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Research Paper

Improving the acidic perspiration fastness of Eucalyptus bark dye with dye levelling agents on cotton

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■ **ABSTRACT :** This paper reports the improving the acidc perspiration fastness of Eucalyptus bark dye on cotton mordanted with eco-friendly mordants and post-treated with various leveling agents. The natural dye with dye levelling agents, extraction of the colourants from natural sources; effects of different mordants and mordanting methods; selection of f levelling agents; dyeing variables; post-treatment process and analysis of colour improvement parameters with levelling agsents for cotton dyed with natural dye; assessed colour improvement with colour fastness test.

■ **KEY WORDS:** Eucalyptus bark natural dye, Levelling agents, Colourfastness, Eco-friendly mordants, Acidic perspiration

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Worldwide, growing consciousness about organic value of eco-friendly products has generated renewed interest of consumers towards use of textiles (preferably natural fibre product) dyed with eco-friendly natural dyes. Natural dyes are known for their use in colouring of food substrate, leather as well as natural fibres like wool, silk and cotton as major areas of application since pre-historic times (Agarwal *et al*., 1992). Although this ancient art of dyeing textiles with natural dyes withstood the ravages of time, but due to the wide availability of synthetic dyes at an economical price, a rapid decline in natural dyeing continued. However, even after a century, the uses of natural dyes never erode completely and they are being still used in different places of the world. Thus, natural dyeing of different textiles and leathers has been continued mainly in the decentralized sector for specialty products besides the use of synthetic dyes in the large scale sector for general textiles/apparels. Recently, most of the commercial dyers and textile export houses have started re-looking to the maximum possibilities of using natural dyes for dyeing and printing of different textiles for targeting niche market. Natural dyes produce very uncommon, soothing and soft shades as compared to synthetic dyes. On the other hand, synthetic dyes, which are widely available at an economical price and produce a wide variety of colours, sometimes causes skin allergy and other harmfulness to human body, produces toxicity/ chemical hazards during its synthesis, releases undesirable/hazardous/toxic chemicals etc.

■ RESEARCH METHODS

In this article we reviewed improving the colourfastness properties of natural dyes with 5 dye levelling agents. Eco-friendly mordants such as alum, stannous chloride and ferrous sulphate. Eucalyptus bark dye was selected for the study as this source produce fugitive colours on Cotton. A pre- treatment with myrobalan was given for better dye uptake. After dyeing the Sample were post treated with 5 dye leveling agents such as Soda ash, Glauber's Salt, Common Salt, Di-Ammonium Hydrogen Phosphate and Magnesium Chloride Hexahidrate for better colourfastness of natural dyes on cotton. The dye extraction and treating procedures were standardized based on the procedures suggested by AICRP- Home science (1997). The treatments were given to the cotton samples and evaluation of treated samples in terms of colour fastness to perspiration of acidic before and after treatment was undertaken by following the standard procedures laid down by Bureau of Indian Standard Test Series IS 768-1956 for colour change and is 769-1956 for staining using geometric grey scale. The results were analyzed based on the colour fastness of control samples to find out the impact of the treatments. Alkaline method was suitable for extraction of dye from Eucalyptus Bark. The optimum time for extraction of dye liquor from the Bark 60 minutes. A dye material concentration of 4 per cent (2g/ g of fabric) was selected. The optimum time for dyeing was 45 minutes for both then dye. Cotton fabric was pre-treated with 20per cent myrobalan concentration. Increase the tannin deposition which intern increased the depth of the shade obtained. To improve the colorfastness 5 per cent solution of levelling was selected. Based on absorption values, depth of the shade and appearance three concentrations for each mordant was selected. In case of alum 5, 10, and 15 per cent and 1, 2, and 3 per cent concentrations of alum, stannous chloride and ferrous sulphatemordants for cotton were selected for pre -mordanting cotton fabric. Evaluation of colorfastness of test fabrics with two colour fastness tests were carried out on cotton fabric to evaluate the colours obtained from Eucalyptus bark and also assesses improvement in colour of the fabric treated with 3 levelling agents. These levelling agents were selected, as they are common levelling agents used for dyeing fabrics. As per Dedhia (1998) first 5 per cent solution of each of the f levelling agents was prepared. Five per cent of levelling agents produced noticeable changes in the dyed samples. Hence, 5 per cent solution of each of the leveling agents. The solution was then divided into three parts. While dyeing, all the three parts were added to the dye solution at 10 minutes' gap. After all the three parts of the leveling agents were added, the fabric was removed, rinsed in soap solution and dried.

■ RESEARCH FINDINGS AND DISCUSSION

Acidic perspiration fastnesses of eucalyptus bark on cotton mordanted with eco-friendly mordants and used various levelling agents is given in Table 1.

Treatment with soda ash produced excellent resistance to colour change with negligible staining on composite fabrics due to acidic perspiration. After

Table 1 : Acidic perspiration fastness properties of eucalyptus bark dye on cotton

Mordant	Mordant conc. G/100 g of fabric	Control			T_1			T_2			T_3			T_4			T_5		
		CC	CS		CC	CS		CC	CS		CC	CS		CC	CS		CC	CS	
			C	S		C	S		C	S		C	S		C	S		C	S
Alum	5	¾	4	3	5	4	4	5	4	4	5	4	3	5	4	4	5	4	4
	10	¾	3	2/3	5	4	4	5	4	¾	5	4	3	5	4	4	5	4	4
	15	¾	3	2/3	5	4	4	5	4	¾	5	4	3	5	4	4	5	4	4
Stannous	1	3	4	4	5	4	4	5	4	4	5	4	3	5	4	4	5	4	4
chloride	2	3	4	3	5	4	4	5	4	¾	5	4	3	5	4	4	5	4	4
	3	3	4	3	5	4	4	5	4	¾	5	4	3	5	4	4	5	4	4
Ferrous	1	4	4	3	5	4	¾	5	4	¾	5	4	3	5	4	4	5	4	4
sulphate	2	4	4	3	5	4	¾	5	4	¾	5	4	3	5	4	4	5	4	4
	3	4	4	3	5	4	¾	5	4	¾	5	4	3	5	4	4	5	4	4

Dye percentage: 3% Mordants: Alum, Stannous chloride and ferrous sulphate Extraction medium: Alkaline conc:1g/100 ml
Dye extraction time: 60 min. Mordanting time: 30 min Dyeing time: 45 min.
Note: CC-Colour Change, CS- Colour Staining, C- Cotton, S- Silk T_1-Soda ash (Na_2CO_3), T_2-Glauber's salt ($Na_2SO_4.10H_2O$) T_3- Common salt NaCl, T_4- Di - ammonium hydrogen phosphate ($(NH_4)_2 HPO_4$),T_5- Magnesium chloride hexahydrate ($MgCl_2.6H_2O$)

exposure, all mordanted cottons exhibited excellent resistance to colour change and fair to good resistance to staining on both the composite fabrics. On silk composite fabric, alum and stannous chloride mordanted cottons showed good resistance to staining. Ferrous sulphatemordanted cottons had registered very fair resistance to staining on silk. However, improvement over control was observed.

Improvement in colourfastness to acidic perspiration was observed in mordanted cottons when treated with Glaber's salt. Excellent resistance to colour change was observed in all mordanted cottons. The resistance to staining was found to be good on cotton. Fair to good resistance to staining on silk was observed in all mordanted samples. Over all, the treatment with Glauber's salt had contributed for improvement in colour change due to acidic perspiration.

Similar improvement in resistance to colour change due to acidic perspiration was observed in mordanted cottons treated with common salt. However, good resistance to staining on cottons and fair resistance to staining was observed. Improvement in colour change was recorded over the control.

Di - ammonium hydrogen phosphate as a leveling agent seemed to have contributed for improvement in colour change and colour staining on mordanted cottons due ot acidic perspiration. Excellent resistance to colour change and good resistance to staining on both the composite fabrics was observed in mordanted cottons irrespective of the mordant used.

Identical acid perspiration fastness was also observed when mordanted cottons were treated magnesium chloride hexahydrate irrespective of the mordant used (Agarwal *et al.*, 1993). Similar work related to the present investigation was also carried out by Mairal and Shah (2001); Paul *et al*. (1996 and 2002); Sharma and Kalitha (1999) and Singh *et al*. (1993) and Vineeth (1998).

Conclusion:

Soda ash treatment had contributed for production of better shades and even dye in samples pre-mordanted with alum and ferrous sulphate. The treatment was resulted in increased acidic perspiration fastness. Increased resistance to colour staining and colour change was observed in acidic perspiration with Glauber's salt. Improvement was observed both color change and colour staining was observed on both composite fabrics with common salt due to acidic perspiration. Treatment with Di ammonium hydrogen phosphate improved the depth of the shade and level dyeing in case of alum and ferrous sulphatemordanted samples the acidic perspiration fastness was increased over control. Magnesium chloride hexahydrate treatment had contributed for obtaining better shades even dyeing in all mordanted samples. Identical acid perspiration fastness was also observed.

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