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Characterization of pre-gelatinized maize starch-zein blend films produced at alkaline pH

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Abstract

Biodegradable materials are considered as alternative to synthetic materials to alleviate the environmental burdens caused by petroleum based synthetic materials. Biopolymer blends have been extensively researched to improve the material properties of biopolymer-based materials for potential replacement of non-biodegradable materials. Compatible blends of pre-gelatinized maize starch (uncomplexed or complexed with stearic acid) and commercial zein in 0.1 M NaOH were used to produce the films. The effect of the ratio of uncomplexed starch, zein and starch complexed with stearic acid on the tensile, water vapour and oxygen barrier and thermal properties of the composite films were investigated. Blending zein with starch increased the tensile strength and reduced the tensile strain compared to starch films. Addition of starch complexed with stearic acid to the blend further increased the tensile strength and decreased the elongation at break. Both blending zein with starch and addition of starch complexed with stearic acid to the blend decreased the water vapour permeability, however, the oxygen permeability was increased compared to starch films. The starch-zein blend films had an endothermic temperature and thermal transition in between the uncomplexed maize starch and zein films suggesting possible compatibility at molecular level. The microstructure of the blend films also showed good miscibility of pre-gelatinized starch and commercial zein. In conclusion alkaline solvent (0.1 M NaOH) could produce compatible starch-zein blends that can produce films with improved tensile strength and water vapour permeability compared to starch films.