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Effect of incorporation of bioactive agent on physical and mechanical properties of active PLA composites

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In recent years, an increased demand has been evolved for producing active packaging films with strong mechanical and physical properties. Moreover, addition of bioactive agents to packaging material can be considered as an effective strategy for controlling chemical and microbial deterioration of foods. In this context, herbal essential oils (EOs) are promising natural antioxidant/antimicrobial compounds which approved by FDA (Food and Drug Administration of USA) for using as food additive. In present study, active PLA-based packaging films produced by addition of Thymus vulgaris EO and nanocellulos as bioactive and reinforcement compound, respectively. The films were developed by solvent casting method, which different concentration of the EO (0, 0.5, 1, and 1.5 %v/v) and nanocellulose (0, 1) were added to PLA solution (1%wt in chloroform). Water vapour permeability (WVP, by the cup method), oxygen permeability (according to ASTM method D 3985), mechanical (tensile strength (TS) and elongation at break (%E) parameters) and optical properties of resulted composites were measured. The results showed that barrier and mechanical properties of the films slightly decreased by lower concentration of the EO (0.5 %v/v), but higher percentage of Thymus vulgaris EO (1 and 1.5 %v/v) had negative effects on overall permeability of the composites. On the other hand, as we expected incorporation of nanocellulose improved all the aforementioned properties of the films (except for optical parameters). The obtained results revealed that possible defects in physical and mechanical properties arising from incorporation of the essential oil to PLA can be compensated by addition of nanocellulose. In fact, Thymus vulgaris essential oil and nanocellulose together developed PLA film to an applicable active packaging nanocomposite for extending shelf life of foods.

Biography

Mohammadreza Rezaeigolestani is a student in Food Hygiene and Quality Control, Department of Food Hygiene, Faculty of Veterinary Medicine, University of Tehran. Natural antimicrobial and food preservative compounds are his field of interest and also his research project was about development of antimicrobial-biodegradable food packaging films and their application for extending shelf life of meat products.

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