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Kaempferia galanga aqueous extract coated silver nanoparticles: Synthesis and *in vitro* screening for antimicrobial properties

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Background: Medicinal plants consist of potent bioactive secondary metabolites and are a source of promising therapeutic agents for the improvement of wound healing processes. In traditional medicine, rhizomes of *Kaempferia galanga* (aromatic ginger, inguru piyali, Family: Zingiberaceae) are pounded into a poultice and applied to treat wounds.
Objective: Synthesis of *K. galanga* silver nanoparticles (KG-AgNPs) and *in vitro* screening for antimicrobial properties.
Methods & Materials: Rhizomes of *K. galanga* (100 g) were subjected to Soxhlet extraction (100 °C, 36 hour) in H_2O. Resulting extracts (3.0, 6.0, 9.0 mg/mL) were mixed with $AgNO_3$ (90 mL, 1 mM), in separate to synthesize KG-AgNPs. Several different conditions i.e., homogenization or magnetic stirring with exposure to UV light/sunlight/dark were employed and yields were optimized based on UV spectral data. Nanoparticles were characterized using particle size analyzer. Total polyphenol content (TPC), loading efficiencies (LE) and loading capacities (LC) were calculated using Folin-Ciocalteu assay. Antimicrobial activity of AgNPs with the highest LE and LC was evaluated by Agar well-diffusion and broth microdilution methods against *Staphylococcus aureus* (ATCC 25923).
Results: The observed Z-average particle diameter was 158.6±1.0 nm with polydispersity index (PDI) of 0.340 for KG-AgNPs with a zeta potential at –20.3±1.7 mV. The Z-average particle diameter, PDI and zeta potential of uncoated silver nanoparticles (U-AgNPs) were 128.8±0.8 nm, 0.474 and –17.6±1.2 mV, respectively. The highest LE (89.02±0.88%) and LC (4.56±0.13%) were obtained at 6.0 mg/mL loading concentration. The inhibition zone diameter of KG-AgNPs was 20 mm, while it was zero for the crude extract at 10 mg/mL. In the broth microdilution assay, KG-AgNPs, U-AgNPs and the crude extract at the concentration of 2.5 mg/mL showed microbial growth of 1.53±0.01%, 18.81±0.01% and 66.56±0.01% respectively.
Conclusion: The present study revealed that the novel KG-AgNP formulation is a promising antimicrobial agent with potential application in wound healing.
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