NATURAL DYE DERIVED FROM BOUGAINVILLAEA GLABRA USED AS NATURAL FABRIC COLOURANT

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ABSTRACT

One of the major risks to the environment is the waste water from textile dyeing. Natural dyes have been utilised as an environmentally friendly substitute for synthetic colours to maintain the delicate balance of our planet's ecosystem. In the current work, an effort was undertaken to extract dye from Bougainvillaea glabra and evaluate its potential to colour cotton fabric. Water, acid, alkali, and alcohol were used as solvents to extract the pigment from Bougainvillaea glabra flowers. A UV-visible spectrophotometer was used to examine colour intensity.For dye extraction, a number of factors including pH, temperature, duration, and dye source concentration were optimised. Henna was employed as a mordant in a variety of pre, post, and simultaneous mordanting techniques to improve the dye uptake and colour fastness. At pH 9.0, 45 minutes of extraction time, and 600C, dye extraction was shown to be most effective. The results of the coloured fabric's colour fastness abilities were positive. One could draw the conclusion that cotton can be coloured using the dye obtained from Bougainvillaea glabra.

Keywords: Natural dye, Mordant, Extraction, Optimization

Introduction

Natural colours are derived from organic materials like plants, animals, or minerals. These colours pose no health risks and are non-toxic and biodegradable. Synthetic dyes are created in laboratories and they have a major negative impact on respiratory and asthmatic conditions. Because natural dyes are safer than synthetic ones, there is a rising demand for natural dye products all over the world. The Nyctaginaceae family includes the Bougainvillaea glabra, which has predominantly red blooms. Different colour tones are produced by the dye that is taken from Bougainvillaea glabra flowers. To improve the colour fastness of natural dye on fabrics, various mordants are employed since the dye has a lower affinity for cotton

This article attempts to extract dye from Bougainvillaea glabra flowers while optimising several extraction factors including pH, Time, Temperature, and Dye Source Concentration.

Methodology

1. **Natural Dye Source**: Fresh Bougainvillaea glabra flowers were bought at the neighbourhood

market. It was cleaned, given a water wash, and allowed to air dry for 24 hours at room temperature in a shaded area. Powdered dried flowers were used.

2. Cloth Choice: Cotton cloth was used for the investigation. It was scoured, bleached, and desized.

3. Solvent Selection: To choose the best solvent, dye was extracted using several media, including aqueous, alcohol, acidic, and alkaline solutions. A UV-visible spectrophotometer was used to determine the intensity of the colour in the extracted dye. The greatest absorbance was seen in dye extracted with sodium hydroxide. NaOH was chosen as a good solvent for dye extraction as a result.

4.Extraction Optimisation: To get the most colour compound from a dye source, extraction optimisation is crucial. Dye source Concentration, pH, Time, and Temperature are just a few of the variables that can be optimised. Different dye source concentrations (1%, 2%, 3%, 4%, and 5%) and extraction times (15, 30, 45, 60, and 75 minutes) were used. Similar to this, the ideal pH (8, 9, 10, and 12) and temperature (300, 450, 600, 750, and 900C) were established based on the UV-visible spectrophotometer measurement of the dye extracts' colour intensity.

5.Extraction of dye from Bougainvillaea glabra: The extraction of dye from Bougainvillaea glabra was carried out using the measured quantity of optimised factors such as Time (45 min), Temperature (60 ºC), pH (9), and Dye concentration (4%). The colour was then filtered out and absorbance wasmeasuredusing spectrophotometer.

6. Dyeing: Cotton cloth was dyed using an industrial-scale dyeing machine and the extracted dye. After the dyeing process was finished, the samples were taken out of the machine and rinsed in water before being dried in the shade. Henna (10% concentration) was used for pre-, post-, and simultaneous mordanting in order to fix the dye to the fabric and improve colour fastness.

In Pre-mordanting method, the fabrics were mordanted at M: L: R 1:20 at 60 ºC with pH 9 for 45min.Then the fabric was dyed. Simultaneous mordanting was carriedout with both dye Extract and mordant simultaneously. In post mordanting, the cotton fabric was dyed at optimized parameters and removed from the dye bath and then treated with mordant solution.

7. Evaluation of colour fastness properties: The dyed cotton samples were evaluated for colour fastness to washing, rubbing and light.

Result and Discussion

The effect of various solvents was assessed, and the result are investigated in Table1. FromTable 1, it is clear that maximum absorbance was noticed with sodium hydroxide extraction. Hence, Alkaline extraction was selected for dye extraction from flower of

Bougainvillea glabra

Table1 Selection of solvent

No	**Solvents**	**Absorbance(523 nm)**
1	Alcohol(ethanol)ml	0.485
2	**NaOH(1%)**	**0.679**
3	Waterml	0.497
4	Acid(Hcl)(1%)	0.378

The results of optimising the dye source concentration are shown in Table 2. Table 2 makes it clear that the 5% dye source concentration produced the highest colour yield. With an increase in dye source concentration, colour production rises. As a result, an ideal dye source concentration of 5% was chosen.

Table2:Optimization of extraction conditions

No	**DyeSource con.(%)**	**Absorbance (523nm)**	**pH**	**Absorbance (523nm)**	**Temperature (°C)**	**Absorbance (523nm)**	**Time (min)**	**Absorbance (523nm)**
1.	1g	0.125	8	0.789	30	1.017	15	0.693
2.	2g	0.245	**9**	**1.328**	45	1.126	30	0.889
3.	3g	0.432	10	0.826	**60**	**1.245**	**45**	**0.986**
4.	4g	0.643	12	0.621	75	1.137	60	0.829
5.	**5g**	**0.652**			90	1.078	75	0.761

It was discovered that whether the pH was above or below 9, pH 9 had the highest colour absorbance. Colour intensity decreases as pH levels rise further. pH 9 was therefore chosen as the best option for dye extraction. At a temperature of 60°C, the maximum colour intensity was discovered. The hue intensity reduces as temperature rises. Therefore, 60°C was determined to be the ideal temperature. The colour yield peaked at 45 minutes as well. As a result, it was chosen as the best period to extract dye from Bougainvillaea glabra flowers.

Pre-mordanting was shown to have good colour fastness against washing, rubbing, and light among the mordanting techniques; the results are shown in Table 3.

Table3: Effect of mordanting conditions on colour fastness properties of dyed fabric

Mordanting	Mordant Con%	Washfastness	Lightfastness	Rubbingfastness Dry	Rubbingfastness Wet
Pre-mordanting	10%	4-5	4	4	3-4
Simultaneousmordanting	10%	3-4	3	4	3
Postmordanting	10%	3-4	3	3-4	3

Conclusion

According to the study's findings, cotton cloth may be dyed successfully using Bougainvillaea glabra. Henna premordanting improved the colour fastness qualities and produced pleasing colour tones. Additionally, the dye made from Bougainvillaea glabra was more eco-friendly when used to colour textiles.

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