RESEARCH ARTICLE

A Natural Colorant for silk fiber *: Plumeria rubra*

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ABSTRACT

Plumeria rubra L. a member of family Apocyanaceae is a very common ornamental plant. Flower of *Plumeria* is found to be a good source of natural dye for producing various green and ivory shades on silk cloth. Aqueous medium was suitable for extraction of dye from the flower. Alum, Chromes, Copper sulfate, Ferrous sulfate, Acid, Sodium Hydroxide and Sodium chloride with different combinations were used to get different shades of color. Premordant method is useful for dyeing. Excellent fastness to sunlight was found in all mordant combination. Pretreatment of *Terminalia chebula* to silk cloth enhanced the shade and improve the color fastness property of dye. Color change was found in all samples subjected to dry and wet crocking. Only 30 gm material is required for dyeing 5 meter silk cloth. This dye is biodegradable and the technology is found to be economically viable.

Key words: *Plumeria,* Mordant, Color Fastness, Biodegradable.

INTRODUCTION

Recently number of commercial dyers and small textile export houses are searching possibilities of using natural dyes on regular basis for dyeing and printing textiles to overcome the environmental pollution caused by the synthetic dyes (Mahanta and Tiwari, 2005). For successful commercial use of natural dyes we need to explore new plant resources from nature and to adopt appropriate and standardized dyeing techniques. *Plumeria rubra* a member of family Apocyanaceae is a very common ornamental plant. Originally native to Mexico, Central America, Colombia and Venezuela, it has been widely cultivated in subtropical and tropical climates worldwide and is a popular garden and park plant, as well as being used in temples and cemeteries. It grows as a spreading tree to 7-8 m (20-25 ft) high and wide, and is flushed with fragrant flowers of shades of pink, white and yellow over the summer and autumn (Siva 2007). Flower of *Plumeria* is found to be a good source of natural dye for producing various shades on silk cloth. Selective mordant or their combinations can be applied on the Silk cloth to obtain varying color shades and to increase the dye uptake and to improve the color fastness behavior of dye. The present paper reports the studies carried out on the application of dye on silk cloth and the effect of various chemical mordant, pretreatment of cloth by *Terminalia chebula* (hirda) on shade of dye.

MATERIALS AND METHODS

***Selection and preparation of dye material*:** Collected fresh flowers were dried in shade. Grinded material used to extract dye.

Selection and preparation of fibers for dyeing: Silk cloth was washed with detergent soap and rinsed thoroughly to remove traces of detergent. Divide this cloth in to two parts. Pretreated one part with *Terminalia chebula* (hirda) by boiling the cloth in the aqueous extract for half an hour.

***Extraction of dye and dyeing of fabrics*:** The dye was extracted in pure water medium by boiling dye material for one hour. Various combination of mordant like Alum, Acid, Sodium hydroxide, Sodium chloride, Copper sulfate, Ferrous sulfate, Potassium Chromate was used (Dasa D. et.al. 2008).

***Procedure*:-**Extract was obtained by boiling 3 gm powder material in 500 ml water for one hour. Cloth (plain as well as pretreated) was dipped in 1 % solution of above mordant for one hour before dyeing (premordant technique). Premordant cloth was dyed by soaking that cloth in extract for 2 hours.

RESULTS AND DISCUSSION

Aqueous medium was found best for extracting dye from *Plumeria* flowers good amount of dye was yielded in it (Mahanta D. and Tiwari S. C.2005). After comparing the result of premordant, simultaneous mordant and post mordant technique (Dasa D. et.al. 2008). Premordant method was selected in this investigation. Cloth was premordated by using various mordant (as mentioned above). Water fastness and light fastness property dye was checked by regular washing and drying cloth in sunlight (Dasa D. et.al. 2008). Various color shades were obtained from same extract by using different mordants. Shades were different in plain silk cloth and pretreated silk cloth (Siva R. 2007).

In plain silk cloth desert ivory colour was observed in control solution and Various Ivory shades were found in NaCl, $FeSO_4$+NaOH and K_2CrO_4 solution.(Table1).Various light green shades were observed in Alum, $CuSO_4$, $CuSO_4$+K_2CrO_7, $CuSO_4$+NaOH solutions. Metallic green colour was found in Fe SO_4 and Fe SO_4+ $CuSO_4$ solution.

In pretreated silk cloth Brown shade was observed in control solution and A range of brown shade was observed in $CuSO_4$, $CuSO_4$+K_2CrO_7, $CuSO_4$+NaOH solutions as well as in NaCl, Fe SO_4+NaOH and K_2CrO_7 solution (Table 2).Fresh green shade was found in Alum solution. Black shade was obtained in Fe SO_4 and Fe SO_4+ $CuSO_4$ solution (photo plate).

Photo plate 1.

Table .1 Shades on Plain Silk Cloth

Sr. No.	Name of Mordant	Color Obtained on Silk Cloth	Fastness of Dye	
			Washing	Light
1	Control	Plumy skin Brown	3/5	3/5
2	Alum	Plumy Fresh green	4/5	4/5
3	Sodium Hydroxide	Plumy woody brown	4/5	4/5
4	Sodium Chloride	Plumy tinch woody brown	3/5	3/5
5	Ferrous Sulphate	Plumy black	3/5	3/5
6	Copper Sulphate	Plumy deep green	5/5	5/5
7	Potassium Chromate	Plumy green	3/5	3/5
8	Copper Sulphate + Potasium Chromate	Plumy woody brown	4/5	3/5
9	Copper Sulphate + Sodium Hydroxide	Plumy deep olive green	5/5	5/5
10	Copper Sulphate + Ferrous Sulphate	Plumy black	3/5	3/5
11	Ferrous Sulphate + Acid	Plumy coco brown	5/5	5/5
12	Ferrous Sulphate + Potassium Chromate	Plumy grey green	5/5	5/5

Table. 2 Shades on Pretreated Silk Cloth

Sr.No.	Name of Mordant	Color Obtained on Silk Cloth	Fastness Dye	
			Washing	Light
1	Control	Plumy deep skin brown	4/5	4/5
2	Alum	Plumy deep Fresh green	4/5	4/5
3	Sodium Hydroxide	Plumy khaki brown	3/5	3/5
4	Sodium Chloride	Plumy deep woody brown	5/5	5/5
5	Ferrous Sulphate	Plumy deep black	5/5	5/5
6	Copper Sulphate	Plumy woody brown	5/5	5/5
7	Potassium Chromate	Plumy russet grey	4/5	4/5
8	Copper Sulphate + Potasium Chromate	Plumy bark brown	5/5	5/5
9	Copper Sulphate + Sodium Hydroxide	Plumy deep skin brown	5/5	5/5
10	Copper Sulphate + Ferrous Sulphate	Plumy black	5/5	5/5
11	Ferrous Sulphate + Acid	Plumy deep coco brown	5/5	5/5
12	Ferrous Sulphate + Potassium Chromate	Plumy deep skin brown	5/5	5/5

CONCLUSION

Plumeria is found to be a good source of green colorant on silk cloth. With the use of different mordant various shades were produced from extraction. Alum is the good mordant for fresh green color. Hirda pretreatment improves the fastness property of dye. Used mordant are not harmful for skin and biodegradable in nature. As the wide distribution of plant, ample amount of flowers were available throughout year. Extraction method is economically viable and dye is biodegradable in nature. Natural coloration is known from ancient time as artisanal practices for handicraft, paintings and handloom textiles, (Samanta A. et al 2009). The chemistry of interaction of such colorant with textile is of relatively recent interest for producing eco-friendly textile, this dye may help to solve some problems relative to application method, reproducibility and color fastness.

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