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Chitosan and Curcumin films as active packaging with antioxidant-activity

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Introduction

At present, many people are interested in active biopolymer packaging due to its excellent biodegradability, edibility, and potential applications. The goals of developing active packaging systems for foods include extending both shelf life and the time during which food remains of high quality. Active packages are those which, due to the presence of antimicrobial and/or antioxidant additives can extend the freshness period of a packed food product. Chitosan is a natural biopolymer that has been widely used in food packaging applications for its capacity to reduce microbial growth, extend food shelf-life and film forming properties [1]. Therefore, it may be possible to improve chitosan film by incorporating phenolic compounds as a good source of antioxidant agents [2]. This work deals with the production and characterization of films, based on chitosan and containing curcumin as an antioxidant agent.

Experimental

Chitosan and curcumin formulations were prepared by dissolving 1% w/v of chitosan (CHI) in aqueous acetic acid and by adding 0.25%, 0.5% and 1.0% curcumin (CUR) (based on total solid content). The formulations were kept under magnetic stirrer for about 24 hours and then dried in oven at 40°C. The CHI/CUR 0.25, 0.5 and 1 films obtained were characterized for chemical composition and distribution of the curcumin into the chitosan matrix using by Scanning electron microscopy (SEM), Spectrum Spotlight FT-IR Imaging System. Mechanical behaviour was evaluated by DMA, analysis and swelling degree was measured for films dried to up to constant weight and subsequently placed to rehydrate in an environment saturated with water vapor. Free radical scavenging activity of CHI/CUR films was assessed by scavenging activity (DPPH) assay.

Results and Discussion

FT-IR chemical images revealed a homogeneous chemical composition of the films. Spectra acquired from the chemical maps showed the absorption bands characteristic of chitosan and curcumin. The moisture behavior of film showed that the addition of curcumin allowed a modest increase in films stiffness compared with those of pure chitosan. The values of water absorbed over time by samples containing curcumin were lower than those of chitosan. This could be related to the lower hygroscopicity of the antioxidant agent. Moreover, the antioxidant activity of the chitosan film was very low but increased significantly as the curcumin content of the films increased.

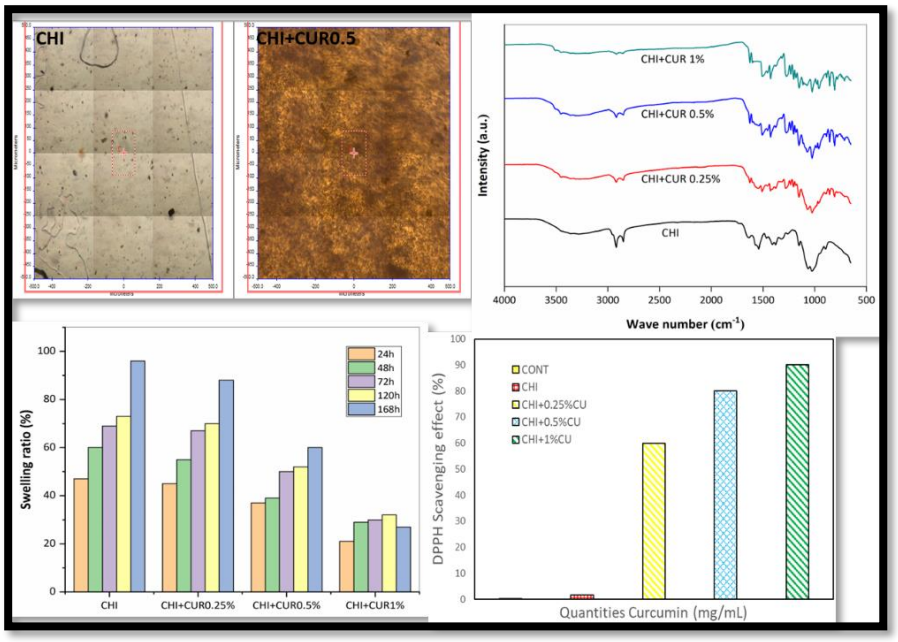

Figure 1. Physical-chemical characterization, swelling ratio and bioactivity of CHI/CUR films

Conclusions

In this work, we demonstrated that incorporation of curcumin confers significant antioxidant activity to the films with a great potential as active food packaging. These results represent a first step towards the valorization of biomass such as chitin extracted from insects.

Biography

Neetu Malik PhD in Mechanical Engineering (Centre for Materials Science and technology (CMST)) Birla Institute of Technology & Science, Pilani at Deemed University of India. She is currently working as a postdoctoral fellow at the Department of Civil and Industrial Engineering (DICI) at the University of Pisa, actively involved in the writing of research proposals in the field of sustainable packaging concepts, experiments conduction and scientific papers production.

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