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SYNTHESIS AND CHARACTERIZATION OF SMART BIOFILMS BASED ON CHITOSAN-CURCUMIN FOR FRUIT PACKAGING

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The strategy of coating fruits with protective films can be used to prevent degradation caused by oxidation or microbiological action. In this process, the fruit surface is covered with a thin layer of protective material that acts as a barrier against microbiological action, gas exchange, dehydration, or oxidation. Chitosan, a natural polymer derived from crustaceans, is widely used in the fabrication of edible films due to its biocompatibility, antimicrobial activity, abundance, as well as its film-forming capability[1]. However, the natural properties of chitosan films can be enhanced. One strategy is to incorporate a natural photosensitizer into the film, which can generate reactive oxygen species (ROS) when irradiated with light at a specific wavelength range. These ROS can then inactivate microorganisms by destroying biomolecules such as proteins, nucleic acids and lipids[2]. Such films containing a photosensitizer can be considered smart as they are capable of producing ROS, enhancing their protective capacity. Therefore, the aim of this study was to synthesize and characterize chitosan edible films containing the photosensitizer curcumin, a pigment found in turmeric. Initially, chitosan was characterized using potentiometric titration, nuclear magnetic resonance spectroscopy (NMR) and infrared spectroscopy (FTIR). Chitosan films with and without curcumin were then produced in Petri dishes. The films containing curcumin at different concentrations were irradiated (t = 5 min, λ_{max} = 450 nm, intensity = 40 mW cm^{-2}) to determine whether their physicochemical properties were altered by the irradiation. These films were investigated for their chemical composition using FTIR and X-ray diffraction techniques. The samples were also examined for subjective analysis (homogeneity, handleability, absence of bubbles, ruptures and fractures), thickness, moisture content, water degradation and soil degradation. The potentiometric titration and NMR techniques were used to determine the degree of deacetylation of the chitosan, yielding values of 97.8 ± 2.2% and 91.4 ± 0.7%, respectively. The thickness of the films was measured and ranged between 50 and 60 µm. Additionally, the subjective analysis of the films revealed that the samples have suitable properties for use as edible films. The characterizations of the films by FTIR and X-ray diffraction confirmed the effective incorporation of curcumin into the samples. Moisture content tests revealed that the presence of curcumin reduces the moisture levels of the films. Conversely, water and soil degradation data indicated that curcumin tends to decrease the degradation capacity of the film samples. It is noteworthy that, although no changes in the physicochemical properties of the irradiated and non-irradiated films were observed, the samples containing curcumin are expected to have greater protective capacity. To test this hypothesis, the next steps of the project will involve applying the films to the surface of the fruits to verify their protective properties. It is expected that the irradiated films containing curcumin will be more effective than those containing only chitosan.

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[1] JURIĆ, S. et al. Food Chemistry: X, v. 17, 2023, p. 100575.
[2] SARAIVA, B. B. et al. Lwt, v. 151, 2021, p. 112143.