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Novel activities of green synthesized silver nanoparticles in food preservation

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Because of the potential uses in the development of new technologies, the synthesis of metal and semiconductor nanoparticles is a growing study topic. Biologically generated nanomaterial, in particular, has emerged as an important branch of nanotechnology. The current study investigates the biogenic production of silver nanoparticles from benign and non-toxic aqueous leaf extract and their antibacterial activity. In the green production of Ag NPs from aqueous silver ions, the phytochemical substances worked as a reducing and stabilizing agent. X-Ray Diffraction (XRD), UV–visible absorption (UV–Vis), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM) and Fourier Transform Infrared (FT-IR) spectroscopy were used to validate the nanoparticles. At 430 nm, the surface plasmon resonance caused substantial absorption. The crystalline nature of the particles was confirmed by XRD examination, with an average crystallite size of 40 nm. FT-IR analysis was also utilized to identify putative biomolecules involved in silver ion bio-reduction. Antimicrobial activity was used to confirm the bactericidal efficiency of produced nanoparticles against foodborne pathogenic microorganisms. Besides, the mechanism of action responsible for morality of microorganisms was assessed and showed that disruptions of membranes, leakage of intracellular biomolecules, are the main mechanisms. Furthermore, polysaccharide hydrogels encapsulating silver nanoparticles were prepared and they showed fruit and vegetable preservative effects as well as increasing their shelf life. Green synthesis of Ag NPs appears to be ecologically benign, cost-effective, and more successful than conventional one-spot synthesis and are highly effective as preservatives and antimicrobial agents in food systems.

Conclusion: In conclusion, in this study, we report that silver nanoparticles can be biosynthesized using non-toxic constituents and low-energy intensive techniques. The fabricated AgNPs showed good stability and excellent antimicrobial activity against food-borne pathogenic microorganisms. The silver nanoparticles encapsulated in hydrogel matrix showed very good food preservative effect as evident from fruits and vegetable samples. Thus, these silver nanoparticles can act as two-faced sword inhibiting harmful microbes as well as extending the freshness or shelf-life of food matrices without imparting any toxicity.

Importance of research: This research work shall pave new ways covering new facets of use for silver nanoparticles. Various studies have covered the toxicological aspects of such metal nanoparticles but use of such fabricated biogenic particles can be applied in various novel scenarios along with areas of food preservation.

Biography

Niloy Chatterjee is a Ph.D scholar working in the field of Nanoscience and Nanotechnology. He obtained his masters in Microbiology from University of Calcutta. He has expertise in the field of Nanomaterials biosynthesis along with nanoemulsions and such related drug delivery systems. He published several chapters in reputed books and review papers in peer reviewed journals.

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