*Asian Journal of Chemistry* Vol. 11, No. 4 (1999), 1546–1548

*NOTE*

# Extraction of Colouring Material from *Butea monosperma, Frondosa* (Tesu, Palash Flowers)

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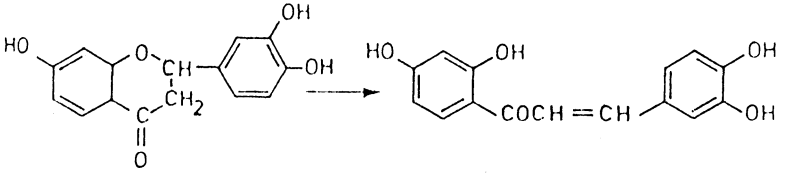
The world has become aware of environmental issue in recent years. Synthetic dyestuff are highly polluting in their process of manufacturing as well as application. There has been a renewal of interest in the use of natural colouring matter for dyeing. Many studies have been conducted on colour characterization and dyeing methods used for dyeing with natural dyes. This paper is an attempt to study, in details, the optimization of extraction conditions to get pure and higher yield of dye content form *Butea monosperma Frondosa* (Tesu flowers).

Due to the existence of the German ban, dyes must be tested to ensure the absence of carcinogenic aryl amines as a degradation product. The user of synthetic dyes is looking for suitable options.[1-3] With the introduction of synthetic dyes in the nineteenth century, there was a decline in the use of natural dyes. (In ancient days people were using natural dyes, but they were not aware about the chemistry of dyes, which is much more important.)[4,5]

This paper describes extraction procedure and optimization of extraction conditions to get pure and maximum yield of colouring matter. The Tesu flower has traditionally been used for dyeing purpose. The main colouring matter is Butin[5] chalcone of orangish red colour, but other anthochlor pigments are also present.




Butin Butein

Flowers of Tesu acquired from a remote part of India[4]. The flowers were first dried in sunlight and ground to made powder. The powder was extracted in buffer of different pH. For optimization of extraction conditions, parameters of extraction were changed (temperature, extraction time and ML ratio). 2 kg of *Tesu* flower was taken for experiment. First it was soaked in the buffer of different pH, then extracted

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in glass-lined reactor at different temperature, extraction time and ML ratio. The extracted liquid was centrifuged to remove the insoluble part, then dried at 60°C and calculated the dried mass of extract for each experiment. Then the experimental data were observed (Table-1). The solubility of extracted colouring matter was checked with various solvents including water (Table-2). TLC study was also carried out for observation of fragments of colouing matter (Table-3).

TABLE-1

| Experiment No. | Quantity of tesu flower | mL Ratio | pH | Soaking Time (h) | Soaking Timp. (°C) | Extraction Time (h) | Extraction Timp. (°C) | Colour of Extract | Appearance (After Drying) | Yield (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 Kg | 1 : 10 | 7 | 17 | 40 | 2 | 90 | brick red | powder | 29.0 |
| 2 | 2 Kg | 1 : 10 | 9 | 17 | 40 | 2 | 90 | brick red | powder | 33.8 |
| 3 | 2 Kg | 1 : 10 | 10 | 17 | 40 | 2 | 90 | coffee brown | powder | 33.0 |
| 4 | 2 Kg | 1 : 5 | 9 | 17 | 40 | 0.5 | 90 | brick red | powder | 24.0 |
| 5 | 2 Kg | 1 : 5 | 9 | 17 | 40 | 1 | 90 | brick red | powder | 28.0 |
| 6 | 2 Kg | 1 : 5 | 9 | 17 | 40 | 1.5 | 90 | brick red | powder | 28.0 |
| 7 | 2 Kg | 1 : 5 | 10 | 17 | 40 | 1 | 50 | coffee brown | powder | 29.4 |
| 8 | 2 Kg | 1 : 5 | 10 | 17 | 40 | 1 | 60 | coffee brown | powder | 29.9 |
| 9 | 2 Kg | 1 : 5 | 10 | 17 | 40 | 1 | 70 | coffee brown | powder | 30.0 |
| 10 | 2 Kg | 1 : 5 | 10 | 17 | 40 | 1 | 80 | coffee brown | powder | 32.5 |
| 11 | 2 Kg | 1 : 5 | 10 | 17 | 40 | 1 | 90 | coffee brown | powder | 34.5 |

TABLE-2
STUDY ON SOLUBILITY OF EXTRACTED DYE
Solubility was tested in various solvent and water

| Solvent | Solubility |
|---|---|
| Water | Soluble |
| Methylene chloride | Soluble |
| Chloroform | Partially soluble |
| *n*-Hexane | Partially soluble |
| Chloroform | Partially soluble |
| Ethyl acetate | Partially soluble |

## Thin Layer Chromatography Study for Separation of Extracted Dye

TLC analysis were carried out using precoated TLC aluminum sheet supplied by E. Merck, Germany (Silica 60 F 254). Dissolved the crude sample in methanol for spotting on TLC plate. Seven different solvent systems were tried for optimizing the system(s) for good resolution of the crude dye powder. These are listed in Table-3.

TABLE-3

| Solvent system | Mobile phase | Ratio of mobile phase | $R_f$ | No. of fraction obtained | Colour |
|---|---|---|---|---|---|
| I | chloroform : acetic acid | 60 : 40 | 0.80 | 1 | Yellow |
| II | *n*-hexane : chloroform | 70 : 30 | 0.10 | 1 | Yellow |
| III | chloroform | 100 | 0.06 | 1 | Yellow |
| IV | *n*-hexane : ethyl acetate | 9 : 1 | Spot not moved | 1 | Yellow |
| V | ethyl acetate : *n*-hexane | 9 : 1 | 0.83 | 1 | Yellow |
| VI | ethyl acetate : methanol : Acetic acid | 60 : 30 : 10 | 0.83<br>0.73 | 2 | Yellow |
| VII | butanol : acetic acid : ammonia | 10 : 10 : 10 | 0.79<br>0.71<br>0.59 | 3 | Yellow |

After observing all the experimental data (Table-1), it has been found that the following condition for extraction gives high yield of colouring matter and soluble in water. Thin layer chromatography experiments show presence of maximum three colouring matters of yellow colour. The UV-VIS experiment was also carried out to determine the $\lambda_{max}$ of colouring matter which was found to be 489 nm.

TABLE-4

| Quantity of Tesu flowers (kg) | Soaking time (h) | Soaking temperature (°C) | Extraction time (h) | Extraction temperature (°C) | ML ratio | pH | Yield (in %) |
|---|---|---|---|---|---|---|---|
| 2 | 17 | 40 | 60 | 90 | 1.5 | 10 | 34.5 |

## ACKNOWLEDGEMENT

The authors are thankful to Prof. M.L. Gulrajani, IIT, Delhi for his valuable guidance and Mr. Chetan Mehta of Kailash Dyeing, Sahibabad for providing all the facilities for experiments.

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(Received: 15 June 1999; Accepted: 3 August 1999) AJC-1836