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Biosynthesis of Silver Nanoparticles from Leaf Extract of Tithonia diversifolia and Its Antimicrobial Properties

Authors : Babatunde Oluwole Ogunsile, Omosola Monisola Fasoranti

Abstract : High costs and toxicological hazards associated with the physicochemical methods of producing nanoparticles have limited their widespread use in clinical and biomedical applications. An ethically sound alternative is the utilization of plant bioresources as a low cost and eco–friendly biological approach. Silver nanoparticles (AgNPs) were synthesized from aqueous leaf extract of Tithonia diversifolia plant. The UV-Vis Spectrophotometer was used to monitor the formation of the AgNPs at different time intervals and different ratios of plant extract to the $AgNO_3$ solution. The biosynthesized AgNPs were characterized by FTIR, X-ray Diffraction (XRD) and Scanning Electron Microscope (SEM). Antimicrobial activities of the AgNPs were investigated against ten human pathogens using agar well diffusion method. The AgNPs yields were modeled using a second-order factorial design. The result showed that the rate of formation of the AgNPs increased with respect to time while the optimum ratio of plant extract to the $AgNO_3$ solution was 1:1. The hydroxyl group was strongly involved in the bioreduction of the silver salt as indicated by the FTIR spectra. The synthesized AgNPs were crystalline in nature, with a uniformly distributed network of the web-like structure. The factorial model predicted the nanoparticles yields with minimal errors. The nanoparticles were active against all the tested pathogens and thus have great potentials as antimicrobial agents.

Keywords : antimicrobial activities, green synthesis, silver nanoparticles, Tithonia diversifolia
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