Applications of Biocompatible Nanoparticles in Plant Biotechnology for Enhanced Secondary Metabolite Biosynthesis

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Abstract

Nanoparticles within the realm of plant biotechnology, have garnered considerable interest in recent years, as a result of their notable and unique chemical and physical criteria, which can affect the growth, productivity, and biochemical synthesis of plants secondary metabolites, and help to enhance them. The focus of this review is to outline the recent developments in plant Nano biotechnology and different Nanomaterials with focusing on bio compatible ones to summarize their effects on plant secondary metabolites. Also, we have discussed the physico-chemical properties of Nanoparticles which makes them an attractive and suitable tool for plant biotechnology and a general view of their mechanisms in modulate the biosynthetic pathways of phytochemical metabolites. Different types of Nanomaterials used in biotechnology, like metal and non-metal Nanomaterials and carbon based Nanoparticles were provided in this review. Moreover, we have highlighted potential utilizations of Nanomaterials based approaches in plant biotechnology in the production of phytochemicals with agricultural, industrial, and pharmaceutical applications.

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