EFFECT OF GREEN SYNTHESIZED ZINC OXIDE NANOPARTICLES USING *Mimosa pigra* LEAF EXTRACT ON ROOT GROWTH OF TOMATO (*Solanum lycopersicum*) SEEDLINGS

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

[1]*Department of Agricultural and Plantation Engineering, The Open University of Sri Lanka, Nawala, Nugegoda, Sri Lanka*
[2]*Department of Urban Bio-resources, University of Sri Jayawardanapura, Ganagodawila, Nugegoda, Sri Lanka*
[3]*Department of Botany, The Open University of Sri Lanka, Nawala, Nugegoda, Sri Lanka*

Abstract

Zinc is an essential micronutrient for plant growth however, its limited bioavailability in soil limits crop productivity. Zinc oxide nanoparticles have emerged as a promising alternative to conventional zinc fertilizers due to their enhanced solubility and nutrient delivery efficiency. This study investigates the effect of ZnO NPs synthesized using a green synthesis method employing *Mimosa pigra* leaf extract as a bio-reductant, stabilizer, and capping agent on seedling root growth of the tomato (*Solanum lycopersicum*). Synthesized ZnO NPs were characterized using UV-visible spectrophotometry and scanning electron microscopy, confirming the formation of nanoparticles with an average size of 81 nm. Effects of different ZnO NPs concentrations (0, 1, 5, 10, 50, 100, 500, and 1000 ppm) on seedling root growth were evaluated under laboratory conditions. Results revealed a significant influence of ZnO NPs on root growth. Seedling root length was significantly affected by ZnO NPs application. The optimal concentration for enhancing root growth was determined to be 10 ppm. At this concentration, ZnO NPs promoted enzymatic and metabolic activities, leading to enhanced cell growth and overall seedling development. Beyond 10 ppm, increasing ZnO NPs concentrations resulted in a gradual decline in root length. This is likely attributed to the stress response induced by higher concentrations. Overall, the study demonstrates the beneficial effects of ZnO NPs synthesized using *Mimosa pigra* leaf extract on tomato seedling root growth. The optimal ZnO NPs concentration of 10 ppm holds promise for improving tomato seedling root length and growth efficacy.

Keywords: Green synthesis, Nanoparticles, Seedling root growth, Tomato, ZnO NPs

**Corresponding author*: *hksma@ou.ac.lk*