

EFFECT OF METALLIC COPPER NANOPARTICLES ON *ARABIDOPSIS THALIANA* GROWTH, PHOTOSYNTHESIS AND STRESS SIGNALLING

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Metallic copper nanoparticles (Cu NPs) are widely used in industry and released in a large quantity to the environment. They cause harmful effect on animal and bacterial cells starting from approximately 100 mg l⁻¹. Here, we have examined the toxicity and possible mechanisms of toxic action of Cu NPs (38 ± 5 nm) on plant cells using standardised cultures of whole *Arabidopsis thaliana* plants. Arabidopsis root growth dramatically decreased when 2.5 mg L⁻¹ Cu NPs (29.6±4.8% decrease of the root elongation rate) was added to the Phytogel growth media. Complete blockage of root growth has been observed at 15 mg L⁻¹ Cu NPs. Bulk and supernatant were significantly less toxic agents. Cu NPs (same concentrations) also affected leaf expansion rate. 2.5-15 mg l⁻¹ Cu NPs activated key plant stress reactions, such as elevation of cytosolic free Ca²⁺, production of reactive oxygen species (ROS) and inhibition of photosynthetic efficiency (measured by high resolution PAM). To our knowledge such extreme sensitivity of plants (or any other living organism) to Cu NPs has not been reported previously. Thus, pollution by Cu NPs and potential harmful effects on flora require serious attention by environmentalists.