

## **COPPER OXIDE NANOMATERIAL FATE IN PLANT TISSUE: NANOSCALE IMPACTS ON REPRODUCTIVE TISSUES**

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A thorough understanding of the implications of chronic low exposure to Engineered Nanomaterials through the food chain is lacking. The present study aimed to characterize such response in zucchini (*Cucurbita pepo* L.) upon exposure to a potential nanoscale fertilizer: Copper oxide (CuO) nanoparticle. Zucchini was grown in soil amended with nano-CuO, bulk CuO and CuSO<sub>4</sub>, from germination to flowering. Nano-CuO had no impact on plant morphology or growth, nor pollen formation and viability. The uptake of Cu was comparable in the plant tissues under all treatments. RNA-seq analyses on vegetative and reproductive tissues highlighted common and nanoscale-specific components of the response. Mitochondrial and chloroplast functions were uniquely modulated in response to nanomaterial exposure as compared with conventional bulk and salt forms. X-ray absorption spectroscopy showed that Cu local structure changed upon nano-CuO internalization, suggesting potential nanoparticle biotransformation within the plant tissues. These findings demonstrate the potential positive physiological, cellular and molecular response related to nano-CuO application as plant fertilizer, highlighting the differential mechanisms involved in the exposure to Cu in nanoscale, bulk or salt forms. Nano-CuO uniquely stimulates plant response in a way that can minimize agrochemical inputs to the Environment, and therefore could be an important strategy in nano-enabled agriculture.