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RESEARCH PAPER
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Study on economic importance of indigenous dyes

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ABSTRACT

The age-old art of dyeing with indigenous dyes was common in India. These dyes are generally obtained from vegetable matter, minerals and insects. Indigenous dyes are eco-friendly, biodegradable and less toxic and less allergic compared to synthetic dyes. In spite of several advantages indigenous dyes have over synthetics, the use of indigenous colour is still very limited due to non-availability of standard shade card, precise and specific way of application, standard norms and also lack of awareness. Even though most of the ethnic communities of Assam still practicing indigenous dyes for dyeing traditional textiles with their own way. Hence the study was undertaken with an aim to develop the dyeing conditions of the bark of Cochin goroka tree (*Garcinia xanthochymus)*, which is easily available in North East India, on muga (*Antheraea assamensis)* silk yarn. The eco-friendly mordant used in the research work is alum for better fixation of the dyes. The dyes are extracted by alkaline method and the extraction time is optimized from the optical density values. Three different mordanting method is used for mordanting the yarn. Golden yellow colour is obtained from the dye which is found to be colour fast and suitable for muga silk.

Key Words : Indigenous dyes, Colourfast, Mordant

INTRODUCTION

The Sub-Himalayan region of North-Eastern India particularly Assam and Arunachal Pradesh are the treasure house of wide varieties of plant species. Due to the varied topographic and climatic conditions, various types of flora with their own distinctive characteristics are available in this part of the country. Many of the plant species have medicinal and aromatic value, while some plant species contain indigenous colouring matters. The practice of extraction of colouring matters from plant sources is in vogue in this part of the country from very ancient time. The rural people of NE region extract dyes either from leaves, roots, flowers, seeds or bark of some selected plant species, adopting their own methods of extractions. These methods mostly involve boiling, scraping, powdering and mixing with other materials to get desired colour. In these methods wastages of raw materials were observed very much. Sometimes fermentation processes are also involved in extraction of dyes. In most cases, dyes are extracted and used fresh for colouring textile materials. Apart from a few conventionally used plant materials for extraction of dyes by rural folks, many dye-yielding plants remain unutilized due to ignorance and due to non-availability of research and development data on their quality and quantity. Thus, the present work is an attempt to develop standard methods for extraction and dyeing

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Objective:

The present work was undertaken with the following objectives:

1. To study the standardized dyeing conditions of selected indigenous dye on muga silk yarn.
2. To study the colourfastness properties of the dyed yarn
3. To study the physical properties of dyed yarn.

METHODOLOGY

Selection of yarn for dyeing:

Muga silk yarn was selected for dyeing and collected from local source.

Selection of indigenous dyes:

Table 1 : Dye yielding plants selected for the study

Sr. No.	Botanical name	Common name	Family	Parts used
1.	*Garcinia xanthochymus*	Cochin goroka	Guttiferae	Bark

Selection of mordent for dyeing:

Alum (aluminium potassium sulphate) was used for mordanting.

Extraction of colour from Cochingoroka:

The barks of Cochingoroka were collected and washed thoroughly with plain water then allow to dry. After that the dried bark were crushed into powder form. The powder was allowed to swell inside water for at least 10-12 hours . Then, the swollen powder was boiled for around 1-2 hours in an open vessel or less than half that time by using a pressure vessel. The extract is filtered and dried at 50°C to bring it to solid form. The water extractable matter in Cochingoroka bark is around 20% to 30% (w/w).

Application of natural colour:

The solidified dye is pasted in cold water and hot water added while stirring till the solution is brought to 70°C-80°C. Then the muga silk yarn is added to the dye solution for dyeing. The dyeing was done for 30 to 40 min keeping the M: L ratio at 1:30.

Methods of mordanting :

Pre-mordanting :

The required amounts of mordants are dissolved in water, and the pre-soaked yarn is immersed in the liquor. The temperature is raised gradually up to 60°C- 70°C and the treatment continued for 30 min. The bath is cooled down. Then the yarn is rinsed, dried, and dyed as discussed.

Simultaneous mordanting :

The required amount of dye is dissolved in water. The dye liquor temperature is raised up to 70°C. Then the pre-soaked yarn is introduced. Dyeing at 60 ° C- 70°C is continued for 30 min, then the required amount of mordant in dye liquor is added, and the dyeing continued for another 10 min. Then the dye bath is allowed to cool and finally, the yarn is rinsed and dried.

Post mordanting :

The yarn is dyed at 60°C- 70°C for 30-40min and dye bath allowed to cool then the yarn is rinsed and dried. The required amount of mordant is dissolved in fresh bath and exact pH at which dyeing is done should be maintained. The dyed yarn is treated at 60°C- 70°C for about 30 min. The bath then is allowed to cool; finally, it is rinsed and dried.

RESULTS AND DISCUSSION

The most suitable conditions identified for dyeing muga silk yarn with selected dye is given in the Table 2.

Table 2 : Optimized dyeing conditions of muga silk yarn

Dye source	Mordant	Mordant concentration	Mordanting method	Dyeing Temp °C	pH	Time of dyeing (Min)	Light fastness Grade*
Cochin goroka							
-do-	Alum	0.25%	Pre	60- 70	6.5	30 to 40	5
-do-	-do-	0.50%	Simultaneous	60- 70	6.5	30 to 40	4-5
-do-	-do-	0.50%	Post	60- 70	6.5	30 to 40	4-5

*1: very poor, 2: poor, 3: fair, 4: very fair, 5: good

Dye obtained :

A golden yellow dye could be imparted from the bark of Cochingoroka .

Performance of dye:

It produces a very brilliant colour. Colour fastness in terms of light, washing, perspiration and crocking are found to be very good.

Economic importance:

A good amount of coulourants can be extracted from these materials. However, the dye produce golden yellow colour which is similar to natural muga colour. As the muga yarn itself is a very strong fiber with its natural golden yellow colour. But after long used the strength of the fiber remains same though the colour may fade, in that case if the used fabric could be dyed with this dye to get its original colour for father used with a new look. The labour cost of collection of raw materials, transportation, grinding, powdering and extracting colour are not expensive.

Table 3 : Physical properties of muga silk yarn before and after dyeing

Sr. No.	Yarn properties (before dyeing)	Yarn properties (after dyeing)	
		Sources	
		G. xanthochymus	
		Dyed sample	% change
1.	Weight (0.016 g)	0.019	+18.75
2.	Breaking load (2.199kg)	2.275	+3.46
3.	Breaking strength (32.07 g/denier)	33.18	+3.46
4.	Elongation (18.51 mm)	18.83	+1.78
5.	Stress (10.43%)	10.57	+1.34

Note : '+' indicate increase, '-' indicate decrease

The data presented in Table 3 on physical properties of muga silk yarn before and after dyeing with *bark of cochingoroka* dye. From the data it was observed that the physical properties of the yarn remained same after dyeing. It also found that, in some properties, dyed yarn showed better result than the undyed yarn.

Summary:

From the present study, it could be concluded that the dye was found to be an ideal source of eco friendly dyes. At the 21st century, maintaining a safe environmental balance becomes even more important as synthetic dyes are based on toxic raw materials and intermediates. The effluents from the industry are some of the major causes of environmental pollution. Eco friendly dyes are not only free from this handicap but could also assist the regeneration of the environment if plans were developed to cultivate these plant varieties on a commercial scale. Petrochemicals, the base of synthetic dyes is limited and irreplaceable while the vegetarian based resources of dyes are replaceable besides being bio-degradable. As the plant of cochingoroka also used as fruit plant and the bark produce a brilliant golden yellow dye. Hence the plant has an economic importance. The natural golden yellow colour of muga fabric could be remaining same after dyeing with this dye. So, it could be summerized that cochingoroka dye has an economic importance especially on muga silk.

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