Natural Dyes for Silk Fabric

SA Byadgi, G Mahale, R Kotur and JV Vastrad
Department of Textile and Apparel Designing, College of Rural Home Science, University of Agricultural Sciences, Dharwad, Karnataka, India

Abstract

Dyeing is usually among the last processes of the long time of manufacturing operations that leads to an end product that can make or mark the aesthetic appeal of the fabrics. The environment - friendly vegetable dyes and natural dyes are enjoying resurgence in popularity as a result of concerns with the carcinogenic, mutagenic and sensitizing characteristics of synthetic dyes. The present study was taken up to dye the silk fabric with natural dye sources - arecanut and teak and assess the colour fastness properties of dyed material. Four mordants viz. Potash alum, Potassium dichromate, Copper sulphate, Ferrous sulphate were selected. The samples were subjected to colour fastness tests using the following BIS standards: Colour fastness to washing, rubbing, sunlight and Colour fastness rating: Grey scale for evaluating change in colour and staining. The results revealed that all the arecanut dyed samples simultaneously and post mordanted with 1% potassium dichromate, 10% potash alum and 2% copper sulphate gave excellent results for colour fastness to washing, rubbing and sunlight. In general teak dyed sample, simultaneously mordanted with 5% alum and 1% potassium dichromate, copper sulphate and ferrous sulphate exhibited excellent to good colour fastness results.

Key words: Arecanut, Colour fastness, Mordants, Natural Dyeing, Teak

Introduction

Silk is the most beautiful and precious natural fibre, it has its own place in the textile world and rightly recognized as "Queen of Textiles". It has been used as a luxury fabric for many years due to its soft hand, excellent drape and good luster. India ranks second in production of raw silk next to China. India has the unique distinction of being the only country in the world bestowed by the nature with all four varieties of silk i.e., mulberry, tasar, eri and muga of which mulberry silk, the best known of all silks is the product of *Bombyx mori*. Sericulture, identified as one of the fast growing foreign exchange earners for the country has tremendous potentiality in helping the rural people to make their economy viable, especially in developing countries and so has the natural dyeing of raw silk.

Dyeing is usually among the last processes of the long time of manufacturing operations that leads to an end product that can make or mark the aesthetic appeal of the fabrics. Pollution, ecology and environment are talked about both nationally and internationally (Mahale et al. 2004). The increasing awareness of these factors associated with synthesis, processing and use of dyes has led to world wide interest in colouration of textiles with flora and fauna. The environment - friendly vegetable dyes and natural dyes are enjoying resurgence in popularity as a result of concerns with the carcinogenic, mutagenic and sensitizing characteristics of synthetic dyes. Revival of natural dyes and their use on textiles has been just one of the consequences of increased environmental awareness worldwide.

Currently there is also a move to find renewable resources to supplant the need to deplete our global assets and this trend has led to research into production of natural dyes on commercial scale. It is of immense importance to explore the sources of natural dyes particularly from waste materials which will open up a new avenue in the globalization. Hence the present study is taken up to dye the silk fabric with natural dye sources - arecanut and teak and assess the colour fastness properties of dyed material.

Material and Method

Selection of silk material and dye sources: Silk material was procured from Demonstartion Cum Training Centre (DCTC), Central Silk Board, Rayapur and arecanut and

teak leaves were collected from Department of Horticulture, UAS, Dharwad, Karnataka.

Degumming of silk: The natural gum sericin present in the silk hinders the dyeing process and hence silk needs to be degummed. Degumming of silk was carried out by using the BIS method, IS 970-1980.

Neutral soap/non-ionic detergent 2g/l

MLR (Material liquor ratio) 1:30

Detergent solution was prepared by dissolving the liquid soap 2ml/l water with MLR 1:30. Silk material was boiled in the prepared solution for 45-60 minutes. Then the material was kneaded, squeezed and rinsed under running water to make it free from traces of detergent and shade dried.

Myrobolan pre-treatment: Pre-treatment with myrobolan was given for better dye uptake. Myrobolan fruits were powdered and soaked in cold water for 24 hours. Prior to dyeing, shade dried silk material were pre-treated with 20% myrobolan solution for one and half hour at room temperature, squeezed and dried under sunlight.

Extraction of dye liquor: A known quantity of arecanut were soaked in warm water overnight. Arecanut extract was obtained by boiling in water for 60 minutes. The dye extract was allowed to cool, filtered and used for dyeing. Similar procedure was followed to extract dye liquor from teak leaves.

Dyeing: Prior to dyeing the silk material was soaked in water for half an hour and later dyed using open dye beaker bath for 30 minutes. Four mordants viz. Potash alum, Potassium dichromate, Copper sulphate, Ferrous sulphate were selected. After dyeing, the solution was allowed to cool completely; the samples were removed from the dye bath, rinsed under running water to remove the excess dye particles and shade dried.

Laboratory assessment: The samples were subjected to colour fastness tests using the following BIS standards: Color fastness to washing: Test 2 (IS: 3361-1979), rubbing (IS: 766-1988), sunlight (IS: 686-1985)
Assessment of colour fastness is done by using grey scale method: Grey scale for evaluating change in colour (IS: 768-1982) and staining (IS: 769-1982)

Results and discussion

Table 1 furnishes the results of colour fastness test of arecanut dyed silk sample using Potash alum, Potassium dichromate, Copper sulphate and Ferrous sulphate in acidic media.

Silk material dyed with arecanut extract: Three mordants viz, potash alum, potassium dichromate and copper sulphate with 10, 1 and 2 concentrations respectively were selected. The mordanting method followed was post mordanting for potash alum and copper sulphate while simultaneous method for potassium dichromate.

Silk sample mordanted with all the three mordants depicted excellent colour fastness results to washing. Almost all the dry and wet rubbed samples were rated as excellent (Table 1). The control sample and arecanut

Table 1: Fastness properties of silk sample dyed with arecanut and teak in different mordants

Mordants used	Arecanut									Teak								
	Mordant concentration (1g/100g of silk)	Mordanting method	Washing		Rubbing				Sunlight	Mordant concentration (1g/100g of silk)	Mordanting method	Washing		Rubbing				Sunlight
					Dry		Wet							Dry		Wet		
			CC	CS	CC	CS	CC	CS				CC	CS	CC	CS	CC	CS	
Control	-	-	4	4	5	5	5	5	CI	-	-	2	2	5	2	5	4	4
Potash Alum	10	Post mordanting	5	5	5	5	5	5	CI	5	Simultaneous	5	5	5	4	5	3	5
Potassium Dichromate	1	Simultaneous	5	5	5	5	5	5	3	1	Simultaneous	5	5	5	4	5	4	5
Copper Sulphate	2	Post mordanting	5	5	5	5	5	5	5	1	Simultaneous	5	5	5	4	5	4	5
Ferrous Sulphate	-	-	-	-	-	-	-	-	-	1	Simultaneous	5	5	5	5	5	4	5

CC = Colour Change **CS = Colour Staining** **CI = Colour Increase**

dyed silk sample mordanted with potash alum showed increase in the depth of colour to sunlight where as the silk sample mordanted with copper sulphate exhibited excellent fastness to sunlight.

Silk material dyed with teak leaves: The concentration of mordants selected was 5 per cent for potash alum and 1 per cent for potassium dichromate, copper sulphate and ferrous sulphate. Simultaneous mordanting method was followed for all the selected mordants. The silk samples mordanted with potash alum, potassium dichromate, copper sulphate and ferrous sulphate depicted excellent fastness to sunlight compared to control sample. Almost all the dry and wet rubbed samples exhibited excellent results to colour change while the fastness rating for colour staining showed good to excellent fastness. The sunlight fastness was found to be excellent for all the mordanted samples where as control sample depicted good fastness results to sunlight (Table 1).

Conclusion

In a nut shell, all the arecanut dyed samples simultaneously and post mordanted with 1 per cent potassium dichromate, 10 per cent potash alum and 2 per cent copper sulphate gave excellent results for colour fastness to washing, rubbing and sunlight. In general teak dyed sample, simultaneously mordanted with 5 per cent potash alum and 1 per cent potassium dichromate, copper sulphate and ferrous sulphate exhibited excellent to good colour fastness results. Further the shades obtained for arecanut and teak dyed samples are rust, brown, coffee brown and bluish black. Increasing consciousness among consumers towards health and environment has encouraged the utilization of natural resources for eco-friendly product development. Natural dyes are one among those technologies that not only increases the aesthetic appeal of textile materials but are also useful in production of healthy fabrics/garments that helps in environment conservation.

References

Mahale G, Sakshi and Sunanda RK 2004 An eco friendly dye for silk – teak leaves. Man-made Textiles in India. 57(4): 130-134.