USING NANOPARTICLES OF MICRONUTRIENTS TO SUPPRESS ROOT DISEASE AND ENHANCE PLANT HEALTH

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Micronutrients, such as B, Cu, Mn, and Zn, activate enzymes that catalyze a wide array of metabolic reactions that are active in generating defense products against root infecting fungi. When nanoparticles (NP) of AlO, B, CuO, FeO, MnO, NiO, SiO, TiO or ZnO, were compared to bulked equivalents and sprayed (500-1,000 µg/ml) onto tomatoes, eggplants or watermelon, we observed that NP of CuO showed the greatest growth and disease suppression from root infecting species of *Fusarium* and *Verticillium*. Acid digests of roots revealed more Cu in plants treated with NP CuO than in controls suggesting basipetal intra-plant movement. Single foliar applications of NP of CuO (500 µg/ml) to young transplants of eggplants, tomatoes, and watermelons were associated with increased yields. Other field studies with alternative sources of Cu found the highest yield came from plant treated with NP of CuO. Digests of edible flesh from eggplant and watermelons showed no increase in metals when compared to untreated controls. Transcriptomic analyses of exposed root tissue found expression of polyphenol oxidase and PR1 genes were strongly uploaded in plants exposed to both the pathogen and NP of CuO. Along with eggplant, tomatoes, and watermelon, we have also observed that NP of CuO enhances disease resistance on asparagus, chrysanthemum, soybeans *Spartina alterniflora*, and strawberries. The use of NP in agriculture has tremendous potential for IPM.