ORIGINAL RESEARCH

69. Green Synthesis of Streptomycin-Conjugated Silver Nanoparticles and their Efficacy Against Multi Drug-Resistant Staphylococcus aureus

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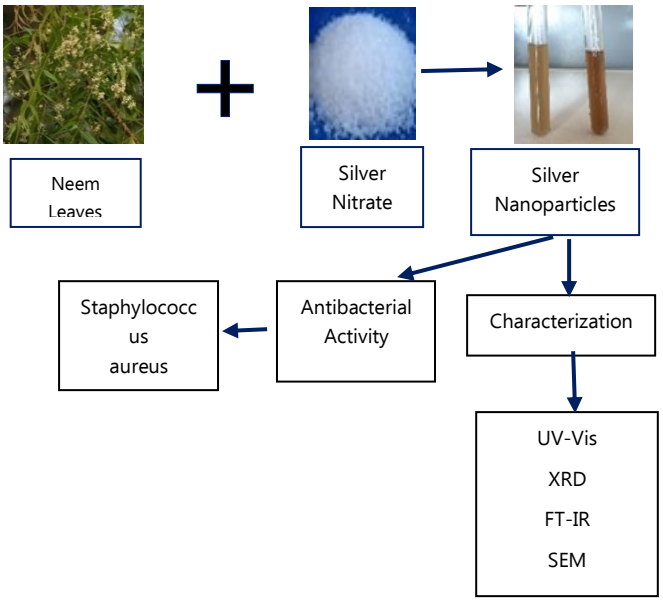
Background: The emergence of multidrug resistant (MDR) pathogenic microbes against typical antibiotics is a global problem. Novel and effective strategies are being explored to treat various disease causing MDR pathogens. In this study, we prepared and tested the efficacy of antibiotic-conjugated silver nanoparticles against MDR-pathogens.

Methods: We used the plant extract for the green-synthesis of Silver nanoparticles (AgNPs) as well as Streptomycin-conjugated AgNPs. The aqueous *Azadirachta indica* (Neem) leaf extract was used for the synthesis of AgNPs. The synthesized nanoparticles were characterized by various techniques and the antimicrobial activity was determined by agar-well plate method.

Results: The green synthesized Streptomycin-conjugated AgNPs were characterized by different analytical techniques to establish the nanoparticle formation, size, shape and the presence of functional groups. The UV-visible spectra indicating absorbance at 450 and 440nm confirmed the formation of AgNPs and St-AgNPs, respectively. The scanning electron microscopic images showed that AgNPs and St-AgNPs are spherical in shape and the size in the range of 21-30 nm and 29-43 nm, respectively. The X-ray diffraction pattern of AgNPs and St-AgNPs showed peaks establishing the crystalline nature of the particles with characteristic peaks of 2θ for (111), (200), (220) and (311) planes. The Fourier Transform Infrared spectrum of St-AgNPs shows distinct peaks at 2980.47 (C-H bond), 1723.37(C=O bond), 1606.89 (C=C bond), 1507.63 (N-O group), 1445.33 (C-H), 1269.02 (C-O bond),1019.19 (C-O bond), and 812.43 cm (C-C bond) which corresponds to the functional groups present in both AgNPs and the conjugated antibiotic streptomycin. Further, the antimicrobial activity of AgNPs and St-AgNPs was examined by using the agar-well plate method against MDR Staphylococcus aureus. The antimicrobial activity analysis showed that St-AgNPs exhibited ~50% higher activity as compared to streptomycin alone.

Conclusion: The results of our study indicate that the green synthesized antibiotic conjugated AgNPs could be used to treat MDR *Staphylococcus aureus* and potentially other MDR pathogens as well. Further detailed studies are in progress to confirm the utility of these antibiotic conjugated AgNPs.

Figure 1. Green Synthesis Workflow of Silver Nanoparticles using Neem Leaves



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