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Natural Dye Powder: An Easy Technique for Eco- Dyeing

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Abstract

A dye is a coloured substance that has an affinity to the substance to which it is being applied the clothing were dyed with natural dye substrates. The major problem faced for survival of natural dyes were lack of availability of standard shade cards and reproducibility of shades, as a result the synthetic dyes captured the market. Because clothing is in constant contact with our skin, the chemicals used in dyeing are absorbed into our skin through the pores and these create various skin problems. The alternative to the problem is natural dyes which are more aesthetic and safe for dyers as well as wearers. Keeping in view the importance of eco textiles and their demand in the national and international market and to make dyeing less time consuming and to overcome the problem of shade variation the present investigation was carried out to prepare the ready to use dye powder for dyeing of silk and silk blend and test its colour fastness. Three dye sources viz, bhringraj leaves, kachnar bark and rein wardtia flowers were used. Dye powder was prepared from the selected dye materials by extracting dye in alkaline medium and precipitation of dye with nitric acid. Results of the study revealed that powder of bhringraj leaves dye was formed with precipitation method, kachnar bark dye's powder was formed by both precipitation as well as alkaline method. Powder of rein wardtia flowers dye was formed by precipitation method only. The colour value of samples dyed with powdered dye of bhringraj leaves were lighter in shade as compared to extract dyed samples, whereas colour value of samples dyed with powder dye of kachnar bark and rein wardtia flowers were same as that of extract dyed samples. Fastness grades of powder dyed samples tested at different time intervals against washing and sunlight were found at par with extract dyed samples.

Keywords: Natural dyes, dye powder, eco dyeing, silk, silk blend, colour value, fastness properties.

Introduction

India has a very rich tradition in the use of natural dyes. Natural dyes have been a part of human life since time immemorial and were the only colourants in the world. But with the invent of synthetic dyes about 175 years back, use of natural dyes almost diminished. During last two decades, natural dyes have witnessed a process of revival[1]. With the increasing awareness of consumers for eco textiles and need to preserve environment has lead to the revival of old practice of colouration with natural dyestuffs. Due to the carcinogenic nature of some synthetic dyes and their intermediates natural dyes are being looked at as an "eco solution" to the ill effects of synthetic dyes. The serious limitation associated with the natural dyes is that the process of dyeing with natural dyes is very lengthy and time consuming. Moreover reproducibility of shades is also a major problem faced in dyeing with natural dyes as traditional processes for their application on various substrates have been lost in the absence of proper documentation and years of neglect. Therefore, it becomes necessary to develop new techniques of colouration and also to standardize these processes with the help of modern scientific inputs so that these dyes can offer themselves as an effective eco option.

Keeping in view the importance of eco textiles and their demand in the national and international market and to overcome the problem of shade variation the present investigation was carried out to prepare the ready to use powdered dye for dyeing of silk and silk blend and test its colour fastness properties.

Figure-1
Bhringraj Plant

Figure-2
Kachnar Tree

Figure-3
Rein Wardtia Flowers

Material and Methods

Selection of dye materials: Three dyes from plant sources as described in table-1 were selected for the present study.

Preparation of dye powder: The ready to use dye powder of selected dyes was prepared by extracting the dye in alkaline medium and precipitation with nitric acid.

Alkaline medium: The raw plant material was dissolved in water and its pH was brought to 10 using sodium hydroxide. It was extracted on water bath for 60 minutes, cooled and strained through filter paper. The filtrate thus obtained was concentrated on hot plate for 20 minutes and kept on water bath for complete drying. The flakes thus obtained were crushed to powder form.

Precipitation with nitric acid: The raw plant material was extracted in alkaline medium at pH 10.0 for 45 minutes keeping the MLR 5:100. The solution was cooled and nitric acid was added to bring its pH to 4.0 and the dye was precipitated. The precipitated dye was filtered and dried in hot air oven and crushed to powder form. Silk and silk blend fabric samples were dyed with prepared dye powder.

Determination of colour value: The colour value of the powder dyed samples was analyzed visually by five experts who had experience of working with natural dyes in terms of hue, lightness and brightness and compared with that of extract dyed samples.

Determination of colour fastness: The colour fastness of the samples dyed with powder dye and extract dye was tested in terms of wash and light fastness using IS: 3361- 179 and IS: 686- 1985 test methods, respectively.

Table-1
Selected Dye Sources

Sr. No.	English name	Common name	Botanical name	Family	Part used	Source	Cost
1.	Trailing eclipta	Bhringraj	*Eclipta prostrata*	Compositae	Leaves	Khari Baoli, New Delhi	Rs.30/kg
2.	Geranium	Kachnar	*Bahunia variegata*	Cesalpiniaceae	Bark	HUDA Nursery, Hisar	Free
3.	Rein wardtia	Rein wardtia	*Rein wardtia trigyana*	Compositae	Flowers	CCS HAU Campus, Hisar	Free

Table-2
Preparation of dye powder

Sr.No.	Raw material	Method of Preparation
1.	*Bhringraj*	Alkaline (Powder not formed) Precipitation (**Powder Formed**)
2.	*Kachnar*	Alkaline (**Powder formed**) Precipitation (**Powder Formed**)
3.	Rein wardtia	Alkaline (Sticky mass) Precipitation (**Powder Formed**)

Results and Discussion

Preparation of dye powder: Ready to use dye powder of all the three dyes was prepared by extracting the dye in alkaline medium at pH 10 using alkaline and precipitation methods (table 2). Powder of *bhringraj* leaves was made with precipitation method as in alkaline method powder could not be obtained.

Powder of *kachnar* bark dye was made with precipitation and alkaline method, but the colour value of powder obtained with alkaline method was best.

Rein wardtia flowers dye's powder was prepared with precipitation method, because in alkaline method sticky mass was obtained.

It is thus concluded that powder of selected dyes could be prepared with different methods *i.e*. powder of *bhringraj* leaves and rein wardtia flowers can be prepared with precipitation method and dye powder of *kachnar* can be made with both precipitation and alkaline method with acceptable colour value.

The colour value of samples dyed with powder dye was analyzed visually and compared with the samples dyed by extraction method and a change in colour characteristics in terms of hue and lightness was observed. The samples dyed with powdered dye of *bhringraj* leaves were lighter in shade as compared to extract dyed samples, whereas the other two dye powders *i.e*. rein wardtia flowers and *kachnar* bark gave similar colour value.

The less dyeing power of powder dye in case of *bhringraj* leaves might be due to prolonged heating and processing *i.e.* precipitating the dye in acid.

Colour fastness of dyed samples at different time intervals: Fastness grades of samples dyed with extract dye and powdered dye and tested at different time intervals are presented in table 3.

It was observed that the colour fastness properties of the samples dyed with *kachnar* and rein wardtia dye powder were at par with the extract dyed samples. Colour fastness properties of samples dyed with *bhringraj* dye powder were lower as compared to extract dyed samples as the colour value of the dye powder was also low.

Table 3 depicted that change in colour and colour staining grades for *bhringraj* dye powder were good *i.e*. 4 at different intervals and the light fastness grades of powder dyed samples were at par with the extract dyed samples on both silk and silk blend fabrics. Though the tinctorial value and fastness grades of powder dyed samples were less as compared to the extract dyed samples but the overall colour fastness properties were good. So the powder dye can be used effectively. Heat and sunlight decreased the tinctorial value of annatto dye[2].

In case of *kachnar* bark and rein wardtia flowers the fastness grades of powder dyed samples and extract dyed samples were similar on both the fabrics when tested at different time intervals, as the initial tinctorial values of powder dyed samples were also at par with the extract dyed samples. Thus it was concluded that the dye powder can be used effectively. Fastness properties of powder dyed samples were at par with the extract dyed samples even though the colour value of powder dyed samples were low at initial stage[3].

Table-3
Colour fastness of dyed samples at different time intervals

Dye materials	Fabric	Wash fastness								Light fastness	
		Extract dyeing		Powder dyeing							
				1 day		3 months		6 months		Extract dyeing	Powder dyeing
		CC	CS	CC	CS	CC	CS	CC	CS		
Bhringraj leaves	Silk	4	4/5	4	4	4	4	4	4	3	3
	Silk blend	4/5	4/5	4	4	4	4	4	4	4	3/4
Kachnar bark	Silk	4/5	4/5	4/5	4/5	4/5	4/5	4/5	4/5	3/4	3/4
	Silk blend	4	4/5	4	4/5	4	4/5	4	4/5	3/4	3/4
Rein wardtia flowers	Silk	3	3	3	3	3	3	3	3	3	3
	Silk blend	4	4	4	4	4	4	4	4	3	3

CC: Colour change; CS: Colour staining

Conclusion

i. The prepared dye powder can be used effectively to get the same shade even in different dye baths. ii. The fastness of dye to washing and sunlight was very good. iii. Local artisans at cottage level can take up the activity for income generation.

References

1. Gulrajani M.L., Introduction to natural dyes. In: Gulrajani, M.L. and Gupta, D. (*Ed*) *Natural Dyes and their Applications to Textiles*: 1-17, IIT, Delhi **(1992)**

2. Gulrajani M.L., Gupta D. and Maulik S.R., Studies on dyeing with natural dyes: Part I-Dyeing of annatto on nylon and polyester. *Indian Journal of Fibre and Textile Research,* **24(6)** 131-135 **(1999)**

3. Tomer P., Development of technology for dye production from medicinal plants. Ph.D. Dissertation, CCS Haryana Agricultural University, Hisar, **(2006)**

4. Agarwal K.K., Problems and prospects of using natural dyes in an industrial enterprise, Colourage, **50(6),** 37-40 **(2003)**

5. Chawan R.B., Revival of natural dyes- a word of caution to environmentalists, *Colourage*, **42(4),** 27-30 **(1995)**

6. Dixit S. and Jahan S., Optimization of dyeing variables for euphorbia (Euphorbia cotinifolia) leaves dye on silk fabric, *Manmade Textiles in India,* **48(5),** 191-193 **(2005)**

7. Goel B. and Goel A., Dyeing wool, rayon blends. *The Indian Textile Journal,* **108(1),** 48-49 **(1998)**

8. Mondal S., Dutta C., Bhattacherya S., Ganguly D., Ganguly S., Bandyopadhyay S., Chattopadhyay S. and Sau M., The effect of dyeing conditions on fastness properties of natural dyes on silk fibres, *Colourage,* **51 (8),** 33-36 **(2004)**

9. Needles L.H., Textile fibers dyes, finishes and processes. Standard publisher's distributors, Delhi, 6-67, 188, 201 **(2001)**

10. Ramakrishna K., Into the golden era of natural and vegetable dyes, *Colourage,* **46(7),** 29-30 **(1999)**