Effect of chitosan/Nano-TiO_2 composite coatings on the postharvest quality and physicochemical characteristics of mango fruits

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Abstract

The chitosan nano-coating film used during the storage and preservation of fruits and vegetables is attracting increasing attention. In this investigation, the chitosan/titanium dioxide nanocomposite (nano-TiO_2) coating was prepared with using chitosan as the primary film-forming material and nano-TiO_2 modified by sodium laurate. More importantly, the effects of the chitosan monolayer treatment and chitosan/nano-TiO_2 composite coating on the postharvest physiology and storage of mangoes were investigated. Scanning electron microscopy (SEM) images were used to examine the composite membranes containing different concentrations of nano-TiO_2. The results showed that the mass fractions of the chitosan and nano-TiO_2 in the chitosan/nano-TiO_2 composite film were 1% and 0.03%, respectively. The decay index of the composite coated fruits was 14.49% lower than the control group (CK), and the breathing peak appeared 5 d later. The composite membrane enhanced the firmness of the mangoes, which was 5.9 kg/cm^2 higher that of than uncoated fruits. The total soluble solid content (TSS) was 6.53 % lower than in CK. Furthermore, the peroxidase (POD) and polyphenol oxidase (PPO) activity of the composite coated fruits, as well as the total phenol and flavonoid content was also higher than in CK, while the malonaldehyde (MDA) content was lower than that in CK. These results indicated that the chitosan/nano-TiO_2 composite coating could maintain the nutrient composition of mangoes while playing a significant role in preserving the quality of fruit at 13 °C.