Preparation and characterization of biocomposite film based on chitosan and kombucha tea as active food packaging

An active film composed of chitosan and kombucha tea (KT) was successfully prepared using the solvent casting technique. The effect of incorporation of KT at the levels 1%–3% w/w on the physical and functional properties of chitosan film was investigated. The antimicrobial activity of chitosan/KT film against Escherichia coli and Staphylococcus aureus was evaluated using agar diffusion test, and its antioxidant activity was determined using DPPH assay. The results revealed that incorporation of KT into chitosan films improved the water vapor permeability (from 256.7 to 132.1 g cm⁻² h⁻¹ KPa⁻¹ mm) and enhanced the antioxidant activity of the latter up to 59% DPPH scavenging activity. Moreover, the incorporation of KT into the chitosan film increased the protective effect of the film against ultraviolet (UV). Fourier transform infrared spectroscopic analysis revealed the chemical interactions between chitosan and the polyphenol groups of KT. In a minced beef model, chitosan/KT film effectively served as an active packaging and extended the shelf life of the minced beef as manifested in the retardation of lipid oxidation and microbial growth from 5.36 to 2.11 log cfu gr⁻¹ in 4 days storage. The present work demonstrates that the chitosan/KT film not only maintains the quality of the minced beef but also, retards microbial growth significantly, extending the shelf life of the minced beef meat up to 3 days; thus, chitosan/KT film is a potential material for active food packaging.

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