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Antimicrobial activity of silver and zinc oxide nanoparticles and formulated cream from *Nigella sativa* seed oil hexane fraction.

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ABSTRACT

Antimicrobial activity of Silver nanoparticles (Ag-NPs) and Zinc oxide nanoparticles (ZNO-NPs) biosynthesized from hexane fraction of *Nigella sativa* seed oil (Nshf), the Nshf silver and zinc oxide nanoparticle s(NshfAg-NPs and NshfZnO-NPs) and their formulated cream-blend was investigated. NshfAg-NPs and NshfZNO-NPs were characterized using visual observation, UV-visible spectrophotometry, Fourier Transform Infrared Spectrophotometer (FTIR), Scanning Electron Microscopy (SEM), Thermogravimetry Analysis (TGA), Dynamic Light Scattering (DLS), Energy Dispersive X-ray (EDX), and X-ray Diffraction (XRD). NshfAg-NPs and NshfZNO-NPs had surface plasmon resonance peaks at 450nm and 500 nm. Alkenes, alkynes and alkyl aryl ether were the prominent functional group found associated with the nanoparticle. SEM, DLS and TGA analysis showed needle-like and rectangular particles with 6.0 nm and 4.0 nm in sizes, particle diameter average of 223.6 nm and 383.7 nm, Polydisperse index of 0.791 and 0.489 and thermo-stable particles with degradation temperatures of 250^oC and 301^oC for NshfAg-NPs and NshfZNO-NPs. EDX and XRD analysis shows the formation of pure silver and zinc oxide nanoparticles and their crystalline nature. The nanoparticle have antimicrobial activity against the test bacteria, fungi and methicillin resistant *Staphylococcus* strains. NshfAg-NP had higher activity compare to NshfZNO-NPs and *Candida tropicalis* has the highest susceptibility (20 mm). Optimization of production parameters has effect on the nanoparticle production. Cream blends formulated using the nanoparticle were white in colour homogenous and smooth with pH, spreadability and viscosity well within the acceptable range for topical application. Thus NshfAg-NPs has a broad spectrum antimicrobial potency compared to NshfZNO-NPs and the nanoparticle are good blends for nano-cream-blend formulations.

Keywords: *Nigella sativa* hexane fraction, silver and zinc oxide nanoparticle, Antimicrobial property, *Candida tropicalis* and *Staphylococcus epidermidis*, formulated cream.

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