A Sustainable Approach Using *Caprinae* and *Gossypium Hirsutum* fabric Coated with *Cera Alba*

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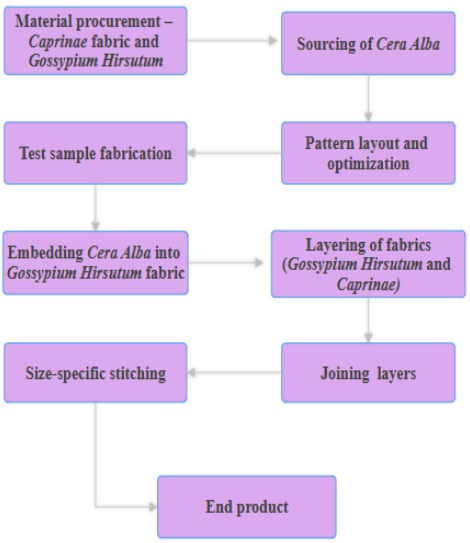
***Abstract*-Durable fashion is becoming more popular because both companies and customers are rapidly looking for environmentally conscious textile production processes. The development and construction of durable heel socks, which incorporates wool from renewable resources coated with *Cera Alba* to enhance durability, comfort and distort for moisture, is the primary goal of this research study. *Cera Alba* coatings provide antibacterial and water repellent characteristics, while wool, which has become recognized for its insulating and permeable capacity, provides an excellent auxiliary material. Biodegradation has been performed through the use of these naturally occurring substances, so there is no need for synthetic options. Wearability evaluation and material analysis is employed in the investigation to evaluate the conditions of ecological effects, efficiency and effectiveness of the appearance of the appearance. My research increases antibacterial, antifungal, water saving, biodegradableness, breathing ability, repetition of water. Further to create an efficient and environmentally responsible responsible shoes, these benefits aim to encourage permanent textile innovation.**

***Index terms*- *Cera Alba*, biodegradability, antibacterial, renewable resources, eco -friendly products**

1. INTRODUCTION

This project presents a sustainable approach by using natural fabrics *Caprinae* and *Gossypium hirsutum* (cotton fabric). Both materials are known for their comfort, durability, and biodegradability, making them ideal for eco-conscious textile innovation. The blend of these two fabrics brings together the insulating properties of Caprinae with the softness and breathability of cotton.To enhance the functionality of the fabric, a coating of *Cera Alba* is applied. This natural wax provides water resistance, antimicrobial benefits, and a flexible finish, without compromising the sustainability of the material. The use of beeswax also improves the texture and longevity of the fabric. All components *Caprinae* fabric, *gossypium hirsutum* fabric, and *Cera Alba* are renewable, biodegradable, and environmentally friendly. This project aims to offer a practical and ethical solution for sustainable fashion and functional textile design.

2. EXPERIMENTAL PROCUDURE



2.1. Material procurement – *Caprinae* fabric and *Gossypium Hirsutum*

- Natural fabrics like cotton and wool are commercially procured from textile manufacturers, wholesalers, and certified organic suppliers.
- Cotton is sourced from mills where it is processed into yarn and fabric, while wool is obtained from farms and processed through spinning and weaving facilities. Bulk purchasing from reputable suppliers ensures quality, consistency, and sustainability in textile production.

PLATE I-*CAPRINAE* FABRIC

PLATE II-*GOSSYPIUM HIRSUTUM*

2.2. Sourcing of *Cera Alba*

Cera Alba is sourced from beekeepers, organic farms, and commercial suppliers in purified forms such as pellets, blocks, or flakes. It is often filtered and refined to remove impurities, making it safe and suitable for both cosmetic and textile applications. It enhances *Caprinae* fabric by adding durability, water resistance, and skin-friendly properties, making it ideal for use in sustainable heel socks and other

2.3. Pattern layout and optimization

Marker planning for socks ensures optimal fabric utilization by strategically arranging patterns to minimize waste and maximize efficiency. This process maintains design consistency, ensuring proper fit, alignment, and uniformity in production.

PLATE III -PATTERN

2.4. Test sample fabrication

- Sampling a product helps identify errors in seams, design, and overall fit before mass production.
- It allows for necessary adjustments, ensuring quality, durability, and proper functionality in the final product.

Sampling provides a physical representation of the design concept, allowing designers and stakeholders to visualize and evaluate the product more effectively.It helps in cost estimation and material planning, offering insights into fabric consumption, production time, and labor requirements before scaling up.

2.5.Embedding *Cera Alba* into *Gossypium hirsutum* fabric

Coating *Cera Alba* on *Gossypium hirsutum* fabric involves melting the beeswax and evenly applying it to the wool surface. This process enhances the fabric's durability, water resistance, and antimicrobial properties, making it suitable for sustainable textile applications like heel socks.

PLATE-IV
COATING *CERA ALBA* INTO GOSSYPIUM HIRSUTUM FABRIC

2.6. Layering of fabrics

- Layering three fabrics in a wool-cotton-wool order involves sandwiching a wool layer between two cotton layers to optimize both functionality and comfort.
- The inner wool layer provides insulation, cushioning, and moisture-wicking properties, keeping the feet warm and dry.
- The outer cotton layers enhance softness, breathability, and durability, ensuring a gentle feel against the skin while maintaining fabric strength.

PLATE-V LAYERING OF FABRICS

2.7. Size specific stitching

- Sewing according to different sizes, from adults to elderly individuals, involves adjusting measurements for comfort, fit, and support.
- The stitching process ensures flexibility, proper seam alignment, and durability to accommodate varying foot shapes and needs.

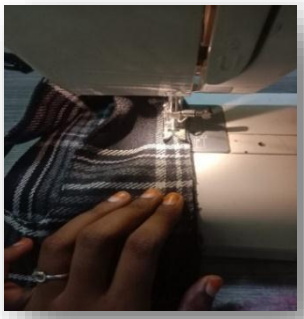


PLATE VI-Stitching

2.8. End product

- The end product is a sustainable and skin-friendly heel sock made from a biodegradable wool-cotton-wool layered structure, coated with *Cera Alba* for moisture retention and antimicrobial protection. It offers enhanced comfort and breathability, with wool providing insulation and, while cotton ensures softness, durability, and air circulation to keep feet dry.
- The *Cera alba* coating helps lock in moisture, preventing heel cracks and dryness, making it ideal for foot health and skincare.
- Designed for daily wear and therapeutic use, these socks are durable, eco-friendly, and suitable for year-round usability.

PLATE VII-ENDPRODUCT

7. CONCLUSION

The Innovative Heel Socks developed in this project showcase a sustainable, functional, and skin-friendly approach to foot care by integrating *Caprinae* and *Gossypium Hirsutum* fabrics coated with *Cera Alba*. The wool-cotton-wool layering enhances breathability, insulation, and durability, while the *Cera alba* coating provides moisture retention, antimicrobial protection, and improved skin hydration. This unique combination not only promotes foot health by preventing heel dryness and cracks but also aligns with eco-friendly and biodegradable textile solutions.

By incorporating natural fabrics and bio-based coatings, this project contributes to sustainable fashion and circular economy principles, reducing dependence on synthetic materials and minimizing textile waste. The end product offers comfort, protection, and long-lasting performance, making it a viable alternative for daily wear, therapeutic use, and environmentally conscious consumers. This research opens possibilities for further innovations in functional textile finishing, emphasizing the potential of bio-coatings in sustainable footwear and hosiery industries.

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