NANOFIBER-BASED WOUND DRESSINGS ENHANCED WITH ESSENTIAL OILS

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Abstract: Nanofibrous surfaces, characterized by their extensive surface area and high porosity, find use across various fields [1]. They are fabricated through techniques including bicomponent fiber production, electrospinning, phase separation, template synthesis, and meltblowing. Electrospinning, among these methods, is distinguished as a relatively simpler and cost-effective approach, particularly in laboratory settings, providing the flexibility to explore a wide array of polymers [2].

Electrospun nanofibrous surfaces can acquire functional features based on the choice of polymer or the incorporation of active ingredients into the spinning solution [3]. With the escalating concerns surrounding environmental and health issues in recent times, the utilization of natural constituents has acquired significant attention for enhancing the functionality of electrospun nanofibers. Essential oils, comprised of a complex blend of natural volatile compounds, present a viable option for functionalizing nanofibrous materials owing to their antimicrobial, antifungal, anti-inflammatory, and other properties.

This study focuses on the fabrication of nanofibrous surfaces loaded with cinnamon oil. Thermoplastic polyurethane was chosen as the polymer for nanofiber production. The spinning solutions were formulated by incorporating cinnamon oil into the polymer solution, followed by the electrospinning process to produce nanofibers. Characterization of the nanofibrous surfaces was conducted using scanning electron microscopy (SEM). The antibacterial activity was assessed using the disk diffusion method, while cytotoxicity was evaluated by extraction method.

In conclusion, SEM images revealed the formation of smooth nanofibers with diameters ranging from 500 to 900 nm (Figure 1). Antibacterial activity assays demonstrated the efficacy of the nanofibers against both *S. aureus* and *E. coli* bacteria (Figure 2). Cytotoxicity assessments revealed that as the concentration of cinnamon oil decreased, the percentage of cell viability on the nanofibrous surfaces remained at 70% or higher compared to the cell control group. Therefore, it can be inferred that these surfaces did not exhibit cytotoxic effects. These findings suggest the potential suitability of cinnamon oil-loaded nanofibrous surfaces for wound dressing applications.

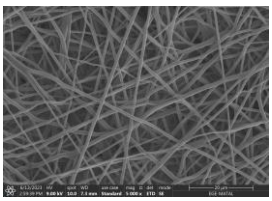
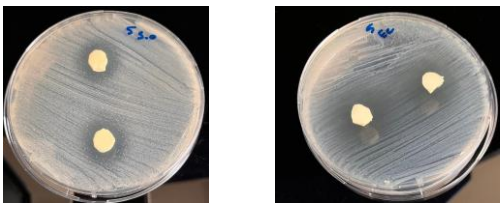


Figure 1 SEM image of the nanofibers



S. aureus *E. coli*

Figure 2 Antibacterial activity test results of the cinnamon oil loaded nanofibers

Keywords: *Cinnamon oil, nanofiber, electrospinning, antibacterial, cytotoxicity.*

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