**Abstract**

In this study, aqueous extract of *Spirulina platensis* has been utilized as a reducing and stabilizing agent in a green synthesis method that produces silver capped zinc oxide nanoparticles. *Spirulina platensis* aqueous extract was optimized at 0.5 % concentration and 4° C, centrifuged at 6000 rpm for 5 minutes, and gave UV-Vis spectra peaks at 300-400 nm and 550-600 nm, and Ag-ZnO NPs showed UV-Visible spectra peaks at 300-400 nm at optimized conditions. Zetasizer study verified that Ag-ZnO NPs had an average size of 204 ± 0.28 nm. Functional groups, crystallinity, and surface morphology were further investigated by FTIR, SEM and XRD analysis. Research into novel nanoparticles with antimicrobial properties is urgently needed because antibiotic overuse is a major concern in public health. The present research explores the antibacterial potential of Ag-ZnO NPs. Silver capped zinc oxide nanoparticles was tested with a range of Gram-positive (*Streptococcus* species, *Staphylococcus aureus*) and gram-negative (*Pseudomonas aeruginosa*, *Escherichia coli*, *Klebsiella pneumonia*) bacteria that are intrinsically resistant to antibiotics like colistin, ampicillin, gentamicin, augmentin, trimethoprim, amoxicillin-clavulanic acid, ceftriaxone and penicillin. Compared to ascorbic acid (80%), Ag-ZnO NPs demonstrated an excellent 84% antioxidant activity at 530 nm. Anticancer potential with an $IC_{50}$ of 6.401 µg/mL for immobilized NPs indicates high cytotoxicity.