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ANTIFUNGAL EFFECT OF GREEN SYNTHESIZED ZINC OXIDE NANOPARTICLES AGAINST PLANT PATHOGENS *Fusarium* spp.

H.K.S. Madusanka[1*], A.G.B. Aruggoda[1], J.A.S. Chathurika[2] and S.R. Weerakoon[3]

[1]Department of Agricultural and Plantation Engineering, Faculty of Engineering Technology, The Open University of Sri Lanka, Nawala, Sri Lanka
[2]Department of Urban Bioresources, Faculty of Urban and Aquatic Bioresources, University of Sri Jayewardenepura, Sri Lanka
[3]Department of Botany, Faculty of Natural Sciences, The Open University of Sri Lanka, Nawala, Sri Lanka
[*]hksma@ou.ac.lk

This study evaluated the antifungal potential of green-synthesized zinc oxide nanoparticles (ZnO NPs) against plant pathogens of the *Fusarium* species. The synthesis process utilised *Mimosa pigra* leaves, which were dehydrated, pulverized, and extracted by mixing 8 g of dried leaf powder with 100 mL of double-distilled water. Zinc nitrate hexahydrate ($Zn(NO_3)_2 \cdot 6H_2O$) served as the precursor salt for the eco-friendly synthesis of ZnO NPs. The formation of ZnO NPs was confirmed through UV-visible spectroscopy, revealing a characteristic absorption peak at 356 nm. Scanning electron microscopy indicated a heterogeneous distribution of particle shapes and sizes, with an average particle size of 81 nm (range: 35-164 nm). The antifungal efficacy of the synthesized ZnO NPs was assessed using the poisoned food technique. ZnO NP concentrations of 0 (negative control), 50, 100, 500, and 1000 mg/L were incorporated into potato dextrose agar (PDA) plates. *Fusarium* species mycelial plugs (8 mm diameter) were inoculated into 9 cm diameter Petri dishes. All treatments were incubated at 28 ± 2 °C for seven days, with three replicates per treatment. Mycelial growth was measured, and statistical analysis was performed using one-way ANOVA, yielding a significant F-value of 43.93 ($p < 0.001$). Duncan's Multiple Range Test (DMRT) was applied as a post hoc analysis to identify significant differences in growth inhibition between treatments. ZnO NPs exhibited concentration-dependent inhibition of *Fusarium* species, with the highest inhibition (61.52%) observed at 1000 mg/L and 22.21% inhibition at 500 mg/L compared to the control. These findings indicated that green-synthesized ZnO NPs could be a sustainable approach for managing *Fusarium* infections in agricultural systems. Further research is warranted to elucidate the mechanisms of action and evaluate their potential for field applications.

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