

Development of size controlled chitosan nanoparticles for anti-microbial food packaging applications

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Abstract:

Chitosan is a naturally occurring polysaccharide has many unique properties such as biocompatibility, biodegradability and anti-microbial activity [1, 2]. This makes chitosan an ideal food grade anti-microbial. The objectives of this study were to develop a size controlled chitosan nanoparticles (CSNP's) for use as an antimicrobial material.

CS NP's were prepared using an ionic gelation technique, with sodium tripolyphosphate (TPP) as the crosslinking agent. The size and dispersity of the CS NP's were controlled using both an ultrasonic technique and change in concentration of chitosan at initial formation. Antimicrobial properties of the synthesised NPs were assessed using the disk diffusion method and the minimum inhibitory concentration (MIC) was determined using a microdilution method against *Pseudomonas fluorescens* (NCIMB 9046) and *Staphylococcus Aureus* (NCIMB 13062).

It was found that the size and monodispersity of concentrations of 0.5 and 0.75 w/v% CS NPs could be controlled using high intensity sonication; however for 0.1 w/v% CS NPs did not require any external forces to produce monodisperse CS NPs. The anti-microbial assay results indicated that CS NPs of 125 and 250 nm have good anti-microbial properties against both bacterial strains tested. Evidence from the results suggests that monodisperse CS NPs have potential for antimicrobial packaging applications

References:

1. Qi, L., et al., Preparation and antibacterial activity of chitosan nanoparticles. *Carbohydr Res*, 2004. 339(16): p. 2693-700.
2. Fan, W., et al., Formation mechanism of monodisperse, low molecular weight chitosan nanoparticles by ionic gelation technique. *Colloids Surf B Biointerfaces*, 2012. 90: p. 21-7.

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