



KHADI DYEING WITH NATURAL DYE EXTRACTED FROM BARK OF COTTON PLANT (GOSSYPIUM HERBACEUM LINN)

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ABSTRACT

In the present study, experiments were carried out to extract natural dye from bark of cotton plant (*Gossypium Herbaceum* Linn). Aqueous extraction method was used for the extraction of the dye. The bark of cotton plant dye was used for dyeing of scored Khadi(Cotton) Cloth using five mordant- alum, pomegranate skin, Harda, Copper Sulphate and Ferrous Sulphate in 10% of weight of fabric. Dyeing and mordanting techniques with included pre-mordanting and post mordanting was carried out. Present study is about colour strength of the dye which was determined in terms of K/S values.

Keywords: Khadi(cotton) natural dye, cotton plant, Mordants, K/S values.

INTRODUCTION

Dyeing makes an important contribution to fabric decoration by producing many beautiful colours and the colour harmonies obtained by a combinations of various dyeing methods. It is an ancient art which predates written records. It was practiced during the Bronze Age in Europe. (5) Primitive dyeing techniques included sticking plants of fabric or rubbing Crushed pigments into cloth. Natural dyes are known for their use in colouring of fibers since prehistoric times.

Natural dyes are the colours derived from plants and animals or insects matter without any chemical processing. (7),(2).A renewed international interest has arisen in natural dyes due to increased awareness of environmental and health hazards associated with the synthesis processing and use of synthetic dyes.(10),(5)

Certain problems with the use of natural dyes in textile dyeing are colour yield, complexibility of dying process and its reproducible results, limited shades, blending Problems and



inadequate fastness properties.
(9),(11)

But these problems can always be overcome by using chemicals called mordants. Mordants are the metal salts which produce an affinity between dye & fabric. (1),(6) Common mordants used are – Alum, Chrome, Stannous Chloride, Copper Sulphate, Ferrous Sulphate etc.(5)

Khadi is considered to be the most environment friendly fabric, khadi is a fabric of India that is hand spun and woven using cotton, Silk, Wool or mixture of two or all such yarns. Originally Khadi is also known as Khaddar (12).

India is rich natural wealth and there is an ample scope of explore and review application of natural dyes on textiles. The use of natural dyes however can offer not only a rich and varied source of dye source but also provide an alternative and sustainable income to the farmers through harvest and sale of these plants. The source of the natural dye can be made easily available from tree waste and grown in forest, There is greater

need in the present days to revitalized the sacrament of natural dyes and dyeing techniques as an alternative for the use of unsafe synthetic dyes.

Cotton plant of genus *Gossypium* in the mallow family Malvaceae. Cotton plant is shrub native to tropical and subtropical regions around the world including America, Africa and India.(3)

In the present study, focus is on the dyeing of Khadi with bark of cotton plant. For dyeing two different techniques are used named as pre-mordanting and post mordanting. The purpose of this study is also to investigate the dyeing behaviour and K/S value of dyed samples.

METHODOLOGY, MATERIALS AND METHODS

Material

Source: The bark of Cotton plant collected from farm Kharangana (Gode) village.

**Pic****Fig. 1: Cotton Plant****Fig. 2: Bark of Cotton Plant****Fig. 3: Aqueous Extract from Bark of Cotton Plant**

Substrates: 100% Khadi (Cotton) cloth was used as substrate. Cloth was purchased from Magan Sangrahalaya Khadi shop, Wardha.

Mordants

1) Natural Mordants

- Harda Fruit (Terminaliachebula)
- Pommegranate (Punica Granatum)

2) Metal Mordants

- Alum
- Copper Sulphate
- Ferrous Sulphate

Chemicals

- Caustic Soda (NaOH)
- Soda Ash (sodium Carbonate) ($\text{Na}_2 \text{CO}_3$)
- Non Ionic detergent

Methods

The dyeing of the Khadi cloth was basically done in four stages, pre-treatment, extraction of dyes from bark, mordanting and dyeing as described by Jothi, (2008) (4): (Extraction of natural dyes from African Marigold Flower (Tangates Erectal) for Textile coloration AVTEX Journal 8 (2).)



The entire process of dyeing was done through control method.

Preparation of Raw Material

The samples were collected from farm and washed thoroughly with water to remove any impurities.

Extraction of dye

Used Aqueous extraction method. Bark of Cotton plants were cut into small fine pieces and mixed with distle water and kept the mixture for a night and next day mixture boiled for 30 minutes on boiling temperature for extraction of dye. Liquor ratio was maintained to 1:20 Throughout the process, extraction was carried out to got optimum colour of the solution. Then solution was filtered to get clear extract.

Scouring of Khadi (cotton) cloth

Khadi(cotton) cloth was scoured in a solution containing 2% caustic soda (NaOH) 1% TRO and 1% soda ash (NaCo₃) for 3 to 4 hours at boiling temperature keeping M:L as 1:20. After processing it was washed thoroughly with a hot water. and then with cold water, The scoured

fabric was dried in air for 48 hours.

Mordanting

The cotton samples were treated with different metallic salt & natural mordants by following two methods.

- i. Pre-mordanting : In this method samples were pretreated with solution of different chemical and natural mordants and then dyed with dye extract.10% of the weight of fabric,mordants were used for premordanting. M:L Ratio 1:20 time 30 Minutes tem- 60 to 80⁰ C only Copper 40⁰-50⁰;, Time'10-15 Minutes.
- ii. Post – mordanting: In this method dyed cotton samples were treated with solution of dirrerent chemical and natural mordants. The above condition was followed in post mordanting.

Dyeing

The Khadi(cotton) samples were dyed with extract keeping M:L ratio as 1:50. Dyeing of carried out at 60⁰ to 90⁰ C and continued for 90 minutes. Maintaining PH values



5 then washing procedure was done.

Drying

Fabric is dried by hanging in wrinkle free form on rope holding it at the edges with the help of clips drying is to be carried out in shed.

Measurement of Colour strength

The spectral reflectance's of the dyed samples were measured using a Text flash spectro Photo meter (Data Colour Crop). The K/S values were calculated by KubelkaMunk equation.

$$K/S = (1-R)^2 / 2R$$

Where R is the decimal fraction of the reflectance of the dyed samples at max. K is the absorption coefficient and S is scattering coefficient. (8)

RESULT AND DISCUSSION

Dyeing behaviour of the dye extract

The dye extract was suitable for Khadi(cotton). The Khadi(cotton) fabrics were dyed with natural mordants, it was observed that some K/S values of dye were found good in pre-mordanting, and some other KS. values were found good in post-mordanting as given in figure 4.

Optimization of mordants with K/S values and colour hue changes

Different hues of colour were obtained from pre and post mordanted khadi with Harda, Pomegranate, Copper Sulphate (CuSo₄), Ferrous Sulphate (Fe So₄), Alum, as shown in table 1.

The difference between pre and post mordanting and their K/S values of Khadi(cotton) dyed with bark of cotton plant was that in pre- mordanting Fe So₄(k/s value) 4.498 higher than all mordants and in post mordanting, pomegranate. k/s value 4.256 was higher than all mordants. Ferrous sulphate is more effective with bark of cotton plant dye source.

Table 2 shown L*, a*, b*, and k/s values and it can be seen that mordants which show higher values of L* show lighter shades while lower L* value show darker shades for Khadi. Similarly, negative values of a*, represent green and positive values of a b* represent yellow. The highest colour value k/s 4.498 was obtained with ferrous sulphate and lowest colour value k/s = 1.965



Harda k/s = 1.492 greater than Alum & smaller than copper k/s 2.525 in pre-mordanting.

In post-mordanting the highest colour value (k/s 4.256) was obtained with pomegranate and lowest colour value (k/s = 1.291) with Alum copper is (k/s = 1.471) bigger than Alum , Fe so₄ (k/s = 3.489) bigger than copper Harda (k/s = 3.701) greater than copper.

CONCLUSION

The present work shows that, bark of cottonplant.L.canbe used as dye for colouring textiles. Cotton plants are grown throughout India and it is easily available in farm. Because it is common crop for the farmers. Almost all farmers are planting cotton seeds in their farm. Besides cotton crops its waste is also useful to us for dyeing. Thus different natural and metal mordants.

Table 1: Colour produced on khadi by different mordants in pre and post mordanting











Colour obtained		
Mordant	Pre-Mordanting	Post Mordanting
1 Harda		
2 Pomegranate		
3 Alum		
4 Copper sulphate		
5 Ferrous sulphate		



Figure 4: Surface colour strength (k/s values) of dyes Khadi (cotton) fabrics after pre & post mordanting methods.

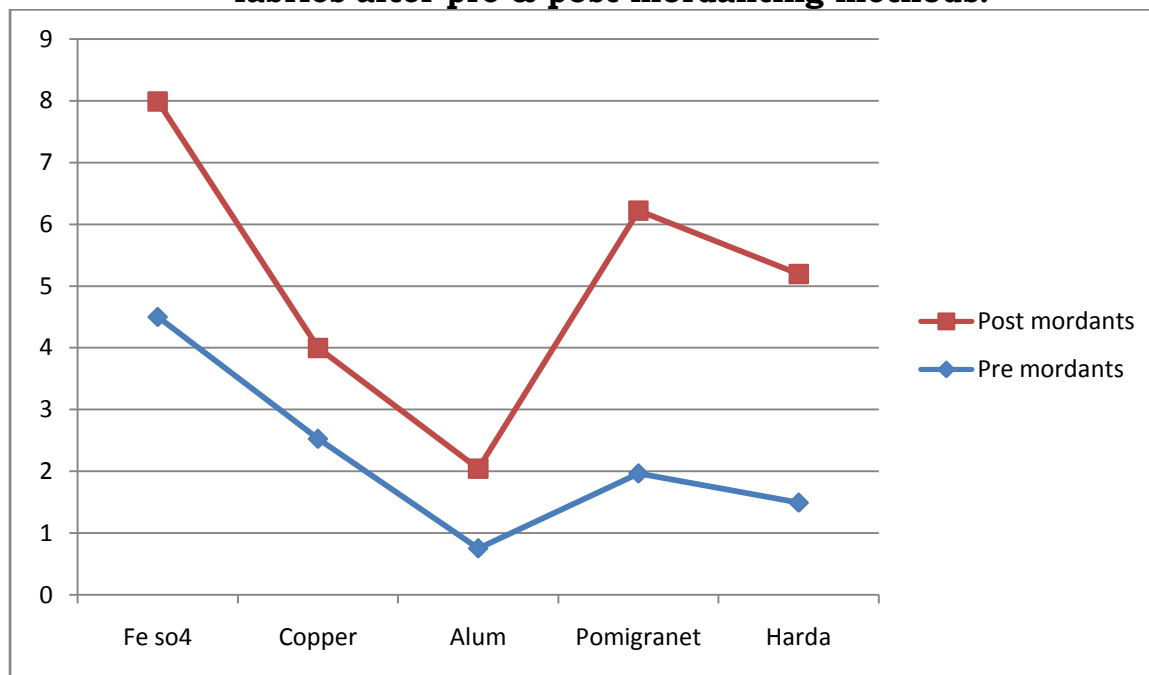


Table 2: Different pre and post mordants, L*, a*, b* and K/S values for dyed Khadi (cotton)

Sr. No	Mordants pre & post	L*		a*		b*		k/s value	
		Pre	Post	Pre	Post	Pre	Post	Pre	post
1	Fe so ₄	-17.71	-10.30	-5.29	-5.81	2.65	6.24	4.49	3.48
2	Copper	-6.74	-1.71	0.04	-0.77	7.57	4.50	2.52	1.47
3	Alum	5.92	-1.33	-0.94	4.53	2.61	3.15	0.75	1.29
4	Pomegranate	-0.35	-5.18	-3.96	-3.46	7.39	14.10	1.96	4.25
5	Harda	3.54	-2.39	-5.14	-4.17	7.27	12.88	1.49	3.70

REFERENCES

1. A.K. Samanta, and P. Agrawal, "application of Natural dyes on Textile Research 34: PP. 394-399, 2009,
2. D.V Rangari, Natural colorants and dye in phrmacognasy, and phytochemistry(part II) 1st Career publication, pp, 98-11-7,2004.



3. en.wikipedia.org/wiki/Cotton
4. Jothi, (2008): (Extraction of natural dyes from African Marigold Flower (TangatesErectal) for Textile coloration AVTEX Journal 8 (2).
5. Kulkarni S.S.,Gokhale A.V, Bodake U.M, pathadle G.R (2011): "Cotton Dying with Natural dye extracted from Pomegranate (Punicygranatum Peel. Universa) Journal of Environmental Research Technoligy Volume 1 . Issue 2 :/35-/39;
6. P.S. Vankar, R. Shankar, and S. Vijaypala, "Dyeing cotton, Silk and Wool yarn with Extract of Garniciamangostana pericarp" JTATM, 6(1): 2009.)
7. Rakhi Shankar, and S.V. Padma, dyeing Cotton, Wool and Silk with Hibiscus mutabilis, (Gulzuba) , dyes and pigments.
8. S. Habibzadeh, H. Tayebi, E. Ekrami, A. Shams Nateri, M. Allahinia and M. Bahmani, world Jouranl of ApplieddJouranl 2010, vol 9(3) PP 295-299.
9. Sachin, K and Kapoor, V.P. (2005): "Optimization of Extraction and Dyeing Condition for Traditional Turmeric Dye. IJTK, 6 (2): 270-278
10. SaimaUmbreen, Shaukat Ali, TanveerHusasain and Rakhshanda Nawaz (2008) "Dying properties of natural dyes Extracted from Turmeric and their Comparison with Reactive Dying RJTAVol .12NO.4
11. Siva,l R (2007) "Status of Natural Dyes and dye yielding plants in India Science 92c(7)
12. www.mgiri.org/publication/drt/pdf.Govt. of india and Khadi& village industries Commission (kvic 2007)