Synthesis and Characterization of *Aegle marmelos* Gum Based Antimicrobial Coating/Film for Food

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This research focuses on the synthesis and characterization of Aegle marmelos gum (Bael fruit gum) for the development of antimicrobial coatings and films for food products. The precipitation method was identified as the most efficient technique for extracting bael gum (BG). A range of analytical techniques, including scanning electron microscopy (SEM), energy dispersive X-ray spectroscopy (EDX), X-ray diffractometry (XRD), Fourier transform infrared spectroscopy (FTIR), and thermogravimetric analysis (TGA), were employed to assess the morphology, composition, and thermal behavior of the extracted pure BG. FTIR and XRD results confirm the polysaccharide nature of BG.

A specific formulation for both coating and film was developed, consisting of purified BG, citric acid, starch, and glycerol. This formulation was evaluated using an aging test on ripe lady finger bananas and veralu (Ceylon olive-*Elaeocarpus serratus*) fruits, with results demonstrating its effectiveness. The antimicrobial properties of bael gum and the finalized formula at three different concentrations were tested using the disk diffusion method.

Bael gum offers several advantages for food packaging, including strong adhesiveness, biodegradability, biocompatibility, antimicrobial activity, and non-toxicity. The primary aim of this research is to develop a non-toxic antimicrobial coating/film for food packaging. This innovative approach not only enhances food safety by extending shelf life but also promotes sustainability by reducing reliance on synthetic packaging materials. The promising results from this study open new possibilities for utilizing natural resins in various industrial applications.

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