BIOGENIC ZnO NANOPARTICLES: STRUCTURAL CHARACTERISATION AND BIOACTIVITY EVALUATION

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Abstract. Zinc oxide nanoparticles (ZnO NPs) were synthesised using *Nicotiana plumbaginifolia* plant extract through a green approach. XRD, FTIR, and EDX confirmed their hexagonal wurtzite structure and high purity. SEM and TEM showed spherical ZnO NPs (16–24 nm), with a band gap of 3.33 eV. FTIR spectra displayed a peak at 480 cm^{-1}, confirming Zn–O bond formation. The ZnO NPs exhibited strong antibacterial activity against *P. aeruginosa, E. coli, K. pneumoniae,* and *S. aureus* at 100 μL using the well diffusion method. They also showed excellent antioxidant potential, scavenging DPPH radicals with 75.59% inhibition at 250 μg/mL. This eco-friendly synthesis method offers a sustainable approach for ZnO NP production, highlighting their potential for biomedical and pharmaceutical applications.

Keywords: green synthesis, ZnO nanoparticle, EDX, FT-IR, SEM, antibacterial activity, antioxidant activity.