayurveda is very much scientific in terms of understanding the span of life, strength of person, probable cause and strength of the disease. Ayurvedic tool for assessing the current health of a patient and status of disease provides a basis for prognosis. *Taila Bindu Pareeksha* is one of these prognostic tools of Ayurveda, in which, the patient's first morning urine sample is to be collected for examination. It is a novel method of urine examination to ascertain severity of the disease and thereby assessing the fate of disease. In this technique, a small drop of sesame oil is placed on the surface of urine and feature of the drop (Velocity of spread, Direction of spread, and shape after complete spread) was observed. If shape is circular/oval or semicircular it indicates healthy status of the person or a good prognosis. Irregular or Dot shape indicates bad and worst prognosis.

MATERIALS AND METHODS

The present study, was carried out in the Department of Vikriti Vigyan, Department of Cardio Thoracic & Vascular Surgery (CTVS) and Department of Cardiology, Sir Sunder Lal Hospital, IMS, BHU. The cases were registered from January 2021 to March, 2022. The above study was approved by the Institutional Ethical Committee vide letter No. Dean/2020/EC/2062 dated 15.07.2020 and registered in Clinical Trial Registry- India

vide Registration number: CTRI/2021/01/030174. All the newly diagnosed cases of RHD as per the WHF Criteria irrespective of age and sex during the study period of 14 months, which fulfill the inclusive and exclusive criteria, providing the written consent were selected. Total 60 patients of RHD were selected for the study.

METHOD FOLLOWED

- Taila Bindu Pareeksha of urine was done to ascertain the features in patients described in the text and was performed as per standard method developed by the Department.
- Assessment of severity of Rheumatic Heart Disease was ascertained by using the “Severity Grading of Rheumatic Heart Disease” according to Rheumatic Heart Disease (RHD) Notification form for clinicians, generated by Queensland Government (Australia) mentioned in “The 2020 Australian guideline for prevention, diagnosis and management of Acute Rheumatic Fever and Rheumatic Heart Disease.

Severe RHD	Severe Regurgitation or Severe Stenosis of any Valve or Combined Moderate regurgitation and/or moderate stenosis of one or more valve or Past or impending valve repair or prosthetic valve replacement.
Moderate RHD	Moderate regurgitation or moderate stenosis of a single valve Or Combined mild regurgitation and/or mild stenosis of one or more valve.
Mild RHD	Mild regurgitation or mild stenosis of single valve ,or atrioventricular conduction abnormality on ECG during ARF episodes.

METHODOLOGY

- Detailed history along with complete physical examination of the patients was done
- **Collection of Urine:**-The patients were advised not to drink water after 10 pm and to have good sleep and then to collect the midstream of first morning urine sample in a wide mouth plastic container provided to them. Then the container was tightly capped to avoid contamination and leaking during transport. The RHD patients who were on catheter were advised to empty the bag at 12 AM and the urine was collected at 6 AM. The urine was subjected to *Taila Bindu Pareeksha* at one and half hour of collection as per the standardized method i.e 90 minutes after collection.

Procedure of Taila Bindu Pareeksha: - $\frac{3}{4}$ of the Petri dish was filled with the urine. When the urine surface becomes calm, 12 microliter oil drop was put on the center of that surface of urine through a micropipette. The spreading pattern, direction of spread, spread time and split time were recorded.

Statistical Analysis: Statistical analyses were performed using the SPSS statistical software. Friedman Chi-Square Test has been applied to test the significance of difference between different grades of RHD for intragroup comparison.

OBSERVATION AND RESULTS

1. AGE

Patients selected for the study were in the range of 11-70 yrs. Out of 60 RHD patients, the maximum frequency was found in age group of 21-30 years i.e 33.3% , followed by age group of 31- 40 and 41-50 years i.e 20.0% each.(Table no 1)

Table 1

Age	No. of cases	Percentage
11-20	09	15.0%
21-30	20	33.3%
31-40	12	20.0%
41-50	12	20.0%
51-60	06	10.0%
61-70	01	1.7%
Total	60	100.0%

2. GENDER

It was observed in the study that out of the 60 cases, 37 patients i.e 61.7% were females and 23 patients i.e 38.3% were males. So in our study overall frequency of Female patients was more than Male. (Table 2)

Table 2

Sex	No. of cases	Percentage
Female	37	61.7%
Male	23	38.3%
Total	60	100.0%

3. Severity Grading in Rheumatic Heart Disease Patients: Out of 60 patients of RHD, only 06 patients were having Mild, 16 were having Moderate and 38 patients were having Severe Grading. (Table no 3)

Table 3

Severity grading	No of cases	Percentage
Mild	06	10%
Moderate	16	26.7%
Severe	38	63.3%
Total	60	100.0%

4. Severity Grading of Rheumatic Heart Disease With Surface Tension of Urine : Out of 60 patients of RHD maximum number of cases i.e 30 patients were having surface tension between 55-46 m N/m followed by 17 cases having surface tension 45-36 mN/m. Out of six mild grade RHD, 50% of cases were having surface tension between 55- 46mN/m. In 16 moderate cases of RHD, 43% of cases were having surface tension between 55- 46mN/m. Similarly, out of 38 severe grade of RHD 52.6% cases were having surface tension between 55-46mN/m. (Table no 4)

Table 4

Surface tension (mN/m)	Severity						Total	
	Mild		Moderate		Severe		Total No of cases	Percentage
	No of cases	Percentage	No of cases	Percentage	No of cases	Percentage		
>65	1	16.7%	0	0.0%	0	0.0%	1	1.7%
65- 56	2	33.3%	6	37.5%	3	7.9%	11	18.3%
55- 46	3	50.0%	7	43.8%	20	52.6%	30	50.0%
45- 36	0	0.0%	2	12.5%	15	39.5%	17	28.3%
< 35	0	0.0%	1	6.2%	0	0.0%	01	1.7%
TOTAL	6	100.0%	16	100.0%	38	100.0%	60	100.0%

On applying Chi Square Test on Rheumatic Heart Disease severity grading with Surface tension, value came is 22.909, p value is 0.003, which is significant statistically (p < 0.05).

5. Severity Grading of Rheumatic Heart Disease with Specific Gravity of Urine: Out of 60 patients of RHD, maximum no of cases i.e 40 patients were having Specific gravity <1.030. Only 20 patients were having specific gravity >1.030. Out of those 40 cases, 5 cases were having Mild RHD, 12 cases of Moderate RHD and 23 cases were having Severe RHD. Similarly out of 20 cases having Specific gravity >1.030, 1 case was having Mild grade RHD, 4 cases Moderate and 15 cases were having Severe RHD. (Table 5)

Table 5

Specific gravity	Severity						Total	
	Mild		Moderate		Severe		No of cases	Percentage
	No of cases	Percentage	No of cases	Percentage	No of cases	Percentage		
<1.030	5	83.3%	12	75.0%	23	60.5%	40	66.7%
>1.030	1	16.7%	4	25.0%	15	39.5%	20	33.3%
TOTAL	6	100.0%	16	100.0%	38	100.0%	60	100.0%

On applying Chi Square Test on Rheumatic Heart Disease severity grading with Specific gravity of urine, value came is 1.895, p value is 0.388, which is not significant statistically. (P > 0.05)

6. Severity Grading of Rheumatic Heart Disease with ASO Titres of the Patients: Due to technical constraints, the ASO Titres could not be done in two patients. Out of 58 cases, 33 patients were having ASO Titres upto 200 IU/ml and 25 patients were having ASO titres > 200 IU/ml. Out of 33 cases having ASO titres upto 200 IU/ml, 4 cases were having Mild, 12 cases were having Moderate and 17 cases were having Severe

grade RHD . Out of 25 cases having ASO titres > 200 IU/ml , one case was having Mild, 04 cases were having Moderate and 20 cases were having Severe grade RHD.(Table 6)

Table 6

ASO Titres (IU/ml)	Severity						Total	
	Mild		Moderate		Severe			
	No of cases	Percentage						
Upto 200	4	80.0%	12	75.0%	17	45.9%	33	56.9%
>200	1	20.0%	04	25.0%	20	54.1%	25	43.1%
TOTAL	5	100.0%	16	100.0%	37	100.0%	58	100.0%

On applying Chi Square Test on Rheumatic Heart Disease patients with ASO Titres the value came is 5.036, p value is .081 ,which is not significant statistically.(p>0.05)

7. Severity grading of Rheumatic Heart Disease with Shape of oil drop in Taila Bindu Pareeksha : Out of 60 RHD patients, 34 patients were having Circular shape of oil, 12 patients were having Irregular and 14 patients were having DOT shape i.e did not spread at all.All the 6 cases of mild grade RHD were having Circular Shape of oil in *Taila Bindu Pareeksha*.Out of 16 cases of Moderate RHD 68.8% were having Circular Shape, while 31.2% were having Irregular Shape of oil in *Taila Bindu Pareeksha*. Similarly out of 38 cases of Severe RHD, 44,7% were having Circular Shape, 36.8% were having DOT, 18.4% were having Irregular shape of oil in *Taila Bindu Pareeksha*. (Table 7)

Table 7

Shape of oil drop	Severity						Total	
	Mild		Moderate		Severe			
	No of cases	Percentage						
Circular	6	100.0%	11	68.8%	17	44.7%	34	56.7%
Irregular	0	0.0%	5	31.2%	07	18.4%	12	20.0%
Dot (No spread)	0	0.0%	0	0.0%	14	36.8%	14	23.3%
TOTAL	6	100.0%	16	100.0%	38	100.0%	60	100.0%

On applying Chi Square Test on Rheumatic Heart Disease severity grading with Shape of oil after spread in Rheumatic Heart Disease patients value came is 13.720, p value is 0.008 ,which is significant statistically.(p<0.05)

8. Severity Grading of Rheumatic Heart Disease with Direction of Spread of Oil in Taila Bindu Pareeksha: Out of 60 RHD Patients, 34 patients were having Uniform Direction of spread, 12 patients were having Non uniform and 14 patients were having no spread to any direction.Out of 6 mild grade RHD all cases were having Uniform Direction of Spread in *Taila Bindu Pareeksha*. Out of 16 moderate grade RHD 68.8% of cases were having Uniform , while 31.2% cases were having Non uniform direction of spread. Similarly, out of 38 cases of severe RHD , 44.7% cases were having Uniform , 36.8% were having no spread while 18.4 % cases were having Non uniform spread in *Taila Bindu Pareeksha*. (Table 8)

Table 8

Direction of Spread of oil	Severity						Total	
	Mild		Moderate		Severe			
	No of cases	Percentage						
Uniform	6	100.0%	11	68.8%	17	44.7%	34	56.7%
Non uniform	0	0.0%	5	31.2%	07	18.4%	12	20.0%
No spread to any direction	0	0.0%	0	0.0%	14	36.8%	14	23.3%
TOTAL	6	100.0%	16	100.0%	38	100.0%	60	100.0%

On applying Chi Square Test on Rheumatic Heart Disease severity grading with direction of spread in Rheumatic Heart Disease patients value came is 13.720, p value is 0.008, which is significant statistically. (p<0.05)

9. Severity Grading of Rheumatic Heart Disease with Spread Time in Taila Bindu Pareeksha: Out of 60 RHD atients, 18 patients were having spread time < 30 seconds, 16 cases within 30-60 seconds, 8 cases within 60-120 seconds, 4 cases having >120 seconds and 14 cases having no spread of oil. Out of 6 cases of mild RHD, 50.0% were having spread time <30 sec, while other 50.0% cases were having spread time between 30 -60 seconds. Out of 16 cases of Moderate RHD, 50.0% were having spread time < 30 Sec, while 25.0% were having spread time between 30 -60 seconds. Similarly, out of 38 cases of Severe RHD, 36.8% were having No spread, while 23.7% cases having spread time between 30 -60 seconds. in *Taila Bindu Pareeksha*. (Table 9)

Table 9

Spread time (in seconds)	Severity						Total	
	Mild		Moderate		Severe		No of cases	Percentage
	No of cases	Percentage	No of cases	Percentage	No of cases	Percentage		
<30	3	50.0%	8	50.0%	7	18.4%	18	30.0%
31-60	3	50.0%	4	25.0%	9	23.7%	16	26.7%
61-120	0	0.0%	2	12.5%	6	15.8%	8	13.3%
>120	0	0.0%	2	12.5%	2	5.3%	4	6.7%
No spread	0	0.0%	0	0.0%	14	36.8%	14	23.3%
TOTAL	6	100.0%	16	100.0%	38	100.0%	60	100.0%

On applying Chi Square Test on Rheumatic Heart Disease severity grading with spread time, value came is 16.414, p value is 0.037, which is significant statistically. (p<0.05)

10. Severity grading of Rheumatic Heart Disease with Split time in Taila Bindu Pareeksha. : Out of 60 RHD Patients, 22 patients were having split time < 60 seconds, 13 cases within 60-120 seconds, 7 cases within 120- 240 seconds, 4 cases having > 240 seconds and 14 cases having no split of oil in *Taila Bindu Pareeksha*. Out of 6 cases of mild RHD 83.3% were having split time <60 sec, while 16.7% cases were having split time between 60 -120 seconds. Out of 16 cases of Moderate RHD, 56.2% were having split time < 60 Sec, while 18.8% were having split time between 60 -120 seconds. Similarly, out of 38 cases of Severe RHD, 36.8% were having No split, while 23.7% cases having split time between 60 -120 seconds. in *Taila Bindu Pareeksha*. (Table 10)

Table 10

Split time (in seconds)	Severity						Total	
	Mild		Moderate		Severe		No of cases	Percentage
	No of cases	Percentage	No of cases	Percentage	No of cases	Percentage		
<60	5	83.3%	9	56.2%	8	21.1%	22	36.7%
61-120	1	16.7%	3	18.8%	9	23.7%	13	21.7%
121-240	0	0.0%	2	12.5%	5	13.2%	7	11.7%
>240	0	0.0%	2	12.5%	2	5.3%	4	6.7%
No split	0	0.0%	0	0.0%	14	36.8%	14	23.3%
TOTAL	6	100.0%	16	100.0%	38	100.0%	60	100.0%

On applying Chi Square Test on Rheumatic Heart Disease severity grading with split time, value came is 18.183, p value is 0.020, which is significant statistically. (p<0.05)

DISCUSSION

To know the human body, its structures along with the function and to maintain the equilibrium within the body is the prime job of a Physician. The concept of Prakritisthta (Homeostasis) is very ancient in Ayurveda. To maintain Homeostasis the physician must ascertain the whole body in a glance. There are four modalities of clinical work, diagnosis, therapy, prophylaxis and prognosis. These four represent different paths of medical thinking. Prognostication exhibits certain peculiarities in the management of probabilistic information. Knowing prognosis plays an important role in end-of-life decisions and it helps to determine whether it makes more

sense to attempt certain treatments or to withhold them. If we look into Ayurvedic texts then we will find that art of prognosis was well developed in ancient times. In medieval period, a new technique of urine examination known as *Taila Bindu Pareeksha* was evolved for prognosis of diseases. In our study we tried to find out the Prognosis of Rheumatic Heart Disease through *Taila Bindu Pareeksha* and compare this with RHD Severity Grading.

In our study, the maximum frequency was found in age group of 21-30 years. A Study conducted by **Lawrence JG et al** from 1997 to 2010 stated that “ Although RHD occurs in children, its prevalence peaks in adulthood, usually between the ages of 25 years and 45 years”. Another elegant study by **Cannon et al** found prevalence RHD between the ages of 5 to 24 years .A study by **Raman k.kumar et al** shows that highest prevalence of **RHD** is in the **20** to 30 yearsold **age** group as a result of cumulative episodes of ARF .All the above mentioned studies favours our study findings.

Also, The overall frequency of Female patients was more as compared to Males. A prospective hospital based study by **Prakash chand negi et al** on 2475 patients shows that the prevalence of RF/RHD was more than two-fold higher in female gender than male (71.4% vs. 29.6%) . Another prospective study by **Dr. M. Martínez-Sellés** stated that Rheumatic disease was more frequent in women, at 35.7%, than in men, at 16.3% .Both studies substantiate the findings of our study.

• **Severity grading of Rheumatic Heart Disease**

Out of 60 patients of Rheumatic Heart Disease, only 06 patients were having Mild,16 were having Moderate and 38 patients were having Severe grade RHD.

- **Surface Tension:** In this study, the value of Surface tension of urine shows a negative relation with Severity grading of RHD. Decreased Surface Tension of urine in RHD patients may be due to Chronic Inflammation. On assessing, severity grade of Rheumatic Heart Disease with Surface tension of urine. it shows that mild and moderate grade RHD have higher surface tension, while severe RHD has lower surface tension of urine. On Statistical analysis value came is significant statistically, which means severe grade RHD has lower surface tension of urine. A study by **Siniachenko OV et al** favours our findings
- **Specific Gravity:** This shows No significant relationship with increased or decreased specific gravity with severity grading of RHD.
- **ASO Titres :** In our study only 25 patients are having ASO Titres greater than 200IU/ml .ASO titres is a acute phase reactant, the value is only significant in case of Acute Rheumatic fever and few weeks after its manifestation. A study was conducted by **Sarkar subendu et al** on 84 patients, revealed high **titre** of serum antistreptolysin O (**ASO**) antibody in pharyngitis compared to RF and RHD patients .Also, a significant elevation in ASO titre was also observed in RF than RHD .Another study done by **Saini Navjot et al** shows that relative increase in ASO titers was greater in ARF patients than in RHD patients. In all the findings we can conclude that ASO titres increase only 7 to 14 days after the onset of infection and remain high for weeks, and it is increased many folds in case of Acute phase as compared to Rheumatic Heart Disease.
- **Severity Grade of Rheumatic Heart Disease with Features of Taila Bindu Pareeksha:** As per the Severity grading of Rheumatic Heart Disease, the severe categories of Rheumatic Heart Disease mostly showed irregular and Dot shape of *Taila Bindu* having non uniform and No spread of oil drop, thereby indicating their bad prognosis. While all the Mild grade RHD and most of Moderate grade RHD, showed Circular shape and Uniform spread indicative of good prognosis.

Prognosis predicted by the Spread time and Split time matched with Severity grading of Rheumatic Heart Disease. As per the Severity grading of Rheumatic Heart Disease, the severe categories of Rheumatic Heart Disease mostly showed spread time >30 seconds or no spread thereby indicating their bad prognosis. While Mild and Moderate grade RHD mostly showed spread time < 30 seconds indicative of good prognosis. Similarly the severe categories of Rheumatic Heart Disease mostly showed split time > 60 seconds or no split thereby indicating their bad prognosis. While Mild and Moderate grade RHD mostly showed split time <60 seconds indicative of good prognosis.

CONCLUSION

Taila Bindu Pareeksha is an ancient Ayurvedic method for examination of urine, is used as a prognostic tool to assess the current health of patient, understanding the span of life along with severity of disease. Prognosis is an important aspect of diagnosis and treatment. In our study, the prognosis predicted by the shape of *Taila Bindu*, direction of spread, spread time and split time, matches with severity grading of Rheumatic Heart

Disease. So, it is concluded from the above research work that *Taila Bindu Pareeksha* can be used as a prognostic tool to assess the severity of Rheumatic Heart Disease.

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Impact of Covid-19 on Digital Marketing and Its Effects on Buying Pattern of the Housewives in Mumbai

Nazma Banoo Shaikh and Gajraj Singh Ahirwar

Sri Satya Sai University of Technology and Medical Sciences, Sehore Madhya Pradesh, India

ABSTRACT

In the contemporary world, where technology is taking all walks of life, social media is grasping the retail market to encourage the retailers to attract a variety of customers. Social media is growing at a faster pace. This has been a significant revolution in the communication system, where the virtual world has emerged in its own way. All this is influencing the purchase decisions of the consumers. Various social networking platforms are associated with social media, which are used to make online trading. Social Media Marketing has gained immense benefit in the digital world. Consumers, all over the world are getting the services, through this type of platform, under one roof. The main aim of the paper is to test the impact of COVID-19 on the social media marketing. The author tries to highlight whether, due to this pandemic situation, there is any change in the marketers/ services/ ideas marketed and how the marketers can have upper edge in the digital competitive market, by adopting different online marketing strategies. For the present study 100 respondents across Mumbai suburbs were chosen as sample frame. The findings of the study reveal the fact that platforms such as Facebook and Instagram are more frequently used by the consumers. They generally see that the marketers are advertising the health care products and online courses were regularly, followed by the groceries, during the pandemic situation.

Keywords: Covid-19, Digital marketing, Social media platforms, buying pattern, Housewives

1. INTRODUCTION

The horrifying pandemic situation of outbreak of Coronavirus in the world, since the last quarter of 2019, has led to wide implications on several fields ranging from health care facilities, education, and employment scenario to personal life. Likewise, it could be noted that there is a severe change in the social media marketing due to the widespread pandemic situation of Covid-19. The entire landscape shows marked reformation in the social media marketing platforms. The change has been witnessed in aspects such as positive involvement of the consumers due to increase in the digital advertisements and simultaneous rise in ad cost and profits for the marketers globally. During the 4 periods of lockdown, it was really impossible for the consumers to know of the scenario across the globe. However, social media platforms had in their own style, reduced the efforts of the people. The major phenomena for advertising through social media platform were in terms of Higher education. Difference courses were advertised and people started enrolling themselves for various online courses.

Recently, it has been seen that social media activity has almost erased the usage of emails. These activities are used for connecting with people, sharing information, sharing opinions and thoughts about multiple aspects and building businesses. It is also seen that many consumers use social media for exchanging their ideas about the product and related information. Many scholars have also mentioned that all the major decisions about the purchases of the consumers are impacted greatly by social media. People are switching themselves to online mode of purchases than the traditional ones to get an in-depth sight of the product information. They usually have more faith on the reviews and recommendations of other customers, which they use before making any purchase decisions. People are now using social media platforms to share information about the products and brands. Today the city breed population represents the new generation to use the social media platforms to make their purchases and bloom in the global competitive market with their rising activity. Social media has supported them with the web, which they are using to establish connectivity with their friends and family. There is increasing proliferation of social media, making an impact on the professional and personal capacities of the consumers. The youth needs to be targeted by these social media platforms, so that the customer base can be attracted. These youths are using social channels very frequently. Most of the consumers, who are attached to the social networking sites, are using the internet with three basic motives: gaining insight of the situation, for entertainment purposes and managing their social lives. Social media accelerates the functioning of online trading by adding up the feedback from the users. There is a strong notion that the factors such as attitudes of the people regarding brands and the purchase decisions are dependent upon how associated consumer decision is with social media. It is thus, rightly said that consumers' behavior in different scenarios is highly impacted by social media. The most significant change has been witnessed in the consumption pattern of the consumers. All the social media platforms are seeking for consumer's engagement via social interactive tools. Social media

platforms are creating space for conversation between the consumers, where they speak on brands, products, prices, quality, etc. The spread of this conversation is often word-of-mouth, but also sometimes digitally. Consumers finalize their decision by creating and disseminating data of the online products via these platforms. The most significant fact the marketers need to know are the factors that influence the consumer's decisions of purchases through marketing using social media to improve their online strategies.

The main aim of the present research study is to highlight the present situation with regards to digital marketing and its effects on the buying patterns of the consumers so that the marketers will implement the necessary strategies required to rule the global competitive market.

2. LITERATURE REVIEW

Asma, et. al (2018), in their paper on "Impact of Social Media Marketing on Consumer Buying Behaviour – A Study", highlights the fact that the companies require social media platform to reach to their customers. The companies are very much depending on such platforms to increase their profitability. According to the authors, social media marketing has even been beneficial to the consumers, who are having wide range of choices to make their purchase. The marketing done through social media helps them to compare the products across the companies. This enables them to make bet decision in terms of buying the products. [1]

Deshpande, M. (2019), "The Impact of Advertisement on Consumer Buying Behaviour in Electronic Industry", in their paper the authors explore the promotional channels used by the electronic industry to advertise their products. There is huge competition in the market. The authors highlight he increase in technology to influence the buying behaviour of the customers. The study aims at creating awareness and building the perceptions among the consumers. [2]

Ceesay, et. al (2018), in their paper on "The Impact of Digital Media Advertising on Consumer Behaviour Intension towards Fashion and Luxury Brands: Case of the Gambia" are using the sample from Gambia. They try to explore the impact of digital marketing on consumer intention of purchase of fashion and luxury items. The study revolves around the usage of new methods implemented in marketing with the help of digital platform. The author carries on the research by studying various factors such as familiarity of the brands, trust, the consumers have in advertisers, privacy, how entertaining is the digital advertisement and interactivity among the consumers and the producers.[3]

Pallav (2016), in his paper on "Impact of Media Advertising on Consumer Buying Behaviour", has highlighted how various factors of advertising like presentation of products to consumer affect the buying behaviour of consumers. In the paper author explains how through effective tools of advertising consumers can be influenced to buy the products. Researcher had collected the primary as well as secondary source through observations. The main objective of the research is that factor which affects buying behaviour of consumer due to media influence. There are various types of media advertising. [4]

Haider, et. al (2018), in the paper on "A Study on the Influence of Advertisement on Consumer Buying Behaviour", highlighted the implications of advertising on Consumer buying behaviour. The main objective of the paper is to study how effects of entertainment, familiarity, and advertisement and social media influence on consumer buying behaviour. Authors had pointed out some important factors such entertainment, familiarity, social imaging and advertisement spending affects the consumer behaviour. If all this factors considered before each advertisement will create effective approach. Through random sampling method data were collected from the people of Dhaka city. Through data analysis it is found that familiarity has the most powerful impact on Consumer behaviour, followed by entertainment and advertising spending. It is concluded that the advertising has the most crucial role in buying behaviour of the consumers and what products they wish to buy for that it is advisable to companies to consider all the factors which make the advertisements. [5]

Harshini, (2015), "Influence of Social Media ADS on Consumer Purchase Intention", have highlighted characteristics of online ads and its effects on consumer purchase. In today's world use of internet is globally expanding and is increasing more and more. Internet use gives a handy way to channelize the advertisement through the social media. Medium of advertisement is shifting from traditional media such as print, magazine to digital media advertisement and this has the global out reach. [6]

Bokde, et. al (2019), in their paper on "To Study the Impact of Digital Marketing on Purchase Decision of Youth in Nagpur City", mentions that internet along with mobile phones, display advertising and other digital medium forms the part of the digital technology influencing the consumer behaviour. E-marketing and interactive marketing are the most preferred channels by the marketers, because they enable the direct linkage

with the consumer preferences and satisfaction instantly. Through such portals the marketers are able to track the on-going trend in the market and make necessary strategies to establish themselves in the market. [7]

Ahuja et.al (2003) in their paper on "An Empirical Investigation of Online Consumer Purchasing Behaviour" highlight the importance of factors and relationships that influence the buying behaviour of individual as well as shopping preference and role of internet to buy the products online. The research study targets two groups of people i.e. students and non- students. Students were considered being tech-savvy and are concerned about privacy. The study was carried out to check what they buy online, motivating factors and barriers behind online shopping and why are few people not buying online. Demographic differences may or may not affect the online shopping behaviour. From the collected data, it is found that people usually spend more on travel tickets and the least spending is done on grocery. The findings of the study also suggest that factors such as difficulty in returning the products, too much information and connection problem are the reasons, which refrain them from shopping. The author concluded that convenience and customer service could act as strong motivators. By minimising the security concerns, online shopping can take an upper hand.[8]

Vinerean, et.al (2013), in the paper on "The Effects of Social Media Marketing on Online Consumer Behaviour" mentions that the consumers are depending on social media for satisfying their requirements. The researchers have developed the model in which they have identified various set of variables and separated those based on their utility in digital marketing. For the purpose of the study a random sampling of 236 respondents were carried out by the authors. Initially the researchers begin with highlighting the characteristics of the internet and role of social media. They even mentioned about the factors, which influence consumer's decision. The significant among them identified was social media marketing. They are of the opinion that customers tend to satisfy all the requirements under one roof without physically going to retail outlets, they prefer using social media advertisements. This influence is there buying behaviour. [9]

Goyal, et.al (2016), in their paper on "Impact of Increasing Trend of Online Marketing on Consumer Buying behaviour: FMCG Brands in Indian Scenario", have identified several web experience components, focusing on how the influence consumer buying behaviour. Online networking has marked its own relevance against personal connections. The authors believe that there is urgent need of identifying difference between online and offline advertising and their relevance in today's world. With this aim, the main objectives of the present study are to determine factors responsible to drive consumers to online marketing against the traditional advertising and to highlight the impact of online marketing on the behaviour of the consumers. Non-probability sampling or convenience sampling method was applied on 200 internet users who have experience of using online marketing strategies of several FMCG companies.[10]

Harun et.al (2019) in their paper on "Is the Purchasing Behaviour of Suburban Millennials Affected by Social Media Marketing? Empirical Evidence from Malaysia", highlighted the influence of online marketing on millennial in Suburban area of low involvement products. This study aims at highlighting influencing consumer choice of product. The authors have carried out a systematic literature review on various aspects dealing with online advertisements. Subsequently hypothesis was framed. These hypotheses were pertaining to relationship between online communities and their product purchase and behavior, and entertainment, trust largely seen among the customers and their interaction in social media marketing and millennial behaviour and consumer engagement parameters. The data was analysed using both descriptive and inferential statistics. It was concluded by the author that millennial choose their favourite online websites as per their requirements. They enjoy social media marketing because this source provides them with immense information of the product.[11]

3. OBJECTIVES OF THE STUDY

With the aim of understanding the Impact of social media marketing on the consumer buying pattern, during the outbreak of Covid – 19 pandemic, the main objectives of the present study are –

1. To study the impact of Covid – 19 on Social media marketing and its effects on buying patterns of the consumers in Mumbai suburbs.
2. To assess the change in the marketed and buying products/ services due to lockdown for Covid-19 pandemic in Mumbai suburbs.

4. DATA AND METHODOLOGY FOR THE STUDY

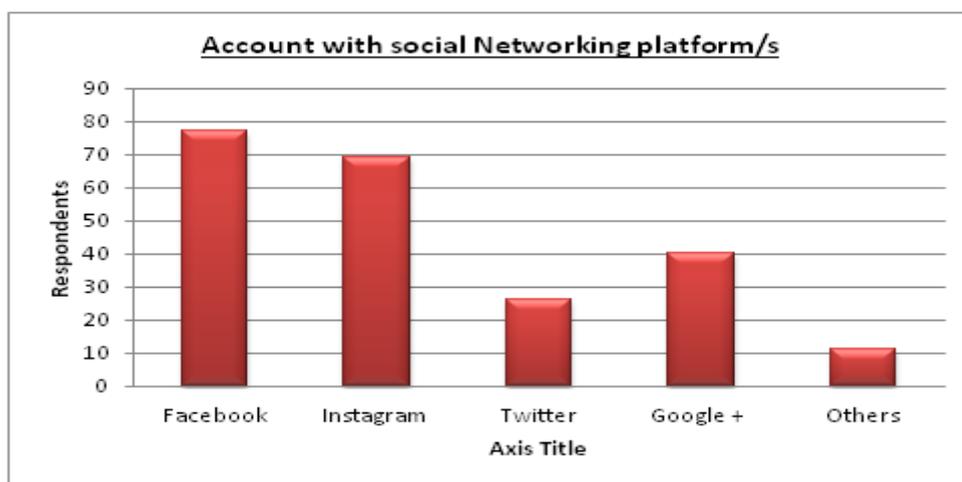
For the present research paper, both primary and secondary data was used. Primary data was gathered from a structured close ended questionnaire, which was circulated among 100 respondents via Google forms in Mumbai suburbs. The responses were collected by using random sampling method in the second week of June 2022. These responses were analysed using graphical description analysis and the results were presented in a

tabular form. Further the secondary data was used to compliment the findings analysed by processing the primary data. The researcher then concluded the paper by suggesting some marketing strategies to the online marketers to improve their sales.

5. FINDINGS AND DISCUSSIONS

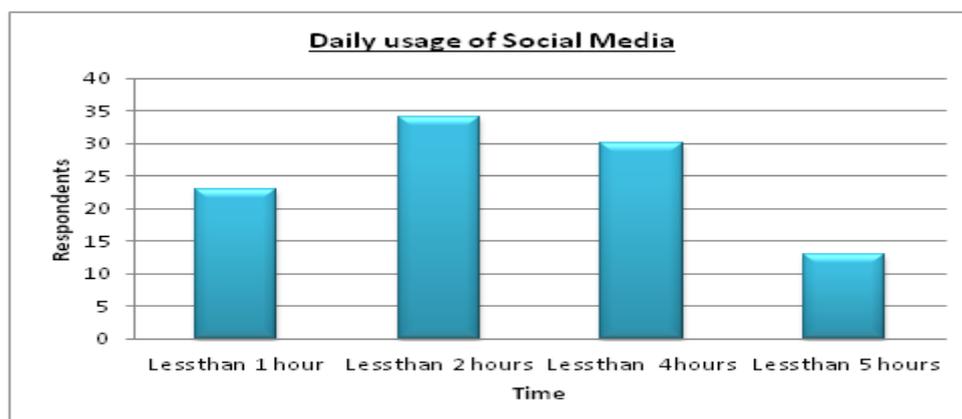
For the present research study total 100 housewives across the Mumbai suburbs were surveyed with the help of Google form. The respondents belonged to various age groups. The main purpose of the study was to investigate the effect of COVID – 19 on social media marketing, thus, it was felt by the researcher to interrogate various housewives in different age category, who can share their understanding on social media marketing. Out of the total respondents maximum of the people belong ted to age group of less than 25 years (55 percent), Nearly 33 percent belonged to age group of 26 to 35, 11 percent belonged to age group of 36 to 45 and only 2 percent belonged to age category of above 55. Similarly, it was found that these respondents were having an average range of income. Nearly 71 percent of the respondents were having an average family income of less than Rs. 30000 per month, nearly 17 percent are having income range of Rs. 30,000 to Rs, 60,000 per month, 8 percent respondents are having income range of Rs. 60,000 to Rs. 90,000 per month and only 4 percent are having income of more than Rs. 90,000.

While surveying it was also found out that though all the respondents were having a social networking account, but only 96 percent of them were using that in their day to day life. When interviewed it was found that they use such social media platform for various purposes like shopping, online training, online learning, to connect with friends, to increase their awareness of general understanding, etc. Only 4 percent respondents said that though they have social media account on some or the other platform, but they do not use it frequently.



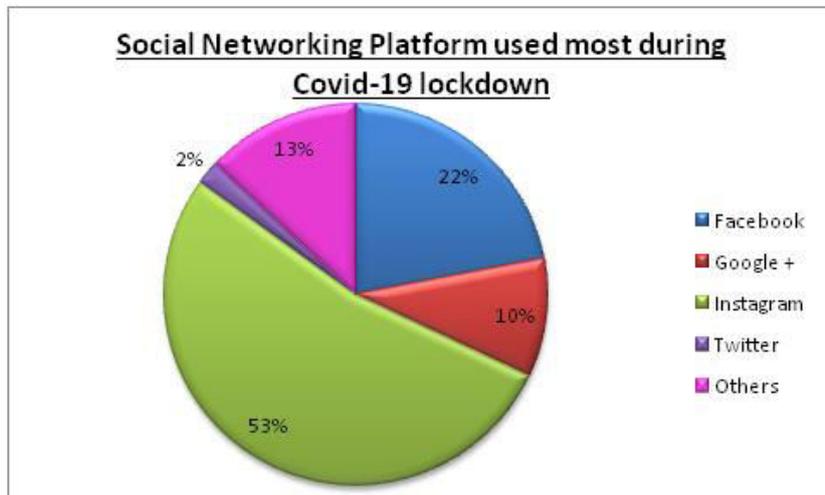
Graph 1

From the above graph 1, it can be observed that respondents were having their social networking account on more than one platform. However, it was also noted that Facebook users are larger as compared to any other platform. Nearly 77 percent respondents are having their account on Facebook. Apart from this they are also having account on Instagram (69 percent), Google + (40 percent), Twitter (26 percent) and other platforms (11 percent).



Graph 2

The above graph 2 reveals the fact that people like spending maximum time on such social networking platforms. Only 23 percent respondents relied that they use these platforms for less than 1 hour, 34 percent of the respondents believed that they use such platforms for less than 2 hours, 30 percent said that they use it for less than 4 hours and remaining 13 percent use it for more than 5 hours a day. By interviewing on telephone, it was noted that during the lockdown period, their social media usage have increased to double. They are using social media platforms for entertainment as well as a source of surfing new ventures.

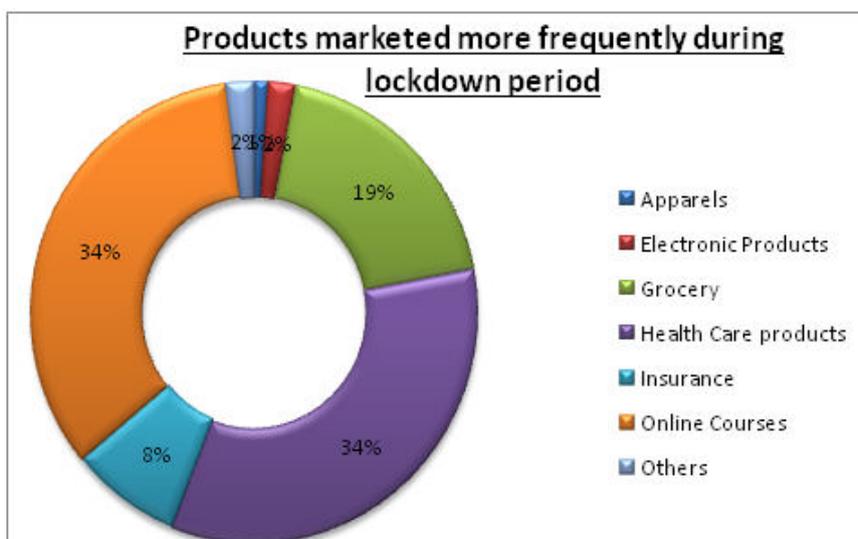


Graph 3

The above graph 3 signifies the fact that Instagram remains favourite among the people from Mumbai suburbs among other social media platforms. Nearly 53 percent respondents use Instagram more frequently than Facebook, which is used by 22 percent respondents, Google + used by 10 percent respondents and Twitter used by 2 percent respondents. Instagram seems more appealing to the respondents particularly in the age category of less than 25 years who are the graduation and post-graduation students. Facebook is more often used by middle age people.

At the same time the respondents were also asked on effectiveness of information of the products/ services and ideas which are marketed through the social media. Nearly 47 percent respondents felt that they are able to understand each aspect of the product/ service/ idea they are willing to purchase. Due to competition on online marketing, the marketers are trying to bring out the best possible of their efforts to retain their consumer base. In this attempt, they are furnishing all the information as far as possible, related to the products, so that the consumers do not switch over to other company in search of more information. By providing maximum information, the marketers are trying to stop the search of the consumers and purchase for their company itself.

Apart from this, nearly 66 percent of the respondents see that there is a change in the products/ services and ideas advertised by the social media marketers during the lockdown period due to Covid – 19 situations.



Graph 4

During the lockdown period, the most frequently marketed products/ services/ ideas included Health care products, as mentioned by 34 percent respondents and even online courses (34 percent respondents marked the same). They feel that due to the need of the hour, the most common commodities marketed were hand sanitizers, soaps, hand wash, cleaning agents, etc. It was very strange to see that the online educational and vocational courses were also marketed at its best during the lockdown period. Nearly 34 percent of the respondents are of the view that they having seen emerging aspects of online courses through webinars on social networking platform during the lockdown period. Apart from that as people were not able to step out of their house, the marketers thought that they could earn better on profit margin if they are able to market the grocery online and sell it to the doorsteps of the consumers. Nearly 19 percent of the respondents felt that grocery are marketed frequently as compared to the non-pandemic situation, because, it is the most important need of the consumers during the pandemic situation. The luxurious items including apparels and electronic products are not much marketed during this period. One significant point which was noticed was that the insurances (both life as well as health) were not much marketed.

Finally it was inferred from the survey that social media marketing is considered safe from the point of view of the marketers. They are able to influence more than 50 percent of the respondents.

Social Media Marketing and Purchase Behaviour of the Housewives amidst COVID-19 pandemic period

Table 1 – Social Media Marketing and Purchase Behaviour of the Customers

Consumer Buying Behavior						
Social Media Marketing	Purchase Decision	Online Purchase Decision	Consumer attitude	Shopping Experience	Post Purchase Behavior	Overall
Quality Content	.304 (.000)	.371 (.000)	.369 (.000)	.323 (.000)	.217 (.000)	.451 (.000)
User Experience	.181 (.000)	.160 (.000)	.445 (.000)	.239 (.000)	.205 (.000)	.375 (.000)
Frequency of Visit	.378 (.000)	.375 (.000)	.350 (.000)	.329 (.000)	.216 (.000)	.469 (.000)
Overall	.377 (.000)	.391 (.000)	.539 (.000)	.397 (.000)	.289 (.000)	.571 (.000)

Presented in the Table 5 the significance of the relationship between social media marketing and consumer buying behavior with overall computed r-value of 0.571 which means that there is a MODERATE positive relationship in the learnability of social media marketing and consumer buying behavior of the respondents. Thus, we reject the null hypothesis since $p\text{-value} < 0.05$. There is a significant relationship in the learnability of social media marketing and buying behavior of the housewives. Furthermore, it is shown that association between user experience and consumer attitude has the highest r-value of 0.445 which means that there is a MODERATE positive relationship in the user experience and consumer attitude of the respondents. However, online purchase decision and user experience relationship got the lowest r-value of 0.160 which means that there is a VERY WEAK positive relationship in the user experience and buying behavior of the housewives.

It is revealed in the correlational analysis that there is a significant relationship between the social media marketing and buying behaviour of the housewives amidst Covid period. Particularly the relationship between the user experience and consumer attitude with a positive, moderate, and significant correlation. This results confirms the proposition of Voramontri and Klieb that the consumer compares the feedback to previous experiences and perceptions and after a period of reflection, consumers move to the decision-making stage, deciding to make a purchase based on logical insight.

6. RECOMMENDATIONS

It can be recommended to the marketers to take maximum benefit of social media advertisements. Most importantly they need to place the ads which are more contextual and targeted. They need to see that the products/ services/ ideas are in real need and none of the other marketer is putting forward such products. Even if they come up with the very same product, their showcase of the features of the products needs to be more logical. The consumers do not at all like the advertisements which has meaningless base. Celebrity endorsements can be increased on a maximum scale, to attract the consumers. The advertisements need to be related to everyday life. Story ads can have more impact on consumers. The marketers can more frequently use

the Facebook page for marketing their products/ services because that is the most frequently used platform. This will help the marketers to gain targeted conversations. With this they can even send personalised offers to their consumers. The display advertisements need to focus on the real aspects of daily life.

7. CONCLUSION

It can be concluded that social media marketing has its own role to play in the modern day world, not only during the pandemic situation, but in general also. The most important aspect is that, in recent times, particularly in the city like Mumbai, people have limited time to go for retail shopping to the stores. They prefer to make their purchases online, using advertisements from the social media platforms. They get to know the products/ services/ ideas they are in need of, through such platforms. Thus, with full information they are able to step in their purchase decisions. At the same time, it was seen that they are able to get specialised offers whenever they are using the channels regularly. This adds up on their discounts. Gift coupons and vouchers are also available for them. It is possible for them to compare between the products, marketed by two different firms, thus enabling them to choose the best according to their requirement. All this simply denotes the fact that social media marketing is influencing the consumers to make the best purchasing decisions.

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Monitoring of Atmospheric Parameters Using Internet of Things

Poonam and Vaishali Singh

Department of Computer Science, Maharishi University of Information Technology, Lucknow, India

ABSTRACT

IOT based environmental parameter monitoring framework has been developed which is capable of monitoring temperature and humidity of a particular area. Framework is based on sensors. Two sensors i.e. temperature and humidity sensor have been connected to a Raspberry Pi board and board is connected to internet cloud. To implement the prepared framework, it has been connected to www.thingspeak.com a personally created channel. Both the sensors have been connected to Raspberry Pi b3+ and data is sent to the www.thingspeak.com channel. Sensors collect the data and the information is subsequently delivered to the client through the HTTP protocol. The board has been connected to the internet through LAN via the Ethernet port or via USB dongle via the USB port. The results obtained are displayed in a graphical format on www.thingspeak.com.

Keywords: IoT, Sensors, Raspberry Pi Board, Environmental Parameters,

INTRODUCTION

India is country of various seasons. Twelve months of year have different seasons. Therefore, prediction of weather in India becomes important because many people in India work in different areas and their work is significantly affected by different weather. Timely prediction of weather in India may result in prevention of many negative effects caused by natural disaster due to bad weather. Monitoring of weather is also an important task. Monitoring of weather in India is done by different methods. But, now-a-day technology has come in force to make the things easy and precise. Therefore, monitoring of weather can also be done using novel technology. One of the most important technologies is Internet of Things (IoT). It is fast growing technology and plays important role in different areas. IoT has wide applications in many areas like development of urban groups, development of organization of essentialness resources and frameworks, adaptability, transport, collaborations etc. The development in IoT realizes a growing number of arranged data are being studied, secured and transmitted in different conditions. (Potu, A. et al., 2016) [1-2].

The term IoT stands for Internet of Things. It refers to the collective network of connected physical devices. It is technology which facilitates communication between physical devices & internet cloud, and different devices themselves. Due to advancement of computer chips and high internet bandwidth billions of devices can be connected together. Everyday used IoT enabled devices like toothbrushes, vacuum cleaners, cars and other machines use sensors to collect data and respond to users very intelligently via internet. IoT can also be used in collecting and transmitting weather information considering different weather / environmental parameters.

HISTORICAL BACKGROUND

Work on IoT based system for monitoring of environmental parameters started recently i.e. just in last decade. In this reference, work of Satyanarayana, K. N. V. et al. (2016) [3], is appreciable, who worked on IoT based smart weather station using raspberry and suggested that climate condition puts a vital part in our everyday life. Gathering of information about the distinctive parameters of the climate is important for arranging in home and situations. Late improvements in Internet of Things made conceivable to gather the information in-situ. The paper proposes a framework that screens climate parameters at a place and introduces the information according to the client's need. The client can get to this information anyplace on the planet, whenever through web. The proposed framework utilizes Raspberry-pi installed with sensors that gather climate parameters. The gathered information is transferred to cloud for additionally get to.

In continuation of the above, Rao, B. S. et al. (2016) [4] proposed an IoT based weather monitoring system. The system proposed in this paper is a moved response for checking the environment settings at a specific region and make the records clear anywhere on the earth. The development behind that is IoT, which is an advanced and effective response for interfacing the matters to the internet and to relate the complete universe of things in a framework. Here matters is probably whatever like electronic gadgets, sensors and vehicle electronic rigging. The machine oversees checking and controlling the everyday situations like temperature, relative moisture, light power and CO degree with sensors and sends the information to the web site web page and after that plot the sensor statistics as graphical estimations. The records revived from the executed method can be open in the web from wherever on the planet.

Rasal, M. V. & Rana, J. G. (2016) [5] worked on raspberry pi based weather monitoring system they actualized a model for the climate observing framework is the fundamental point of the paper Temperature, relative stickiness and barometrical weight estimation by utilizing the fitting sensors is extremely advantageous for modern, climate observing. A climate observing model or framework has been created as talked about in this paper to record and showing of the climate parameters like temperature, dampness, wind course speed, rain fall location and climatic weight Various climate checking procedures have been audited in this paper. Recorded data is kept in the gadget for additionally utilize. Client can discover the information spared by the framework whenever as per the demand. Among Various procedures radars, satellites, microcontrollers of climate observing frameworks raspberry pi is the latest& proficient remote climate observing procedure.

Priya, V. L. et al. (2017) [6] worked on weather monitoring system using IoT. The framework proposed in this paper is a moved response for checking the surroundings conditions at a particular location and make the records discernible everywhere in the international. The development at the back of that is net of factors, that is an advanced and successful response for associate the matters to the internet and to interface the whole universe of things in a framework. The device oversees searching and controlling the commonplace conditions like temperature, relative moistness, slight strength and CO degree with sensors and sends the information to the internet site internet page and a quick time later plot the sensor records as graphical bits of expertise. The information revived from the realized gadget can be open within the net from anywhere on the earth.

Sudha, T. et al. (2017) [7] worked on detailed and high speed smart IoT based weather monitoring system. They proposed a brilliant climate revealing framework over the web. Her proposed framework takes into account climate parameter announcing over the web. It enables the general population to straightforwardly check the climate details online without the need of a climate determining office. Framework utilizes temperature, dampness and, in addition rain sensor to screen climate and give live detailing of the climate measurements. The framework always screens temperature utilizing temperature sensor, stickiness utilizing dampness sensor and furthermore for rain. The framework always transmits this information to the microcontroller, which now forms this information and continues transmitting it to the online web server over a Wi-Fi association. This information is live refreshed to be seen on the online server framework.

Satyanarayana, K. N. V. et al. (2017) [8] worked on mobile app & IoT based smart weather station and concluded that these days climate conditions are changing every day, subsequently some kind of framework must be intended to gauge the climate parameters in a successful route at the place of intrigue. This paper extends a simple method to quantify the dynamic parameters of climate without human elucidation. As this proposed strategy utilizes versatile application and IoT innovation, gathered climate parameters in a remote zone can be transferred to cloud and specific portable application.

Literature survey reveals that there is very little attention on IoT technology in monitoring the environmental parameters. So, it becomes important to apply IoT technology on monitoring the environmental parameters.

Therefore, present study focuses on application of IoT technology in monitoring the environmental parameters. A framework to monitor two parameters i.e. temperature and humidity has been designed in this paper.

METHODOLOGY

The framework developed in this study consists of two sensors (Temperature Sensor and Humidity Sensor), which processes environmental factors temperature and humidity for rainfall. Sensors have been mounted on a Raspberry Pi board, which deals with data relentlessly on cloud server and user can obtain this data on hourly basis or any normal time of interval. Data obtained from these sensors change over to cutting edge regards by Arduino and forwarded to raspberry pi, along these lines goes about as normal analog to digital converter. A modem (which converts analog to digital signals and digital to analog signal) is also connected for conversion of signals. By this, a simple framework has been designed with less perplexed equipment and easily gained sections. Framework is capable of collecting numerous surroundings factors as par the sensors connected to Raspberry Pi 3 B+ board. This collected data is then combined and Memory chip on Pi board records and holds the acquired information as same as reminiscence chip on the liquid crystal display associated for displaying the outcome. Python (a programming language) and software tools have been used for the same. Think Speak web is used for observing the results.

To implement the prepared framework, it has been connected to www.thingspeak.com a personally created channel. Both the sensors have been connected to Raspberry Pi b3+ and data is sent to the www.thingspeak.com channel. On the framework side, the Raspberry Pi b3+ board has two modes: information security and web server. Sensors collect the data and the information is subsequently delivered to the client through the HTTP

protocol. The board has been connected to the internet through LAN via the Ethernet port or via USB dongle via the USB port. The results obtained are displayed in a graphical format on www.thingspeak.com. One channel has been created on www.thingspeak.com and both the fields are placed in it, so that results are obtained in graphical form.

RESULTS

Results are obtained on computer screen in graphical form when personal channel is logged in on www.thingspeak.com. Outputs of the results are shown on figure 1 and figure 2 as follows:

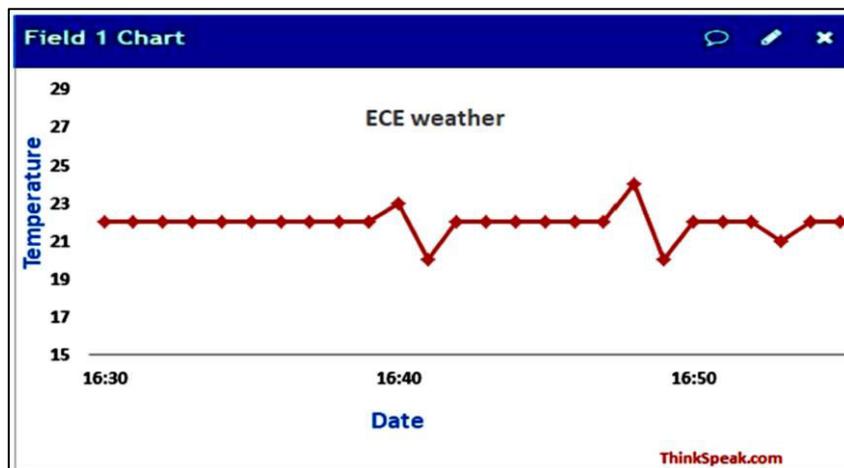


Fig.1: Temperature Chart

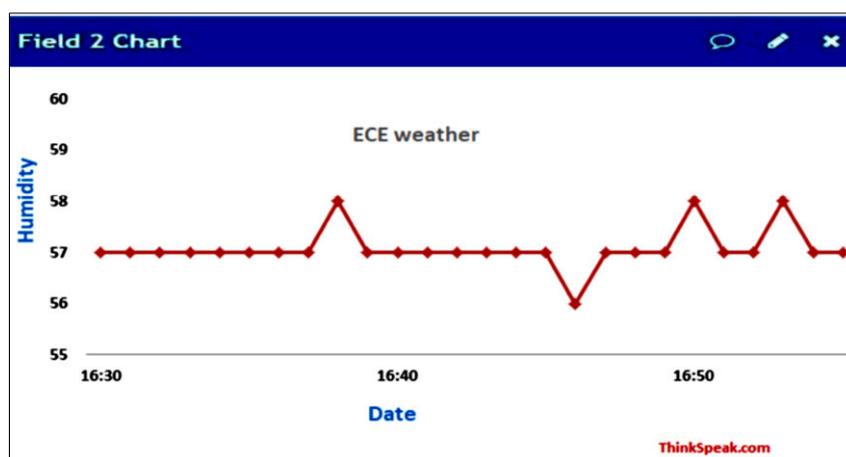


Fig. 2: Humidity Chart

Above charts represent temperature and humidity respectively in half an hour time interval. These charts indicate that temperature and humidity are monitored using IoT technology.

CONCLUSION

Presently developed framework is capable of monitoring of temperature and humidity in a particular area. Framework is based on IoT technology along with sensors and softwares. IoT technology is one of the important technologies used these days. This technology along with sensors and software can be used to make any system smart. It has been concluded from the present study that smart systems can be developed to monitoring various environmental conditions. Different framework can be developed to monitor different environmental parameters using different sensors on board. Using the data obtained from such frameworks weather forecast is also possible to avoid any environmental disaster. The IoT is capable of making new business openings and to enhance the life of human being significantly. This technology keeps on challenging our best endeavors to construct smart and more secure ways of smartness of different gadgets and systems.

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