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Azamal Husen *Editor*

Plant Response to Gold Nanoparticles

Plant Growth, Development, Production, and Protection

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Azamal Husen
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Contents

Plant Response to Gold Nanoparticles in Terms of Growth, Development, Production, and Protection: An Overview

Satya, Tahmeena Khan, Kulsum Hashmi, Saman Raza, Sakshi Gupta, and Seema Joshi

Abstract The specialized chemical and physical characteristics of nanoparticles make them quite different from bulk materials and therefore useful in nearly every aspect of life. A great deal of research has also gone into how they interact with living systems, as well as how they affect their physiology, morphology, and biochemistry. Nanoparticles (NPs) are widely used in agriculture to improve seed germination, encourage plant growth, and shield crops from biotic stress. Studies have shown that a variety of NPs from the environment can enter plants, accumulate there, and subsequently go up the food chain. Silver, gold, copper, titanium, iron, and zinc-based metallic nanoparticles are frequently utilized in agriculture to promote plant growth and yield. The potential of metallic NPs in protecting plants, promoting development, detecting diseases, and identifying pesticide and herbicide residues has been highlighted by recent studies. Different NPs bring about different changes in the plants. Gold nanoparticles (AuNPs) have gained immense popularity and are the most researched NPs due to their wide range of commercial applications, ease of synthesis, unique optical properties, chemical stability, and non-toxicity. The use of AuNPs in agriculture, specifically for plant growth and development, has been elucidated in this chapter. The interactions between AuNPs and the biota have also been described in detail in this chapter.

Keywords AuNPs · Gene regulation · Mechanistic insight · Biotic stress · Photosynthetic efficiency · Translocation

Satya · K. Hashmi · S. Raza · S. Gupta
Department of Chemistry, Isabella Thoburn College, Lucknow, India

T. Khan (✉) · S. Joshi
Department of Chemistry, Integral University, Lucknow, India
e-mail: tahminakhan30@yahoo.com

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