

ENVIRONMENT FRIENDLY NATURAL DYE DERIVED FROM *BOUGAINVILLEA* AS NATURAL FABRIC COLOURANT

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ABSTRACT

The waste water from textile dyeing is one of the biggest threats to the environment. With respect to environmental quality, natural dyes have been used as an alternative to synthetic dyes for keeping the delicate ecosystem of our planet in balance. In the present study an attempt has been made to extract dye from *Bougainvillea* and analyse its dyeing ability on cotton fabric. The pigment present in flowers of *Bougainvillea* was extracted using solvents such as water, acid, alkali and alcohol. Colour intensity was investigated using UV-Visible Spectrophotometer. Various parameters such as pH, temperature, time and dye source concentration were optimized for dye extraction. To enhance the dye uptake and colour fastness, Henna was used as mordant in different ratios (5%, 10%, 15% and 20%). Dye extraction was found to be optimum at pH 9.0, extraction time of 45 min and temperature of 60°C. The results of the colour fastness properties of the dyed fabrics was found to be good. It could be concluded that dye extracted from *Bougainvillea* can be used for colouration of cotton.

Keywords: Natural dye, Mordant, Extraction, Optimization

INTRODUCTION

The natural dyes are extracted from natural substances such as animals, plants or minerals. These dyes are non-toxic, biodegradable, free of health hazards. Where, Synthetic dyes are made in laboratory, chemicals present in that dyes causes serious problems like asthma, allergic, dermatitis and respiratory problems. The natural dyes are safer than the synthetic analogues result in increasing demand for natural dye products globally. These produce soft colours to bright colours to the yarn and fabrics. But, have less affinity towards cotton so some mordant are used for increasing colour fastness properties of natural dyes.

One such source of natural dye is *Bougainvillea* is a member of Nyctaginaceae family. Flowers are mostly red in colour, it's a non woody plant. Floral source of natural dyes

producing different colour like red and yellow. In this article, an attempt has been made to provide valuable information on floral dye extracted from natural resources and application of dye on cotton fabric. The aim of the study was also based on optimization of dye extraction with Solvent, pH, Temperature, Time and Dye concentration.

OBJECTIVES OF THE STUDY

- To extract dye from the source
- To optimize the source for extraction
- To find the efficiency of dyes with suitable solvent
- To test the effectiveness of coloured material

MATERIALS AND METHODS

Source: The fresh flower of *Bougainvillea* waste were purchased from the local market was cleaned, washed with water and dried under shade for 24 hours in room temperature. Then the flowers were made into powder by using mixer.

Substrate: Cotton fabric were use as substrate.

Desizing of cotton cloth:

Desizing plays a major role in achieving a perfect fabric feel. It is a process of removing starch from the material. It was carried by boiling solution containing 5g/l of the non-ionising detergent for 30 min. The desized material was thoroughly rinsed and dried at room temperature.

METHODOLOGY

- The extraction of dye was carried out under various optimized conditions.
- Dyeing of cotton cloth with optimized parameters
- Mordanting
- Assessing colour fastness of the dyed cotton sample

Optimization of dye extraction condition

Determination of solvent: The different media for extracted dye are aqueous, alcohol, acidic and alkaline. The powder form of *Bougainvillea* flower were soaked in water for 24 hours prior to extraction by boiling. The effect of various solvents was measured using Nano UV- Visible Spectrophotometer by colour intensity.

Optimum dye concentration: 1,2,3,4,5g of dye source were soaked for 24hours in 100ml of distilled water each for 1g of fabric weight. Dye solutions were extracted by boiling above solutions for 1 hour on water bath making up the solution 100ml as when required. The solutions were filtered and absorbance was measured.

Optimum time: As determined optimum concentration of the above, extraction was carried out by boiled at five different time 15, 30, 45, 60, 75 minutes and the results are observed.

Optimum temperature: To determine the optimum temperature for the effective extraction of natural dye, the boiling carried out by the above determined time and dye concentration under different temperature from 30°C, 45 °C, 60 °C, 75 °C, 90°C.

Optimum pH: To determine the optimum pH for the extraction of dye from celosia cristata, the extraction was carried by determined above time, temperature and dye concentration with different pH from 8, 9,10, 12 and the result are determined.

Extraction of dye from *Bougainvillea*: Extraction was carried out by using NaOH as solvent in water bath with M:L ratio, 1:10, 1:20, 1:30 with optimized extraction parameters such as time 45 min, temperature 60 °C, pH 9, dye concentration 4g respectively.

Application of the extracted dye on cotton fabric: After extraction, the effect of dyeing parameters such as temperature, time, pH, dye concentration, the desized cotton fabric was dyed by lab scale dyeing machine. At the completion of dyeing, the dyed samples were removed from the lab dyeing machine and washed with water until there was no colour bleeding followed by drying under shade.

Mordanting: Post Mordanting is utilized to fix the dye to the fabric and to increase the colour fastness. The henna concentration used was 5% and 10%.

Colour measurement: The colour intensity was measured using UV-Visible spectrometer.

Evaluation of colour fastness properties: Colour fastness to washing, rubbing, and light tests were performed using standards after dyeing.

RESULT AND DISCUSSION

Effect of solvent: The maximum absorbance was NaOH(1%) hence, it was selected for extraction of natural dye from *Bougainvillea*

Effect of dye concentration: The measurement clearly indicates the colour yield increased with increase in the amount of *Bougainvillea*. The maximum colour intensity was noticed at 4% concentration was used for extraction of dye.

Effect of time: The effect of extraction time was determined at various time intervals are noted. It is clear that the colour yield was maximum at 60 minutes. So, the optimum time for extraction of dye selected as 60 minutes.

Effect of temperature: The colour yield was maximum at 60 °C. Hence, 60 °C was fixed as the optimum temperature for the extraction of natural dye from *Bougainvillea*.

Effect of pH: The colour yield was maximum at pH 12 so, it was fixed as optimum for extraction of dye.

Selection of solvent

No	Solvents	Absorbance 523nm
1	Alcohol (ethanol) ml	0.385
2	NaOH (1%)	0.479
3	Water ml	0.238
4	Acid (Hcl) (1%)	0.178

Optimization of extraction condition

Effect of mordanting conditions on colour fastness properties of dyed fabric

Mordanting	Mordant conc %	Wash fastness	Light fastness	Rubbing fastness	Rubbing fastness
				Dry	Wet
Post mordanting	5%	3	4	3-4	3
Post mordanting	10%	3-4	5	4	3-4

Colour fastness properties: The colour fastness properties presented shows the best performance in 10% mordant concentration.

No	Dye con.	Absorbance 523nm	pH	Absorbance 523nm	Temperature	Absorbance 523nm	Time min	Absorbance 523nm
1.	1g	0.125	8	0.289	30 °C	0.217	15	0.143
2.	2g	0.196	9	0.328	45 °C	0.223	30	0.189
3.	3g	0.245	10	0.326	60 °C	0.245	45	0.226
4.	4g	0.332	12	0.321	75 °C	0.237	60	0.229
5.	5g	0.356	12	0.321	90 °C	0.228	75	0.231

CONCLUSION

Optimization of dyeing is more essential condition to minimize the investment cost and avoid discrepancy in the dyed fabric. The study reveals with *Bougainvillea* showed that the post mordanting gives good colour shades. The optimized dyeing condition were pH 9, Time 45min, Temperature 60°C and M:L ratio 1:20 gives better colour yielding on cotton fabric as well as it possesses good colour fastness.

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