DEVELOPMENT OF UV PROTECTIVE FABRIC USING NATURAL HERBS

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ABSTRACT

Excessive exposure to the sun is a major cause that augment the skin cancer, erythema, abnormal pigmentation and finally suppress the immune system. Due to stratospheric ozone depletion and climate change UV levels are increasing, there is an urgent need to protect human skin from the harmful effects of UV. Compounds with photo-protection activity are very useful in reducing the effect of ultraviolet rays. For this reason, today's sunscreens that contain one or more different types of chemical filters are used to protect the skin from ultraviolet rays. When this UV rays touches our body surface i.e., skin, it exposed our skin-to-skin cancer, skin irritation, etc. To prevent this, we have been applied rambutan and Cinnamon as a UV protective finish on the fabric surface. The herbals of rambutan and Cinnamon is having the effect of suncare product naturally. It's also having the ability to cure the healing, soothing, protect skin diseases etc, for our human body. Thus, we extracted these herbals using Soxhlet extraction method and dyed them through padding mangle and the samples will be tested and compared with existing products.

Keywords: *Polyphenol, Flavonoids, Sun Protection Factor, Antioxidant*

1. INTRODUCTION

The harmful effects of ultraviolet (UV) radiation on human health, including skin cancer, premature aging, and other skin disorders, have necessitated the development of protective measures in various fields, including textiles. UV-protective fabrics have gained significant attention in recent years, particularly for applications in outdoor clothing and gear. While synthetic materials have traditionally been used to create UV-resistant fabrics, increasing environmental concerns and the demand for sustainable alternatives have driven interest in natural solutions. This research explores the development of UV-protective fabrics using natural herbs, which offer a renewable and eco-friendly alternative to synthetic chemicals. Many herbs contain bioactive compounds that absorb or block UV radiation, providing a natural defence against its harmful effects. By incorporating these herbs into fabric production, it may be possible to create textiles that not only offer UV protection but also align with sustainable and eco-conscious practices. This study aims to investigate the efficacy of various herbal treatments on fabric UV protection, evaluate their durability, and assess their potential for large-scale application in the textile industry.

2. ADVANTAGES OF NATURAL HERBS IN UV PROTECTIVE FABRIC

- Natural herbs are biodegradable and renewable, Rambutan and cinnamon can be sourced from agricultural waste or sustainable farming practices, reducing environmental impact.
- Natural herbs like cinnamon and rambutan are generally non-toxic and gentle on the skin, making them suitable for individuals with sensitive skin.
- Herbs such as cinnamon and rambutan are rich in antioxidants, which not only help block UV radiation but may also offer additional skin health benefits.

- Cinnamon has antimicrobial properties, Rambutan is known for its anti-inflammatory properties, potentially offering extra comfort when worn for extended periods in the sun.
- Both rambutan and cinnamon are abundant in tropical regions, making them cost-effective and readily available for textile applications.
- These herbal extracts are naturally compatible with fibres such as cotton, linen, and silk.
- By using natural herbs, the production process can lower the ecological footprint associated with chemical treatments.

3. METHODOLOGY

Bleached cotton fabric

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Soaping the fabric (using soap oil)

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Herbal extraction (using Soxlet extraction)

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Treating the fabric with UV protection finish (using Cinnamon, Rambutan and TIO_2, Zinc oxide.)

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Testing

4. MATERIALS

- Fabric: Cotton, Cotton/Polyester Blend
- Soap Oil
- Rambutan extract
- Cinnamon extract
- TiO_2

5. EXPERIMENT

a. HERBAL EXTRACTION

- Extraction of colour component from source natural dye material is important step for dyeing any textile substrate to maximize the colour yield.
- Using Soxhlet extraction (SE) method the natural herbs are extracted from rambutan and cinnamon.

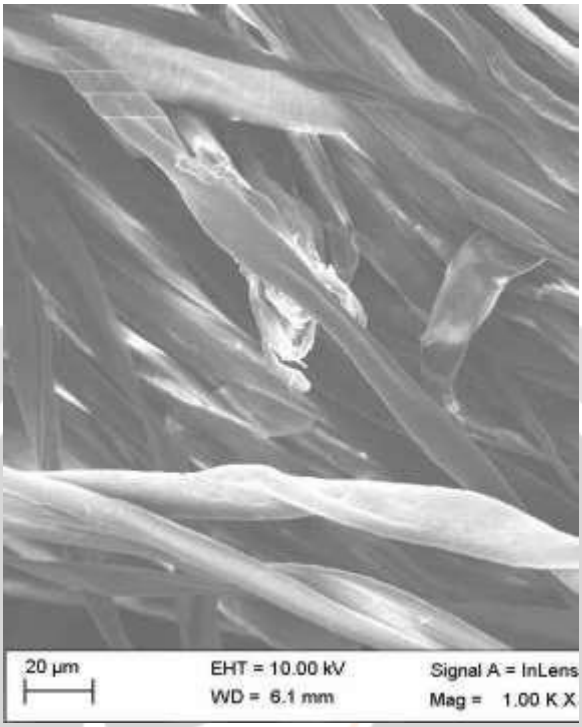
b. DYEING

- Using the plant extract the fabric samples are dyed in padding mangle and then it dry and washed. This is done in different set of samples as cotton, polyester/cotton blend.
- And the dye is used in different proportions such as:
  i. Rambutan (100%)
  ii. Cinnamon (100%)
  iii. Rambutan (60%) & Cinnamon (40%)
  iv. Cinnamon (60%) & Rambutan (40%)
  v. Ti_2O (100%)

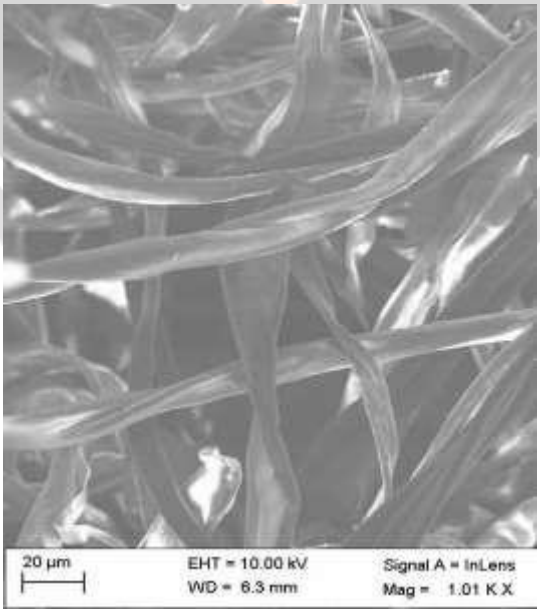
6. OBSERVATION

6.1 SEM ANALYSIS:

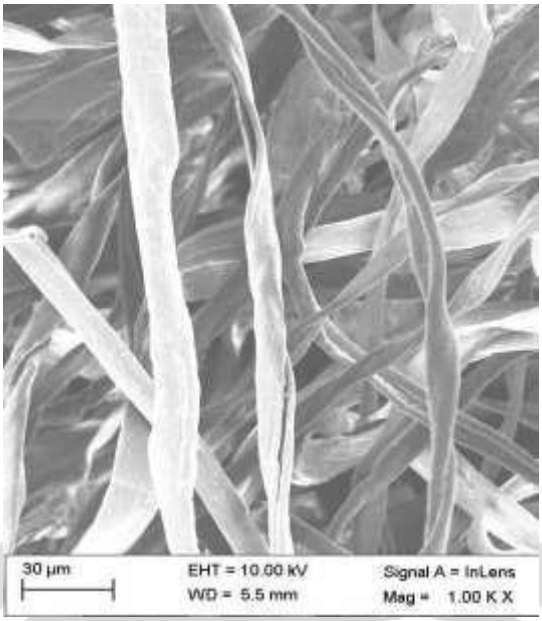
Electrode Distance: 4cm / Time: 5 minutes



Electrode Distance: 4cm / Time: 15 Minutes



Electrode Distance: 8cm / Time: 5 minutes



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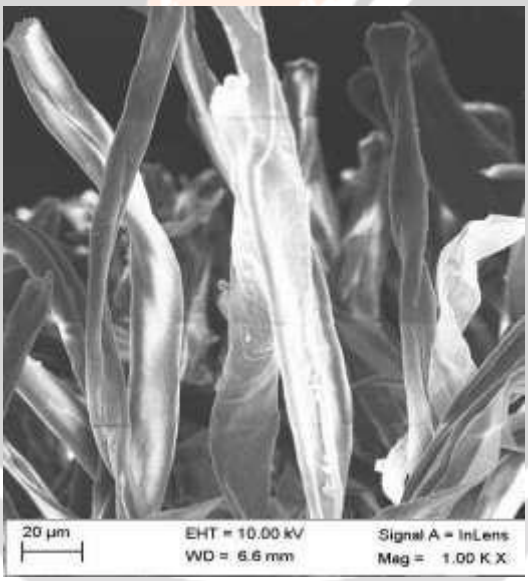

7. CONCLUSIONS

Development of UV-protective fabrics using natural herbs such as rambutan and cinnamon represents a significant advancement in the quest for sustainable and eco-friendly textile solutions. This study highlights the potential of these herbs, known for their bioactive compounds, to provide effective UV protection while offering additional benefits such as antioxidant and antimicrobial properties. As environmental concerns drive the demand for greener alternatives in various industries, the textile sector stands to benefit from the integration of natural, renewable materials into protective fabrics. By utilizing natural herbs, manufacturers can reduce the reliance on synthetic chemicals, decrease environmental impact, and create products that are not only protective but also gentle on the skin. The findings of this research suggest that natural herb-based UV-protective fabrics are a viable and promising alternative to synthetic materials. Future research should focus on optimizing the extraction processes, improving the durability of these treatments, and scaling their application for commercial use. Ultimately, the use of herbal treatments in textile production aligns with the growing movement toward sustainability and offers a holistic approach to enhancing fabric performance.

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