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DESIGN AND DEVELOPMENT OF JUTE TABLE MAT USING NATURAL DYE

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Abstract - The main goal of this paper is to avoid environmental pollution by extracting natural dyes from plant sources and using biodegradable jute table mats to avoid pollution. Nowadays, there is widespread concern about the use of environmentally friendly and biodegradable materials. Jute table mats are dyed using natural dye. The grey jute fabric has been bleached by hydrogen peroxide chemically, the gray-bleach, to produce white fabric. Jute mat fabrics were dyed with a natural dye extraction from annatto , nochi , sappan wood, and neem . Multi-coloured threads are used to make embroidery on a jute mat. The colour of the fabrics was investigated using a sublimation fastness, rubbing, and thermal resistance properties were evaluated.

***Key Words*:** table mat ,jute fabric , natural dyeing.

1.INTRODUCTION

Nowadays, a lot of people use plastic, synthetic dyed fabric mats, and rubber table mats. The fact that table mats take a very long time to decompose has a significant negative influence on the environment. When table mats decompose under sunlight, hazardous compounds are released into the soil, and when plastic mat is burned, a toxic substance is discharged into the air, causing ambient air pollution. So, using biodegradable jute for table mats and natural dyes extracted from plant sources. It is 100% biodegradable and recyclable, making it environmentally friendly. natural fibre with a golden and silky glow. After cotton, it is the second most important and widely cultivated vegetable fibre. High tensile strength with low elongation. Jute absorbs water quickly, dries quickly, and is highly resistant to abrasion and stains. Raw jute fabric was treated with hydrogen peroxide and bleached jute fabric to produce white fabric. Natural dyes are a nontoxic alternative to synthetic dyes, which are causing irreversible damage to the environment.

Natural dye extractions from annatto, nochi, sappan wood, and neem were used to dye jute fabrics. Annatto seeds have antimicrobial, antioxidant, and anticancer properties. Neem leaf and its constituents have been shown to have immunomodulatory, anti-inflammatory, antihyperglycemic, antiulcer, antimalarial, antifungal, antibacterial, antiviral, antioxidant, antimutagenic, and anticarcinogenic properties. Sappanwood is used to treat malignant conditions such as pitta, burning sensations, wounds, ulcers, leprosy, and skin diseases. So we have chosen these plants for dyes.

2. literature review:

Jute fibres provide a smooth feel. These are eco-friendly and biodegradable. The jute fibres common structural characteristics are their extremely high tensile strength and minimal extensibility(1). One of the most crucial fibres for the creation of bio-composites and bio-plastics is jute fibre(2). Jute can withstand some heat and fire. Jute has the property of being biodegradable. Jute has excellent antistatic and insulating qualities, as well as low heat conductivity and a moderate moisture regain. Jute can be combined with various fibers, both synthetic and natural, and it can be dyed using cellulosic dyes from the natural, basic, vat, sulfur, reactive, and pigment dye classes(3).

The analysis of the bleached jute fibre and the bleaching process revealed that good whiteness can be achieved with minimal weight and tensile strength loss, but the achieved whiteness is lower than that produced by the hydrogen peroxide bleaching process(4). As a result, an attempt has been made to bleach jute fibre using peracetic acid in a neutral or mild alkaline environment. The bleaching of jute fibre, yarn, and fabric was studied in comparison using both bleaching agents, hydrogen peroxide and peracetic acid. The analysis of the bleached jute fibre as well as the bleaching process revealed that good whiteness can be achieved with minimal weight and tensile strength loss, but the achieved whiteness is lower than that produced by the hydrogen peroxide bleaching process(5).

Jute can be bleached white with peroxide while losing only a small amount of lignin, and the composition of its residual lignin remains relatively unchanged. The point of attack by peroxide is thought to be a phenolic hydroxyl group, and the colour change is primarily due to an unknown structural modification of native lignin(6).In recent years, researchers worldwide have investigated the efficacy of different

techniques for extraction of natural dyes from different plant parts(7).

The natural extracts were used to dye bleached jute fabric without the use of a mordant, yielding lighter colours. With an increase in mordant content, dye uptake increased. When dyeing jute fabric, the application of a mordant produced a richer hue with excellent washability(8).

Using a traditional method, grey jute fabric was scoured and bleached with hydrogen peroxide. Natural dyed jute fabric with manjistha, annatto, and ratanjot exhibits good to very good UV protection Grey, scoured, and bleached jute fabrics have no UV protection. Natural dyed jute fabrics have good UPF values and protection grades(9). The majority of natural dyes can be obtained from various plant parts such as roots, bark, leaves, flowers, fruits, and seeds. Plants, on the other hand, generally give less colouring matter when extracted with water. Because the colouring component is tightly bound to the cell wall, novel techniques to improve the major mechanisms of natural dye extraction, such as cell wall rupture, natural dye release, and dye transport into the external medium required(10).

3.MATERIALS AND METHEDOLOGY:

3.1 Material:

The jute fabric sourced from market, woven Fabric 290 GSM . The following chemicals were used in the experiment: hydrogen peroxide, trisodium phosphate, sodium hydroxide, sodium carbonate, acetic acid, sodium acetate.

Fig -1 jute fabric

3.2 Bleaching:

Bleaching of grey fabrics was done in a closed vessel for 90 min at 80–85°C, keeping the material to liquor ratio at 1:20 with hydrogen peroxide (2 Vol.), trisodium phosphate (5 g/L), , sodium hydroxide (1 g/L) .

The pH of the bath was maintained at 10. After bleaching, the fabrics were washed thoroughly in cold water and neutralised with acetic acid (2 mL/L), washed again in cold water and finally dried.

Fig -2 bleaching

3.3 Dyeing :

The jute fabric was carried out in water bath for 15 minutes. Natural dye was prepared using natural ingredients without modarant and it is filtered to remove the residues. Then fabric dye was prepared using natural ingredients without modarant and it is filtered to remove the residues.

fabric was squeezed and further subjected to dyeing with Annatto,Nochi,Neem,Sappan Wood extract at 100 °C for 30 mins. The fabric undergoes cold wash for 3 times. At last soapnut is used to wash the fabric in hot boiling condition. Then the fabric washed again in cold water and finally dried.Dye colour is dark brown .

Fig -3 dyeing

3.4 Embroidery:

The embroidered fabric can be used to make shawls, mirror covers, boxes, and pillows, among other things. The embroidery was done with multi-colored thread on jute fabric table mat.

3.5 Testing :

3.5.1 Sublimation Fastness:

The sublimation fastness of natural dye is typically tested for staining and shade change at 150ºC for 30 seconds and rated on a 1-5 grey scale. Sublimation fastness was tested using the MAG presohot tester , the AATCC test method 117-2004 standard ISO 105-P01 .

3.5.2 Rubbing Fastness:

A rubbing fastness test can be performed on either dry or wet fabric. The test specimen is placed on the Crockmeter's base, and the Crockmeter finger is used to rub a square of white test cloth on the coloured specimen.

3.5.3 Thermal Resistance:

The measuring head is heated to body temperature (33ºC - 35ºC) and the room temperature is maintained at 20ºC - 22ºC. With and without the sample, the output voltage is calculated. The difference in heat flow with and without the sample determines the dry thermal resistance of the fabric sample.

4.RESULT AND DISCUSSION:

4.1 Sublimation Fastness:

The sublimation fastness of the jute fabric samples shows that in the dry state, wet state, and damp state fabrics have good fastness properties with the highest rating of grey scale 5, in colour change. The dyed jute table mat fabric has no colour change and good colour fastness property.

Table -1: sublimation fastness

S.NO	TEMPERATURE	GRADE (COLOUR CHANGE)	RATING IN GREY SCALE FOR CHANGE IN COLOUR
1	150ºC (dry state)	5	Negligible or no change in colour
2	150ºC (wet state)	5	Negligible or no change in colour
3	150ºC (damp state)	5	Negligible or no change in colour

4.2 Rubbing Fastness:

The rubbing fastness of the jute fabric samples shows that in the dry state, wet state fabrics have good fastness properties with the rating of grey scale 4/5, in colour change. The dyed jute table mat fabric has small colour change and good rubbing fastness property.

Table -2: Rubbing fastness

S.NO	TEMPERATURE	GRADE (COLOUR CHANGE)	RATING IN GREY SCALE FOR CHANGE IN COLOUR
1	dry state	4/5	Change in colour equivalent to grey scale step 4-5
2	wet state	4/5	Change in colour equivalent to grey scale step 4-5

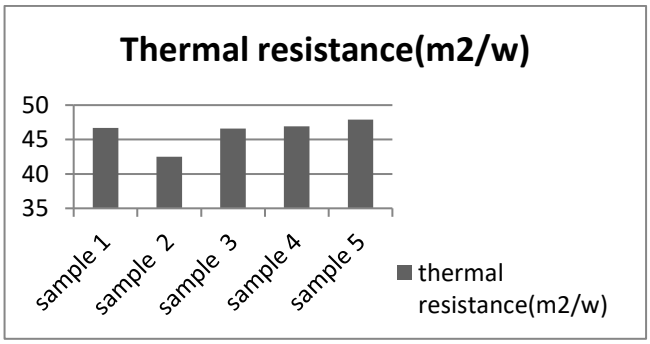
4.3 Thermal Resistance:

The thermal resistance of the fabric samples have been given in the table 3.The thermal resistance of jute fabric samples shows good thermal resistance property.

Table -3: thermal resistance

S.NO	Thermal resistance (m^2/w)
1	46.7
2	42.5
3	46.6
4	46.9
5	47.9
Average:	**46.18**

Chart -1



Final product :

Fig - 4 jute table mat

Conclusion:

Based on the results of the experiment done, it concluded that dyed jute table mat fabric has no colour change and good colour fastness property. The dyed jute table mat fabric has small colour change and good rubbing fastness property. The thermal resistance jute table mat shows good thermal resistance property. The jute table mat was fully biodegradable and sustainable.

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