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Synthesis and Characterization of Zinc Oxide Nanoparticles and Their Role in Enhancing Groundnut Growth

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In this study, zinc oxide nanoparticles were synthesized through a simple and cost-effective chemical precipitation method using zinc acetate as the precursor and sodium hydroxide as the reducing agent. The synthesized nanoparticles were characterized and subsequently employed to evaluate their effects on the seed germination of the K7 variety of groundnut. A range of nanoparticle concentrations (50 ppm, 100 ppm, 150 ppm, 200 ppm, 250 ppm, and 300 ppm) were prepared to determine the optimum level for promoting seed germination. Germination assays were conducted under controlled conditions using sterilized Petri plates lined with moistened filter paper. Groundnut seeds were treated with each concentration, and germination progress was recorded daily over a period of seven days. Among all the tested concentrations, the 100 ppm treatment exhibited the most significant improvement in germination rate, speed, and uniformity compared to the control and other treatments. Seeds treated with 100 ppm nanoparticles showed earlier sprouting and a higher overall germination percentage, suggesting a stimulatory effect of zinc oxide nanoparticles at this concentration on the physiological processes involved in germination. These findings highlight the potential of zinc oxide nanoparticles as growth-promoting agents in sustainable agriculture.

Keywords: Groundnut, Nanotechnology, Seed germination, Sustainable agriculture, Zinc oxide nanoparticles

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