

Effect of rein wardtia flowers dye on physical properties of silk fabric

■ SAROJ YADAV, NEELAM M. ROSE AND SAROJ S. JEET SINGH

Received: 12.03.2013; Revised: 11.06.2013; Accepted: 14.06.2013

See end of the paper for authors' affiliations

Correspondence to :

SAROJ YADAV

Department of Textile and Apparel Designing, I.C. College of Home Sciences, C.C.S. Haryana Agricultural University, HISAR (HARYANA) INDIA
Email:sarojyadav69@gmail.com

■ **ABSTRACT** : Since the last one and half decade, application of natural dyes on different fabrics viz., cotton, wool, silk, jute and some blends, etc. is gaining popularity all over the world in light of famous German ban. Only dyeing and producing a colour range for different fabrics is not enough it is equally important to study the effect of dyeing on various physical properties of the dyed fabric as end use of different fabrics depend on these properties. Thus, a study was conducted to investigate the effect of dye obtained from rein wardtia flowers on physical properties of silk fabric. The fabric was dyed and post mordanted with stannous chloride, ferrous sulphate, Indian gooseberry and *Babool*. From the experiment, it was found that general appearance, lusture and texture of dyed fabric were good. In case of fabric thickness, weight, count and flexural rigidity and crease recovery angle the dyed and mordanted samples showed increase in the properties. Breaking strength and elongation of all the samples except ferrous sulphate mordanted increased in both warp and weft directions.

■ **KEY WORDS** : Natural dye, Physical properties, Silk fabric, Lusture, Texture

■ **HOW TO CITE THIS PAPER** : Yadav, Saroj, Rose, Neelam M. and Singh, Saroj S. (2013). Effect of rein wardtia flowers dye on physical properties of silk fabric. *Asian J. Home Sci.*, 8 (1): 250-253.

The history of dyeing with natural dyes is more than 4,000 years old. India was the colour box of the ancient world and source of earliest natural dyestuff known to man. But with the advent of synthetic dyes in 1856, which boosted of certain advantages like good shades and brilliance in colour hopes for natural dyes began to fade (Verma and Gupta, 1994).

With the increasing National and International awareness about depletion of natural resources, ecological imbalances, pollution problem and our disturbed environment due to the ample usage of hazardous chemicals and particularly synthetic dyes have forced us to think of safer alternatives and natural dyes appear to be an ideal choice (Ghorpade *et al.*, 2000). Natural dyes are biodegradable, non-carcinogenic, non-mutagenic, produce colours soothing to human eyes and sometimes they act as health cure (Gulrajani, 2001). Thus, dyeing with natural dyes can be a way of value addition to the textile products (Singh, 1999). Though at every quarter the dyeing with natural dyes is in progress, but much attention has not been paid to study the effect on physical properties of fabrics which is very important according to the end use of different fabrics. Hence, an attempt has been made in this direction to study

the effect of dyeing on physical properties of silk fabric.

■ RESEARCH METHODS

Textile materials used:

Pure silk fabric was used for the experimental work.

Preparation of fabric:

The fabric was degummed to remove the sericin/ gum, natural and added impurities like oil, fat and waxes and natural colouring matter present in fabric to make it more absorbent.

Preparation of dye bath and dyeing:

Rein wardtia flowers were collected from CCS HAU nursery. Petals were separated from flowers, dried in shade and ground to powder form. Eight per cent dye material was extracted in alkaline medium at 8 pH for 15 minutes and strained. The fabric samples were dyed for 30 minutes at 4.5pH and temperature of dye bath was 100°C.

Mordants used and mordanting method:

Stannous chloride and ferrous sulphate, Indian

gooseberry and *Babool* were used as mordants using post mordanting method.

Determination of physical properties:

Physical properties of degummed, dyed and mordanted samples were determined using standard test methods and were assessed on the basis of per cent change.

Properties	Test method
Fabric thickness	ASTM- D1777-60T
Weight per unit area	ASTM- D3776-90
Fabric count	ASTM- D123
Bending length and flexural rigidity	ASTM- DI388-64
Crease recovery angle	BS3086: 1972
Drape co-efficient	IS 8357: 1977
Tensile strength and elongation	ASTM- D1682-64

Appearance:

Five judges having experience of working with natural dyes evaluated the dyed samples visually. A tool for the subjective evaluation was prepared to assess the appearance in terms of lustre and texture of the dyed samples.

Lustre:

The term lustre refers to the gloss, sheen or shine that a fabric has. It is the result of the amount of light reflected by a fabric and it determines the fabric's brightness or dullness.

The lustre ratings given by the judges were assigned 3, 2 and 1 scores as high, moderate and low, respectively. These scores were summed up and weighted mean scores were obtained.

Texture:

Texture is the appearance of the surface of the fabric. It determines the hand or feel of a fabric. For the evaluation of

texture of the dyed samples, the judges were asked to assign the scores 3, 2 and 1 as fine, medium and rough, respectively. The scores were summed up to obtain the weighted mean scores. The sample which got highest score was ranked first.

RESEARCH FINDINGS AND DISCUSSION

The results are discussed in relation to the preliminary physical properties and appearance of the dyed fabrics.

Effect on preliminary properties :

The data on basic properties of controlled and dyed fabric *i.e.* fabric thickness, weight and count with rein wardtia flowers are presented in Table 1. It is evident from table that an increasing trend was observed in all the properties of dyed fabric. The maximum increase in thickness was observed when mordanted with stannous chloride, ferrous sulphate and *Babool*. Maximum increase in weight was observed when mordanted with *Babool*. However, the fabric count increased when compared with controlled sample but highest increase was observed in sample mordanted with *Babool*. Thus, the samples mordanted with *Babool* showed maximum increase in basic properties of dyed fabric.

The increase in weight may be due to the absorption of mordant and dye during dyeing and increase in fabric count due to the consolidation of yarn during dyeing which increased the count and also due to the absorption of dye the results are in accordance to the findings given by Chanchal (1986).

Effect on physical properties :

The data related to effect of dye on physical properties *i.e.* flexural rigidity, crease recovery angle, drape coefficient, tensile strength and elongation are presented in Table 2.

It is clear from Table 2 that tensile strength and elongation of all dyed samples increase significantly except ferrous sulphate mordanted samples, which decreased in both warp and weft directions. Flexural rigidity, crease recovery

Table 1: Effect of dye on preliminary properties of fabric

Properties	Controlled	Dyed				
		Unmordanted	Mordanted			
			Stannous chloride	Ferrous sulphate	Indian gooseberry	<i>Babool</i>
Thickness (mm)	0.132	0.141	0.142	0.142	0.141	0.142
% Change	--	+6.38	+7.04	+7.04	+6.38	+7.04
Weight g/sq.m)	39.6	42.0	41.6	41.0	42.0	42.3
% Change	--	+6.06	+5.05	+3.53	+6.06	+6.38
Fabric count (threads/ inch)						
Warp	122	123	123	123	124	123
% Change	--	+0.81	+0.81	+0.81	+1.63	+0.81
Weft	101	103	103	103	103	104
% Change	--	+1.98	+1.98	+1.98	+1.98	+2.88

(+) ve sign indicate increase in properties, (-) ve sign indicate decrease in properties, (--) no change in properties

angle and drape co-efficient of all the dyed samples also increased significantly after dyeing and mordanting. Ahmed *et al.* (1997) reported that dyeing with vegetable dyes have pronounced effect on physical properties of silk as increase in fabric count, thickness, weight and tensile strength were observed. Elongation increased in warp direction and decreased in weft direction. Gaba *et al.* (2001) in their study on assessment of physical properties of cotton dyed with *Pili Kaner* also reported that fabric thickness, count and weight of all the dyed samples increased after mordanting.

Table 3 shows that stannous chloride mordanted sample scored highest *i.e.* 2.8 for lusture followed by Indian gooseberry (2.5) and ferrous sulphate (2.5). In case of texture also stannous chloride scored highest (2.8) followed by Indian gooseberry (2.6) and ferrous sulphate (2.6) whereas *Babool*

scored lowest (2.4).

Conclusion :

It is thus, concluded that the dyed fabrics with and without mordant showed positive enhancement in all the properties. Hence, rein wardtia flowers can be effectively and efficiently used for dyeing of silk fabric for commercial purpose as an eco-friendly dye. Ratings for general appearance *i.e.*, lustre and texture of rein wardtia flowers dyed silk varied with the use of different mordants. Stannous chloride, ferrous sulphate, Indian gooseberry and *Babool* can be used as mordants as they have no adverse effect on physical properties of dyed fabric rather showed improvement when compared to original. There was increase in tensile strength which is very important according to the end use of fabric

Table 2: Effect of dye on physical properties of fabric

Properties	Controlled	Dyed				
		Unmordanted	Mordanted			
			Stannous chloride	Ferrous sulphate	Indian gooseberry	<i>Babool</i>
Flexural rigidity (mg-cm)	0.054	0.056	0.056	0.057	0.066	0.060
% Chnage	--	+3.57	+357	+5.26	+18.18	+11.11
Crease recovery (^o)	115.9	117.0	117.6	117.3	117.6	118
% Change	--	+0.94	+1.44	+1.19	+1.44	+1.77
Drape co-efficient (%)	33.17	33.19	33.19	33.19	33.18	33.20
% Change	--	+0.06	+0.06	+0.06	+0.03	+0.09
Tensile strength (kg/cm)						
Warp	26.75	28.0	27.25	27.75	27.60	28.75
% Change	--	+4.67	+1.86	+3.60	+3.07	+6.95
Weft	26.25	27.5	28.00	25.45	28.75	28.50
% Change	--	+4.54	+6.25	-3.14	+6.95	+7.89
Elongation (%)						
Warp	12.01	12.07	12.11	11.76	12.11	12.12
% Change	--	+0.49	+0.82	-2.12	+0.82	+0.90
Weft	11.76	11.97	11.87	11.73	11.78	11.87
% Change	--	+1.75	+0.92	-0.25	+0.16	+0.92

(+) ve sign indicate increase in properties, (-) ve sign indicate decrease in properties, (--) no change in properties

Table: 3 Visual assessments of Rein wardtia flowers dyed silk for appearance

Sr. No.	Type of treatment	Weighted mean score	
		Lusture	Texture
1.	Without mordant (control)	2.2	2.6
2.	Stannous chloride	2.8	2.8
3.	Ferrous sulphate	2.5	2.6
4.	Indian gooseberry	2.6	2.6
5.	<i>Babool</i>	2.2	2.4

hence, recommended for use. Different shades of yellow were obtained using different mordants with the rein wardtia flowers dye. Silk fabric dyed with natural dye will provide excellent comfort properties, free from health hazards and also will provide clean atmosphere hence an up gradation for textile industries.

Authors' affiliations:

NEELAM M. ROSE AND SAROJ S. JEET SINGH, Department of Textile and Apparel Designing, I.C. College of Home Sciences, C.C.S. Haryana Agricultural University, HISAR (HARYANA) INDIA
Email: nmrose@rediffmail.com, sarojsjsingh@gmail.com

■ REFERENCES

- Ahmed, S.S., Gogoi, A., Phukon, R. and Gogoi, N.** (1997). Effect of natural dyes on the physical properties of silk. *Textile Trends*, **40** (7): 31-33.
- Chanchal, B.** (1986). A study of consumer preferences and an assessment of the properties of fabric produced from textured yarns. Ph.D. Thesis, Anna University, Madras (T.N.) INDIA.
- Gaba, G., Singh, S.S.J., Yadav, S. and Kant, K.** (2001). Effect of *Thevetia peruviana (Pili Kaner)* on physical properties of cotton fabric. *Textile Trends*, **43** (11): 25-27.
- Ghorpade, B., Darvekar, M. and Vankar, P.S.** (2000). Eco-friendly cotton dyeing with Sappan wood dye using ultrasound energy. *Colourage*, **45** (1): 27-30.
- Gulrajani, M.L.** (2001). Present status of natural dyes (Part-I). *Colourage*, **46** (1): 23-26.
- Singh, O.P., Bains, S., Goraya, G. and Sharma, K.B.** (1999). *Value addition of agro and animal based fibres*. All India coordinated Research Project in Home Science. Annual Report, Department of Clothing and Textiles, Punjab Agricultural University, Ludhiana (Punjab) India.

★ ★ ★ ★ ★ of Excellence ★ ★ ★ ★ ★
8th
Year