

Antibacterial Activity of Silvernano-Chitosan Composite

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Silver nanoparticles, ranging from 1-100 nm in diameter, are well-known for their anti-microbial activity. Both silver and chitosan have been well known for their anti-microbial activity separately. The combination of these two in a nanocomposite, expects to exhibit enhanced anti-microbial activity other than their macro-scaled counterparts. In this study, chitosan-based silver nanoparticles (AgNPs) were synthesized using silver nitrate (AgNO_3) as the salt precursor, non-toxic and biodegradable chitosan as the stabilizer and gamma ray irradiation as the method of reduction.

Sample solutions (1 mM AgNO_3 in 0.1% (w/v) chitosan, 2 mM AgNO_3 in 0.1% (w/v) chitosan, 1 mM AgNO_3 in 0.5% (w/v) chitosan, 2 mM AgNO_3 in 0.5% (w/v) chitosan) were prepared along with control samples and irradiated at 20 ± 2 kGy. Formation of the silvernano particles was observed by the appearance of the yellow colour of the solution and the maximum absorption band at 420 nm in the UV-Visible spectrum. Silvernano-chitosan composite was further characterized using FT-IR spectroscopy and the particle size analyzer. The stability of the synthesized particles was monitored for three months by UV-visible spectroscopy. The sample having 2 mM AgNO_3 in 0.5 % (w/v) chitosan was stable during this period. This sample was used to determine the anti-bacterial activity against *Bacillus subtilis* (*B. subtilis*) and *Escherichia coli* (*E. coli*). Pure cultures of *B. subtilis* and *E. coli* were obtained. Antibacterial activity of silvernano-chitosan composite was determined using the filter disk diffusion method. After incubating 24 h at 37°C mean diameter of the inhibited zones was measured.

Silvernano-chitosan composite [2 mM AgNO_3 in 0.5 % (w/v) chitosan] showed a significant inhibition towards *B. subtilis* and *E. coli* (mean diameters of clear zones were 0.8 (± 0.1) cm and 1.4 (± 0.1) cm, respectively) compared to 0.5% (w/v) chitosan sample irradiated at 20 ± 2 kGy (control). Silvernano-chitosan composite is more efficient than chitosan without silver nanoparticles in controlling above bacteria. This composite has a good potential to be developed into commercially viable end products in food packing.