

A Comparative Study on Dyeing Effects of Commiphora Caudata Tree Extract on Distinct Natural Blended Fabrics

*Janani.R¹, Manochitra.C²

*¹ Janani. R, M.sc Fashion Technology and Costume Designing, Jamal Mohamed College, (Autonomous), Trichy – 620020. (Affiliated to Bharathidasan University, Tiruchirappalli-24). Tamil Nadu, India.
*² Manochitra.C M.Sc., PGDTT, NET, Assistant professor, Department of Fashion Technology and Costume Designing, Jamal Mohamed College (Autonomous), Trichy – 620020. (Affiliated to Bharathidasan University, Tiruchirappalli-24). Tamil Nadu, India.

ABSTRACT:

This study focuses on the comparative analysis of commiphora caudata tree bark extract as a natural dye on three distinct natural blended fabrics – Silk cotton, Linen cotton and Bamboo cotton. The objective is to analyze dyeing property from commiphora caudata tree bark, commiphora caudata extract with blended fabric, and evaluate colorfastness test. The methodology involves a collection of commiphora caudata, selection of natural blended fabric, optimize dyeing process, pretreatment process to enhance dye absorption, and the dyed fabric are then subjected to testing like colorfastness evaluation to determine any fading or color bleeding. Alum is employed as a mordant to fix the dye onto the fabric and improve its fastness properties. Commiphora caudata is also known as **'hill mango or green commiphora'**. Commiphora caudate belongs to the family burseraceae. In Tamil it's known as **'pachai kiluvai'**. It is known for its anti-inflammatory, and it is used in traditional medicine. The comparative analysis enables a better understanding of how different fiber blend interact with natural dye and mordant's, paving the way for environmental friendly textile processing techniques.

KEY WORDS: Dyeing property, natural blended fabric, colorfastness analysis, eco-friendly dyeing.

1 INTRODUCTION:

In textile a fabric or cloth created by weaving, knitting or crocheting is referred as 'Textile'. Textile simply applied to woven fabrics, now mostly applied to any flexible material that is composed of thin films of polymers or fibers, yarns or fabric. Dyeing is the procedure used to give color through textile products like fibers, yarns and fabrics. Dyes like synthetic and natural dyes are categorized. Natural dyes are extracted from natural resources like plant, flower, animal, vegetables and minerals although it produce rich and vibrant colors like red, yellow, brown, pink and green etc. natural dyes well works on cotton, silk and linen fabrics. Mordant is an element used to connect a relation between dye and fabric, so that the dye was well absorbed. Dyeing without mordant will reduce dye absorption and less vibrant. Mordant was a fixing agent. Natural blended fabric is a textile made combining of two or more different fibers that mean a new fabric is created in unique properties. Blending of two fibers has different texture and dye effects.



Cotton was the most important natural cellulosic fiber. Another name of cotton is seed-hair fiber. It doesn't cause allergic reaction and it has unique properties like comfort, durability, easy care. Cotton is a major component of many blended fabrics. Cotton has high absorbency to dye the fabric. Silk is a natural protein fiber. Silk is universally approved as luxury fabric. It has good moisture absorption, high strength and draping quality. Silk is a natural filament fiber and it can be dyed in radiant color. Linen refers to the fabric made from flax plant. Linen has equal property of cotton. Linen is known for its more elevated natural luster, good moisture absorbency. It is an allergen-free fabric; good for dyeing. Jute is a bast fiber one of the cheapest natural fibers and also a vegetable fiber which spun into coarse, strong thread which is soft, long and shiny. Another name of jute is 'Golden fiber' and also it is inexpensive fiber mostly used for ropes, packaging and backing carpets because of its coarseness. It has high absorbency, durable, light weight, and coarse texture. Jute has high natural dye affinity.

The common name of **commiphora caudate** is **"Hill mango or Green commiphora"**. **"Pachai kiluvai"** is the Tamil name of commiphora caudata tree. This tree family belongs to burseraceae is circulating throughout the Sri Lanka, Western peninsula and India and it is grown in dry zone area. It is known for its anti-inflammatory, and it is used in traditional medicine and also it treats conjunctivitis like juice from stem is used as an eye drop to treat conjunctivitis.

2 MATERIALS AND METHODS:

2.1 SELECTION OF NATURAL BLENDED FABRICS:

Natural blended fabrics combine fibers to enhance durability, comfort, and dye absorption. Silk-cotton (protein + cellulose) bonds well with dyes, while linen-cotton and jute-cotton (cellulose + cellulose) require mordants for better retention. Fiber composition affects color richness and fastness.

Linen cotton: Linen cotton has high dye absorption due to its cellulose content. It's moisture-wicking, durable, and slightly rough texture gives a rich, elegant color.

Silk cotton: Silk (protein) fiber has good dye absorbency. Blending of protein and cellulose fiber makes a fabric durable and good strength. Silk cotton fabric ensures a vibrant color.

Jute cotton: Jute cotton both the fabric has cellulose content which absorbs the dye. Jute fabric has loose structure and absorbs dye well cotton helps to achieve the dye uniformly and look elegantly.

2.2 PRETREATMENT PROCESS:

Pre-treating blended fabric enhances absorption and impurities. natural dye removes Water is heated beyond boiling and transferred to another vessel to avoid direct heat. The fabric is soaked in the for 30 minutes, thoroughly. hot water and then rinsed Finally, it is air-dried to prepare for efficient and even dye penetration.

2.3 COLLECTION OF COMMIPHORA CAUDATA TREE BARK:

Commiphora caudata, also known as hill mango or "pachai kiluvai" in Tamil, belongs to the Burseraceae family and grows in dry zones. It is widely used in traditional medicine for its anti-inflammatory properties, and its leaf extract is used to treat eye conjunctivitis. The bark is carefully peeled using a sharp knife, removing only the outer layer. Collected bark is cleaned to eliminate dirt and the dry outer surface. It is then shade-dried for a day to preserve its natural properties. Finally, the dried bark is stored in a container for dye extraction.





FIGURE-1: COMMIPHORA CAUDATA TREE BARK

2.4 METHOD OF EXTRACTION (BOILING METHOD 100°C):

Dye from Commiphora 100°C. was extracted caudata bark using the boiling method at 75–100g of bark was boiled in 2–3 liters water for 60-90 minutes with stirring. About of The extracted dye solution was then filtered using a strainer to remove excess residue.



FIGURE-2: BOILING METHOD



FIGURE-3: DYE SOLUTION

2.5 DYEING PROCESS (POTASH ALUM AND SODIUM CHLORIDE):

The hot dye bath is transferred to separate vessels, and 7.5g each of alum and sodium chloride are dissolved in water. These solutions are added to the dye bath, and the natural blended fabric is immersed. After 15 minutes, the same alum and salt solution is added again for uniform color absorption, with occasional stirring. After one hour, the fabric is removed and air-dried for final use.



FIGURE-4: DYEING PROCESS IN LINEN



FIGURE-5: DYEING PROCESS IN SILK



FIGURE-6: DYEING PROCESS IN JUTE







FIGURE-7: SODIUM CHLORIDE FIGURE-8: POTASH ALUM

2.6 COLOR FASTNESS TEST:

Colorfastness testing is to analyze how well the color will exposed in dyed fabric. Types of colorfastness testing's

- Wash fastness test
- Rub fastness test
- Light fastness test
- Iron fastness test
- Color bleed fastness test

2.6.1 Wash fastness test

The wash fastness test involves soaking the dyed fabric in a mild detergent solution at 40°C for 30 minutes. Afterward, the fabric is rinsed with cold water and air-dried. This process helps assess how much the dye fades during washing.



FIGURE-9: WASH FASTNESS IN LINEN

2.6.2 Rub fastness test





FIGURE-10: WASHFIGURE-11: WASHFASTNESS IN SILKFASTNESS IN JUTE

Rub fastness test checks color transfer from the dyed fabric through rubbing, in both dry and wet conditions. A 5x5 cm white cotton fabric is fixed in the crock meter and rubbed 20 times against the sample using the crank handle. For the wet test, the white fabric is moistened before rubbing. The degree of dye transfer is then evaluated using a grey scale for rating.





FIGURE-12: CROCKMETER RUBBING PLATE

T



2.6.3 Light fastness test

The light fastness test evaluates how well the dyed fabric resists fading in direct sunlight. A 5x5 inch sample is placed under sunlight for one full day. After exposure, the sample is analyzed for any color changes. It is then compared to an unexposed sample to assess fading and rated accordingly.



FASTNESS IN LINEN

2.6.4 Iron fastness test

The iron fastness test checks for discoloration, fading, or color transfer in dyed fabric. A white cotton fabric is placed over the dyed fabric and ironed for 15 seconds. The sample is then examined for any visible changes or dye transfer.



FIGURE-16: IRON

FASTNESS IN LINEN

2.6.5 Color bleed fastness test





FIGURE-17: IRON FIGURE-18: IRON FASTNESS IN SILK FASTNESS IN JUTE

The color bleeding fastness test checks if dye bleeds or transfers when exposed to water. Dyed and white cotton fabrics are soaked in distilled water for an hour then air-dried and examine using a grey scale.



FIGURE-19: COLOR BLEED IN LINEN





12:11

T



3 RESULTS:

• Sample of dyed fabric







FIGURE- 22: Linen cotton

Linen cotton has good dye absorption.

FIGURE-23: Silk cotton

FIGURE-24: Jute cotton

• Colorfastness test result in comparison table

TEST TYPE	LINEN COTTON	SILK COTTON	JUTE COTTON
Wash Fastness			
GREY SCALE RATING	4-5	4-5	4-5
Rub Fastness (Dry)		0	
GREY SCALE RATING	4-5	4-5	4-5
Rub Fastness (Wet)			



Scale

Volume: 09 Issue: 04 | April - 2025

SJIF Rating: 8.586

ISSN: 2582-3930

GREY SCALE RATING	4-5	4	4
Iron fastness			
GREY SCALE RATING	5	5	5
Light Fastness			
GREY SCALE RATING	4-5	4-5	4-5
Color Bleed Fastness			
GREY SCALE RATING	5	5	5

interpretation: 5- Excellent, 4-5 - Very Good, 4- Good, 3- Average, 2- Poor, 1-Very Poor



4 DISCUSSIONS:

Commiphora caudata barks of the dye were obtain earthy yellow-brown hues. Jute cotton looked earthy color absorption, silk cotton had a subdued tone, and linen cotton displayed the most vibrant color. The linen cotton had the best dye absorption. A potash alum mordant enhanced the materials' ability to retain color. The dye uptake and fastness outcomes have significant impact due to its fiber composition. The sustainable, therapeutic natural dye source Commiphora caudata is highlighted in this study.

5 CONCLUSIONS:

This study explores natural dye extraction from *Commiphora caudata* (hill mango) bark and its application on three natural blended fabrics—linen cotton, silk cotton, and jute cotton. Known for its medicinal properties, *C. caudata* offers potential as a sustainable dye source. Linen cotton showed the most vibrant absorption, silk cotton a muted tone, and jute cotton an earthy finish. Potash alum was used as a mordant to improve dye retention and fastness. The research also includes colorfastness tests to evaluate dye stability across different fabric compositions, promoting eco-friendly alternatives to synthetic dyes in textiles.

REFERENCES:

Textiles, Sara J.Kadolph, 11th Edition, published by Dorling Kindersley India Pvt.Ltd., 2013, Pearson Education Limited.

Identification of textile fibers, Houck, M. M. (Ed.). (2009).

Jose, S., Gurumallesh Prabu, H., & Ammayappan, L. (2017). Eco-friendly dyeing of silk and cotton textiles using combination of three natural colorants. *Journal of Natural Fibers*, *14*(1), 40-49.

Jahan, N., & Datta, E. (2015). A comparative study on dyeing of cotton and silk fabric using madder as a natural dye. *IOSR Journal of Polymer and Textile Engineering*, 2(2), 5-11.

The Dyeing of Cotton Fabrics, Franklin Beech, First edition 2010, Abishek Publication.