



Cyprus
University of
Technology

Faculty of Geotechnical
Sciences and
Environmental
Management

Master's Thesis

**EVALUATION OF ZEOLITE-BASED NANOMATERIALS
AS A NOVEL PRIMING AGENT IN *ARABIDOPSIS
THALIANA***

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Limassol, June 2023

CYPRUS UNIVERSITY OF TECHNOLOGY
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DEPARTMENT AGRICULTURAL SCIENCES, BIOTECHNOLOGY
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Approval Form

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ABSTRACT

Agricultural sustainability currently confronts crucial challenges due to escalating environmental stressors and a rapidly expanding global food demand. Emerging nanotechnology presents a compelling solution towards these challenges, particularly through the application of seed priming technologies to optimize plant growth and resilience. This study posited that zeolite-based nanomaterials, due to their unique physicochemical properties, could be utilized via priming technologies, thereby enhancing agricultural productivity. The present research explored the effects of zeolite-based nanomaterials, as priming agents, on various aspects of plant health and their potential in alleviating environmental stressors. Zeo 5ppm, Zeo 50ppm and Zeo@Se-Zn 5ppm, Zeo@Se-Zn 50ppm and Zeo@Se-Si 5ppm, exhibited promising growth promoting effects and improved plant tolerance under saline conditions. Additionally, seed priming with Zeo, Zeo@Se-Zn and Zeo@Se-Si, Zeo@Se at 5ppm and Zeo at 50ppm boosted seedling establishment during early growth stages both under control and saline conditions. Biochemical analyses supported these indications for the above nanomaterials under saline conditions, with an observed increase in MDA and Proline content and a decline in H₂O₂ levels. Despite the existing need for further research into the operative mechanisms, these findings propose that zeolite-based nanomaterials hold the potential to revolutionize sustainable agriculture by optimizing nano-priming technologies.

Keywords: nano-priming, zeolite composites, plant promotion and tolerance, salt stress