

Abstract

Green synthesis of silver nanoparticles has gained great attention in the field of nanotechnology for their immense potential in biomedical applications. The purpose of this research work is to synthesize environmentally benign and cost-effective metal nanoparticles. In this current research scenario, the leaf extract of *Cedrela toona* was used as a reducing agent to biosynthesize silver nanoparticles (AgNPs), and then the antibacterial, antioxidant, and cytotoxic activities of synthesized nanoparticles were evaluated. Different experimental factors were optimized for the formation and stability of AgNPs. The synthesis of AgNPs was confirmed by the color shift of the reaction mixture i.e. silver nitrate and plant extract, from yellow to dark brown colloidal suspension and was established by UV-visible analysis showing a surface plasmon resonance band at 434 nm. The optimum conditions were found to be 1mM AgNO₃ concentration, a 1:9 ratio of extract and precursor, and 70°C incubation temperature. The spectrum of Fourier transform infrared spectroscopy indicated the presence of phytochemicals in the leaf extract that played their role as bioreducing agents in the formation of AgNPs. The size distribution and morphology of AgNPs were investigated by scanning electron microscopy (SEM) which showed irregular flower shape and size distribution of 58 to 99 nm with a mean average size of 79 nm. Moreover, the antibacterial activity of AgNPs was evaluated against *E. faecalis*, *S. aureus*, *B. subtilis*, *E. coli*, *P. mirabilis*, *K. pneumoniae*, and *P. aeruginosa* where maximum activity was found against *P. mirabilis*. In addition, antioxidant activity was checked by DPPH assay which was found higher in synthesized AgNPs compared to plant extract. Furthermore, cytotoxic activity was also investigated by MTT assay against MCF-7 cells. The results indicated that silver nanoparticles synthesized from *Cedrela toona* leaf extract could be employed as an antibacterial, antioxidant, and antineoplastic agent for the treatment of bacterial, free radical-oriented, and cancerous diseases.