Sustainable Textiles with Plant Extracts for Skin Applications

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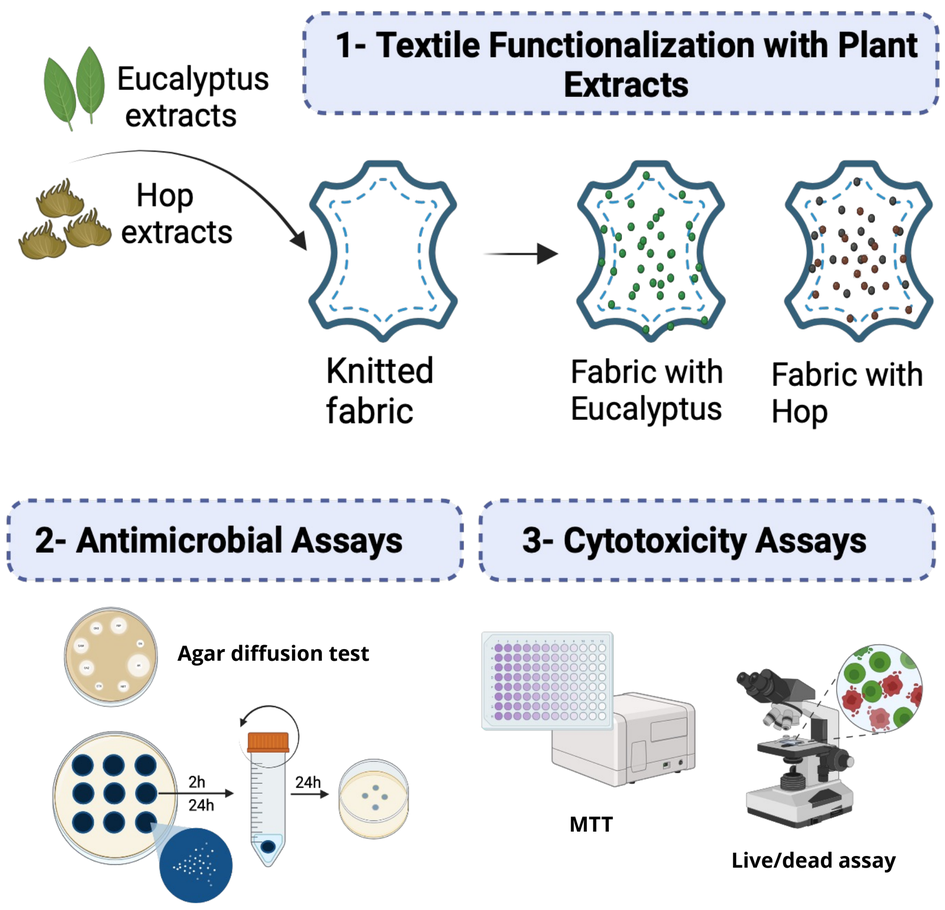
Background and Objective

The expanding market for antimicrobial textiles demands innovative products to support modern technological advancements across various industries. This growing need includes the food industry, where antimicrobial textiles are vital for preventing contamination through uniforms and surface coverings; healthcare institutions, which utilize these products to reduce infection spread; consumer goods such as clothing and sportswear that benefit from enhanced hygiene and odor control; and dermato-therapeutical applications where antimicrobial textiles aid in treating skin infections. Given their direct contact with human skin, it's crucial to consider their safety and effectiveness.

To address this demand, numerous antimicrobial textiles have been developed, often relying on synthetic components like metals (silver, copper, zinc) and chemical agents (quaternary ammonium compounds, triclosan). However, the potential side effects of these synthetic materials highlight the need for natural antimicrobial agents, which are considered safer. Plant extracts, rich in bioactive compounds, offer a promising alternative. For instance, Eucalyptus and hop extracts have shown strong antimicrobial properties against various bacteria. This study evaluates the use of these plant extracts to functionalize textiles, testing their antimicrobial activity against common skin bacteria (*Staphylococcus aureus*, *Staphylococcus epidermidis*, and *Escherichia coli*), while assessing their biocompatibility with human skin cells to ensure safety for direct skin applications.

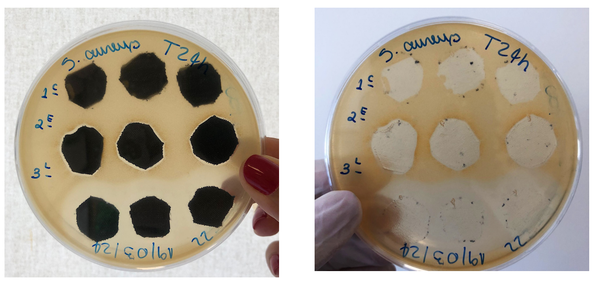
Methods



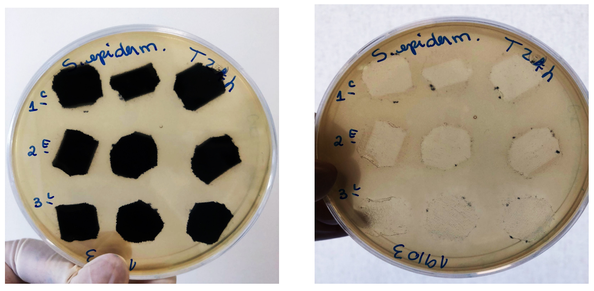
Results

Antimicrobial Activity

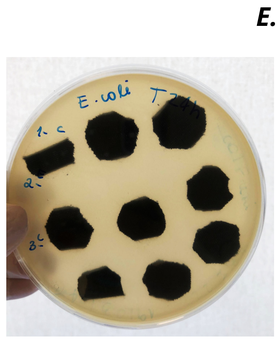
S. aureus



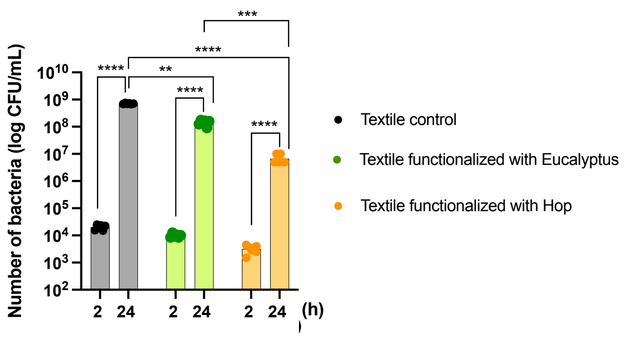
S. epidermidis



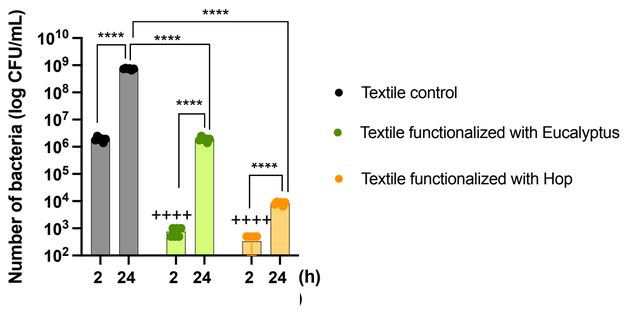
E. coli



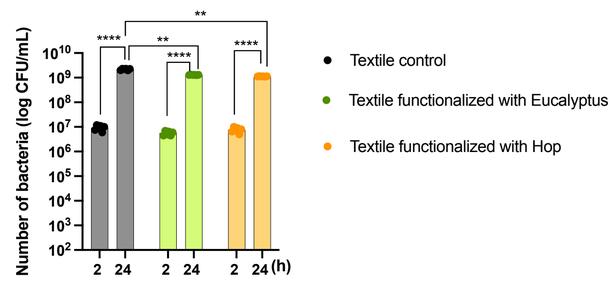
S. aureus



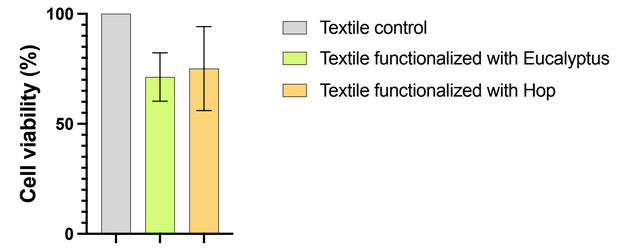
S. epidermidis

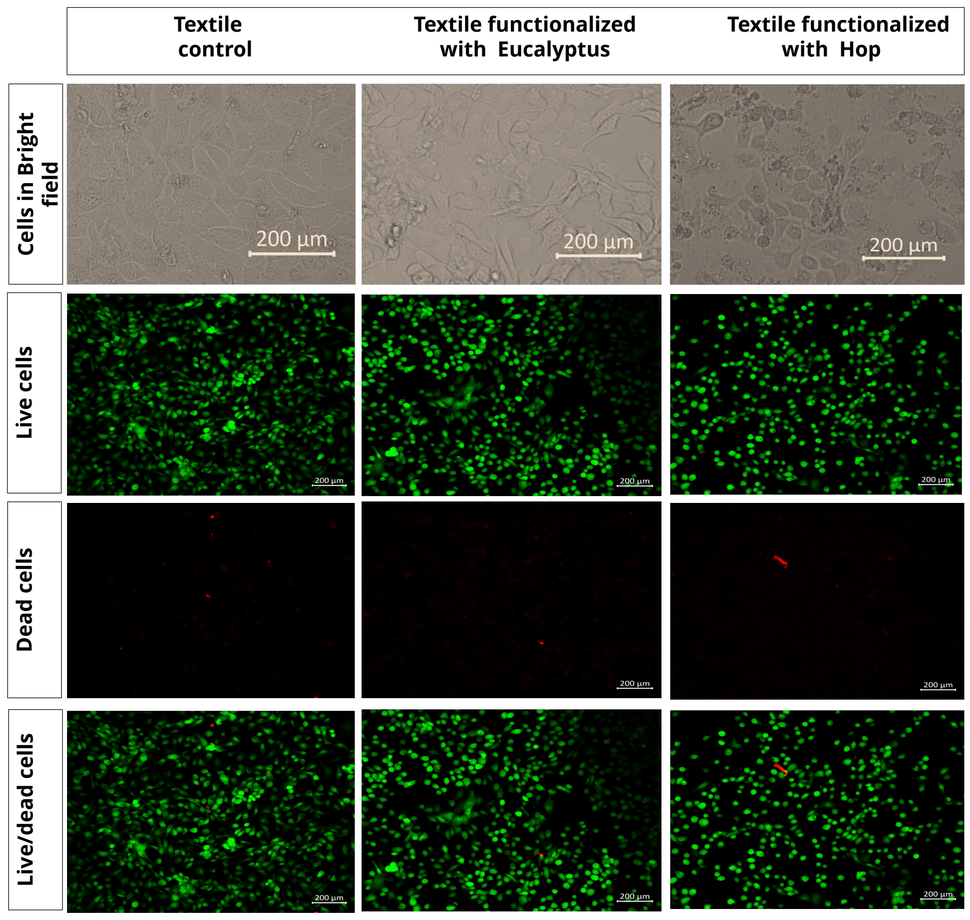


E. coli



Biocompatibility in human skin cells





- ✓ **Strong antimicrobial activity against both Gram-positive bacteria (*S. aureus* and *S. epidermidis*).**
- ✓ **Low antimicrobial activity against Gram-negative bacteria (*E. coli*).**

Conclusion

These findings suggest that plant extracts can serve as natural, sustainable antibacterial agents in textiles, offering an eco-friendly alternative to synthetic antimicrobials and paving the way for innovative, safe and sustainable products in the market.

Acknowledgments

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