

## **Chitosan/aloe vera gel coatings infused with orange peel essential oils for fruits preservation**

### **ABSTRACT**

Continuous fruit waste poses significant environmental and economic challenges, necessitating innovative fruit coating technologies. This research focuses on harnessing discarded orange peels to extract essential oil (OPEO), which is then integrated into a chitosan/aloe vera (CTS/AVG) matrix. The study comprehensively characterised the coating in terms of its physicochemical properties, antioxidant capacity, and antimicrobial efficacy. The investigation involved an analysis of particle size and distribution in the coating solutions, highlighting changes induced by the incorporation of orange peel essential oil (1 %, 2 % and 3 % v/w) into the chitosan/aloe vera (4:1 v/v) matrix, including particle size reduction and enhanced Brownian motion. The study quantifies a 33.21 % decrease in water vapour transmission rate and a reduction in diffusion coefficient from  $9.26 \times 10^{-11} \text{ m}^2/\text{s}$  to  $6.20 \times 10^{-11} \text{ m}^2/\text{s}$  following the addition of OPEO to CTS/AVG. Assessment of antioxidant potential employing DPPH radical scavenging assays, revealed that CTS/AVG/3 %OPEO exhibited notably superior radical scavenging activity compared to CTS/AVG, CTS/AVG/1 %OPEO, and CTS/AVG/2 %OPEO, demonstrated by its IC<sub>50</sub> value of  $17.01 \pm 0.45 \text{ mg/mL}$ . The study employs the well diffusion method, demonstrating a higher susceptibility of gram-negative bacteria to the coating solutions than gram-positive counterparts. Remarkably, CTS/AVG/3 %OPEO displayed the most pronounced inhibition against *Escherichia coli*, generating an inhibitory zone diameter of  $14 \pm 0.8 \text{ mm}$ . The results collectively emphasised the potential of CTS/AVG/3 %OPEO as a viable natural alternative to synthetic preservatives within the fruit industry, attributed to its exceptional antioxidant and antimicrobial properties.