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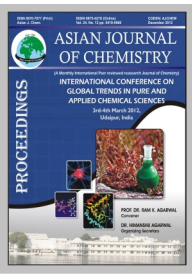

Pollution Status of Jodhpur Town-Its Geology and Human Activities†

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Jodhpur is the second largest city of Rajasthan situated at the edge of Thar Desert. The old walled city or Jodhpur city has eight gates of which Jalori gate and Sojati gate on the south are surrounded by the busiest commercial centres of city. The new city is currently expanded to the south and east of the old city. Continuous industrial growth and increasing population of Jodhpur city polluting its water resources including natural age old water bodies as well as new resources though the drinking water link from canal from Indira Gandhi Nahar Main Canal. The human activities as well as the geology of the area are adversely affecting the drinking water quality of Jodhpur. The intensive study under taken has been carried out to identify the causes for redresses to this problem. For this purpose the city of Jodhpur have have been divided into four rational zones. North-West, North-East, West-South and East-South. From these four zones we have collected water samples and analyzed their physical and chemical parameters. Geological aspects of Jodhpur city have also been incorporated to suggest effective redressing measures of the current problem.

Key Words: Management of water resources, Industrial growth, Increasing population, Redressing of water resources, Pollution.

INTRODUCTION

Jodhpur is situated at the West side of Rajasthan State. All the life lines for the western Rajasthan are centered at Jodhpur. The city is growing at a rapid rate and various water resources to augment water requirement are in sufficient and suffering from number of bottle necks regarding the availability, distribution and quality considerations for various uses. A number of industries basically include the guar gum, chemicals and stain less steel produce the effluents, which are deteriorating the quality of drinking water in various sectors of the town. These include the high contamination of fluorides, acids, dyes as well as domestic waste materials.

EXPERIMENTAL

Problem of water seepage in certain residential areas located in proximity of Jodhpur fort is attributed to the geological structure of rockes. Malani Igneous suite, an integral component of the Thar Desert in Rajasthan, extends at the periphery of the desert, to an area of 44,500 square kilometres (17,182 sq m) covering parts of Pali, Sirohi, Jodhpur, Barmer, Jaisalmer, Jalore and Siwana districts of western Rajasthan. The seepage of water was not a problem in the earlier years because the water level in kaylana lake was lower but now due to regular inflow of water into lake the water table has raised and it appears as a consequence certain areas from Ranisar-Padamsar to Girdikot are suffering from this problem.

Sampling: In order to carry out a systematic study of the sources that pollute the ground water and surface water of the Jodhpur town the urban areas of the city was divided into four zones. The zones were ear marked keeping in view- (i) Drainage pattern; (ii) Population density; (iii) Geography of the area (iv) Location of industries. The four zones are:

Zone-I North-West-Jodhpur: Thinly populated area with sand stone mining.

Zone-II North-East-Jodhpur: Major part of walled city area, Thickly populated area with major human activity.

Zone-III West-South-Jodhpur: Rapidly developing area, well colonized, less thickly populated area, industrial waste water from various industries (textile, mineral, guar gum, *etc*.), drainage towards south.

Zone-IV East-South-Jodhpur: Institutional area, major thrust of drainage, less populated area and no major industrial waste.

RESULTS AND DISCUSSION

In ground waters concentration of fluoride can vary depending on the nature of the rocks, fluoride-bearing minerals and absence of calcium[1]. The high concentration in ground water

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OBSERVATION TABLE

Coding	Zone	Type of source	Samples	pH	ALK(M)	TH	NO_3	F	Total
Permissible limit[12]				6.5	200	300	45	1.0	552.5
Relaxation limit[12]				**8.5**	**600**	**600**	**45**	**1.5**	**1255**
S_I 1	I	T/W	Maheshwari Sarees	7.8	270	250	110	0.3	638.1
S_I 2.	I	O/W	Shanischer ji ka than	7.8	250	550	380	1.1	1188.9
S_I 3.	I	T/W	Kali beri	7.8	100	110	01	0.2	219
S_I 4.	I	T/W	GCR Choukha	6.5	110	108	02	0.2	226.7
S_I 5.	I	O/Pond	Kailana	8.0	100	110	01	0.2	219.2
S_I 6.	I	T/W	Zakir Hussain colony, Pratap Nagar-I	7.1	110	120	05	0.2	242.3
S_I 7.	I	T/W	Zakir Hussain colony, Pratap Nagar-II	7.0	100	110	02	0.2	219.2
S_I 8.	I	T/W	Zakir Hussain colony, Pratap Nagar-III	7.9	100	120	02	0.15	230.05
S_I 9.	I	T/W	Near Kailana	7.6	98	110	02	0.2	217.8
S_{II} 1	II	H/P	Kaga	7.0	250	170	23	0.5	450.5
S_{II} 2	II	O/Pond	Jaswant Thada	9.5	130	220	05	0.3	364.8
S_{II} 3	II	O/W	Tapia Well	7.3	640	440	26	0.25	1113.55
S_{II} 4	II	O/Pond	Padamsar	7.0	310	200	08	0.5	525.5
S_{II} 5	II	O/Pond	Ranisar	7.4	200	200	03	0.3	410.7
S_{II} 6	II	O/W	Navchowkiyan ka bera	8.2	180	160	23	0.15	371.35
S_{II} 7	II	O/W	Jai bera	6.9	270	220	19	0.2	516.1
S_{II} 8	II	O/W	Pataleshwar	7.9	30	360	350	1.1	749
S_{II} 9	II	O/W	Meerti gate	7.4	270	600	450	1.3	1328.7
S_{II} 10	II	T/W	Poata	7.2	720	380	352	3.5	1462.7
S_{II} 11	II	T/W	Maha Mandir Jhalara	7.3	450	460	188	0.6	1105.9
S_{II} 12	II	T/W	Siwanchi gate police chowki	7.6	96	102	02	0.12	267.72
S_{II} 13	II	T/W	Sarafa Bazar, Pyao	7.7	90	106	60	0.2	263.9
S_{II} 14	II	T/W	Rakhi House, Narayan Mishthan	7.9	100	100	50	0.2	258.1
S_{II} 15	II	T/W	Umaid chowk, Chouhan ji ka Nohra	7.7	98	104	58	0.2	267.9
S_{II} 16	II	T/W	Hathi Bawari, Paota Sabji Mandi	7.4	530	530	300	1.4	1368.8
S_{II} 17	II	T/W	Mahadev Bawari, Paota Sabji Mandi	7.3	600	500	280	1.6	1388.9
S_{II} 18	II	T/W	Dictology wellphool bagh, Mondore	7.1	410	580	340	0.2	1337.3
S_{II} 19	II	T/W	Dr.R.S. Gehlot, Paota A Rd.	7.7	490	170	100	0.9	768.6
S_{II} 20	II	T/W	Infront Incometax colony	7.1	560	510	200	2.5	1279.6
S_{II} 21	II	O/W	Nayapura	6.9	410	430	200	0.5	1047.4
S_{II} 22	II	T/W	Lal Maidan, Girls School	7.4	400	570	300	2.6	1280
S_{II} 23	II	O/W	Tapi Bawari	11.0	150	260	120	0.2	541.2
S_{II} 24	II	O/W	Bodo ji ka well	9.0	600	280	160	0.6	1049.6
S_{II} 25	II	O/W	Vimalraj ji ka bera	10.7	300	180	90	0.2	580.9
S_{III} 1	III	T/W	Rajive nagar	7.2	350	750	407	1.0	1515.2
S_{III} 2	III	T/W	Jogio ka bas	7.5	96	100	02	0.18	205.68
S_{III} 3	III	T/W	Nrisingh dara	7.5	98	102	02	0.1	209.6
S_{III} 4	III	T/W	Incometax colony, paota Rd.	7.7	410	440	95	0.6	953.3
S_{III} 5	III	O/W	O/w Nalesahwar Mahadev	7.2	270	290	25	0.2	592.4
S_{III} 6	III	T/W	Near Gourav Taxtile, Basni II-Phase	7.7	350	430	225	0.5	1013.2
S_{III} 7	III	T/W	ISCON surgicals, ltd. Basni II-Phase	7.6	100	108	05	0.3	220.9
S_{III} 8	III	T/W	No.3 New pal	7.4	300	260	25	0.5	592.9
S_{III} 9	III	T/W	No.4, Pal	7.4	350	300	25	0.5	682.9
S_{III} 10	III	T/W	H.W. Gram Pal	7.2	300	1730	125	0.2	2162.4
S_{III} 11	III	T/W	Boranada I-phase	7.7	680	480	100	0.95	1268.65
S_{III} 12	III	T/W	R.O. Plant, near factory gate out	6.8	340	30	01	0.06	376.86
S_{III} 13	III	T/W	Gandhi Maidan	7.1	470	370	390	5.5	1242.6
S_{III} 14	III	T/W	Lal Bhaden, Shastri Nagar (Shastri Nursing College, Gali no. 6	7.7	250	400	220	0.5	878.2
S_{III} 15	III	T/W	Sigma Minerals	7.0	770	550	480	1.6	1808.6
S_{III} 16	III	T/W	JIET-I	8.1	122	130	02	0.3	262.4
S_{III} 17	III	T/W	JIET SET-G-II	8.2	116	124	02	0.3	250.5
S_{IV} 1	IV	T/W	6/10 Ram Chandraji Kudi	7.6	100	100	01	0.2	208.8
S_{IV} 2	IV	T/W	6/25 Bhawarlal ji Kudi	7.5	100	100	02	0.2	209.7
S_{IV} 3	IV	T/W	A/78 Rameshwar nagar	7.6	90	100	02	0.2	199.8
S_{IV} 4	IV	T/W	B/13 Saraswati nagar	7.6	96	102	02	0.2	207.8
S_{IV} 5	IV	T/W	C/13 Saraswati nagar	7.6	96	100	02	0.2	205.8
S_{IV} 6	IV	T/W	F-130 Krishana office	7.7	100	100	02	0.2	209.9
S_{IV} 7	IV	T/W	F-247, Lunkar Fabrics	7.8	98	100	03	0.16	208.96
S_{IV} 8	IV	O/W	Subhash Chowk, Ratnada	7.4	680	1000	900	1.1	2588.5
S_{IV} 9	IV	O/W	Krishna Mandir, Ratnada	7.3	550	500	400	1.1	1458.4
S_{IV} 10	IV	T/W	Vishnoi Dharam Shala	7.5	540	400	175	1.4	1123.9

Coding	Zone	Type of source	Samples	pH	ALK(M)	TH	NO_3	F	Total
S_{IV} 11	IV	O/W	Police line Bawari	7.9	630	150	400	6.2	1194.1
S_{IV} 12	IV	T/W	Best Patel Nagar	7.1	560	380	80	1.6	1028.7
S_{IV} 13	IV	O/W	Police line	7.2	1070	650	1125	4.5	2856.7
S_{IV} 14	IV	O/W	Maheshwario ki Bagechi, Bawari	7.1	540	1090	900	1.0	2538.1
S_{IV} 15	IV	O/W	Nawal Khan, Public Park	7.5	500	1330	800	0.7	2638.2
S_{IV} 16	IV	O/W	Janana Park, Public Park	7.2	540	1020	450	1.4	2018.6
S_{IV} 17	IV	T/W	Kudi Bagtasni	7.8	100	06	02	0.2	116
S_{IV} 18	IV	T/W	RamDayal ji pul ka bas, Basni	7.7	96	98	02	0.1	203.8
S_{IV} 19	IV	T/W	PHED area	7.9	850	440	200	3.2	1501.1
S_{IV} 20	IV	T/W	Railway hospital	7.2	850	600	400	1.0	1858.2

is result of dissolution of fluoride, apatite and topaz from the local bedrock and Handa[2] reported the general negative correlation between fluoride and calcium concentration in Indian ground water. The excess fluoride in ground water posing serious health hazards of Fluorosis to a huge rural population[3]. The fluoride contents in overall water samples are within the acceptable limits.

Foster, *et.al*[4], first brought the threat of rising nitrates in ground water to public attention through a study carried out in East Yorkshire. Excessive use of nitrogeneous fertilizers in agriculture has been one of the primary source of high nitrate in ground water[5]. In and around areas of high urbanisation and industrialization, municipal, and industrial wastes may contribute high levels of nitrate to the ground water[6]. As and when the nitrate rich ground water is pumped out and used for drinking, it causes number of health disorders in human beings[7]. The presence of higher concentration of nitrate in high population density areas indicate lack or insufficiency of natural drainage of rain water as well as the proper sewerage system that needs to be developed.

The open well water quality in almost all samples is not satisfactory and hazardous for health particularly the open wells, which were sources of water to meet the local needs in earlier years are not in use and therefore all the parameters show regular built up of concentrations. These wells should be put in use to augment the water requirement for non drinking purposes like gardening, in industries *etc*.

The reuse or recycling of these resources is not recommended as the quality water is sufficient to meet the drinking water demand.

Status of surface water in industrial area: The heavy industries in Jodhpur are located in southern part and produce varieties of effluents. These pollute natural open Nalas of Bhagat ki Kothi and Basni area. These areas are suffering from bad quality of ground water as revealed by earlier resources. The hand pump water shows high concentration of iron and acidic pH. The effluent from stainless steel plant contains very high concentration of inorganic nitrate and fluorides due to use of nitric acid, hydrofluoric acid and sulphuric acid on very large scale. This requires a separate study and therefore the specific recommendation for this area has not been made.

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