

Investigation of antibacterial activity of copper oxide nanoparticles synthesised from *Aspergillus* species

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ABSTRACT

Introduction: Nanoparticles (NPs) with size ranging from 10 to 100 nm, are classified as materials with vastly different properties compared to their bulk and molecular equivalents. Green synthesis of nanoparticles is the current buzzword due to its potential capability in reducing nanoparticle toxicity and its production to be scaled up efficiently. **Materials and methods:** *Aspergillus* species were isolated from the soil sample, Copper oxide nanoparticles (CuO NP's) were synthesised using aqueous extract of *Aspergillus*. Characterisation studies of CuO NP's were carried out using Ultra Violet spectrophotometric analysis (UV-Vis), Fourier Transform Infrared Spectroscopy (FTIR), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Energy Dispersive X-ray analysis (EDX) & Thermo Gravimetric Analysis (TGA). Antibacterial activity of synthesised CuO NP's were tested against selected Gram positive and negative bacteria using disc diffusion method. Synergistic antibacterial activity of the CuO NPs was also studied using various antibiotics available in the market. **Results and conclusion:** *Aspergillus* was confirmed through microscopical examination, characterization results proved the biosynthesised CuO NPs were well in nano range scale, UV-Vis recorded the maximum absorbance at 265 nm. FTIR confirms various functional groups associated with the NP's, SEM analysis confirmed the surface topology of the NPs, furthermore mean particle size was measured as 37.39 ± 11.2 nm according to TEM image. EDX confirms the elemental purity of copper, TGA confirms the stability of nanoparticles at various temperatures. Antimicrobial testing demonstrated that *Staphylococcus aureus* had the greatest zone of inhibition (21mm) at a concentration of 80 $\mu\text{g}/\mu\text{l}$, however the synthesised CuO NP's showed good synergistic effect in combination with selected antibiotics against tested bacteria. To conclude the biosynthesised CuO NP's can be a potential antibacterial agent which has further to be studied exclusively for its toxicity and efficacy *in vivo*.

Keywords: *Aspergillus*, Copper oxide nanoparticle, TEM, Antibacterial activity.