



Dyeing of Chanderi Silk with Natural Dyes

Simmi Bhagat

Introduction

The revival of the use of Natural Dyes worldwide was primarily due to the increasing environmental consciousness. Many synthetic dyes led to various harmful byproducts during their manufacture. A number of azo dyes that released harmful carcinogenic amines have already been banned by most of the countries. Moreover the effluent discharged was also causing a lot of concern. Hence, there was an increasing realization in the textile industry as well as among the textile consumers to develop and demand eco-friendly methods of dyeing. Natural dyes offered an important alternative in this regard. Their non-toxic, biodegradable properties made them exceedingly popular. Natural dyes procured from natural wealth like plants, minerals and insects are fairly nonpolluting, more challenging, have rare colour ideas and unlimited scope to generate new shades. During last decade and a half lot of research and development work has been taken up in this area. Though the initial enthusiasm about ecological movement has subsided but natural dyes have carved a unique niche for themselves in the world of fashion and textiles and shown a slow but steady growth over the last few years. Also, globally the trend is to go back to nature and patronize natural products. In regards the value addition these

Natural Dyed fabrics or products would come under concept selling. This is a relatively new and unique concept with few players in the market and it carries a specific quality or benefit that the buyer is looking for or made to look at. This point has been proven by the fact that consumers are willing to pay more for eco-friendly products. With these views natural dyes were introduced in Chanderi too where the type of silk used is undegummed which provides the characteristic lustre and sheerness to the fabric.

Materials

Fabric: Undegummed, undyed 100% silk X silk hand woven fabric in plain weave was procured from weavers of Chanderi.

Dyes: Seven Natural dyes were used for the study. All the dyes were used as commercially available and were procured from Alps Industries Ltd., Sahibabad. The dyes used for the study are given in the following Table.

Auxiliaries : Sodium Hydroxide, Ammonium Sulphate, Non-Ionic Detergent, Aluminium Potassium Sulphate (Alum), Tartaric Acid, Ferrous Sulphate, Copper Sulphate, Stannous Chloride, Oxalic Acid, Acetic Acid, Trisodium Phosphate, Alpsfix were used for the study.

Natural dyes	Botanical Name	Brand Name
Cutch	<i>Acacia catechu</i>	THAR
Golden Dock	<i>Rumex maritimus</i>	SAHARA
Lac	<i>Kerria lacca</i>	RHINE M
Pomegranate fruit rind	<i>Punica granatum</i>	PACIFIC
Gall Nuts	<i>Quercus infectaria</i>	AMBER M
Acacia	<i>Acacia nilotica</i>	CASPIAN
Indian Madder	<i>Rubia cordifolia</i>	INDUS

Table showing dyes used for the study

Methods

Seven natural dyes used on silk were selected for the study. Dyeing's were carried out at three different temperatures according to the following recipes (Alps Industries Ltd) to find the optimum temperature for dyeing for undegummed silk.

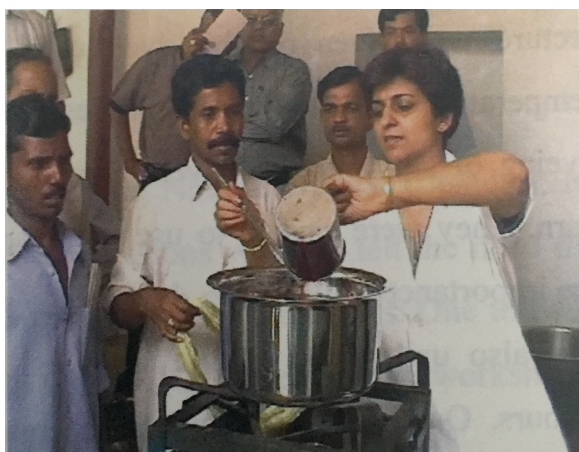
Soaping of all the dyed samples was done with non-ionic detergent (0.5g/l) at 60°C for 20 minutes. After soaping samples were washed with hot water and then with cold water and air-dried.

Application of cutch

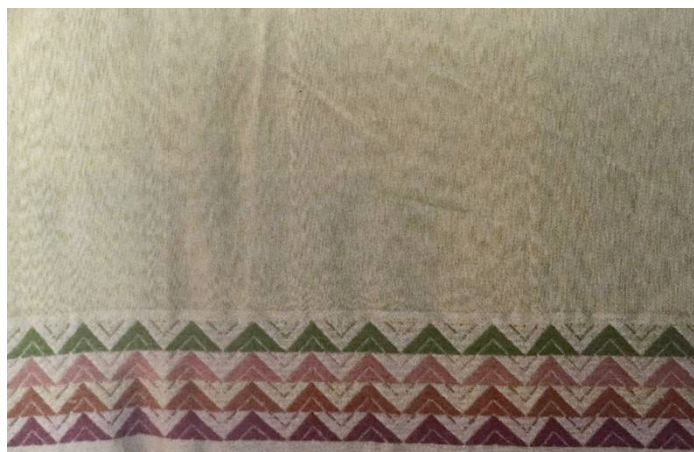
- The dye bath was prepared using 6% of dye and water (1:30); 0.25% Copper Sulphate, was added to the dye bath. It was stirred well to dissolve it properly. The material was added to the dye bath. Dyeings were carried at temperatures of 60°C, 70°C and 80°C for 30 minutes. This was followed by soaping.
- The dyed samples were post mordanted using 5% Ferrous Sulphate for 1 minute at room temperature. Soaping was done as mentioned above.

Application of golden dock

An alkaline dye bath (pH 9) was prepared using sodium hydroxide. Dye (10%) was added to the dye bath and stirred well. The material was added to dye bath. Dyeing were carried out at the required temperature of 60°C, 70°C and 80°C for 15 minutes. Copper Sulphate 2% was added to the same dye bath and temperature maintained for 15 minutes. Then Trisodium Phosphate 5% was added to the same dye bath and temperature maintained for further 15 minutes. The dyed samples were soaped, rinsed and air-dried.



Workshop for weavers in dyeing Chanderi fabric



Chanderi silk fabric

Application of lac

Samples were dyed using three different methods to achieve three different hues:

- **Premordanting:** The required amount of water (MLR 1:30) and alum 10% and tartaric acid 5% were added to it. The material was added and mordanting was carried out for 30 minutes at 80°C. The solution was drained and material was squeezed and dried without rinsing.
- **Dyeing:** The required amount of dye (6%) was added to the dye bath (MLR 1:30). Premordanted samples were added to the dye bath and dyeing was carried at different temperatures 60°C, 70°C and 80°C for 30 minutes. Dyed samples were soaped rinsed and dried.
- **Simultaneous Mordanting:** The dye bath was prepared using 10% dye, 2% Stannous chloride and 10% oxalic acid. The material was added to the dye bath. Dyeings were carried out for 30 minutes at 60°C, 70°C and 80°C. The samples were soaped as described earlier.
- **Postmordanting:** Un-mordanted samples were dyed with 10% shade at 60°C, 70°C and 80°C for 30 minutes.
- **Soaping:** The dyed sample were postmordanted using Copper sulphate (1%) at 80°C for 30 minutes followed by soaping.

Application of pomegranate fruit rind

- **Premordanting:** (same as used for lac dye)
- **Dyeing:** The required amount of dye (9%) was added to the dye bath. It was stirred well to dissolve the dye. The premordanted material was added to the dye bath and dyeings were carried at 60°C, 70°C and 80°C for 30 min. The dyed samples were soaped, rinsed and dried.

Application of gallnuts

- **Dyeing:** The required amount of dye (6%) was added to the dye bath. It was stirred well to dissolve the dye. The samples were added to the dye bath and dyeings was carried on at the required temperatures 60°C, 70°C and 80°C for 30 minutes.
- **Postmordanting:** All the samples were postmordanted with 0.5% Ferrous Sulphate solution at room temperature with constant stirring for 1 minute. Soaping of the dyed and mordanted samples was done.

Application of acacia

- **Dyeing:** The required amount of dye (10%) and alum (5%) were added to the dye bath. The bath was stirred well to dissolve them properly. The samples were added to the dye bath and dyeing was carried on for 30 minutes at the required temperature 60°C, 70°C and 80°C.
- **Soaping** of the dyed samples was done as described earlier.

Application of Indian madder

- **Premordanting:** same as used for lac dye
- **Dyeing:** The required amount of dye (6%) was added to the dye bath (MLR 1:30). It was stirred well to dissolve the dye. The premordanted samples were added to the dye bath. Dyeings were conducted at 60°C, 70°C and 80°C for 30 minutes. The dyed samples were soaped, rinsed and dried.

Evaluation

The dyed samples were evaluated in terms of their weight loss, fabric handle, colour strength and colourfastness, both wash and light. The results were tabulated and analyzed to arrive at the optimum temperature for Natural dyes on silk. A shade card was prepared using optimized recipe for Natural Dyes.

Findings

Since each recipe was different, the evaluation of the properties cannot be generalized or compared with one another. It was observed that dye uptake increases with the increase in temperature in all the dyes. In case of samples dyed with Acacia, Lac, Golden dock and Cutch, there is a significant increase in dye uptake values with the increase in temperature. The dyes have much less dye uptake at 60°C as compared to 70°C and 80°C.

Evaluation of weight loss was very important to determine the basic characteristics of Chanderi fabric. The degumming, if occurs, would change the entire look and the feel of the Chanderi fabric. So the weight loss of the dyed samples was determined. It was observed that there is no significant change in the values of initial and final weight of fabrics dyed with Gall Nuts, Acacia and Cutch, which indicates that no degumming took place. In case of Golden Dock the values of final weight are less than initial weight. This can be due to the fact that the dyeing was done in alkaline conditions, which may be responsible for partial degumming. The total dyeing time in case of Indian Madder, Lac and Pomegranate fruit rind dyes was one hour while for others it was 30 minutes. These dyes indicate a marginal difference at 80°C. However the weight loss is not significant. The wash fastness of all the selected natural dyes is very good. It can be concluded that the dyeing should be done at temperature of 70°C using standard recipes because at 60°C most of the dyes have lower dye uptake and at 80°C the handle of the fabric is getting modified in some cases. Hence 70°C can be suitably used to produce these colours. A shade card for the same was prepared using standard recipes at 70°C. It was observed that out of the selected dyes the handle is altered in case of Goldendock while Lac mordanted with stannous chloride has poor wash fastness. Hence these two were not recommended for use in Chanderi.



Shade card prepared using optimized recipe for Natural Dyes

Bibliography

- Gulrajani ML and Gupta Deepti 2000, Dyeing of Wool with Natural dyes, IIT, Delhi
- Gupta Sanjay 1999 'Value addition through Design and Trend Applications- Internet shows the way', Convention on Natural Dyes, Department of Textile Technology, IIT, Delhi
- Jain DK 1988 'Fastness properties of dyes on silk', Silk dyeing, printing and finishing, edited by ML Gulrajani, IIT, Delhi, Raj Kamal Electric Press, Delhi