AJHS
Asian Journal of Home Science
Volume 13 | Issue 1 | June, 2018 | 256-260

DOI: 10.15740/HAS/AJHS/13.1/256-260
e ISSN-0976-8351 ■ Visit us: *www.researchjournal.co.in*

Research Paper

Development of batik design on mulberry silk waste / wool blended fabric using vinyl sulphone reactive dyes

■ Sushila **and** Sandeep Bains

Received: 25.11.2017; **Revised:** 08.04.2018; **Accepted:** 28.04.2018

■ **ABSTRACT :** The study attempts to rematerialize the traditional art of *Batik* by studying the results obtained on mulberry silk and wool blended fabric. The objectives were to study the art of batik in detail and explore the possibilities of batik design development on mulberry silk/wool blended fabric with vinyl sulphone reactive dye (Cold reactive dyes). Dyeing time, pH, and dye concentration were optimized for the dye and designs were prepared by use of batik method. Optical density of the dye solution was studied to determine the absorbency of dye from the dye solution at different pH, time, and dye concentration. CIE Lab and K/S values were also assessed for determining the optimum dyeing conditions. Good results were achieved when designs were developed and the dyed samples exhibited fair to good wash, light and perspiration fastness.

■ **KEY WORDS:** Dyeing, Wool, Silk, Blend, Vinyl suphone dyes, Batik, Colorfastness

■ **HOW TO CITE THIS PAPER :** Sushila and Bains, Sandeep (2018). Development of batik design on mulberry silk waste / wool blended fabric using vinyl sulphone reactive dyes. *Asian J. Home Sci.*, **13** (1) : 256-260, **DOI: 10.15740/HAS/AJHS/13.1/256-260.** Copyright@ 2018: Hind Agri-Horticultural Society.

See end of the paper for authors' affiliations

Sushila
Department of Apparel and Textile Science, College of Home Science, Punjab Agricultural University, Ludhiana (Punjab) India
Email : sushila.03ct@gmail.com

Batik is so old a craft that its true origin has never been determined, but can safely be presumed to be at least 2,000 years old. Archaeological finding prove that the people of Egypt and Persia used to wear batik garments, and the same can be said of the people of India, China, Japan, and most countries in the East. In Africa, batik occurs in the symmetrical tribal patterns: in India, in the ancient paisley pattern and in China and Japan it has lent itself perfectly to delicate Oriental designs. Javanese peoples of Indonesia developed it in their own unique manner to the very high degree of excellence so admired today. The usual preference for finery throughout Asia was for silk, but the Javanese favored cotton. The word "batik" as such, is derived from *Ambutik*, meaning a cloth of little dots. A "little bit" or a "little dot" means *ilk*, which once again resembles the Javanese word *Tritik*. At first, batik was applied to homemade cottons and calico but with Marco Polo and probably even before him; some fine muslin reached the Oriental bazaars. The finely woven quality of this cloth was perfect for batik as well as the climate. At first batik was merely a pastime of the ladies of the Javanese courts, but it became a matter of social status to wear batiked *Sarongs* to display one's artistry in design and colour. In order to keep the wardrobes well stocked, all ladies of the court were soon engaged in the decoration of their robes and batik continued to grow in popularity (Keller, 2013).

Batik consists of applying a design to the surface of the cloth by using melted wax. The material is then

dipped in cool vegetable dye; the portions protected by the wax do not receive the dye, and when the wax is removed in hot water the previously covered areas display a light pattern on the colored ground. Remains of clothing found in Java indicate that the same or similar patterns have been in use for about 1,000 years and are handed down in families. Certain designs were traditionally reserved for royalty and high officials. Motifs are geometric or are based on conventionalized natural objects. Cotton cloth is generally used, and some silk (Anonymous, 2014).

The term blending is used by the yarn manufacturer to discribe specifically the sequence of processes required to convert two or more kinds of staple fibres into a single yarn composed of an intimate mixture (Menezes and Choudhari, 2008). Textile made of silk and wool blend can be dyed and printed with dyes belonging to a variety of classes. In practice acid dyes, metal compex dyes and reactive dyes can be used because all of these are suitable for both silk and wool fabric. Reactive dyes are applied to protein fibres under slightly acidic conditions. A range of reactive dyes are available for the colouration of wool and silk.

Reactive dyes are coloured organic compounds that are capable of forming a covalent bond between reactive groups of the dye molecule and nucleophilic groups on the polymer chains within the fibre. Consequently the dyes become chemically part of the fibre by producing dye polymer linkages (Waring, 1990). A cold brand reactive dye is applied at low temperature *i.e.* at room temperature. They are highly reactive with fibre at this temperature. Bi-functional dyes such as vinyl sulphone reactive dye, with the two reactive systems in the dye molecule tend to have the best of both (higher affinity due to the 'Triazinyl' and lower affinity due to the 'Vinyl Sulphone') and therefore more controllable during the absorption phase. Also the fixation due to the two reactive systems one occurring faster —mono Chloro or Flouro Tri-azinyl (higher reactivity) followed by the slower second one— the Vinyl Sulphone (medium reactivity) with stable dye fibre bond. The fixation through the first system is supplemented by the fixation through the second system and thus an overall fixation level of over 80% is achieved. With suitable reactive systems even higher fixation levels are possible due to both neucleophylic substitution (Triazinyl) and addition (Vinyl Sulphone) bonds, the fastness characteristic and resistance to acid, alkali and peroxide are improved (Chinta and Shrivastava, 2013).The present work is aimed to apply vinyl sulphone reactive dye on wool and mulberry silk waste fabric through batik technique in order to produce value added fabric for apparel and decorative purposes.

■ RESEARCH METHODS

Hand woven blend of mulberry silk waste/wool in the ratio of 65:35 using plain weave was used for the research work. Mulberry silk waste was procured from Srinagar (Jammu and Kashmir) and wool fibre was procured from the local market of the Ludhiana city. Blending and spinning was done at Kullu (Himanchal Pradesh) and weaving was done in Ludhiana. Four vinyl sulphone cold reactive dyes *i.e.* Reactive orange 14, Reactive red 2, Reactive orange 4, Reactive blue 4 were used for the study. All the chemicals used for study were of Laboratory reagent (LR) grade. Samples were also assessed for their appeal to other respondents and a questionnaire was prepared.

Optimization of dyeing variables with reactive dyes:

To optimize the dyeing conditions for mulberry silk waste/wool blended fabric, the blended fabric was dyed with cold reactive dyes. The parameters included dyeing pH, time and dye concentration, which were optimized on the basis of optical density, CIE Lab and K/S values. Dyeing procedure for dyeing mulberry silk waste/wool blended fabric using reactive dyes was followed as reported.

Recipe for cold reactive dyeing:

Dye	:	x % (owf)
Liquor ratio	:	1:30
Dyeing pH	:	5-7
Sodium sulphate	:	40g/l
Soda ash	:	3g/l
Temperature	:	Room temperature
Time	:	45-70 minutes

All the experiments for optimization purpose were replicated three times and optical density of the dye solution was taken with the help of UV/VIS spectrophotometer all the samples were dried and CIE Lab and K/S value of all the samples were determined. After analyzing all the values optimum pH, time,

temperature and concentration was achieved.

Optimization of pH for reactive dyes :

The pH optimization for cold reactive dyes was done at room temperature for 1 hour, maintaining MLR 1:30. The required amount of stock solution was pipited out in three beakers and their pH was adjusted to 5, 6 and 7 with a digital pH meter. Dyeing was carried out at room temperature, maintaining MLR 1:30 for 1 hour.

Optimization of dyeing time for reactive dye :

After the optimization of pH and temperature, dyeing time was optimized. For dyeing with cold reactive dye, stock solution was prepared having optimized pH. The stock solution was pipited out and poured into four beakers maintaining MLR 1:30. The dyeing was carried out for six different time durations, *i.e.* 45, 50, 55, 60, 65 and 70 minutes.

Optimization of dye concentration for reactive dyes:

Upon the subsequent optimization of dyeing pH, and time, dye concentration was optimized. Stock solution of different dye concentrations 1, 2, 3, 4, and 5 per cent were prepared. These were separately poured into five beakers. Five samples of same weight were entered in different dye concentration solutions, maintaining the MLR 1:30. The samples were dyed at room temperature using optimum pH, and time.

Dyeing :

The optimized dyeing conditions were used for final dyeing of mulberry silk waste/wool blended fabric. Batik technique involves four steps of drawing, waxing, dyeing and wax removing. After drawing the design wax was applied to the areas to be resisted from the colour. The dye bath was set up with required quantity of dye solution having MLR 1:30. The wet test sample was entered into the dye bath at room temperature and worked for 10 minutes. After 10 minutes salt solution was added at two stages with a gap of 10 minutes between each. After 15 minutes, soda ash was added to the dye bath for fixing the colour. The material was then worked for 30 minutes. The sample was then worked in 1:30 MLR with 6 per cent soap solution at boiling temperature for 30 minutes. Colours were applied from one after another moving from lighter to darker shade of colour. Later it was washed thoroughly and shade dried.

■ RESEARCH FINDINGS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Optimization :

It was found that dyeing at pH 7 for 65 minutes at room temperature using 3% dye concentration was optimum for reactive red 2 dye (cold reactive dye). Whereas 6 pH for 65 minutes at room temperature for 3% dye concentration was considered optimum for dyeing the fabric with reactive blue 4 dye (cold reactive dye). Looking at the optimization values of reactive orange 4 dye it was found that when sample was dyed at 5pH for 65 minutes at room temperature using 3% dye concentration it showed optimum dyeing. For reactive orange 14 dye, dyeing was found optimum at 6 pH when dyed for 60 minutes using 3% dye concentration.

Colour fastness :

The dyed fabrics were also tested for light fastness, wash fastness and perspiration fastness and rubbing fastness. It was found that cold reactive dyed fabric had excellent grade for colour change and slight staining was found on both wool and cotton fabrics after washing. Observing the rubbing fastness, fabric dyed with cold showed good colour fastness to dry rubbing and noticeable to slight staining was observed on the adjacent fabric. The colour fastness of cold reactive dyed fabric for wet rubbing was relatively low. The colour change was rated fair and colour staining ranged between noticeable to slight. The perspiration fastness grade in terms of colour change in acidic medium for cold reactive dyed fabric was fair and excellent. Staining was observed on wool fabric whereas slight staining was observed on cotton fabric. When the medium was alkaline it showed fair to good grade for colour change and slight staining on both wool and cotton fabrics.

Traditional significance and recommendations :

Many craftsmen are practicing the process of batik printing following old traditional methods. Wool-silk blends are becoming important for high quality apparel, though the use is still limited. Natural silk is sometimes blended

Plate 1 :

Plate 3 :

Plate 2 :

Plate 4 :

Fig. 1 : Batik designs

in equal proportions with wool to improve luster and strength. A survey was conducted to assess the appeal of the design samples to the respondents. Samples were assessed for their appeal to respondents on the scale of 1 to 5 *i.e.* from poor to excellent

The criteria used for assessment were colour, hand and feel of the dyed fabric, and the designs developed were asked to be rated on the basis of comparative appeal of designs. After collecting data it was observed that samples were rated very good when assessed for colour, good for hand and feel of the fabric, and for design in order of 1 to 4 plate 2, plate1, plate3 and plate 4 were found appealing to respondents. Thus, it can be assumed that there is a scope for development of comparatively bright and lustrous batik printed textile products than cotton which can cater the demand for high quality products.

Conclusion :

Due to the fast changing fashion trend and the market demand designers are stimulating new approaches to textile art and constantly developing innovative areas for expression. Batik work with wool and silk blend is somewhat new and can be used to make variety of

products. The use of vinyl sulphone dyes provide advantage of good colorfastness on the fabric improving the ultimate quality of the product with few other advantages such as resistance to acid, alkali and peroxide.

Authors' affiliations:
Sandeep Bains, Department of Apparel and Textile Science, College of Home Science, Punjab Agricultural University, Ludhiana (Punjab) India

■ REFERENCES

Anonymous (2014). Batik-The Columbia Encyclopedia, 6th Ed. Retrieved May 10, 2015 from Encyclopedia.com:http://www.encyclopedia.com/doc/1E1-batik.html, 2014.

Chinta, S.K. and Shrivastava, V.K. (2013). Technical facts and figures of reactive dyes used in textiles. *Internat. J. Engg. and Mgmt. Sci.*, **4**(3) : 308-312.

Keller, I. (2013). Batik: The Art and Craft, (Tuttle Publishing), pp. 13.

Menezes, E. and Choudhari, M. (2008). Blend Dyeing, *Colourage*, 55 : 111.

Waring, D.R. (1990). *The chemistry and application of dyes*. Plenum Press, New York, pp. 49-62.

13th Year
★★★★★ of Excellence ★★★★★