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Dyeing Wool with Peanut Skin (Arachis Hypogaea) Using Mordants of Harda, Pomegranate, Lodhra and Tannic Acid

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Abstract

There is a long challenged history with renewed and yet sustained interest for natural dyes on being sustainable and eco-friendly inspite of well-standardized and cost-effective synthetic dyes. Possibility of waste peanut skin for keratin wool coloration (15% and 20% shades) using Harda, Pomegranate, Lodhra and Tannic Acid mordants along with pre-mordanting, simultaneous and post mordanting techniques is explored here. Assessment of dye-uptake and textile fastness properties as per AATCC standards, comparative analysis and derived conclusions indicate that peanut skin is a potential source of natural dye. It produces effective results on coloration of wool with mordant Lodhra and post-mordanting technique.

Keywords: Natural Dyeing, Wool, Peanut Skin, Mordants, Harda, Pomegranate, Lodhra, Tannic Acid

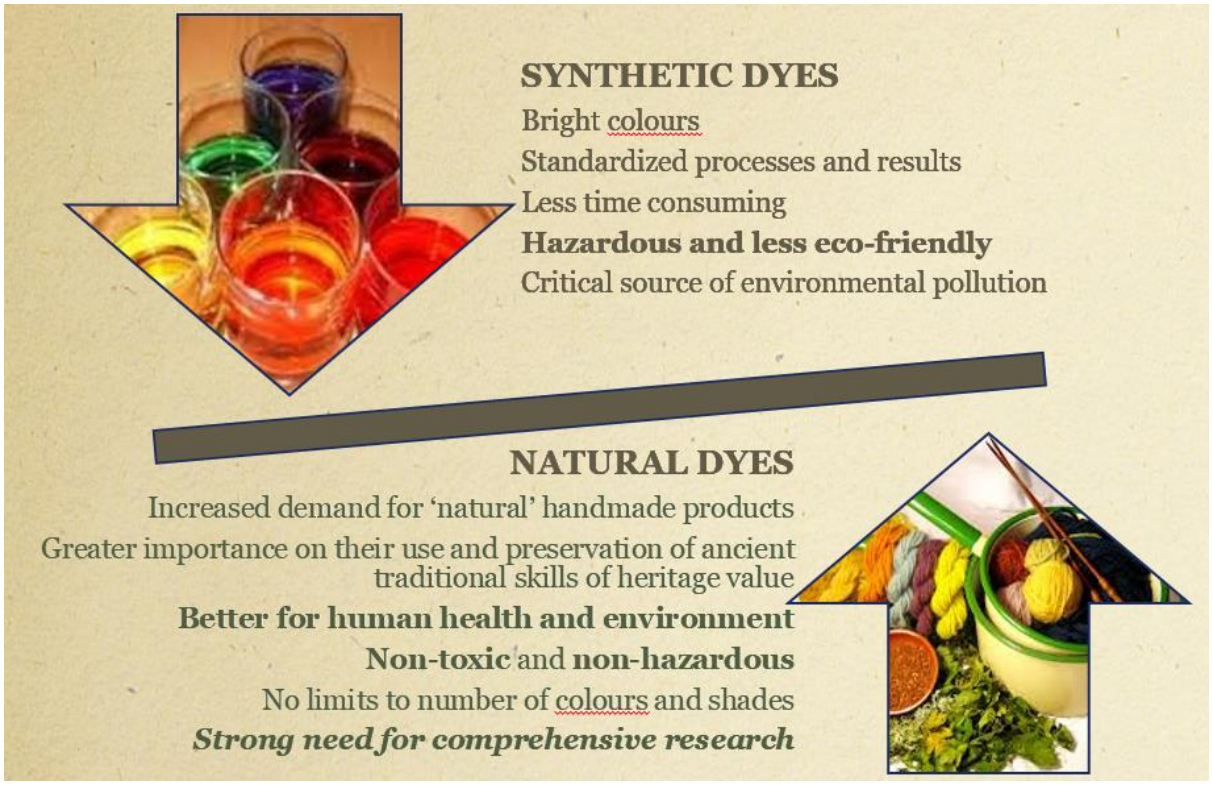
INTRODUCTION

Colour influences every part of our life. In the textile industry it enhances the aesthetic value of the product. Over the last 100 years, people preferred to use brightly- colored synthetic wools brightly coloured with synthetic dyes that make use less time-consuming processes which is one of the main reasons why natural dyes had nearly faded into history. The demand created by foreign tourists for ‘natural’ handmade products, has meant that people are now placing much greater importance on the use of natural dyes and the preservation of their ancient traditional skills. They now reserve their naturally dyed animal fiber for market.

It is generally accepted that natural dyes are better for human health and the environment, but that there is still a need for more complete and comprehensive research into the environmental impact of these natural dyes and processes.

Natural dyes made from plants, animals and shells provide important alternatives to petrochemical-based dyes. Careful harvesting offers environmental and social benefits; in comparison with synthetic dyes. Large variations in colour tone, because of the quality differences of different provenances of the dye plant. They require longer, slower dyeing treatments to achieve good color, particularly for vegetable fibers, making the process more costly than dyeing with synthetics. Synthetic dyes are cheap and easy to use, rapidly, in the past century, they supplanted the natural dyes for commercial dyeing. Pleasures of dyeing with herbs and natural sources is that no two baths will ever give exactly the same results, there will always be an element of surprise, with variations according to the season, the weather, the maturity of the plant, its position in the sun or shade and the quality of the water used for dyeing. Yet the higher

cost, subtle colour variation and greater demands on time means that natural dye technology has a particular cachet and quality that works well in specialist production. In fact, over the last few years synthetic dyes have been losing good reputation because of the risk of toxicity, negative influence on the environment and high allergic potential. Consequently, an increasing demand have naturally developed. Really, no chemical dye can achieve quite the depth and lustre of many plant dyes; the rich and subtle variations of tone and colour derived from plants may mellow and soften with time but never will lose their natural harmony.



Purpose of the Study: Dyeing is the process of changing the colour of yarns or fabrics by treatment with colourants. Various synthetic dyes are being used to produced vibrant colours with specific standards with excellent fastness properties. However detailed research has revealed their hazardous nature and sources of pollution. The drawbacks of synthetic dyes triggered need and value to look for eco-friendly dyes. There is enough need to support the revival of natural dyes, not only because it is valuable part of our heritage but also because it is potentially a commercially viable commodity that is non-toxic and non-hazardous to nature.

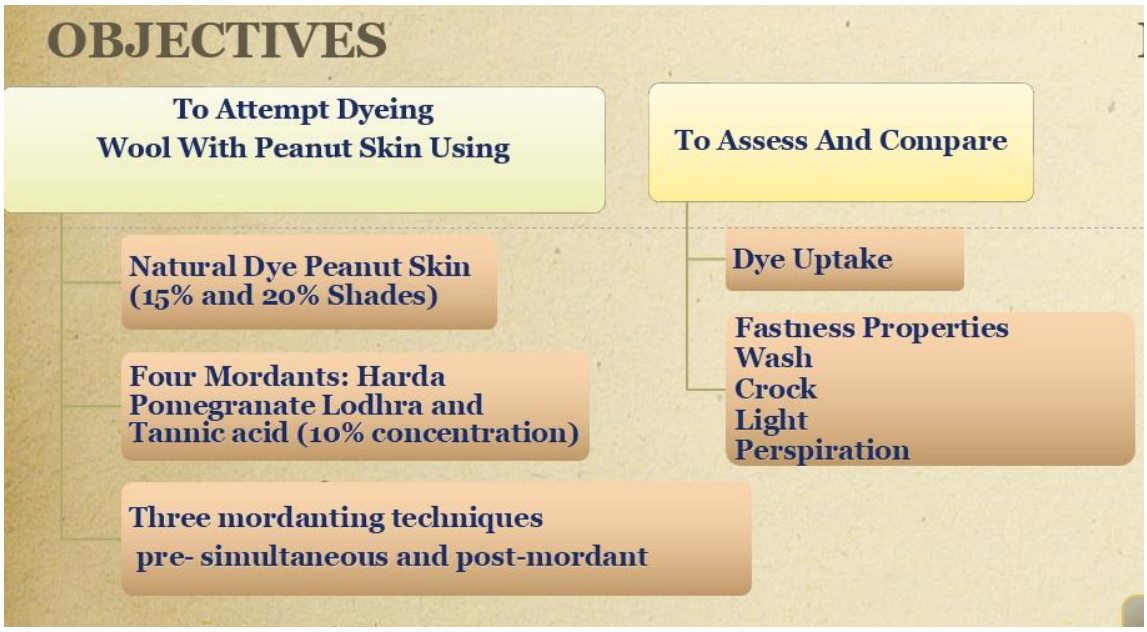
Vegetable dyeing is an exciting process that allows for a lot of creativity and innovation. There are no limits to the number of colours and shades that can be obtained through the process. With the intention to identify a novel source of natural dye the present study explores the possibility of using peanut skin (Arachis Hypogaea) to dye wool. Peanut skin is a waste in the food industry and local markets. The review of literature conducted including journals, dissertations, books, and Internet reveals that peanut skin has not been fully explored as a textile dye.

AIM: To explore the possibility of dyeing wool with peanut skin (Arachis Hypogaea) using mordants Harda Pomegranate, Lodhra, and Tannic Acid

Objectives:

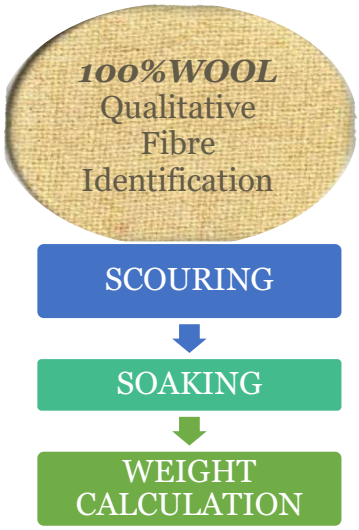
1. To attempt dyeing wool
- With the natural dye namely peanut skin (15% and 20% shades)
- With four mordants namely Harda, Pomegranate, Lodhra and Tannic acid (10% concentration)
- Using three mordanting techniques namely pre-, simultaneous and post-mordanting

2. To assess the dye uptake and compare the fastness properties (wash, rub, light, and perspiration) of the dyed samples.



Experimental Materials:

Fabric: Ready to dye 100% wool (Raymond's India Pvt. Ltd.)
Dye: Peanut skin from Kolkata local market
Mordants: Harda Pomegranate, Lodhra and Tannic acid
Other auxiliaries: Non-ionic detergent



Experimental Procedures

Recipe: weight of the fabric (W)= 2000 gms
Concentration of stock solution (C)= 10
Percentage shades (P)= 15 and 20% shades
Material to liquor ratio MLR= 1:30
Amount of stock solution required for 15% and 20% shades (S)=

WxP/C= 1500 and 2000 ml

Premordanting: Using four different mordants the solutions of 10% concentration on the weight of the fabric (o.w.f.) were prepared using MLR of 1:30. Fabric was immersed into the solution at room temperature and then was gradually increased to 80oC the process is continued for 45 minutes

Simultaneous Mordanting: four mordants with 10% concentration and dye 15% and 20% concentration were prepared o.w.f. using MLR (1:30)

Post-mordanting: After the dyeing described in the following section, mordanting was done with 10% concentration o.w.f. using a MLR of 1:30. The dyed fabric was immersed into the solution at room temperature and the temperature was gradually raised to 800C for 45 minutes.

Extraction and Dyeing: The amount of dye calculated on the basis of weight of the fabric for 15% and 20% shades were soaked in the required water with MLR of 1:10. The dye was extracted by soaking it for 12 hours, boiling for an hour and filtering through clean muslin. This extracted liquor was used as the stock solution for dyeing.

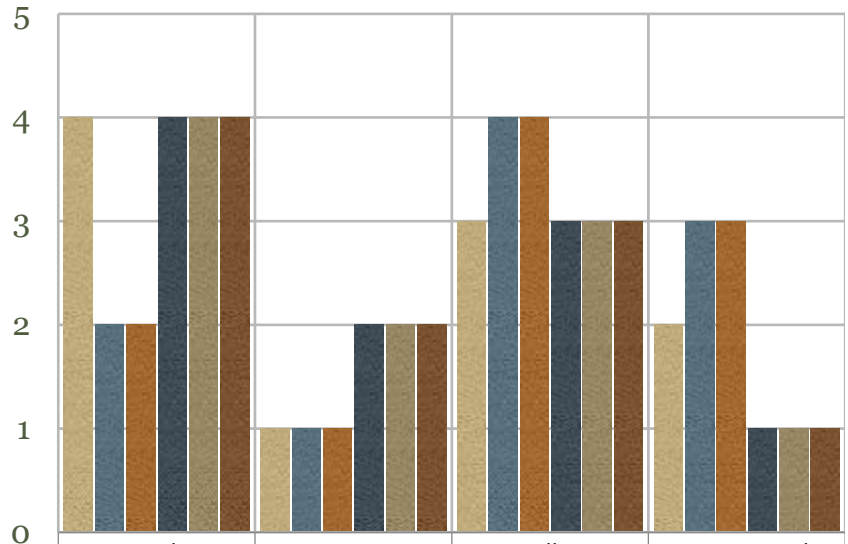
The dye liquor was prepared using the extracted stock solution with MLR of 1:30. The wet fabric was immersed into the dye liquor and the dyeing was begun at 80o C and the temperature was maintained from 80-90^{o}C. The process was continued for 1 hour with continuous stirring.

Rinsing of samples: Soaping: Samples washed with 2 gms of non-ionic detergent per litre of water at 60^{o}C for 30 minutes with a MLR of 1:40 followed by rinsing and drying in shade.

The following evaluation tests were conducted to assess the results:

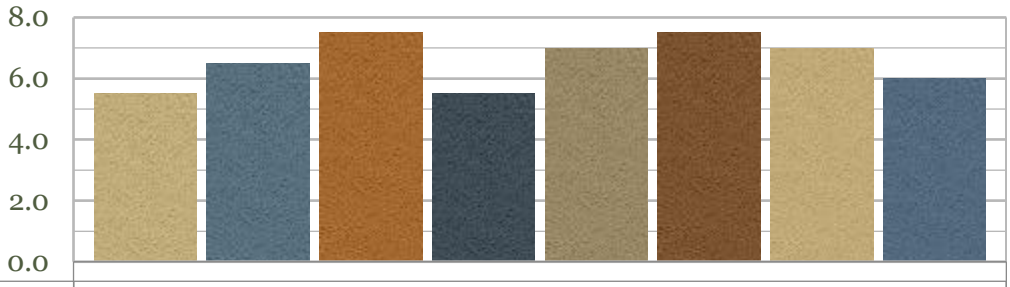
- Dye-uptake using spectrophotometer
- Wash Fastness (2IS: 3361-1979)
- Rubbing Fastness (IS 766-1956)

- Light Fastness (IS: 686-1957)
- Perspiration Fastness (IS: 971-1956)



	Harda	Pomegranate	Lodhra	Tannic Acid
15% Premordanting	4	1	3	2
15% Simultaneous Mordanting	2	1	4	3
15% Postmordanting	2	1	4	3
20% Premordanting	4	2	3	1
20% Simultaneous Mordanting	4	2	3	1
20% Postmordanting	4	2	3	1

Wash Fastness Test Results



15% Harda	5.5
20% Harda	6.5
15% Pomegranate	7.5
20% Pomegranate	5.5
15% Lodhra	7
20% Lodhra	7.5
15% Tannic Acid	7
20% Tannic Acid	6

Light Fastness Test Results

Conclusions:

- Peanut skin (Arachis Hypogaea) is a potential source for dyeing wool for obtaining shades of tan and beige.
- Comparing the mordanting techniques, pre-mordanting gave good results in dry-rub fastness and light fastness. Simultaneous mordanting showed more pronounced results for wash fastness, dry-rub fastness and perspiration fastness tests while post mordanting showed better results in dye-uptake, wash-, dry- and wet-rub, and acid perspiration fastness tests.
- Overall mean ratings in the dye uptake and fastness tests indicate that post-mordanting techniques are effective for dyeing of wool with peanut skin.
- On comparing the test results on the basis of mordants, it was seen that harda produced better dye-uptake, overall good wash and dry rub fastness.
- Pomegranate showed good results in dry-rub, light-, and acidic perspiration.
- Lodhra gave better results in wash dry-rub, light, and alkaline perspiration fastness.
- Samples with Tannic acid showed good wash and dry rub fastness. Hence Harda resulted in better dye-uptake compared to the other three mordants while the fastness test results showed that Lodhra is better as a mordant. Therefore, each mordant contributes to specific dye properties.
- On comparing the performance of samples on the basis of percentage shades, it was observed that 15% shades as compared to 20% shades showed better results in wash fastness, wet-rub, light-, acidic perspiration fastness tests.
- Samples of 20% shades performed well in alkaline perspiration.
- Samples of 15% and 20% shades performed equally well in dye uptake and dry-rub fastness.
- It was also found that in 20% shades, the standard that is without mordanting produced better shades than in the mordanted samples. Thus it may be deduced that higher percentage shades do not require mordanting.
- An overview of all the results indicate that Lodhra as a mordant and Post-mordanting as a technique showed optimum results.

Recommendations:

- Other proteinic fabrics as well as blends may be dyed with alternative natural and synthetic mordants to yield wider range of shades
- Since it was found that mordants function differently in a specific nature and
- influence different dye properties, contribution of two or more mordant treatments may also be experimented
- The composition of Peanut skin (Arachis Hypogaea) and its influence on the affinity for proteinic fibres may be investigated.
- It was found that post-mordanting gave better results than pre-mordanting and simultaneous mordanting. Thus the interplay of the different mordants with the dye and the fabric may be studied further.
- Effect of pH, temperature and the dye mechanism may be studied elaborately.

Limitations:

- Sourcing of the raw material was time consuming.

- The study was limited to assessment of dye-uptake and fastness properties.