

Physical and Microbiological Evaluation of Chitosan Films: Effect of Essential Oils and Storage

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Abstract : It was studied the effect of the inclusion of thyme and rosemary essential oils into chitosan films, as well as the microbiological and physical properties when storing chitosan film with and without the mentioned inclusion. The film forming solution was prepared by dissolving chitosan (2%, w/v), polysorbate 80 (4% w/w CH) and glycerol (16% w/w CH) in aqueous lactic acid solutions (control). The thyme (TEO) and rosemary (REO) essential oils (EOs) were included 1:1 w/w (EOs:CH) on their combination 50/50 (TEO:REO). The films were stored at temperatures of 5, 20, 33°C and a relative humidity of 75% during four weeks. The films with essential oil inclusion did not show an antimicrobial activity against strains. This behavior could be explained because the chitosan only inhibits the growth of microorganisms in direct contact with the active sites. However, the inhibition capacity of TEO was higher than the REO and a synergic effect between TEO:REO was found for *S. enteritidis* strains in the chitosan solution. Some physical properties were modified by the inclusion of essential oils. The addition of essential oils does not affect the mechanical properties (tensile strength, elongation at break, puncture deformation), the water solubility, the swelling index nor the DSC behavior. However, the essential oil inclusion can significantly decrease the thickness, the moisture content, and the L* value of films whereas the b* value increased due to molecular interactions between the polymeric matrix, the loosening of the structure, and the chemical modifications. On the other hand, the temperature and time of storage changed some physical properties on the chitosan films. This could have occurred because of chemical changes, such as swelling in the presence of high humidity air and the reacylation of amino groups. In the majority of cases, properties such as moisture content, tensile strength, elongation at break, puncture deformation, a*, b*, chrome, ΔE increased whereas water resistance, swelling index, L*, and hue angle decreased.

Keywords : chitosan, food additives, modified films, polymers

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