

Title Developing a new antimicrobial edible coating formulation based on carboxymethyl cellulose - silver nanoparticles for coating of 'Berangan' banana (*Musa Sapientum* Cv. Berangan) and in vitro evaluation of its antimicrobial properties

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Abstract

In Malaysia, 'Berangan' banana (*Musa sapientum* cv. Berangan), being one of the important tropical fruits, is becoming increasingly popular due to its unique taste, flavour and high export potential. However, it is also a highly perishable fruit, especially during storage at ambient conditions. Edible coatings incorporated with antimicrobial agents as an alternative packaging method have been employed widely to provide additional protection against contamination of tropical fruits and prolong their shelflife. Silver nanoparticles (SNPs) have attracted intensive research interest due to their high antimicrobial properties. In fact, the larger surface area to volume ratio of SNPs improves their antimicrobial effectiveness against 150 types of microbes. In the present study, antibacterial properties of edible surface coating based on sodium carboxymethyl cellulose (Na-CMC) incorporated with SNPs was investigated against *Escherichia coli* and *Staphylococcus aureus*. Results obtained indicated that minimum bactericidal concentration of SNPs was 60 ppm. Crown rot and anthracnose are two primary postharvest rots of banana, which are caused by the fungus, *Colletotrichum musae*. In vitro evaluation of antifungal properties of edible coating comprising of Na-CMC (1.32%)-Na-caseinate (0.40%)-glycerol (0.86% w/w)-SNPs (60 ppm) against *C. musae*, indicated that this coating formulation significantly ($p < 0.05$) inhibited the growth of this fungus as compared to the same coating formulation without SNPs. Thus, these results indicated that Na-CMC based coating formulation conjugated with SNPs can be employed as a new antimicrobial coating for banana and other fruits to control their diseases.