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Characterization, Antibacterial and Cytotoxicity Evaluation of Silver Nanoparticles Synthesised Using Grewia lasiocarpa E. Mey. Ex Harv. Plant Extracts

Authors : Nneka Augustina Akwu, Yougasphree Naidoo

Abstract : Molecular advancement in technology has created a means whereby the atoms and molecules (solid forms) of certain materials such as plants, can now be reduced to a range of 1-100 nanometres. Green synthesis of silver nanoparticles (AgNPs) was carried out at room temperature (RT) 25 ± 2°C and 80°C, using the metabolites in the aqueous extracts of the leaves and stem bark of Grewia lasiocarpa as reductants and stabilizing agents. The biosynthesized AgNPs were characterized by UV-Vis spectrophotometry, attenuated total reflectance - Fourier transforms infrared (ATR-FTIR) spectroscopy, nanoparticle tracking analysis (NTA), Energy Dispersive X-ray fluorescence scanning electron microscope (SEM-EDXRF) and high-resolution transmission electron microscopy (HRTEM). The AgNPs were biologically evaluated for antioxidant, antibacterial and cytotoxicity activities. The phytochemical and FTIR analyses revealed the presence of metabolites that act as reducing and capping agents, while the UV-Vis spectroscopy of the biosynthesized NPs showed absorption between 380-460 nm, confirming AgNP synthesis. The Zeta potential values were between -9.1 and -20.6 mV with a hydrodynamics diameter ranging from 38.3 to 46.7 nm. SEM and HRTEM analyses revealed that AgNPs were predominately spherical with an average particle size of 2- 31 nm for the leaves and 5-27 nm for the stem bark. The cytotoxicity IC50 values of the AgNPs against HeLa, Caco-2 and MCF-7 were >1 mg/mL. The AgNPs were sensitive to all strains of bacteria used, with methicillin-resistant Staphylococcus aureus (MRSA), Staphylococcus aureus (ATCC 25923) and Escherichia coli (ATCC 25922) being more sensitive to the AgNPs. Our findings propose that antibacterial and anticancer agents could be derived from these AgNPs of G. lasiocarpa, and warrant their further investigation.

Keywords : antioxidant, cytotoxicity, Grewia lasiocarpa, silver nanoparticles, Zeta potentials
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