

# Energy-efficient synthesis of ZnO nanoparticles using white ash gourd fruit extract for their medicinal and environmental applications

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This work reports the green synthesis of ZnO nanoparticles (NPs) using white ash gourd fruit juice. The synthesized NPs have been characterized by various spectroscopic techniques like UV-Visible, FT-IR, Powder XRD and FE-SEM. These NPs display a prominent absorbance at 357 nm in UV-Visible spectra. X-ray diffraction studies confirm the formation of crystalline ZnO NPs with the wurtzite phase. The average particle size (D) of the synthesized ZnO NPs is found to be 40.48 nm. FE-SEM images reveal that synthesized ZnO NPs have nano-flaky structures. The prepared ZnO NPs have achieved 99% photodegradation efficiency against MB dye in 90 min of irradiation of UV light. These synthesized NPs have also been examined for three biological activities: Antimicrobial, antioxidant and anti-diabetic. Antimicrobial activity has been found to be good to moderate. The synthesized ZnO NPs show excellent anti-diabetic activity ( $\alpha$ -amylase activity) compared to standard with IC<sub>50</sub> value equal to 1.21  $\mu\text{g/mL}$ . For  $\alpha$ -glucosidase, green synthesized ZnO NPs (IC<sub>50</sub> value 0.23  $\mu\text{g/mL}$ ) exhibit excellent inhibition activity compared to standard Acarbose (IC<sub>50</sub> value 0.24  $\mu\text{g/mL}$ ). ZnO NPs show better antioxidant capability as well.

**Keywords:** Green synthesis, White ash gourd, Crystalline, Photocatalysis, Anti-diabetic, Antimicrobial