Zinc oxide nanoparticle-mediated changes in biomass yield and some metabolic activities of pomegranate callus.

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Abstract:

The dramatic increase in the use of nanoparticles (NPs) in a variety of applications greatly increased the likelihood of the release of NPs into our ecosystem. To the best of our knowledge, there is still no report on the impact of zinc oxide nanoparticles (ZnO NPs) on pomegranate callus. Pomegranate is a tropical and subtropical countries' shrub, which provides food supplement and various pharmaceutical and medicinal applications. Here, we investigated the effects of both ZnO NPs and its bulk on growth and some metabolic activities of pomegranate (Punica granatum) callus. Growth parameters in callus exposure to high concentrations of ZnO (50-200 μg ml-1) were reduced. Different concentrations of ZnO NPs and bulk did not affect the content of potassium (K) and phosphorus (P). In comparison to control, uptake of Zn was enhanced in pomegranate callus exposed to either ZnO NPs or its bulk. Some metabolic activities and transmission electron microscope (TEM) images were evaluated at three levels (0, 10 and 150 μg ml-1) of ZnO NPs and its bulk. Soluble proteins were decreased upon exposure to 10 and 150 μg ml-1 of ZnO NPs and bulk. Stimulation of soluble carbohydrates content of treated callus at the highest concentration of ZnO NPs was observed, while there was no effect of ZnO bulk on it. Internalization and accumulation of nanoparticles were observed in the tested-callus. From these results, we could consider the toxicity effects of ZnO NPs and bulk on pomegranate and other plants.

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