IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

EXTRACTION AND APPLICATION OF NATURAL DYE ON BAMBOO FABRIC

(COCUNUT COIR DYE & AVOCADO DYE)

Harini. M V[1], Dr. J Banupriya[2]

PG Student[1], Asst.professor[2]

PSG College of arts and science, Coimbatore

ABSTRACT:

The oldest known kind of dyeing is perhaps the use of natural dyes. Natural dye was initially used by humans as a thought tool to create artwork that reflected both their environment and themselves. While natural dyes have been used to colour fabrics since ancient times, the discovery of mauve colourant in the 19th century led to the replacement of natural dyes with synthetic ones. Any colour, pigment, or material originating from organic materials—plants, animals, or minerals is considered a natural dye since it is a sustainable bioresource with no negative influence on the environment. Since ancient times, they have been utilised for colouring culinary components, natural protein fibres like wool, silk, and cotton, leather, and textiles. Avocado seed waste is one of the organic wastes that accumulates and has potential uses. They fall under the category of organic waste. The locals exclusively consume the flesh of avocados from the fruit. In actuality, avocado seeds offer a number of advantages for physical well-being, aesthetics, and natural textile colouring. According to reports, flavonoids, tannins, saponins, phenolics, antioxidant potential, oxalates, phytates, and alkaloids are among the phytochemicals found in avocado seeds. Avocado seeds may be utilised as natural colours by using the extraction procedure because they have pigments related to tannins. Apart from the seeds, other components of avocados, such the leaves, bark, and skin, can also be utilised as natural colours. A natural dye was derived from powdered coconut husk and applied to cotton cloth under various dying conditions. For many years, bamboo fibre has been utilised in a variety of applications, including high performance composites, slope management, décor Superior tensile strength, outstanding UV protection, antibacterial and biodegradable qualities, high moisture absorption, softness, brightness, and great flexibility under compressive and flexible loads are among the mechanical qualities of regenerated bamboo fibres

KEYWORDS: Natural dye, Avocado Dye, Coconut Husk Dye, Bamboo fabric.

1 INTRODUCTION:

The most often utilised portions of herbs to extract dyes include the stems, barks, roots, berries, leaves, flowers, and seeds. Certain sections may have many colours according on whatever portion of the plant is utilised. A plant's colour will change depending on the season, cultivation methods, soil type, etc. when it is harvested. Three main phases make up the herbal resource dyeing process. The first is extracting the colouring material from the The first step is the plant component; the second is bonding the colouring substance to the fabric to be dyed; and the last step is dying. Typically, the material is powdered and then boiled in water for ten to twenty minutes to remove the colour. After giving the yarn or cloth a thorough wash, it is heated in the extract for around 30 to 40 minutes at various degrees [(1).]

Amidst the ecological campaigns and the "green" movement, some dye makers may be reevaluating the viability of using natural dye instead of synthetic dye throughout the dyeing process. It makes sense for them to incorporate a conventional mordant in order to address the issue of low colour fastness and poor dye absorption that may arise from the use of natural dyes. (2) Conventionally, the conventional mordants that are used are mostly classified as heavy metals. However, the heavy metals that are separated from these conventional mordants would contaminate water supplies and harm the ecosystem, undermining the initial goal of utilising ecologically friendly dyes to better safeguard the environment.

The avocado fruit, which is both tropical and subtropical, produces a large amount of solid waste since its seeds and peels account for 16% and 11% of its overall bulk, respectively.60 With the pace of global consumption rising, avocado bio-waste shows a tremendous deal of promise for material utilisation. The peel and seeds of avocados may be used to extract a natural colour, according to earlier reports.61–64 Hatzakis et al.63 suggested the chemical structure of the pigment known as "perseorangin" that is found in avocado seeds. It was reported that the avocado seed extract's greatest absorbance occurred at 480 nm (3).

Asia, Africa, America, and other continents are home to the Arecaceae (Palm) family, which includes coconut coir (Cocos nucifera). The extract from coconut coir is rich in nutrients and is used to treat diarrhoea, inflammation caused by arthritis, and skin irritation without causing toxicity or allergic reactions (Singla and Jagani 2012). There are two kinds of fibres found in coconut coir: brown and white fibres. Brown fibres, or husk, are robust, thick, and possess high abrasion resistance, and as natural colourants, they include tannin dye with a brown hue that gives cloth a brown hue (4) .

Southeast Asian nations have an abundance of bamboo, which is one of the most underutilised natural resources. displays the proportion of bamboo produced per continent, while lists the nations with the greatest bamboo resources. Roughly 1.9% of the world's bamboo resources come from Malaysia. Specifically, Malaysia has over 7 million tonnes of bamboo stock, of which only 6000 tonnes are regularly utilised species. According to Han et al., there were 22 million hectares of bamboo forests globally in 2008, and over 30 million tonnes of bamboo fibre were available annually. (5) Being one of the quickest growing renewable plants, bamboo has drawn attention from all around the world as a possible reinforcement for polymer composites. Its maturity cycle is only three to four years. Its fibres have good mechanical qualities, such as a low elongation at break and a high tensile modulus; they are similar to glass fibres in terms of specific stiffness and strength. This material's potential for production of conventional composite panels has been investigated. However, there hasn't been much published study on bamboo fabric composites; instead, much of the present research focuses on composites reinforced with short bamboo fibres.

Bamboo has multi-nodes and functional gradient structures in both macroscopic and microscopic detail, making it a natural nanotechnology. The outer surface region has a dense distribution of fibres, while the inner surface region has a sparser distribution. Its construction is intended to have uniform strength in both the longitudinal and radial directions on the transverse section at all points. The polylame Liate structure of the thick-walled bamboo fibres has alternating broad and small lamellae. The concentration of lignin in the narrow vs the wide lamellae is greater. The narrow lamellae appear to have a larger concentration of Xy Ian. Techniques for removing pure fibres from bamboo culms and differentiating bamboo fibres from other use microwave and infrared spectroscopy to separate fibres from other plants (6)

2 MATERIALS AND METHODOLOGY:

2.1 Extraction of dye from coconut coir:

For the extraction of coconut husk first we have to take the fresh coconuts and we have to dry them in sun light. Then we have to remove the husk of the coconut from the coconut shell and we have to dry them in the direct sunlight. Then we have to remove the smallest dust particles from the coconut husk to remove improper dyeing in dyeing process. The first step to dye coconut husk is first we have to boil the water for around 2 hours where the dye extraction is done. At this stage alum salt is added to the dyeing extraction solution. Where it helps it give extra colour to the fabric. After three hours of extraction, fabric is added to the extraction water and left for around 6 hours. After this process they are dried in the direct sunlight.

2.2 Extraction of dye from avocado pits and stones:

For the extraction of avocado dye first we have to take the fresh avocado skins and stones and we have to dry them in sun light. first we have to remove the pulp of the avocado from the avocados and we have to dry them in the direct sunlight. Then we have to remove the extra pulps and fleshes from the avocado skin to remove improper dyeing in dyeing process. The first step to dye dry avocado skins and stones is first we have to boil

the water for around 3 hours where the dye extraction is done. At this stage alum salt is added to the dyeing extraction solution. Where it helps it give extra colour to the fabric. After three hours of extraction, fabric is added to the extraction water and left for around 12 hours. After this process they are dried in the direct sunlight.

2.3 Dyeing of bamboo:

Basically dyeing of bamboo was performed using two different ways

- Dyeing of pre mordanted bamboo fabric
- Dyeing of bamboo fabric without mordanting

2.4 Mordanting:

- The mordant used in this dyeing process is alum salt which is helped to extract more amount of dye from dye extraction.
- It helps to give dark colour to the fabric
- Alum salt has different proportions for each kind of dyes

2.5 Procedure for dyeing a bamboo:

- For dyeing a bamboo first we have to select or take the pretreated bamboo fabric
- Then we have to first wash the bamboo fabric in the cold water
- And then place the fabric in the required dye solution for the required amount of time.
- Then remove the fabric from the dye solution.
- These are some of the points for procedure for dyeing a bamboo.

2.6 Testing for dyed samples:

2.6.1 Air permiability test:

In the functioning of textile materials (filters, parachutes, and sails) and apparel applications, air permeability is a crucial feature. The primary factors influencing air permeability are porosity and thickness. The weave, warp and weft linear densities, and fabric density are the textural characteristics that determine how permeable the fabric is to air. Permeability is the general term for a material's ability to allow fluids (such water, vapour, or air) to permeate through it to another medium without being impacted chemically or physically. Fabric permeability may be defined as the air flow rate through a material when there is a pressure difference between the two sides of the material [(7).]

2.6.2 Colour fastness test:

One crucial aspect of textile goods' quality is their ability to retain colour. In actuality, the most common complaints from customers seem to be related to poor colour fastness. "The resistance of the colour of textiles to the different agents to which these materials may be exposed during manufacture and their subsequent use" is the definition of colour fastness. In terms of colour change and staining, it is often evaluated individually. Two sets of standard grey scales are often used as standards for colour fastness assessments: one for colour change and the other for staining. The nine pairs of grey-colored chips that make up the grey scales are arranged next to one another. Every pair has a grade that is sorted based on how different each pair is from the other [(8)]

2.6.3 Drop test:

The purpose of this test is to evaluate how absorbent different fabrics and fabric types are in water. [(9)] The sample is given a drop of water, and the amount of time it takes for the drop to completely soak into the substance is measured. A time estimate in seconds is provided.

2.6.4 Wales and coarse per inch:

A course is a row of loops knitted horizontally by all neighbouring needles in the same knitting cycle. Courses per inch or courses per centimetre are the two ways it is expressed. Course orders are made in order to make fabric. The number of loops used in a course is sufficient to match the number of needles in use.

A wale is a row of loops worked in a vertical column using the same needle in consecutive knitting cycles. It resembles the warp end of a cloth that is sewn. In either wales per inch or wales per centimetre, it is stated [(10)]

The total number of needles in use yields the total number of wales during a fabric. the weft knit fabric's direction of course and wale.

2.6.5 Thickness tester:

Any compressible material, including knitted, woven, and non-woven fabrics, is measured to find its thickness when the fabric specimen is sandwiched between two flat surfaces of incompressible metal. The circular pressing plates' surfaces are maintained parallel to one another. A certain pressure is applied to the specimens during testing.

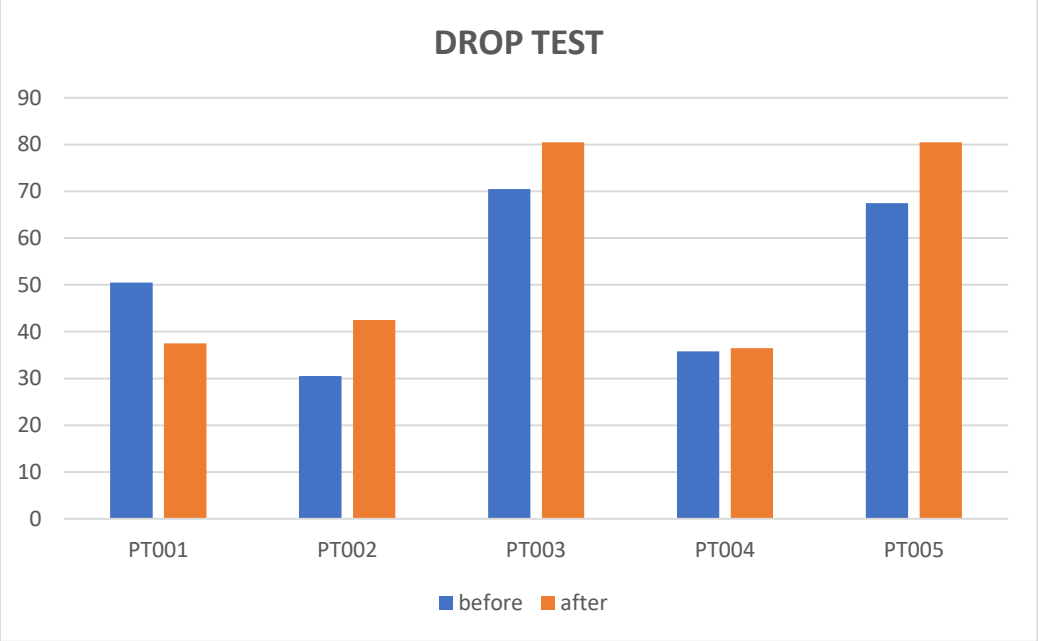
3 RESULTS AND DISCUSSION:

3.1 DROP TEST:

The purpose of this test is to evaluate how absorbent different fabrics and fabric types are in water. The sample is given a drop of water, and the amount of time it takes for the drop to completely soak into the substance is measured.

S NO	SAMPLE	DROP TEST (IN MINUTES)	
1	PT001	BEFORE 50.5	AFTER 37.5
2	PT002	30.5	42.5
3	PT003	70.5	80.5
4	PT004	35.8	36.5
5	PT005	67.5	80.5

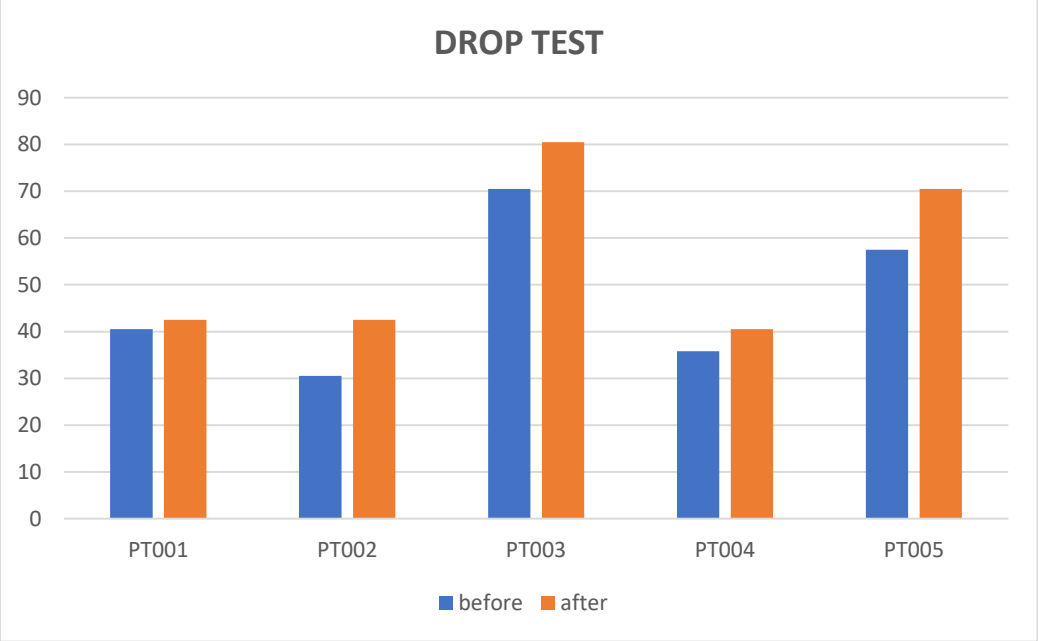
TABLE 1 DROP TEST (AVOCADO DYE)



AVOCADO DYE

S NO	SAMPLE	DROP TEST (IN MINUTES)	
1	PT001	BEFORE 40.5	AFTER 42.5
2	PT002	30.5	42.5
3	PT003	70.5	80.5
4	PT004	35.8	40.5
5	PT005	57.5	70.5

TABLE 2 DROP TEST (COCONUT DYE)



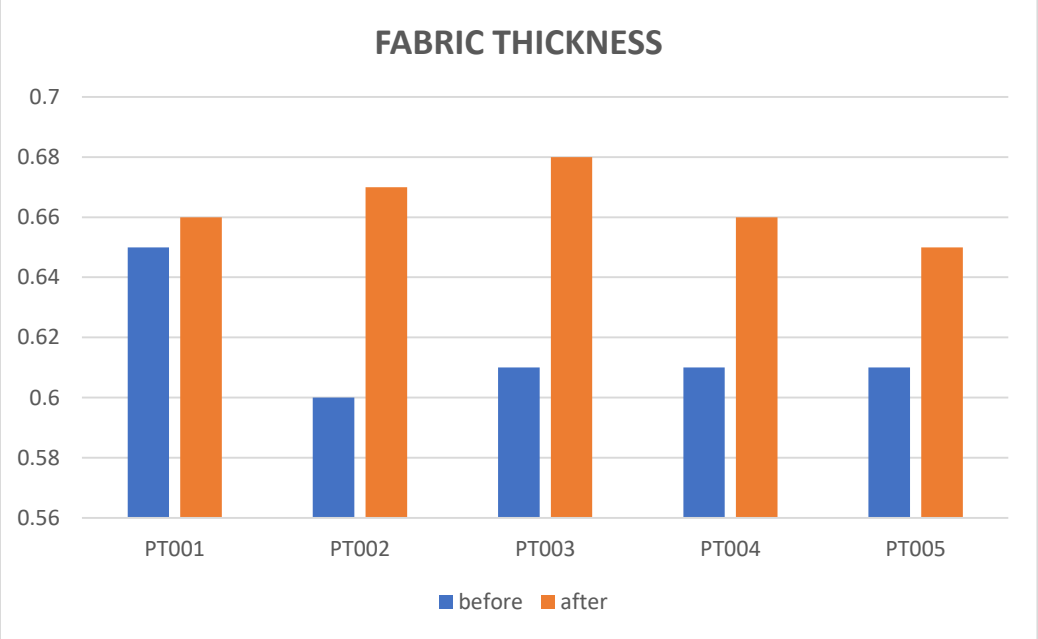
COCONUT DYE

3.2 FABRIC THICKNESS:

The conventional technique for determining fabric thickness is cutting the cloth and compressing it under pressure. In order to measure the distance between the two fabric surfaces using these compression-based techniques, a probe must make contact with the fabric itself.

S NO	SAMPLE	DROP TEST (IN MINUTES)	
1	PT001	BEFORE 0.65	AFTER 0.66
2	PT002	0.60	0.67
3	PT003	0.61	0.68
4	PT004	0.61	0.66
5	PT005	0.61	0.65

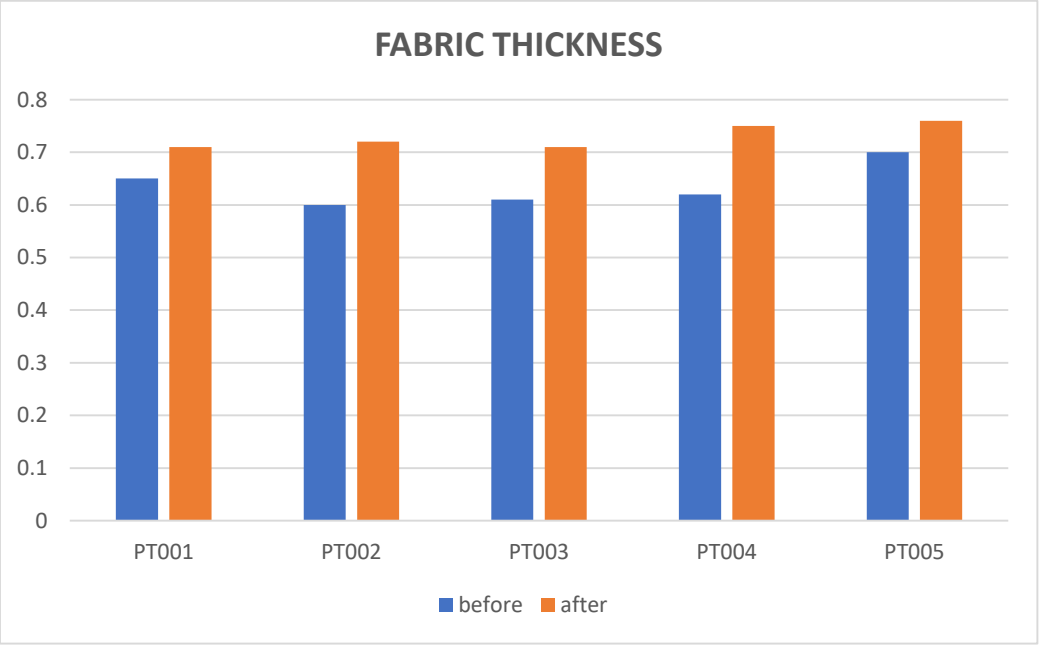
TABLE 3 FABRIC THICKNESS(AVOCADO)



AVOCADO DYE

S NO	SAMPLE	DROP TEST (IN MINUTES)	
1	PT001	BEFORE 0.65	AFTER 0.71
2	PT002	0.60	0.72
3	PT003	0.61	0.71
4	PT004	0.62	0.75
5	PT005	0.70	0.76

TABLE 4 FABRIC THICKNESS(COCONUT)



AVOCADO DYE

4 CONCLUSION:

The natural dye is one of the best dyes which are very eco-friendly and they do not harm the nature like other chemical dyes. These natural dyes do not give irritation to the skin and do not cause any skin allergies and rashes to our body. The avocado dye has more antimicrobial activities and more antibacterial properties which are mostly used in babies garment. The coconut COIR dye also has more antibacterial properties. These natural dyes are good to use on our skin than using chemical dyes on our skin. In conclusion, natural dyes have several advantages for the environment and human health over synthetic colours, making them a sustainable and environmentally responsible option. Natural dyes may produce an array of vivid colours, each with distinct qualities and cultural importance, by employing plant, animal, and mineral sources. Although natural dyes have many benefits, there are drawbacks as well, such inconsistent colour fastness and intensity as well as restricted availability of certain dye sources. Notwithstanding these difficulties, further study and development in natural dye processing methods show promise for improving their efficacy and broadening their use across a range of sectors, including textiles, cosmetics, and beyond. In conclusion, natural dyes offer a healthy balance between history, innovation, and responsible consumption, making them an invaluable tool in the quest of sustainable and ecologically aware activities.

5 REFERENCE:

1) Shang, S. M. "Process control in dyeing of textiles." InProcess control in textile manufacturing, pp. 300-338. Woodhead Publishing, 2013
2) Chan P.M., Yuen C.W.M. and Yeung K.W., 1997, "A Study of Dyeing Properties of Colourants Extracted from the Natural Waste Green Products", Proceeding of the 4th Asian Textile Conference, Taipei, R.O.C., Vol. II, June, pp 795-799
3) Mansour R. Natural dyes and pigments: extraction and appli-cations. In: Yusuf M, ed.Handbook of Renewable Materialsfor Coloration and Finishing. Scrivener Publishing; 2018:75-102
4) Du KZ, Li J, Gao XM, Chang YX (2020) Ultrasound-enhanced matrix solid-phase dispersion micro-extraction applying Mesoporous Molecular Sieve SBA-15 for the determination of multiple compounds in Fructus psoraleae. Sustain Chem Pharm 15:100198
5) Dicker, M.P.M.; Duckworth, P.F.; Baker, A.B.; Francois, G.; Hazzard, M.K.; Weaver, P.M. Green composites: A review of material attributes and complementary applications. *Compos. Part A Appl. Sci. Manuf.* **2014**, *56*, 280–289
6) Lee, J.T.; Kim, M.W.; Song, Y.S.; Kang, T.J.; Youn, J.R. Mechanical properties of denim fabric reinforced poly(lactic acid). *Fibers Polym.* **2010**, *11*, 60–66.
7) Teli M.D. and Paul R., Dyeing of textiles with natural dyes, International Dyers, 191(4), 29-32 (2006)
8) Peterson J., Dwyer J., Bhagwat S., Haytawitz D., Holden J., Eldridge A. L., Beecher G. and Aladesanmi J., Major flavonoids in dry tea, Journal of Food Composition and Analysis, 18(6), 487-501 (2005)
9) https://measurlabs.com/products/textile-absorbency-drop-test/#:~:text=This%20test%20is%20used%20to,given%20in%20seconds%20(s)
10) https://textileinformations.com/knitting/course-and-wales-and-stitch-density-in-knitting/
11) ASTM D1777-07. 2007. Standard test method for thickness of textile materials. West Conshohocken, PA,
12) ASTM International. ASTM D737-12. 2012. Standard test method for air permeability of textile fabrics. West Conshohocken, PA, ASTM International.