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Title: Green Synthesis of Zinc Oxide Nanoparticles (ZnO-NPs) Using *Arthrospira platensis* (Class: Cyanophyceae) and Evaluation of their Biomedical Activities

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ABSTRACT

In this study, zinc oxide nanoparticles (ZnO-NPs) were successfully fabricated through the harnessing of metabolites present in the cell filtrate of a newly isolated and identified microalga *Arthrospira platensis* (Class: Cyanophyceae). The formed ZnO-NPs were characterized by UV-Vis spectroscopy, Fourier transform infrared (FT-IR), transmission electron microscopy (TEM), energydispersive spectroscopy (EDX), X-ray diffraction (XRD), and X-ray photoelectron spectroscopy (XPS). Data showed the efficacy of cyanobacterial metabolites in fabricating spherical, crystallographic ZnONPs with a size ≈ 30.0 to 55.0 nm at a wavelength of 370 nm. Moreover, FT-IR analysis showed varied absorption peaks related to nanoparticle formation. XPS analysis confirms the presence of Zn(II)O at different varied bending energies. Data analyses exhibit that the activities of biosynthesized ZnO-NPs were dose-dependent. Their application as an antimicrobial agent was examined and formed clear zones, 24.1 ± 0.3 , 21.1 ± 0.06 , 19.1 ± 0.3 , 19.9 ± 0.1 , and 21.6 ± 0.6 mm, at 200 ppm against *Bacillus subtilis*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Escherichia coli*, and *Candida albicans*, respectively, and these activities were reduced as the NPs concentration decreased. The minimum inhibitory concentration (MIC) values were determined as 50 ppm for *S. aureus*, 25 ppm for *P. aeruginosa*, and 12.5 ppm for *B. subtilis*, *E. coli*, and *C. albicans*. More interestingly, ZnO-NPs exhibit high in vitro cytotoxic efficacy against cancerous (Caco-2) ($IC_{50} = 9.95$ ppm) as compared with normal (WI38) cell line ($IC_{50} = 53.34$ ppm).

Keywords: cyanobacteria; *Arthrospira platensis*; ZnO-NPs; antimicrobial; in vitro cytotoxicity