Title Physical and antimicrobial properties of nisin-incorporated chitosan/ PP films

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Abstract

Since the major portion of food spoilage originates from microbial contamination on the food surface, antimicrobial packaging will provide an appropriate way to solve the food surface contamination problems. Direct incorporation of active substances into polymeric materials has been frequently used for fabricating the antimicrobial films, but it may lead to excessive loss of antimicrobial activity due to denaturation or chemical changes during extrusion process. Biopolymer-based solution coatings can exploit a new path for holding heat-sensitive antimicrobials onto plastic films with stability and safety. Chitosan-coated plastic films with nisin were formed to determine their physical and antimicrobial properties for food packaging applications. Chitosan coating solutions (1% w/v) containing given amounts of nisin (0, 0.99, 5.16 mg/g chitosan) were applied on corona discharge-treated polypropylene (PP) films and spread evenly using a Bird-type applicator. Coatings were then dried at room temperature for 48 h. Antimicrobial activity of the coated films against *Lactobacillus plantarum* was assessed by viable cell counts after the microbial culture together with sample films were suspended in MRS broth. Physical properties were measured according to ASTM methods for thickness, specular gloss, haze index, color, and transparency. Chitosan coatings on PP could be obtained with good appearance and adhesion. The resulting chitosan-coated PP films have very high gloss and transparency, as well as no color, comparable to the substrate. By addition of nisin, however, gloss and transparency decreased to some extent. Chitosan-coated plastic films showed significant reduction of the bacterial counts. Antimicrobial activity of the coated films with nisin was much greater than that of the films without nisin. Particularly, nisin-incorporated (5.16 mg/g) chitosan/PP films reduced about 5 log cycles of *L. plantarum* cells after incubation at 30 °C for 4 h. Results suggest that chitosan-coated PP films have potential benefits as a suitable carrier for bacteriocins in active packaging systems.