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Phytochemical, Biosynthesis, Characterization and Antimicrobial Activity Of Selenium Nanoparticles Using *Allium Sativum*

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ABSTRACT

Allium sativum is a spice and medicinal plant that has many potentials including antifungal and antibacterial activity. Selenium nanoparticles have become a focus of current interest because of their medicinal properties and antimicrobial potentials. Green synthesis is a biological method of nanoparticles synthesis which is an alternative to chemical and physical methods. This study was aimed at investigating the potentials of *A. sativum* extract for the biosynthesis of selenium nanoparticles (SeNPs) and their antimicrobial activities. Phytochemical screening on aqueous extract was carried out using standard procedures. SeNPs was biosynthesized by *A. sativum* and characterized using Visual detection, UV-Visible spectroscopy, Scanning Electron Microscope, Transmission Electron Microscope, Energy Dispersive X-Ray, X-ray diffraction spectroscopy and Fourier Transformed Infra-red spectroscopy. The effect of the cultivation conditions of the SeNPs was carried out on temperature, pH, volume of extract, concentration of salt, incubation time. Comparison of the antibacterial activity of antibiotics and SeNPs was done using agar-well method. Tannins, Saponins, cardiac glycosides and terpenoids were present. The biosynthesized SeNPs were characterized by a SPR peak at 300 nm and a broad band of 200 - 400 nm. There were colour changes from slightly yellow to orange, they were spherical and square in shape, ranging from 20 - 100 nm in size. There was a strong signal of Selenium and there were no impurities. Functional groups including esters, amino acids, hydroxyl, and carboxylic acid were identified. At 48 hrs incubation time, 37 °C incubation temperature and 8 mM concentration of Na₂SeO₃ the biosynthesis of SeNPs by *A. sativum* extract was induced. GASeNPs and Ciprofloxacin exhibited higher antimicrobial activity than Na₂SeO₃. Greenly synthesized SeNPs are safe and effective for inhibiting the growth of pathogenic organisms.

Keywords: Allium sativum extract, Medicinal plants, Green synthesis, Zone of inhibition, Scanning Electron Microscope.

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