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Antimicrobial Activity of Biosynthesized Silver Nanoparticles Using Different Bacteria

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Abstract : Objectives of the study are: the biosynthesis of silver nanoparticles (AgNPs) using Escherichia coli, Acinetobacter baumannii and Staphylococcus aureus, characterization of silver nanoparticles and determination of antimicrobial activity against E. coli, P. aeruginosa, S. aureus, MRSA, and C. Albicans. Methods: E. coli (ATCC 25922), A. baumanii (clinical strain), S. aureus (clinical strain) cultured in nutrient broth medium were used for biosynthesis of AgNPs. Culture conditions (AgNO3 concentration, pH, incubation time and temperature) were optimized. Characterization of synthesized NPs was done by UV-Visible spectroscopy. The antimicrobial activity of the synthesized NPs was studied using the good diffusion assay against E. coli, S. aureus, MRSA (Methicillin-resistant Staphylococcus aureus), P. aeruginosa and C. Albicans. Results: All the selected bacteria produced silver nanoparticles at alkaline pH above 0.3 g/L AgNO3 concentration. The optimum reaction temperature was 60oC. According to the UV-Visible spectroscopy, the maximum absorbance was found to be around 420 - 430 nm indicating the presence of AgNPs. According to the good diffusion results, AgNPs produced by S. aureus resulted in the larger zone of inhibition (ZOI) against the selected pathogens, while AgNPs produced by E. coli showed comparatively smaller ZOI. In general, biosynthesized AgNPs were highly effective against gram-negative bacteria compared to gram-positive bacterial and fungal species. Conclusions: Green AgNPs produced by each bacterium show antimicrobial activity against the selected pathogens. AgNPs produced by S. aureus are the most effective NPs among tested AgNPs, while AgNPs produced by E. coli are the least effective. Further characterization of NPs is required to study the physical properties of silver NPs.

Keywords : green nanotechnology, silver nanoparticles, bacteria, antimicrobial activity
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