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DESIGN AND DEVELOPMENT OF SUSTAINABLE LAPTOP BAGS WITH ANNATTO NATURAL DYE

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1.Abstract: The textile sector ranks among the largest contributors to global pollution, with synthetic dyes playing a major role in environmental harm. This research centres on the design and creation of sustainable laptop bags utilizing annatto natural dye, a plant-derived colorant extracted from the seeds of *Bixa Orellana.* The objective of this study is to investigate the viability of annatto natural dye as a sustainable substitute for synthetic dyes, thereby minimizing the ecological footprint of textile manufacturing. Cotton fabric was chosen as the primary material, and the annatto dye was extracted and applied with various mordanting agents. The findings indicated that annatto natural dye can yield a spectrum of vibrant colours, ranging from yellow to orange-red, while exhibiting excellent colourfastness and durability. The laptop bags designed in this study fulfilled both functional and aesthetic criteria, showcasing the practicality of incorporating annatto natural dye in textile production. This research advances sustainable practices within the textile industry by advocating for the use of natural dyes and decreasing dependence on synthetic chemicals. The results have significant implications for the textile sector, promoting the transition to environmentally friendly production techniques and sustainable materials.

Keywords: Sustainable textiles, Annatto natural dye, Bixa Orellana, Eco-friendly production, Textile design.

2.INTRODUCTION

Annatto, a natural dye extracted from the seeds of the achiote tree, is used in food coloring, cosmetics, and textiles due to its antioxidant and anti-inflammatory properties. Cotton fabric, derived from the cotton plant, is a breathable and adaptable material used in apparel, home furnishings, and industrial applications. Its temperature-regulating properties maintain comfort and offer a diverse array of vibrant colors and patterns. Cotton laptop bags are a fashionable, resilient, and environmentally conscious option for protecting electronic devices. They offer breathability, moisture-wicking, cushioning, shock absorption, and a variety of colors, patterns, and designs. The natural fibers of cotton can be easily dyed or printed, making them an excellent choice for laptop users seeking a dependable and eco-friendly accessory.

3.METHODOLOGY

3.1 MATERIAL SELECTION – COTTON FABRIC

Cotton cloth was sourced from textile store. Mordant (alum) was sourced from supermarket

Figure 1 (COTTON FABRIC)

3.2 SOURCES OF DYEING

Bixa Orellana

Annatto seed was sourced in online plate form

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Figure 2 (ANNATTO SEED)

3.3 MORANT

Mordant is help to allow the dye to bond to the fabric the mordant used in the dye process were alum in the simultaneous process.

3.4 DYE EXTRACTION PROCESS BOILING METHOD

Crush the Bixa Orellana seed into the fine particulars. boil the water at 100℃ add the annatto seed powder after the water get heated after sometime add the mordant of alum in simultaneous process to improve the shade of the fabric

Figure 3 (ANNATTO POWDER)

3.5 APPILCATION OF DYE IN COTTON FABRIC

After the dye extraction process deep the desired cotton fabric into the boiling dye, leave it for an hour to set in the fabric

3.6 PATTERN DRAFTING

Measure the laptop length and width. Take the paper marker the desired measurement with seam allowance

3.7 CONSTRUCTION OF LAPTOP BAG

Use the pattern cut into the fabric. Keep the right facing side of both pieces. Stitch the edges and side of the bag leave seam allowance for adjustment. Add the fastness at last for the attachment.

Figure 4 (LAPTOP BAG)

3.8 TESTING AND EVALUATION

3.8.1 WASHING TEST

The washing test serves as a crucial technique for assessing the wash fastness of natural dyes applied to textiles. Specifically for annatto, a dye extracted from the seeds of the Bixa Orellana plant, this evaluation is instrumental in determining the dye's adherence to cotton fabric and its resistance to laundering. Given that natural dyes frequently exhibit inconsistent fastness characteristics, particularly on cellulose fibres such as cotton, this test is vital for evaluating the longevity and quality of the dyed material. By replicating typical washing conditions, the washing test illustrates the degree of colour loss and potential staining on neighbouring fabrics, thereby offering valuable insights into the efficacy of the dyeing and mordanting methods employed.

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3.8.2 PROCEDURE FOR CONDUCTING THE WASH TEST

3.8.3.1 PURPOSE

To assess how annatto dye adheres to cotton fabric and maintain its colour after washing.

3.8.3.2 MATERIAL REQUIRED

- Cotton fabric
- Washing machine
- Standard detergent
- Grey scale for colour change and staining

3.8.3.3 TESTING PROCDURE

- Cut the specimen to the size of 40mm X 100 mm
- Cut the standard covering fabric to the sample size.
- Sandwich the specimen between the standard covering fabric and stitch all the four sides.
- Take distilled water in 1:50 ratio and fully wet the sandwiched specimen for 30 min.
- Now place the wetted sample between two plastic plates and place all plastic plates one above the other.
- Now transfer the plates on bottom metal plate of the per spirometer.
- Place the top metal plate and adjust the load with the help of thumb screws.
- Then keep the loaded instrument in the air oven for 4 hours at a temperature of 38+- 1° C
- After 4 hours remove the sample specimen from the instrument and remove the stitching
- Compare the test specimen with the original sample for change in colour compare with scale also.
- Compare the standard covering cloth with the fresh sample

Evaluation

- Colour Measurement: Utilize a colorimeter to assess the colour of each specimen both prior to and following the washing process.
- Colour Difference Calculation: Determine the colour difference (ΔE) between the measurements taken before and after washing.
- Colourfastness Assessment**:** Assign a colourfastness rating based on the ΔE value, following a recognized rating system
- Visual Examination: Conduct a visual inspection of the specimens for any indications of fading, bleeding, or running.

Documentation

Test Documentation: Prepare a comprehensive test report that includes the testing conditions, colour measurement data, calculations of colour differences, and colourfastness ratings.

4.RESULT AND DISCUSSION

FASTNESS TO CROCKING\RUBBING TEST

S.NO	Cloth	Specimen size	Immerse on time	Temperature	Crocking test	Soap	Wash water	Light	Chlorine
1.	Light orange	15mmx15mm	1hrs	Room temperature	Excellent	Good	Excellent	Good	Good

RESULT PASS

RESULT

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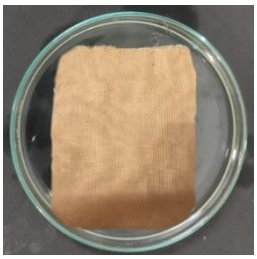
Colour fastness tests might be more important depending on the design and intended use textile products. Standard tests for colour fastness to water wash, chlorinated water, soap and unique conditions. Results were finding the cloth is not fading while doing above tests. The test report finds fabric heaving more durability. durability.

5. SUMMARY AND CONCLUSION

This project focuses on the design and development of sustainable laptop bags using natural annatto dyes, derived from



the seeds of the Bixa Orellana plant. The initiative aims to create environmentally friendly, durable, and aesthetically appealing bags by integrating biodegradable or recycled materials with natural dyeing techniques. By utilizing annatto as a sustainable alternative to chemical dyes, the project promotes eco-conscious production practices while supporting traditional knowledge systems. The outcome is a functional, stylish, and eco-friendly product that aligns with the growing demand for sustainable fashion and responsible consumerism.

ANNEXURE

LAPTOP BAG

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