Investigation on Antimicrobial Properties of Biopolymers Applied to Single-Use Pet

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Abstract- The increasing use of plastic in various applications has led to significant environmental concerns, particularly with the disposal of single-use plastic. Using heavy metals as antimicrobial agents and singleuse plastics generate negative environmental impacts, including coral diseases, skin irritation, nonbiodegradability, and the potential for bioaccumulation. This work presents an experimental study of the antimicrobial activity of biopolymers embedded into electro-spun PET nanofiber mats. This project aimed to identify the antimicrobial activity of Chitosan and Curcumin electro spun with PET. Electro spun PET/ Chitosan and PET/ Curcumin nanomembranes consisted of fiber diameters in the range of 100 - 150 nm. The antimicrobial activity was measured using the quantitative standard test method AATCC 100. For this method, both gram-positive (Staphylococcus Aureus) and gram-negative (Escherichia coli) bacteria were used. The experimental findings revealed that the PET/Chitosan membrane exhibited a significantly higher bacteria reduction rate compared to PET/Curcumin, with reduction percentage of bacteria was 58% and 52%, respectively. The PET/Chitosan membrane displayed impressive effectiveness in combating Staphylococcus aureus, achieving a notably higher reduction in bacterial count. Furthermore, when exposed to a temperature of 260°C to assess their industrial viability, both samples displayed encouraging results in their ability to combat the tested bacteria. The chitosan sample exhibited significantly greater activity compared to the Curcumin sample. These findings underscore the PET/Chitosan membrane's potential as a valuable antimicrobial option and indicate the beneficial impact of elevated temperature on the antimicrobial characteristics of these materials, paving the way for potential commercial production.

Keywords— PET, Antimicrobial, Biopolymer, Curcumin, Chitosan, Electrospinning