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DYEING OF COTTON FABRIC WITH THESPESIA POPULNEA FLOWER BY USING DIFFERENT MORDANTS

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Abstract: The study examined the fastness properties of cotton fabric dyed with flowers from Thespesia populnea using various ratios (1:3,1:1, and 3:1) of various mordants. These ratios included myrobolan:nickel sulphate, myrobolan:aluminum sulphate, myrobolan:potassium dichromate, myrobolan:ferrous sulphate, and myrobolan:stannous chloride. We examined the washing, rubbing and sweat fastness of the colored samples. Comparing the color strength and fastness of cotton flowers colored with Thespesia populnea using a combination of mordants. When Thespesia populnea is simultaneously mordanted with a 1:3 mordant combination, the greatest results are obtained when comparing the fastness qualities and color strength of cotton materials that have been dyed.

Index Terms **- Cotton fabric, Dyeing, Thespesia Populnea, Mordants.**

I. INTRODUCTION

Historically, people have colored fabrics with natural dyes, which were also utilized as the main colorants. More cost-effectiveness could potentially result in a greater range of colors, increased consistency, and improved dying quality. The usage of natural dyes has, however, recently gained popularity due to strict environmental regulations put in place by many countries in response to the detrimental effects and allergic reactions linked to synthetic colors. With the current awareness of environmental issues, the researcher's focus has shifted to the natural dyes to color textile products.

II. MATERIALS AND METHODS

The extraction of natural dye from Thespesia populnea flowers is the goal of this research project. For the peoples of the Pacific Islands, this tree is sacred. Ropes made of twisted bark. The trees block out the wind, the light, and the sea spray. Food and medication are made from seeds, leaves, and bark.

In the past, temple places were surrounded by trees. The tree is becoming more and more rare due to overharvesting in certain areas and increasing urbanization in others. The tree grows easily in the Pacific, thus it should be taken into consideration for urban forestry and reforestation projects when suitable sites are available.

The tree grows well in sandy, salted soils and is resistant to wind and salt spray, it can be used as a coastal windbreak. It spreads easily and expands swiftly. It should not be planted in areas where it is not already established because it readily naturalizes and has become a weed in some areas. The tree is drought-tolerant and does well in direct sunlight. Termites that feed on dry wood cannot penetrate the heartwood. Milo can be used for windbreaks, living fences, animal feed, and protecting coastlines, among other things. Even though it produces good lumber, ornamental trees are probably the most common use of this species in the Pacific today.

Bleached cotton fabric from Erode Textile Market was used for the inquiry. Analytical reagents (AR) included ferrous sulfate, aluminum sulfate, nickel sulfate, potassium dichromate, stannous chloride, commercial-grade acetic acid, common salt, and sodium carbonate. For the investigation, powdered myrobolan (Terminalia chebula), a natural mordant, was utilized. Ethanol extract from Thespesia populnea flowers was used to produce a brown colorant for fabric dyeing. Depending on the type of mordant used, fabrics dyed with Thespesia populnea flower extract may acquire different colors.

Thespesia populnea flower was dried, ground into a powder, and soaked in warm water for one night in a known amount. The color extract was produced by boiling it in the same water. The dye extract was filtered and used for dyeing once it had cooled. The optimal dyeing parameters were followed during the dyeing process: 60 minutes for dye extraction, a material-to-liquor ratio of 1:20, 60 ˚C for temperature, 420 nm for wavelength, and 50 minutes for dyeing. The following combinations of mordants were utilized in the following ratios: 1:3, 1:1, and 3:1 for myrobolan: nickel sulphate, myrobolan: aluminum sulphate, myrobolan: potassium dichromate, myrobolan: ferrous sulphate, and myrobolan: stannous chloride. Five grams of mordant for every 100 grams of cloth was the total amount of two mordants used in each combination. Each of the five mordant substances combinations was used with all three of the mordanting techniques—pre-mordanting, simultaneous mordants, and post-mordanting for dyeing—in the three different ratios mentioned above.

The dyed samples' color fastness to washing was assessed using a Sasmira launder-O-meter in accordance with IS: 764-1984 technique, which was followed by IS-3 wash fastness procedure. In accordance with ISO-05-A02 (a lack of shade depth) and ISO-105-AO3 (the extent of staining), the washing fastness rating was evaluated using a greyscale. This was verified by measuring the staining and loss of color depth using a computer-aided color measurement system (Macbeth 2020 plus). The color fastness to rubbing was evaluated using a crock meter and greyscale in accordance with ISO-105-AO3 (staining extent) according to the IS: 766-1984 procedure.

Color fastness to light exposure was assessed using the IS: 2454-1984 methodology. The sample and the eight standard blue wool standards (Bachelor of Science1006: BOI: 1978) were subjected to UV radiation in a Shirley MBTF Microsal fade-O-meter, which included a 500 watt Philips mercury bulb

tungsten filament lamp that mimicked daylight. Every sample's fading was compared to standards for blue wool fading.

In accordance with IS 971-1983, the color fastness to sweat was evaluated. A composite specimen was created by sandwiching the test sample between two neighbouring cotton pieces and stitching all four sides. The sample was immersed individually in the acidic/alkaline test solution using MLR 1:50 for 30 minutes at room temperature. After that, the sample was loaded with 4.5 kg (10 lbs) and sandwiched between two glass plates of the perspirometer. The device was maintained at 37±2˚C for four hours. The specimen was taken out at the conclusion of this time and allowed to dry in the atmosphere at a temperature that was no higher than 60 ˚C. Grey scales were used to score the test samples based on changes in color and staining.

The outcomes of evaluating color resistance against sunlight, washing, rubbing, and perspiration using a myrobolan:nickel sulphate combination are displayed in Table 1.

All treated samples that are exposed to light exhibit quite strong light fastness for all combinations of mordants. Wash resistance grading of 3 to 4 are achieved by all treated samples, and no color degradation has been observed.

Following both dry and wet rubbing, every treated sample exhibits a remarkable shift in color (5). Results of dry rubbing range from little color deterioration (5 to 4-5) to no color staining. Most of the samples treated exhibit excellent color fastness ratings in both alkaline and acidic circumstances. For every treated sample, there is no color staining (5) in either the acidic or alkaline medium.(Table 1)

Table 1. Fastness properties and colour strength of dyed cotton in a combination of mordants

Plant parts used for dyeing	Mordent used	Method	Properties						
			Washing	Lighting	Fastness in Rubbing		Fastness in Perspiration		Colour Strength
					Dry	Wet	Acidic	Alkaline	
Thespesia Populnea flower	Mybrobolan/Aluminium sulphate 1:3	Simultaneous Mordant	5	4	5	5	4	4-5	3.41
		Pre Mordant	5	3-4	5	5	5	5	3.01
		Simultaneous Mordant	5	3-4	5	5	5	5	3.52
		Pre Mordant	5	3-4	5	5	4	5	3.03

III. RESULT AND DISCUSSION

In this study, five inorganic mordants were combined with the naturally occurring mordant myrobolan to create three distinct proportions of the mordants, such as 1:3, 1:1, and 3:1. The resulting mixture was then dyed on silk fabrics. The color fastness and color strength values of the dyed silk materials obtained in this investigation using different combinations of mordants are displayed in Table 1, together with the values obtained in other experiments. The three dyeing processes using three plant portions yielded satisfactory results when the mordant compounds ferrous sulphate & aluminium sulphate were used.

The results of the color strength comparison indicate that the 1: 3 mordant mixture is the most effective for dying out of the three combinations. When the three dyeing methods were compared, the

simultaneous process yielded excellent results for both natural dyes. The information in Table 1 indicates that the colour strength ratio will increase with mordant concentration. The current study had better light fastness (GS : 4-5) than, who used stannous chloride (GS : 2) as a mordants in the pre process of mordant. When Thespesia populnea is simultaneously mordanted with a 1:3 mordant combination, the findings of a comparative analysis of the fastness characteristics and color strength of colored silk samples are superior. These findings indicate that Thespesia populnea has a higher dyeing capacity than the other natural dyes.

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