



To Study The Dyeability Of Natural Dye For Sustainable Fabric (Cotton)

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Abstract

Natural dye is found from natural source such as from plant animal and mineral. Natural dyed cloth is more eco-friendly product. It is giving non-toxic, chemical free product and this does not harmful environment nature. In this study dyeing of cotton fabric with natural dye from Haldi, Anar, Katha extract. To know the effect of natural and chemical modern fixation of dye cotton fabric and fastness to repeated washing. The study adopted an experimental method. 100% cotton fabric(bleached) were taken for sample. The process of mordanting is done for increasing colour fastness of natural dye. Each mordant give different shades and its fastness is also different. The fastness of a natural dye on cotton fabric can be increased by using alum or potassium dichloride and or vinegar during pre-mordanting and mordanting process. Dyeing through National dye avoid pollution in the atmosphere and it is also cheap. In view of these advantage use of natural dye should be promoted.

Keywords: Natural dye, Mordant, Shades, Fastness, Washing

Introduction

Human and animal share the earth with plants and are dependent on them, India possesses rich variety of soils, climates and other ecological factors, which have endowed it with a vast forest wealth. Wood is recognized as the major forest produce. Apart from wood plants also give us other valuable products viz. Medicine, insecticides, edible and non-edible oils, gums, resins and oleoresins perfumery oils, spices, tannins and colouring matters known as dyes. Natural dyes are obtained from vegetable, animal and mineral sources. Nature is full of fascinating colours and people had been exploiting them for dyeing garments, using them in good and many other items of the daily uses. It has been reported by ancient writers that there were at one time nearly thousand different Natural sources of dyes. Mains desire to decorate his environment has been evident since the very earliest period of civilization. Basic printing techniques and dyes were first applied in patterning directly on to the human body, but with the production of crude fabrics such colouring and patterning methods were soon transferred to cloth.

Two natural dyes, alizarin and indigo, have major significance. Alizarin is a red dye extracted from the roots of the madder plant, *Rubia tinctorium*. Probably the oldest known dye is the blue dye indigo, obtained in Europe from the leaves of the dyerswoad herb, *Isatis tinctoria*, and in Asia from the indigo plant, *Indigofera*

tinctoria. Even by modern standards, both alizarin and indigo have very good dyeing properties, and indigo remains a favoured dye for denim, although synthetic indigo has replaced the natural material.

Dye

The molecules of the organic compounds called dyes are responsible for the colour of dyed and printed textile fiber material Colouring substance are of two types

1. Dye
2. Pigment

By these two methods we can able to colour clothes and different Articles in different colours Dyes are organic sub Which are used in solution for colouring of different. Article fibres, wools, food material and are stable against soap and sunlight. Dyes are coloured compound which get tightly stick to the cloths and don't come. But even on working with soap and water. They remain stable even when brought in sun light.

The following properties should be present in an organic substance to function as a dyes:

- a. It should have a suitable colour
- b. It should have the ability to fix directly with the fabric or by the help of mordant.
- c. After fixing with the fabric, it provides or exposing it to sunlight i.e., it is not affected by water, base, acid etc.

Classification of Dyes

We can classify dyes into the five different manners. These are as follows.

1. According to the origin
2. According to the chemical constitution of dye molecule
3. According to the method of application of dye
4. According to the reaction necessary to the fibres and fabric
5. According to the nature of the reaction necessary to produce colour

Here we will consider first classification which I fall under the category of its origin According to the origin there is three main classifications are found which are

1. Natural or origin dyes
2. Artificial or synthetic dyes

Natural Dyes

As it is clear by the name that it is obtain from natural, i.e., from plants, trees, animals. These colours are very famous for dyeing but now a days. It is less used because it is too costly as then that of synthetic colours. For a substance to act as a dye certain condition must be fulfilled, viz.

1. It must have a suitable colour
2. It must be able to fix itself or be capable of being fixed to the fabric
3. It must not be fugitive after fixing on the fabric to be dyed Natural dyes are obtained from vegetable, animal and mineral sources

Mordants for Natural Dyeing

Mordants are their metallic salts with an affinity for both fibres and dyestuffs which improves the colour fastness. An acidic dye requires a basic mordant and vice versa. Metallic hydroxide are the mordents for the acidic dyes while for basic dyes the commonly used mordant is tannin. The commonly used mordants and other chemicals are below:

S.No.	Mordants	Common chemical used in dyeing	Use
1	Alum	White vinegar	For Acidity
2	Copper Sulphate	Chalk powder	For Alkalinity
3	Potassium Dichromatic	House hold ammonia	For Alkalinity
4	Ferrous Sulphate	Baking soda	For Alkalinity
5	Stannous Chloride	Washing soda	For Alkalinity
6	Tannic Acid	Cream of tarker	Chemical Assist
7	Sodium Chloride	Common salt	Levelling Agent

Aims and objectives

Objective of this study are as follows:

1. To study the effect of natural and chemical mordant on fixation of dye on cotton fabric.
2. To study the fastness characteristics of pre-treated and mordanted vegetable dyes cotton fibre to repeated washing.

Methodology

Selection of Sample

The study was conducted using 100 % cotton fabric which was bleached before use.

Selection of Natural dye

For this study three Natural due are selected they are as follows:

S No	Hindi Name	English Name	Botanical Name	Part Use
1	Haldi	Turmeric	Curcuma longa	Rezone
2	Anar	Pomegranate	Punica granatum	Fruit rind
3	Katha	Catechu	Acacia Catechu	Wood extraction

Selection of Mordant and Mordanting:

To identify the effect of different mordant on shad development we used one Natural and two chemical Mordants.

List of Mordant

S No	Type of Mordant	Name of Mordant
1	Natural Mordant	Alum
2	Chemical Mordant	Potassium dichromate
3	Chemical Mordant	vinegar

Mordanting

Use of natural dyes requires mordanting of fabric for improved fastness. For mordanting of fabric two grams mordant was taken in a beaker in which 100 ml dye extraction was added to prepare a solution.

Tools And Techniques

The method of experiment used was the control observational study. This includes observation of phenomenon under controlled conditions and therefore comes nearer to laboratory type experiment. Under this method a stimulus is produced to the subject and changes are observed to find out the casual effect of the stimulus

The experimental Method has been explained under the following subtitles:

1. Preparation of fabric
3. Extraction of dye
- 3 Dyeing of fabric

1. **Preparation of fabric:** The fabric was soaked in water overnight for shrinkage. The fabric was then scoured in a soap solution cautioning 2gm / litter of soap and 2mg / litter of soda ash at 80 c for 1 hour. The material to liquor ratio was mentioned to 1:30 after which fabric was washed in running tap water then dried at room temp and ironed.

2. **Extraction of dye:** In present study the extraction carried by previous researchers was followed. The dried powder of raw material was soaked overnight in 500 ml of water then the extraction was kept for boiling in water jar for two hours. Then the solution was flittered through muslin cloth and the loss in water by evaporation was made up by adding the required amount of plain water

3. **Dyeing of fabric:**
For Pre mordanted fabric: The pre mordanted fabric sample was taken and according to the weight of fabric required amount of dye solution The fabric for the mordant solution was squeezed and put in the dye solution Dyeing was carried out in a water hath and hailed for 2 hours. The sample was then rinsed in plain water dried and ironed.

For mordanting: The fabric to be mordanted was weight then the fabric sample was soaked in plain water, squeezed lightly and put in solution of dye extract and mordant. Dyeing was carried out in a water bath and boiled for 2 hours. The sample was then rinsed in plain water, derided and ironed. Ratio of water and cloth is 3:1 in volume.

Analysis, Result and Discussion

In order to study the dyeability of natural dye for cotton fibre We dyed cotton fabric by selected dyes with three different mordant such as Alum potassium dichromate and vinegar Different test such as repeated washing rest, light fastness test and manual rating method were performed in the laboratory and out the condition for the experiment was kept constant while doing the test

Colour obtained:

From the experiment method we found different bright and soft colour shades by dyestuffs. The method of moderating was affected on the shed optioned from Haldi, Anar Peel and Katha the list of colour sheds are giving below

Table No 1 Colour obtained from different dyestuff:

Mordant Dyestuff	Mordanting Method	Turmeric Haldi	Anar	Katha
Sustainable	-	Deep Yellow	Dark Green	Coco
Alumi	PM SM	Dark Yellow Dark Yellow	Olive Olive	Light camel Colour
Potassium Dichromate	PM SM	Dusty Yellow Dark Yellow	Light tea colour NC	Coco Dull coco
vinegar	PM SM	light Yellow light Yellow	NC NC	Faded camel colour Faded camel colour

NC - No colour, PM - Pre Mordanted, SM Simultaneously mordanting

According to table (1) Turmeric /Haldi is a good dyestuff which can produced dark yellow colour with alum and potassium dichromate but in other hand vinegar found a weak mordant. In the case of Anar, Peel sustainable fornred produced dark green colour

Only alum was found suitable mordant to produced olive other mordant viz potassium dichromate and vinegar cannot produce colours.

As dyestuff katha gas good dyeing quality for cotton fiber deep coco colour can obtained by sustainable from and with potassium dichromate for same dyestuff alum and vinegar can produce different shades of camel colour.

Colour fastness test:

In the study pre mordanting method was found slight better then simultaneous mordanting method. In this we used one natural and two chemical mordant our result show that Natural mordent found better than any of chemical mordant.

Colour fastness result respected to different fastness test are shown in table (2) and the analysis is discuses below:

Repeated washing / Wash fastness:

The dyed sample were tested for their wash fastness by A.A.T.C.C test method for colour fastness. The sample (2x2) were put in glass for containing soap solution 5gm / litter concentration. Milk washing was carried out for 45 min. This process is repeated for 5 times. The result conducted for wash fastness of the dyed sample were as follows:

All the dyed cloth shows good to mordant wash fastness with natural mordant but in the case of vinegar they shows poor wash fastness quality.

Table No. 2 Fastness Properties of Different Dyestuff

Mordant/Dyestuff	Mordanting Method	Wash Fastness		
		Haldi	Anar	Katha
Sustainable	-	5	5	5
Alum	PM	5	4	3
	SM	4	4	4
Potassium Dichromate	PM	3	2	5
	SM	4	1	4
Vinegar	PM	2	1	2
	SM	3	1	2

Rate scale for Wash fastness

5- Negligible, 4-Slight, 3-Noticeable, 2-Considerable, 1-Server

PM - Pre mordanting SM – Simultaneously

Conclusion

From the study it can be concluded selected dyestuff can easily and have abundantly our forest area. Dye can be extract by simple mordanting method which can easily understood by local dyer. All the result of study indicated that chemical mordant can be substituted by the natural mordant to sum extract to make the entire process more eco-friendly and easily. Natural dye is safe and eco-friendly as they are found to be free from hazardous chemical. In this study notice that if the dyestuff is properly treated to extract the dye. The dyeability can be improve through proper dyeing process as shown table 1 fastness characteristic viz. wash fastness good in all dyestuff.

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