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Onion Peel Waste Mediated-Green Synthesis of Zinc Oxide Nanoparticles and Their Phytotoxicity on Mung Bean and Wheat Plant Growth

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Abstract: Nanoparticles and nanomaterials have gained a huge amount of attention in the last decade due to their unique and remarkable properties. Metallic nanoparticles like zinc oxide nanoparticles (ZnONPs) have been used very widely as plant nutrients and in wastewater treatment. Here, ZnONPs were synthesized by using onion peel and characterized by various sophisticated instruments like Fourier transform infrared spectroscopy (FTIR), dynamic light scattering (DLS), and field emission scanning electron microscopes (FESEM). FTIR confirmed ZnONPs synthesis due to the formation of the band in the region of 400–800 cm^{-1}, while FESEM confirmed the spherical shape of the particles whose size varies in the range of 20–80 nm. FTIR revealed several bands from 1000–1800 cm^{-1} which indicates the capping by the organic molecules on the ZnONPs, which came from onion peel. It also has carbonyl and hydroxyl groups, due to the organic molecules present in the *Allium cepa* peel waste. The average hydrodynamic size of ZnONPs was 500 nm as confirmed by DLS. The synthesized ZnONPs were then used as a plant nutrient where their effect was evaluated on the growth of *Vigna radiate* (mung bean) and *Triticum aestivum* (wheat seeds). The results revealed that the germination and seedling of mung and wheat seeds with ZnONPs were grown better than the control seed. However, seeds of mung and wheat with ZnONPs at median concentration exposure showed an enhancement in percent germination, root, and shoot length in comparison to control. Thus, the effect of ZnONPs has been proved as a nano-based nutrient source for agricultural purposes.

Keywords: phytotoxicity; phytochemicals; onion peel extract; *Vigna radiate*; *Triticum aestivum*

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