Title Cellulose-silver nanoparticle hybrid materials to control spoilage-related microflora in absorbent pads located in trays of fresh-cut melon

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Abstract

The antimicrobial activity of newly developed cellulose-silver nanoparticle hybrid materials was investigated during storage of minimally processed "Piel de Sapo" melon. Silver nanoparticles were produced after in-situ reduction by physical methods of 1% silver nitrate adsorbed on cellulose fibres; they accounted between 5 and 35 nm diameter, and were not aggregated. Fresh-cut melon pieces were stored for 10 days at 4 °C under natural modified atmosphere packaging, in presence or absence of silver loaded absorbent pads. The evolution of headspace gas composition, quality parameters, and the antimicrobial activity against spoilage-related microorganisms were investigated. The cellulose-silver nanoparticle hybrid materials released silver ions after melon juice impregnated the pad. The released silver ions were particularly useful to control the population of spoilage-related microorganisms in cellulose based absorbent pads in contact with vegetable matrices, showing a low chelating effect against silver ions; the lag phases of the microorganisms were considerably incremented and microbial loads in the pads remained in average approx. 3 $\log_{10}$ CFU/g below the control during the investigated storage period. Furthermore, the presence of silver loaded absorbent pads retarded the senescence of the melon cuts, presenting remarkably lower yeast counts, lower °Brix values, and a juicier appearance after 10 days of storage.