Biogenic silver nanoparticles-polyvinylpyrrolidone based glycerosomes coating to expand the shelf life of fresh-cut bell pepper (*Capsicum annuum L. var. grossum* (L.) Sendt)

Kandasamy Saravanakumar, Xiaowen Hu, Ramachandran Chelliah, Deog-Hwan Oh, Kandasamy Kathiresan and Myeong-Hyeon Wang

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Abstract

The present work reported the comparative analysis on the preparation and characterization of chemically and green synthesized silver nanoparticles polyvinylpyrrolidone (PVP) based glycerosomes (C/G-PVP-AgNPs) and their function as antimicrobial nanocoating agent to augment the shelf life of the fresh cut pepper (FCP). The UV Spectrophotometer results revealed peak at 400–420 nm indicating the formation of G-AgNPs and C-PVP-AgNPs. The Fourier-transform infrared spectroscopy (FTIR) results indicated the involvement of phytomolecules from the pedicel extracts on the synthesis of G-AgNPs and this analysis displayed the peaks corresponding to copolymers PVP and glycerol in G/C-PVP-AgNPs. The X-ray diffractometer (XRD) results confirmed G-AgNPs followed the occurrence of the Ag in G/C-PVP-AgNPs. The particle size analyzer (PSA) and field emission transmission electron microscopy- Energy Dispersive X-ray Spectroscopy (FETEM-EDS) revealed the mean size of 37.01 nm for G-AgNPs, 123 nm for G-PVP-AgNPs and 45.26 nm for C-PVP-AgNPs. The G-PVP-AgNPs showed more antibacterial activities than the C-PVP-AgNPs as evident by low minimal inhibitory concentration (MIC) and minimal bactericidal concentration (MBC). The application of the nano coating of G-PVP-AgNPs extended the shelf life of the red or yellow FCP (Fresh Cut bell Pepper) for 12 d at 4 °C without causing any harm to cellular or physicochemical properties of FCP. The G/C-PVP-AgNPs coated FCP juices did not cause any toxicity to the survival of roundworms while the uncoated FCP juice caused the cellular damage in the roundworm. These results suggested the potential application of G-PVP-AgNPs as a preservative agent to augment the shelf life of FCP in food industry for the future.