Exploring the therapeutic potentials of phytomediated silver nanoparticles formed via Calotropis procera (Ait.) R. Br. root extract

ABSTRACT

The objective of this work is to develop cost-effective, reliable, and large-scale production of metallic nanoparticles (NPs) by adopting green chemistry principles for industrial applications. In that view, we have studied the phytochemical reducibility of silver nitrate by making use of Calotropis Procera (Ait.) R. Br root extract, and based on its medicinal properties, an attempt was made to evaluate the therapeutic potentials of silver (Ag) NPs containing this plant extract towards the clinical strains of bacteria. The optimization studies on reducing the potentials were done considering the concentration, pH, temperature, and reaction period of both the extract and the metal precursor. The nanoarchitecture elements were interpreted using visual, spectroscopic, and microscopic analyses cohorting the antibacterial potentials towards the clinically significant strains. The antimicrobial activity exercised by these Ag NPs towards 10 different strains of medically important bacteria at a given concentration was proved to be significant. The antimicrobial potential was further validated quantitatively, and the MIC/MBC concentration values were determined. Finally, the cytotoxicity of Ag NPs when tested against the HEPK cell line indicated that the metal-phytochemical moiety exhibited the maximum therapeutic efficacy and thereby paving the way for the development of disruptive technologies in the field of nanomedicine.

Keyword: Green synthesis; Silver nanoparticles; Plant extract; Calotropis procera; Antimicrobial assay; Cytotoxicity