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

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A thorough undestanding of the implications of chronic low exposure to Engineered Nanomaterials through the food chain is lacking. The present study aimed to characterize such resposne in zucchini (Cucurbita pepo L.) upon exposure to a potential nanoscal fertilizer: Copper oxide (CuO) nanoparticle. Zucchini was grown in soil amended with nano-CuO, bulk CuO and CuSO4, 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 comapred with conventional bulk and salt forms. X-ray absorption spectroscopy showed that Cu local structure changed upon nano-CuO internalization, suggesting potential nanoparticole biotransformation within the plant tissues. These findings demontrate the potential positive physiological, cellular and molecular response related to nano-CuO application as plant fertilizer, highlighting the differentail 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-unabled agriculture.