

SHADE VARIATIONS IN EUCALYPTUS BARK NATURAL DYED COTTON DUE TO POST-TREATMENT WITH ECO-FRIENDLY DYE FIXING AGENTS

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ABSTRACT

In this article we reviewed shade variations of mordanted Eucalyptus bark natural dyed cottons and post treated with different eco-friendly dye fixing agents. Eco-friendly mordants such as Alum, Stannous Chloride and Ferrous Sulphate were used. Eucalyptus bark dye was selected due to its easy availability. A pre-treatment with myrobalan has been given for better dye uptake. After mordanted and dyed cotton sample was post treated with five eco-friendly dye fixing agents such as Alum, Ammonia, Lime juice, Vinegar and Calcium Chloride for Shade variations in Eucalyptus bark natural dye on cotton and analysed.

KEYWORDS: *Eucalyptus Bark Natural Dye, Dye Fixing Agents, Shade Variation, Eco-Friendly Mordants, After-Treatment.*

INTRODUCTION

Natural dyeing of the textiles is an age old practice. It is the result of the quest of man for beauty of colour which made him discover the colouring matter from natural sources such as plants and animals. But the invention of synthetic dyes has limited the application of natural dyes. Natural dyes are considered to be very good for their colour experimentation, quality, excellent for their endurance and soft lustrous colouring. Even after a long period they retain great beauty and charm. They do not pollute the environment as they are applied with simple chemical reactions. The natural dye has several advantages over synthetic dyes from the point of view of health, safety and ecology.

MATERIALS AND METHODS

Selection of Dye Source: Eucalyptus bark natural dye was used for this study, as per the available literature Eucalyptus bark natural dye is the direct natural dye and also easily available in nature. Hence, it was selected to see shade variation with dye fixing agents on cotton material.

Selection of Fabric: Lightweight cotton fabric woven in plain weave was selected for study as it was easily available at low price and exhibited good dye uptake.

Selection of Mordants: The three eco-friendly mordants, namely alum, stannous chloride and ferrous sulphate were used in the study.

Selection of Chemicals for Testing: The following chemicals LR grade was used for conducting the research.

Table 1: Selected Chemicals for Study

S. No	Chemical Used	Molecular Formula	Purpose
1	Alum	$\text{AlK}(\text{SO}_4)_2$	Mordant
2	Stannous chloride	SnCl_2	Mordant
3	Ferrous sulphate	FeSO_4	Mordant
4	Sodium Chloride	NaCl	Colourfastness tests
5	Sodium bi-carbonate	NaHCO_3	Colourfastness tests
6	Urea	NH_2CONH_2	Colourfastness tests
7	Acetic acid	CH_3COOH	Dye extraction/ P^{H} maintenance

Selection of Eco-friendly Fixing Agents: Fixing agents such as vinegar, alum, ammonia, lime juice and calcium chloride were selected as they were eco-friendly and easily available.

Table 2: Eco-friendly Fixing Agents Used for Study

Fixing Agent Selected	Molecular Formula
Vinegar	CH_3COOH
Alum	$\text{AlK}(\text{SO}_4)_2$
Ammonia	NH_3
Lime juice	-
Calcium Chloride	CaCl_2

Selection of Methods

Selection of Research Design: The experimental research design was selected for the study as it involved experiments and laboratory tests.

Preparatory Process for Cotton

Cotton Scouring: the cotton fabric contains dust, oil and other impurities that interfere with the absorption of the dye. Hence, cotton was scoured using mild alkali and a detergent. The scouring procedure standardised by Devi et.al. (2002) was adopted.

Proportion

Non-ionic detergent = 2 g/ litre of water

Caustic soda = 1 g/ litre of water

Pre-treatment of Cotton with Myrobalan: Pre-treatment was required for cotton fabric as it had no affinity towards natural dyers. Myrobalan fruit was selected for giving pre-treatment to cotton as the tannin content present in it, aids in enhancement of dye uptake and fixing of dye on the fabric. The procedure standardized by Devi et. al., (2002) was adopted. The fabric was weighed and kept the fabric in myrobalan filtered solution (material to liquor ratio of 1:20, 5g of myrobalan powder per 100 ml of water was selected) for 24 hours. The fabric was thoroughly squeezed to remove excess liquor and dried in sun for three hours.

Suitable dye Extraction Method for Eucalyptus Bark Natural Dye: The alkaline method was found suitable for extraction of the natural Eucalyptus bark natural dye.

Dye Extraction Time: Sixty minutes of dye extraction time was found for annatto dye seeds.

Selection of Mordanting Methods: There are three methods of mordanting, simultaneous mordanting and post mordanting. Among three methods, pre-mordanting was found suitable for many natural dye sources especially for the selected natural dye of annatto with all mordants (Devi et.al. 2002).

Mordanting Time: The mordanted samples were then dyed in 2 per cent annatto seeds dye liquor for 30 minutes.

Mordant Concentrations: For alum 5, 10 and 15 per cent solutions were selected. In-case, of stannous chloride and ferrous sulphate 1, 2, and 3 per cent solutions were selected.

Dyeing Time: The pre-mordanted samples were placed in dye liquor for 30 minutes.

Fixing Agents: This is a post treatment given to aid fixing of dye on to the fabric. Five eco-friendly fixing agents such as vinegar, alum, ammonia, lime juice and calcium chloride were selected for the treatment. These fixing agents were selected, as they are common fixing agents used for dyeing fabrics. As per Dedhia (1998) first 5 per cent solutions of each of the fixing agents were prepared. Five per cent of fixing agents produced noticeable changes in the dyed samples. Hence, 5 per cent fixing agent was selected.
















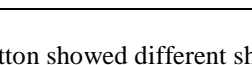
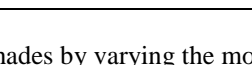
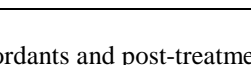
Soaping off: The dyed samples were washed in 2 per cent luke warm detergent solution to remove the loose dye on the fabric and then rinsed thoroughly in water and dried.

RESULTS

Table 3: Shade Variations in Eucalyptus Bark Dyed Cotton Due to Post-Treatment

Alum Mordanted Eucalyptus Bark Dyed Cottons with Post Treatment			
Treatment with Fixing Agents	Mordant Concentrations		
	5%	10%	15%
Control			
Vinegar			
Alum			
Ammonia			
Lime juice			
Calcium chloride			
Stannous chloride Mordanted Eucalyptus Bark Dyed Cottons with Post Treatment			
Treatment with Fixing Agents	Mordant Concentrations		
	1%	2%	3%
Control			
Vinegar			
Alum			
Ammonia			
Lime juice			
Calcium chloride			

Table 3: Cond.,

Ferrous Sulphate Mordanted Eucalyptus Bark Dyed Cottons with Post Treatment			
Treatment with Fixing Agents	Mordant Concentrations		
	1%	2%	3%
Control			
Vinegar			
Alum			
Ammonia			
Lime juice			
Calcium chloride			

Eucalyptus bark dye on cotton showed different shades by varying the mordants and post-treatment with 5 percent fixing agents. All dyed samples showed difference either in depth or in hue when treated with varying eco-friendly fixing agents.

Vinegar post-treated alum mordanted samples displayed pinkish ochre creams. These shades were evenly dyed, although slight increase in depth was noticed with mordanted cottons. Light pinkish cream shade was obtained by stannous chloride. Ferrous sulphate mordanted samples showed dark grey shades than control. Three per cent ferrous sulphate mordanted samples, showed much darker grey shades than control.

Post-treatment with alum had contributed for darkening the shades obtained by mordanting with stannous chloride and ferrous sulphate. However, post-treatment with alum did not contribute in producing bright shades. Bright ochre creams were produced with stannous chloride. In this treatment samples showed good colour which was evident in all stannous chloride samples. A unique shade of grey with slight pinkish tinge was observed in all ferrous sulphate mordanted samples. As percentage of mordant increased, pinkish ochre of higher depth was obtained.

Samples post-treated with ammonia showed only light shades than control. Light cream with slight greenish tinge was observed on alum mordanted samples. The depth of greenish tinge increased with increase in mordant concentration. Light shades of cream with slight pinkish tinge were observed in stannous chloride mordanted samples. Ferrous sulphate mordanted samples produced light shades of grey with slight creamish tinge to dark grayish cream as per the increase in mordant concentration.

In general, it was observed that lime juice had contributed for brightening of the shades obtained on cotton mordanted with various mordants. In case of stannous chloride and ferrous sulphate mordanted cottons bright shade was produced compared to control. But alum mordanted samples produced only light, but bright cream shades. Very slight difference was noticed with the increase in concentration of the mordant. Slight pinkish tinge was observed in stannous chloride mordanted samples. But even colour levelling was observed in all the lime juice treated samples. Ferrous mordanted samples showed cream with greenish tinge. In this sample also very slight difference was noticed in colour depth following increase in concentration of the mordant.

The eucalyptus bark dyed cotton post-treated with calcium chloride exhibited light shade than control. Alum mordanted samples exhibited light creams with slight pinkish tinge, which was darkened with the increase in mordant

concentration. Light cream with dark pink was produced in stannous chloride mordanted samples after the treatment. Light to dark grey shades were produced with ferrous sulphate mordant. But 1 per cent ferrous sulphate mordanted samples showed slight pinkish tinge with grey colour.

CONCLUSIONS

After mordanting with eco-friendly mordants, cotton samples were dyed in Eucalyptus bark, as per the optimized conditions to improve the colour fastness of shades developed. These dyed samples were post-treated with five fixing agents such as vinegar, alum, ammonia, lime juice and calcium chloride. Vinegar post-treated alum mordanted samples displayed pinkish ochre creams. Light pinkish cream shade was obtained by stannous chloride and dark grey shades were obtained by ferrous sulphate mordanted samples showed than control.

Post-treatment with alum had contributed for darkening the shades obtained by mordanting with stannous chloride and ferrous sulphate over control. Samples post-treated with ammonia showed only light shades than control. In general, it was observed that lime juice had contributed for brightening of the shades obtained on cotton mordanted with various mordants. In case of alum mordanted samples produced only light but bright cream shades, slight pinkish tinge was observed in stannous chloride mordanted samples and Ferrous mordanted samples showed cream with greenish tinge.

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