

Title Physical properties of edible chitosan films containing bergamot essential oil and their inhibitory action on *Penicillium italicum*

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Abstract

Chitosan-based films containing bergamot essential oil (BO) at 0.5%, 1%, 2% and 3% w/w were prepared to evaluate their physical and antifungal properties. Film-forming dispersions (FFD) were also characterized in terms of rheological properties, particle size distribution and ζ -potential. In order to study the impact of the incorporation of BO into the chitosan (CH) matrix, water vapour permeability (WVP), mechanical and optical properties of the dry films were evaluated. Furthermore, the antifungal effectiveness of CH-BO composite films against *Penicillium italicum* was studied. Results showed that the incorporation of BO provoked a decrease in the water vapour permeability, this reduction being around 50% when using a BO-CH ratio of 3:1. Concerning mechanical and optical properties, CH-BO composite films were less resistant to break, less deformable and less glossy. The load parameters (TS and EM) decreased more than 50% and the percentage of elongation at break was also dramatically reduced from 22% to 5%, as compared with the pure chitosan films. CH-BO composite films showed a significant inhibitory effect on the growth of *P. italicum*, which depended on the BO concentration. Chitosan films with the maximum bergamot oil content (3:1 BO-CH ratio) led to a total inhibition of the fungus growth during the first 5 days at 20 °C. Although the antifungal effectiveness of the films decreased throughout the storage time, a significant reduction of 2 logarithm units as compared with the control remained possible, after 12 days at 20 °C, using the highest BO content.