Smart Nanomaterials Technology

Azamal Husen *Editor*

Nanomaterials and Nanocomposites Exposures to Plants

Response, Interaction, Phytotoxicity and Defense Mechanisms

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Contents

Aluminum Oxide Nanoparticles: Plant Response, Interaction, Phytotoxicity, and Defense Mechanism

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Abstract Aluminum, being the most abundant metal on earth, has applications in diverse fields. To utilize the benefits of aluminum completely, aluminum oxide nanoparticles (NPs) are synthesized and administered on plants because they are the connecting link between the environment and human health. The effect of aluminum oxide NPs on a variety of plant species to check their interaction, uptake, and translocation is analyzed in this chapter. Aluminum oxide NPs' phytotoxicity is determined by their absorption, transport, and accumulation in plants. Interestingly, the administration of aluminum oxide NPs at different concentrations resulted in a significant effect on root elongation, shoot elongation, seed germination, as well as macro and micronutrient uptake. This chapter has mostly addressed nanoparticle interactions in plants, including their absorption, mobilization, and metabolic effects. We also looked into NPs' potential to protect plants and control stress under a variety of adverse settings. Aluminum oxide NPs' effects on the four enzymatic antioxidants namely CAT, POD, SOD, and APX are compared, to examine their effect on different plant species. This chapter will assist researchers in comprehending nanotechnology in combination with agriculture, allowing them to build specialized NPs to meet agricultural needs sustainably.

Keywords Aluminum oxide nanoparticles · Antioxidant enzymes · Reactive oxygen species

Abbreviations

Al_2O_3	Aluminum oxide
APX	Ascorbate peroxidase
CAT	Catalases
DPPH	2, 2-Diphenyl-1-picrylhydrazyl
H_2O_2	Hydrogen peroxide

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