Volume 9, Issue 4, April – 2024
ISSN No:-2456-2165
International Journal of Innovative Science and Research Technology
https://doi.org/10.38124/ijisrt/IJISRT24APR2667

Cocos Nucifera Dyeing on Cotton Fabric as an Eventual Replacement

[1]M Nandhini; [2]C Anisha; [3]D Suryaprabha
*Asst. Professor; Department of Costume Design and Fashion,
Nehru Arts and Science College, Coimbatore, Tamil Nadu, India

Abstract:- A traditional technique for colouring textiles, yarns, or fibres is called "natural dyeing," and it involves employing dyes made from plants, insects, and minerals. The usage of this age-old technique predates synthetic dyes by thousands of years, as documented by numerous cultures across the globe. In this procedure, colour compounds are extracted from natural sources and applied to textiles using a variety of methods, such as resist dyeing, direct application, or immersion dyeing. Natural dyes are typically more environmentally friendly and biodegradable than synthetic ones, which frequently include harsh chemicals and may have adverse effects on the environment.

The relationship between natural colouring and traditional workmanship as well as sustainability is one of its most alluring features. It encourages a greater respect for nature and the use of renewable resources. A vast spectrum of colours can also be produced by natural dyes, however they might be more delicate and complex than their synthetic equivalents. Although natural dyeing has numerous benefits, there are drawbacks as well, including color fastness, consistency, and the availability of dye supplies. However, artists and textile aficionados are still exploring and expanding the potential of natural dyeing techniques in modern contexts through careful experimentation, sharing of knowledge, and creativity.

The goal of the current endeavour was to employ the extract that was previously described in a sustainable way. Thus, an attempt is made to colour cotton material at different temperatures utilising alum as a colourant extract and a mordant. To extract colour, the coconut husks were soaked and then cooked for half an hour. The colourant extract and mordants were used to dye the fabric for an hour at a moderate temperature. Tests were conducted on the coloured cloth samples to determine their resistance to light, rubbing, and cleaning. Beneficial results were found. The study's findings so suggest that eco-friendly cotton fabric dyeing has a promising future.

➢ *Objectives*

- Environmental impact and sustainability aspects of coconut husk dyeing on cotton fabric
- Eco-friendliness of coconut dye compared to synthetic dyes.
- Dye extraction from a natural source

Keywords:- *Coconut Husk, Cotton fabric, Dyeing, Natural dyeing, Eco friendly dye.*

I. INTRODUCTION

Due to their superior fastness qualities, lower cost, and wider range of vivid colours than natural dyes, synthetic dyes have been utilized extensively in the textile industry over the years. Certain artificial colours are produced with amines that may be carcinogenic from petrochemical sources. Therefore, using such colours puts your health at risk and pollutes the environment. Growing environmental consciousness has led to an increase in the use of natural dyes since they are non-toxic, renewable, biodegradable, and provide a wide spectrum of colours with good colour fastness.

People have been using natural dyes for millennia. They are taken from natural sources, like plant parts like roots, barks, leaves, fruits, and flowers, to improve the shadow depth and colour durability. They are then put to the fabric along with mordant. India is renowned for having a wide variety of plants. Because of this, the vast biodiversity serves as the main source of many distinctive natural products, such as natural dye. Certain natural hues have therapeutic and antimicrobial qualities, which makes them advantageous. Because of these added benefits, small and medium-sized businesses are using natural dye more frequently to produce sustainable end products.

The purpose of this study is to apply an environmentally safe natural colourant extract made by soaking coconut husk in order to meet the growing demand for natural dye. A member of the palm family Arecaceae is the plant cocos nucifera. Other names for it include coco, coconut, coconut-da-bahia, and coconut-of-the-beach. The plant lives in Southeast Asia and on the islands that separate the Indian and Pacific oceans. The exterior protective layer of a coconut is called the coconut husk, or coconut shell. It is made up of fibres and fibrous layers that are situated between the coconut's inner, water-rich core and outer shell. The coconut's husk shields its inside core from damage and helps the fruit withstand external influences thanks to its strong and resilient structure. Thirty percent coconut fibres and seventy percent flesh make up a coconut's husk. Tests for chemicals on coconut fibre extract revealed several different materials: alkaloids, triterpenes, flavonoids, leucoanthocyanidins, phenols, and tannins. Food is not made from the husks; instead, the liquid inside the outer shell is consumed. Coconut husks can be used in a variety of ways, such as chips and enriched potting soil. It can be used to provide flower gardens

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24APR2667

some ground cover. Many people consider the coconut palm to be among the most valuable and exquisite plants in the world.

➢ *Tannins:*

They are naturally occurring substances found in coconut husk that can be used as dye mordants. Tannins can increase colour fastness and aid in the dyes' better adhesion to the fabric. Richer and more durable colours can be achieved by using coconut husk as a mordant or in conjunction with other dye sources.

➢ *Modifier:*

It is also possible to utilise coconut husk as a dye modifier. Substances known as modifiers change or adjust the fabric's dye colour. Coconut husk can be utilised to change the colour or strength of natural dyes, giving the fabric a distinctive look, depending on the exact methods and materials.

Fig 1 Coconut Husk Coir

II. MATERIAL AND METHODS

➢ *Material*

Cotton fabric is used to make our entire base, because using it is pleasurable and comfortable. Additionally, while dyeing cotton cloth, the colour is nicely absorbed. There won't be any skin irritation for the wearer of this material's apparel. Cotton won't react to sweat and produce rashes, even in hot temperatures. Cotton lets the skin breathe and lessens the chance of rashes and allergies. The textile or fibre must be ready to accept the dye before dying. Scrubbing may be necessary to get rid of any oils, filth, or treatments that can obstruct the dye's ability to absorb.

➢ *Dye Extraction*

Extraction of the dye components from the selected natural materials is the next stage. Usually, to do this, the ingredients are boiled in water or extracted using another technique like fermentation or soaking. In order to improve color fastness and brightness, mordants—substances that aid in fixing the dye to the fiber—may occasionally be used during this procedure. After being purchased from the market, the coconut husk was washed with water. Next, using a sharp knife, the coconut husks were chopped into small pieces and added to a jar along with three litres of soft water in the ratio of one to fifty. The vessel was set on a gas stove to bring the solution to a rolling boil. At 90°C, the dye fluid was removed. The vessel was set on a gas stove to bring the solution to a rolling boil. For thirty minutes, the dye solution was extracted at a temperature of 90°C. Filtering was done on the extracted dye liquid.

➢ *Dyeing Process*

Natural dyes can be applied to fibres using a variety of techniques. For more accurate designs, direct application techniques like painting or printing can be utilised, but immersion dyeing entails immersing the textile in a dye bath. In resist dyeing methods like batik and tie-dye, sections of the cloth are blocked to produce patterns. Depending on the desired shade, the dying process took 30 to 45 minutes. After being taken out of the dye bath, the dyed cloth was rinsed under running water to get rid of any leftover dye particles.

➢ *Fixation and After-Treatment*

The material is often repaired to increase colorfastness after dyeing and rinsed to get rid of any leftover dye. This could entail applying more heat, exposing the material to light, or using fixatives like alum.

➢ *Finishing*

To obtain the required texture and look, the dyed material may go through finishing procedures including washing, drying, and pressing after the dye is fixed.

Fig 2 Dyeing of Fabric Dyed Cotton Fabric

III. RESULT

➢ *Physical Testing of the Sample*

- *Washing Fastness Test*

There are specific washing instructions for each sort of laundry. Heat the solution to the appropriate washing temperature before using. Turn on the cold water tap and rinse twice under cold water after using soap. It was then strained and allowed to dry. It was noted that the fibre had a low affinity for colours seen in the natural world, which contributed to its impressive washing fastness. Although it is a natural occurrence after a few washes, this hue sticks to textiles. The fabric's colour somewhat altered after five washings in soapy water, but the dye faded when it washed with ordinary water.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24APR2667

Table 1 Colour Fastness Ratings: 1= poor, 2= fair, 3= very fair, 4=good, 5= very good

S. No	Colour Fastness to Washing	
	Colour Change	Staining on Cotton
1	4	4-5
2	5	5
3	5	5
4	5	4-5
5	4	4-5
	5	4-5

- *Rubbing Test (Using Hand) Dry*

Rub a vibrant piece of fabric firmly with both hands for five minutes. It was discovered that there was good colour retention in the dry state. Nothing changed the colour of the fabric at all. This could be as a result of the dye molecules' increased ability to retain information when they are dry.

- *Rubbing Test (Using Hand) Wet*

To achieve about 100% pick up, moisten a rubbing cloth with regular tap water. The rubbing cloth's ability to support its own weight in water is adequate. In this case, it is important to understand the water's grade. Weigh the dry rubbing cloth, then fully moisten and squeeze it with ordinary water. In a warm place, let the tested rubbing cloth air dry. Furthermore, it was shown that the colour retention quality was robust in a damp state. There was no apparent change in hue. It's also because moist colour molecules have extraordinarily lengthy half-lives. In actuality, the water is the sole thing that causes the molecule to split or separate from the fabric.

Table 2 Colour Fastness Ratings: 1= poor, 2= fair, 3= very fair, 4=good, 5= very good

S. No	Colour Fastness to Crocking	S. No
	Dry	Wet
1	4-5	4-5
2	4-5	4-5
3	5	5
4	5	4-5
5	5	4-5
	5	4-5

IV. CONCLUSION

Natural dyes are becoming more and more popular due to their environmental friendliness. The study's required objectives were met by the results, which enabled us to conclude that coconut husk, a waste product, might be employed as an effective colouring agent with mediocre outcomes. Tannin is present in these dyes, which is why cotton fabrics dyed with coconut husk extract and alum mordants shown good fastness properties under ideal conditions. Additionally, it was discovered that the tested dyed materials' rubbing, washing, and light fastness qualities were all satisfactory. It follows that coconut fibre contributes to cotton fabrics' excellent dyeability.

REFERENCES

[1]. Kumeresan M, Palani PN, Kumar PE. Application of Eco-Friendly natural Dyes on Silk Using Combination of Mordants; Int. J Chem. Res. 2011.
[2]. Ado A, Yahaya H, Kwalli AA, Abdulkadir RS. Dyeing of textiles with eco-friendly natural dyes: A review. International Journal of Environmental Monitoring and Protection. 2014.
[3]. Adeel, S., Kiran, S., Habib, N., Hassan, A., Kamal, S., Qayyum, M. A., & Tariq, K. (2020). Sustainable ultrasonic dyeing of wool using coconut coir extract. Textile Research Journal.
[4]. Emojevwe, Victor. (2013). Cocos nucifera (coconut) fruit: a review of its medical properties. Advances in Agriculture, Sciences and Engineering Research.
[5]. Gray, C., Burnett, G. (2009) Making sense: An exploration of ways of knowing generated through practice and reflection in craft. Proceedings of the Crafticulation and Education Conference.
[6]. Kanchana, R., Fernandes, A., Bhat, B., Budkule, S., Dessai, S., & Mohan, R. (2013). Dyeing of textiles with natural dyes - an eco-friendly approach. International Journal of ChemTech Research.
[7]. Wild Color – “The Complete Guide to Making and Using Natural Dyes" by Jenny Dean.
[8]. Natural Color – “Vibrant Plant Dye Projects for Your Home and Wardrobe" by Sasha Duerr
[9]. Kashyap, R., Sharma, N., & Sharma, L. (2016). Dyeing of cotton with natural dye extract from coconut husk. International Journal of Science Technology & Engineering, 3(4), 92-95.
[10]. Sahara, N., Fitria, R., & Efi, A. (2020). Utilization of young coconut fibers as textile dyes. 2nd International Conference on Culinary, Fashion, Beauty, and Tourism.
[11]. Samant, I., & Gaikwad, D. (2020). Optimization of natural dye extraction from coconut husk. Journal of Experimental Biology and Agricultural Sciences,