ABSTRACT

The present study was conducted to synthesize cerium oxide nanoparticles by plants, microbial and chemical means. The nanoparticles synthesized by these methods were characterized using X-ray diffraction, Fourier Transform Infrared, and Scanning Electron Microscope, and UV-Vis spectroscopy analysis. The phytosynthesised and bacteriagenic nanoparticles showed a surface plasmon resonance peak at 340nm and 355nm. Additionally, nanoparticles synthesized from plants were rectangular in shape in shape with an average size of 97nm.The bacteriagenic nanoparticles appeared in the form of nanoclusters where a number of nanoparticles were agglomerated to form huge structures. On the other hand, chemically prepared nanoparticles showed absorbance at 350nm and were found to be cotton-like in structure with an average size of about 87nm. All of these nanoparticles had crystalline nature and were surrounded by capping agents being depicted by results of XRD and FTIR. The antibacterial activity of plant and bacteriagenic cerium nanoparticles was maximum in comparison to other nanoparticles. The zones of inhibition *Staphylococcus aureus* was 19mm± 0.8, 18± 0.8 *Streptococcus pyogenes*, 16± 0.6 for *Pseudomonas aureginosa* and 17± 0.9 *Escherichia.coli*. The minimum inhibitory concentration of nanoparticle as determined against each bacteria were: *S. aureus*: 6&11ug/ml, *S. pyogenes*: 7&11 ug/ml, *P. aeruginosa*: 13&24ug/ ml, and *E. coli*: 11/24ug/ml respectively. To enhance their production, various parameters were optimized for both plants and bacteria successfully. Bacteriagenic nanoparticles exhibited maximum production in Nitrate broth, 50mg bacterial biomass at 80°C, pH 9 for 80 hours. Phytosynthesised nanoparticles showed enhanced production in presence of 8ml extract, 10mM metal ion concentration at 80°C, PH 9 for 72 hours.