

Extraction of Natural Dye from Some Useful Dye Plants in Upper Myanmar

Soe Win* , Khin Thet Htar Nwe**

Abstract

Myanmar is in an advantageous position since the country holds a rich reservoir of natural products. As the use of natural dyes does not cause pollution, it is the immense importance to explore the sources of natural dye from the abundantly occurring plants. The present research has led to the development of the process for the extraction of natural dyes from some abundantly occurring natural sources such as Acacia Catechu, Eastern Gooseberry Emblica Officinalis, Terminalia Chebula and Terminalia Cattapa ,etc. are almost available everywhere in Myanmar. In this paper, an attempt was made on the dyeing of Myanmar silk yarns using natural dyes with the help of mordants such as rust, vinegar and common salt, etc. to get different colors. Moreover, fastness tests especially for rubbing and washing on dyed silk yarns were carried out. Staining and changing in color were assessed by using standard grey scale and the results were recorded.

Key words: natural dye, mordant, silk yarn, fastness properties

Introduction

Myanmar possesses a rich variety of soils, climates and other ecological factors, which have endowed it with a vast forest wealth. Natural dyes are obtained from vegetable, animal and mineral sources. Nature is full of fascinating colors and people had been exploiting them for dyeing garments, using them in food and many other items of the daily use. Natural materials were the only source of dye until 1856. At that time, the accidental discovery of mauve-colored coal tar product by Perking, which is named "mauveine" was the starting point of synthetic dye industry in the world. Gradually, the use of natural dye in dyeing different types of fabrics became a thing of the past. It is noted that the use of natural dye represented 6,000 years of trials, accidental discovery and evolving refinement. All this make the cause of losing not only the technology of natural dyeing and colors obtained with natural dyes but also contact with still another home art.

Use of natural dyes involves release of enormous amount of hazardous chemicals in the environment during their production and subsequent use. With the environmentally beginning products becoming a top priority in recent years, dye industry has turned its attention to newer products which caters to fashion trends as well to environmental specification. Natural dyes are biodegradable also, unlike the synthetic dyes, these do not pose a problem of pollution for the waste which remains after the dyeing process these are easily absorbed by the soil (Clark,1973).

* Lecturer, Dr., Department of Industrial Chemistry, Yadanabon University.

** Demonstrator, Department of Industrial Chemistry, Yadanabon University.

Materials and Methods

Materials

Table 1. Raw Materials Used for Natural Dyes

Botanical Name	Regional Name	Parts Used
Acacia Catechu	Shar	Sap
Eastern Gooseberry Emblica Officinalis	Zi-Phu	Fruit
Terminalia Chebula	Phan-ga	Fruit
Terminalia Cattapa	Banda	Leaf

(i) Myanmar silk yarn

(ii) Natural dyes

Four natural dyes were extracted from plant sources.

(iii) Mordants

Rust, vinegar and common salt were used as mordants.

Methods

Preparation of Textile Material

(i) Skeining

In contrast to other fibers, silk must be treated with the greatest care in all processes, whether under wet or dry conditions. The surface is extremely delicate and can be damaged in its wet state by the finishing equipment. So, skeining of silk yarn is essential to avoid tangling in degumming and dyeing process. In this study, four ends of silk yarns were twisted together to form a ply yarn on a twisting machine and then these ply yarns were reeled into skein form.

(ii) Degumming

Approximately 5-15 % gum on weight of goods must be removed from cultivated silk in addition to other impurities such as fats, oil, etc. Degumming process was carried out in a soap solution for about five hours and the condition of soap solution was pH 10. After boiling, soft water was used in rinsing and then silk yarns were dried at room temperature.

Dye Extraction Method

The parts used from plant sources were directly boiled in water to get dye solution. Then the solution was filtered through filter paper, and the loss in water by evaporation was made by adding the required amount of plain water (Hall,1965).

Dyeing of Textile Material

The premoderated silk yarns were taken and according to the weight of yarn required amount of dye solution was taken from the stock solution. Silk yarns were put in the dye solution and time taken for dyeing process depends on the type of raw material to be extracted for dye solution (Hall,1965).

Mordanting

Use of natural dyes requires mordanting of textile materials to improved fastness properties. The dyed materials were placed in mordant solution for the required time. Then

the dyed materials were rinsed in plain water, squeezed lightly and dried at room temperature. Table 2 shows the color obtained on silk yarn.

Color Fastness Test

(i) Washing Fastness Test

The dyed samples were tested for their wash fastness by ISO test 2, CO 2. The soap solution is prepared by five grams per liter of soap. The composite specimen of dyed silk sample is treated at $50 \pm 2^{\circ}\text{C}$ for 45 minutes. Then the specimen is rinsed in cold water, squeezed and dried at room temperature. The change in color is assessed by comparing with the original dyed fabric and the rating is defined by using Grey Scale for color change. The staining of the adjacent fabrics is assessed by using Grey Scale for staining.

(ii) Rubbing Fastness Test

Rubbing fastness test is carried out on Crock Meter Rubbing Fastness Test Machine. Dry and wet rubbing are carried out ten times on a 5 cm x 5 cm undyed bleached cotton fabric. The results were shown in Table 3.

Results and Discussion

Color Obtained by Natural Dyes on Silk Using Acacia Catechu or Cutch

Dyeing of silk yarns using Acacia Catechu or Cutch with rust mordant gives reddish brown color where the depth of color on dyed sample dyeing with fresh dye solution, Cutch 1, give deeper in shade than the depth of dyed sample dyeing with residual dye solution, Cutch-2. According to Table 3, both dyed samples were the same in washing fastness but rubbing fastness properties of Cutch-2 is better than Cutch-1.


Using Eastern Gooseberry Emblica Officinalis and Terminalia Chebula

The results obtained by dyeing of silk yarns using 2:1 ratio of Eastern Gooseberry Emblica Officinalis and Terminalia Chebula were shown in Table 2. In this case, dyeing of silk yarn was carried out by using fresh dye solution and aged dye solution (about a week). Dyed sample using fresh dye solution, Zi-phan-1, gives lead color and dyed sample using aged dye solution, Zi-phan-2, gives black color. From Table 3, wash fastness properties of Zi-phan-1 is fair properties are obtained in dry state and fair to good rubbing fastness properties are obtained in wet state.

Using Terminalia Cattapa or Indian Almond

In dyeing silk yarn using Indian Almond or Terminalia Cattapa, pale yellow color dyed sample are obtained by post mordanting with 4% common salt solution. The washing and rubbing fastness properties on dyed sample are good to excellent.

Table 2. Color Developed on Silk Yarn

Sr. No.	Sample Code	Dye Material	Dyed Sample
1	Cutch-1	Acacia Catechu	

2	Cutch-2	Acacia Catechu	
3	Zi-phan-1	Eastern Gooseberry Emblica Officinalis and Terminalia Chebula	
4	Zi-phan-2	Eastern Gooseberry Emblica Officinalis and Terminalia Chebula	
5	Almond	Terminalia Cattapa or India Almond	

Note : Zi-phan = Ziphyu and Phan-ga

Table 3. Fastness Properties of Dyed Samples

Sr. No	Sample Code	Rubbing Fastness		Washing Fastness	
		Dry	Wet	Change of Shade	Staining on Cotton Fabric
1	Cutch-1	3-4	3-4	4-5	3-4
2	Cutch-2	4-5	4	4-5	3-4
3	Zi-phan-1	4	3	3	4-5
4	Zi-phan-2	4	3-4	4	4-5
5	Almond	4-5	3-4	4-5	4-5

Note : 1= very poor, 2 = poor, 3 = fair, 4 = good and 5 = excellent,

These experiments were conducted at Development Centre for Textile Technology in Ministry of Industry, Yangon Region.

Production of Silk Fabric

The production of fabric using dyed silk yarn was carried out on a hand-loom. The fabric woven in this study was shown in Figure. 1 and this fabric was intended to be used for silk Longyi for Myanmar Men.



Figure 1. Silk Longyi

Conclusion

In this paper, four numbers of natural dye yielding plants are studied and each type of natural dye yields luster, soft, subtle and attractive color on silk yarn. Color obtained on silk yarn by natural dyes using mordants exhibits fair to good washing and rubbing fastness. So, the plant sources used in this study are so good to use for dye extraction because they are occurring abundantly in our country. The dye obtained can be used to impart different fast shade on silk yarn which may help in enhancing the export of naturally dyed silk garments to the countries where the use of synthetic dyes have been banned. Utilization of almond leaf will reduce the chances of fire. The biomass left after the extraction of dye can be converted to compost there by finding its complete utilization.

Acknowledgements

We are grateful to Professor Dr Maung Maung Naing, Rector, Dr Si Si Khin and Dr Tint Moe Thuzar, Pro-Rectors, Yadanabon University and Dr Khin Hnin Aye, Professor and Head of Department of Industrial Chemistry, Yadanabon University, for their permission to submit this article. We would like to express my gratitude to supervisor Dr Khin Thet Ni, Professor and Head (Rtd) , Department of Industrial Chemistry, University of Yangon, for giving permission to use research facilities and her suggestions during the research work.

References

- Abrahart, E.N. (1962). *Dyes and their Intermediate*. New York: Chemical Publishing.
- Billmeyer, F.W. and Saltzman, M. (1966). *Principal of Color Technology*. New York: Interscience Publishers, John Wiley and Sons, Inc.
- Birren, F. (1955). *New Horizons in Color*. New York: Reinhold Publishing Corporation, Printed in USA.
- Clark, G.L. (1973). *The Encyclopedia of Chemistry*. 2nd Edition, New York :VanNostrandReinhold Company.
- Dasture, J.F. (1962). *Medical Plants of India and Pakistan*, D.B. Taraporevila Sons and Co private Ltd., Dr. D.Naoroji Road,Bombay.
- Grae, Ida. (1974). *Natures Colors*, 1st Printing Collier-Macnillan Canada Ltd., Printed in the United States of America.
- Gulajani, M.L. (1992). *Introduction to Natural dyes*, Indian Institute of Technology, New Delhi.
- Gulrajani, M.L. (1992). *Present Status of Natural Dyes*, Indian Institute of Technolgoy, New Delhi.
- Hall, A.J. (1965). *The Standard Handbook of Textiles*, The English Language Book Society and Heywood Books, London.
- Harwood, R.J. and Bramhall, A.T. (1987). *Dyeing and Printing of Cotton and Polyester/Cotton Fabrics*. Volume I , Scottish College of Textiles.