The Pharma Innovation Journal 2023; SP-12(9): 1499-1501

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; SP-12(9): 1499-1501

www.thepharmajournal.com
Received: 02-07-2023
Accepted: 06-08-2023

Moirangthem Jeena Devi
M.Sc. Student, Department of Textiles and Apparel Designing, College of Community Science, Assam Agricultural University, Jorhat, Assam, India

Sunita Boruah
Assistant Professor, Department of Textiles and Apparel Designing, College of Community Science, Assam Agricultural University, Jorhat, Assam, India

Binita B Kalita
Professor, Department of Textiles and Apparel Designing, College of Community Science, Assam Agricultural University, Jorhat, Assam, India

Shilpi Buragohain
M.Sc. Student, Department of Textiles and Apparel Designing, College of Community Science, Assam Agricultural University, Jorhat, Assam, India

Purnima Das
M.Sc. Student, Department of Textiles and Apparel Designing, College of Community Science, Assam Agricultural University, Jorhat, Assam, India

Corresponding Author:
Sunita Boruah
Assistant Professor, Department of Textiles and Apparel Designing, College of Community Science, Assam Agricultural University, Jorhat, Assam, India

Colourfastness characteristic of mango (*Mangifera indica*) leaves extracted dyed and eco-printed eri silk fabric

Moirangthem Jeena Devi, Sunita Boruah, Binita B Kalita, Shilpi Buragohain and Purnima Das

Abstract
In this study, mango (*Mangifera indica*) leaves were selected as a natural dye and myrobalan was selected as natural mordant and alum as a metallic mordant to use in dyeing and eco-printing of eri silk fabric. The colour of mango (*Mangifera indica*) leaves dye obtained was deep yellow colour but turned yellowish green and buff yellow when two different mordants namely, alum and myrobalan were added to it. The effect of mordant on dyeing and eco-printing were compared with the mordanted and non-mordanted dyed and eco-printed fabrics. The result revealed that alum mordanted and myrobalan mordanted fabrics showed very fair colourfastness when exposing to sunlight and wet crocking method. While in perspiration and pressing methods, all the sample fabrics showed very fair to fair, good to no stain and neglible to slightly stained respectively.

Keywords: Eri silk, dyeing, eco-printing, *Mangifera Indica*, mordants, fastness

1. Introduction
People love to adorn their clothing by using a variety of methods like colouring, printing etc. Since the beginning of time, people have practiced the technique of applying colour to textile materials [1]. Dyeing fabric is a form of ancient art that predates written records. The primitive dyeing technique included rubbing and crushing coloured pigments from plant sources on the textile materials [2, 3]. Natural colourants are used in a variety of colouring processes, such as textile dyeing and printing, and they are less damaging to people and have anti-allergic properties as compared to synthetic colourants [4]. These natural dyes can give a subtle through soft colours to brightest colour [5]. Mango tree, a member of the *Anacardiaceae* family of plants, has long been used as a source of food, medicine and dye for textile items [6]. Mango leaves give subtle and soft colours to the fabric and using a natural mordant with narural dye gives naturally coloured textile products a more complex ecological profile. Textile surface ornamentation like eco-printing has brought a variety, liveliness, and interest in clothing. When mordants are added to the dye, a multitude of hues are created [7]. Therefore, the purpose of the present study was to evaluate the effectiveness of dyes extracted from the mango leaves in dyeing and printing of eri silk. The specific objectives were to explore the possibilities of producing fashionable hues from the dying and eco-printing by using different mordants, to compare between mordanted and unmordanted dyed and printed fabrics, and to assess the colour fastness properties of the dyed and printed fabrics.

2. Materials and Methods
Eri Silk fabric was collected from the market of Guwahati, Assam, India for the study. The mango leaves used for the extraction purposed were collected from the Assam Agricultural University, Jorhat, Assam, India campus based on their colour yield and availability. Magniferin (1,3,6,7 tetrahydroxyxanthone-c-2-B-D glycoside) as shown in the Fig.1is the substance that gives mango leaves their colour and it has a number of pharmacological qualities, including antioxidant, anti-bacterial, and anti-fungal effects [8, 9].

2.1 Selection and collection of mordants
2.1.1 Metallic mordant: Alum (KAI $(SO_4)_2.12H_2O$) was selected as metallic mordant for the study.

2.1.2 Natural mordant: The flowering evergreen tree *Terminilia chebula*, also referred to as myrobalan, is native to Asia and is extensively utilised in traditional medical practises. They contain a lot of hydrolysable tannins *(pyrogallic)*, with myrobalan having a range of 18.2% to 52% tannin content. From the campus of the Assam Agricultural University, myrobalan was collected as a natural mordant for the study.

2.2 Preparation of fabric for dyeing and printing
Preparatory process of dyeing and printing are necessary for removing impurities from fabrics and for improving their process ability and aesthetic appearance of the fabric.

2.2.1 Degumming
Eri silk fabric was treated with 5 g/litre Na_2CO_3 for the degumming process. The material-liquor ratio (M:L) during the treatment was 1:50 and boiled it for 30 minutes at 60 °C with occasional stirring. After degumming the fabric was properly washed under running water, and allowed to air dry.

2.3 Dye Extraction
Preparation of dye was started by washing the mango leaves thoroughly with water to remove the dirt and other impurities. They were dried in the oven and grinded into tiny units with the help of a grinding machine.

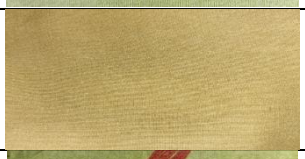
2.4 Mordanting
Pre mordanting was carried out on eri silk fabric using 2% of alum (potassium aluminum sulphate) and 4% of myrobalan (natural mordant) for 30 minutes.

2.5 Dyeing
3gm of dye pigment was added to 100ml of distilled water and then heated to 100 °C for 60 minutes. The hot dye solution was cooled down and filtered by using filtering gauze in order to separate the residue from the dye solution.

2.6 Eco-printing
After dyeing, the mordanted fabric was spread out on a clean smooth surface and the leaves were layed down on the fabric with the moon side down. Then, the blanket fabric was put on top of the leaves and pressure was applied on the fabric either by light hammering or by walking on it. The entire fabric was covered with plastic sheets and started rolling all the layers together as tightly as possible and tightened with a flat ribbon of fabric. The fabric that was rolled was then put inside a big steamer and boiled it for 2 hours then cooled it down and open it.

2.7 Evaluation of color fastness properties of dyed and eco-printed fabric
All the dyed sample of Eri Silk fabric was evaluated for color fastness to washing, colour fastness to sunlight, color fastness to crocking or rubbing, color fastness to perspiration (acidic & alkaline) by using [10] AATCC (1965) gray scale.

Table 1: Shades of dyed and printed eri silk

Mordant used	Shade
Non-Mordant	
Alum Mordanted	
Myrobalan Mordant	
Alum Eco-Printed	
Myrobalan Eco-Printed	

3. Results and Discussion

3.1 Colourfastness to washing
Negligible or no colour stained was observed in alum mordanted and alum eco-printed samples during washing while non-mordanted and mordanted with myrobalan, myrobalan eco-printed samples showed good fastness to washing and colour change. This could be caused by a number of things, including- the dye itself breaks down and becomes a colourless or differently coloured substance [11].

3.2 Colourfastnness to sunlight
Table 2 revealed that non-mordanted and natural mordanted samples showed good colorfastness to sunlight. On the other hand alum mordanted and alum eco-printed samples showed very fair fastness property to sunlight. During exposure to sunlight, the fabrics mordanted with alum might have

destroyed some dye mulecules as little amount of colours are faded as compared to other samples [12].

3.3 Colourfastness to crocking (wet and dry)

All the non-mordanted, mordanted and eco-printed samples were evaluated for colourfastness to crocking in wet and dry conditions. All mordanted, non-mordanted and eco-printed samples were good colourfastness and negligible stained in dry crocking while in wet crocking, all the samples were good fastness except myrobalan mordanted and myrobalan eco-printed samples. No colour stained were observed in non-mordanted dyed sample and slightly stained in mordanted samples. The good rubbing fastness property confirms that almost no superficial loosely held dyes are attached to the fibre surface [13].

3.4 Colourfastness to perspiration (acidic and alkaline)

In case of perspiration, all the fabric samples were found to have a fair fastness in acidic medium. No colour stained was obtained in alum mordanted and alum eco-printed fabric and noticeably to slightly stained were observed in non-mordanted, myrobalan mordanted and myroballan eco-printed samples. It can be explained by the pH of perspiration influencing the hydrolytic stability of dye-fiber bonding and resulting in dye fading [14].

3.5 Colourfastness to pressing

From the Table.2 it was observed that all the samples of non-mordanted, mordanted and eco-printed fabric samples showed good fastness and no stained to dry pressing while in wet pressing all the samples showed good fastness and slightly stained except non-mordanted sample which showed no stained to wet pressing. It might be due to the unfixed or free dye particles from the textile material that have been transmitted to other surfaces and absorbed by the white cloth [14].

Table 2: Ratings for colourfastness properties of dyed and eco-printed samples

Sl. No.	Mordant used	Washing		Sun light	Crocking				Perspiration				Pressing			
					Wet		Dry		Acidic		Alkaline		Wet		Dry	
		CS	CC	CC	CS	CC	CS	CC	CS	CC	CS	CC	CS	CC	CS	CC
1	Non-Mordanted	4	5	5	5	5	5	5	4	3	5	3	5	5	5	5
2	Alum Mordanted	5	5	4	4	5	5	5	5	3	5	4	4	5	5	5
3	Myrobalan Mordanted	4	5	5	4	5	4	5	3	4	4	4	4	5	5	5
4	Eco-alum Mordanted	5	5	4	4	5	5	5	5	3	5	4	4	5	5	5
5	Eco-myrobalan mordanted	4	5	5	4	5	4	5	3	4	4	4	4	5	5	5

CS: Colour Stain; CC: Colour Change

4. Conclusion

This study showed that a greener alternative can be used to satisfy the consumers' growing demand of eco-friendly products by using mango leaves dye. Different shades of colours were obtained from the same dye extract after using different types of mordants on the eri silk fabric. Again, colourfastness was also found to be influence by the addition of mordants. In alum mordanted and myrobalan mordanted fabrics, the colourfastness were found to be very fair fastness when exposing to sunlight and wet crocking method. While in perspiration and pressing methods, all the sample fabrics showed very fair to fair, good to no stain and neglible to slightly stained respectively. Accordingly, it can be concluded from the findings that mango leaves have a lot of potential for use in silk fabric applications.

5. References

1. Boruah SU, Kalita BB. Eco-printing of eri silk with turmeric natural dye. International Journal of Textile and Fashion Technology (IJTFT). 2015;5:27.
2. Jothi D. Extraction of natural dyes from African marigold flower (*Tagetes erecta* L.) for textile coloration. Autex Research Journal. 2008;8(2):49-53.
3. Hunger K, editor. Industrial dyes: chemistry, properties, applications. John Wiley & Sons; c2007.
4. Hanumantha M, Mahalakshmi M, Sannapapamma KJ, Naikwadi S, Patil RS. Effect of mordanting methods on colour strength and colour fastness properties of organic cotton dyed with *Terminalia arjuna* Bark. Journal of Pharmacognosy and Phytochemistry. 2020;9(1):650-654.
5. Win ZM, Swe MM. Purification of the natural dyestuff extracted from Mango bark for the application on protein fibers. World Acad Sci Eng Technol. 2008;22:536-540.
6. Kusumawati N, Samik S, Santoso AB, Wijiastuti A. Development of textile natural dyeing using hybrid dyes from mango leaves turmeric. In Seminar Nasional Kimia-National Seminar on Chemistry; c2018. p. 50-55.
7. Elsahida K, Fauzi AM, Sailah I, Siregar IZ. Sustainability of the use of natural dyes in the textile industry. In IOP Conference Series: Earth and Environmental Science. IOP Publishing. 2019;399(1):012065.
8. Chanu V. Study the Effect of Natural Mordants on Eco-Friendly Dyeing of Eri Matka Silk of Manipur with Bark of Mango (*Mangifera indica*) Tree. MSc. Thesis. Assam Agricultural University. Jorhat-13; c2022.
9. Kusumawati N, Samik S, Santoso AB, Wijiastuti A. Development of textile natural dyeing using hybrid dyes from mango leaves turmeric. In Seminar Nasional Kimia-National Seminar on Chemistry (SNK 2018). Atlantis Press; c2018. p. 50-55.
10. AATCC Technical Manual 1967. AATCC. American association of Textile Chemicals and Colourist, New York. 1968;25:619-639.
11. Lohar A, Majumder J. Silk dyeing with natural dye extracted from floral parts of African marigold (*Tagetes erecta* L.) and its fastness; c2019.
12. Uddin MG. Extraction of eco-friendly natural dyes from mango leaves and their application on silk fabric. Textiles and Clothing Sustainability. 2015;1(1):1-8.
13. Sinnur HD, Verma DK, Kaware R, Samanta AK. Standardization of mordants and dyeing process variables for dyeing cotton khadi fabric with Indian madder as natural dye. Indian J Nat. Fibres. 2017;4(1);21-38.
14. Kampeerapappun P, Wongwandee K, Janon S. Dyeing properties and color fastness of eri silk yarn dyed with soaked red kidney bean water. Journal of Metals, Materials and Minerals. 2020;30(4):51-59.