Influence of Elevated Manganese Rates on Growth Parameters, Nutrient, and Biomass Accumulation of HLB-affected Citrus Trees in Florida

Researcher: Davie Kadyampakeni
Contact: dkadyampakeni@ufl.edu
UF/IFAS CREC

Enhancing nutrient uptake and tree health play an important role in managing HLB-affected citrus trees in Florida. A greenhouse experiment was established to evaluate the effect of varying rates of manganese (Mn) on growth and development of 1-year-old HLB-affected sweet orange (*Citrus sinensis*) trees in October 2018 at UF/IFAS CREC. Fifty percent of the trees were graft-inoculated with the HLB pathogen and the rest of the trees were used as the HLB-free, control trees. Four treatments were applied on both sets of the trees in a randomized complete block design with 7 replicates. Data including trunk diameter, tree height, and leaf samples were collected, processed and analyzed from trees treated with four treatments, 0.0 kg Mn ha^{-1} (Control), 5.6 kg Mn ha^{-1} (1x – UF/IFAS rate), 11.2 kg Mn ha^{-1} (2x UF/IFAS rate), and 22.4 kg Mn ha^{-1} (4x UF/IFAS rate) on HLB- and non HLB-affected citrus trees, all the other essential nutrients were maintained at current recommendations in all the treatments. Leaf Mn concentrations, tree height, and trunk diameter were analyzed by year with repeated measures in SAS-GLIMMIX. Leaf Mn concentrations were significantly different among Mn rates, and across sampling times in both HLB and non HLB-affected trees in 2019. In both HLB and non HLB-affected trees, Mn rate of 22.4 kg Mn ha^{-1} recorded the highest leaf Mn concentration with the least square mean (LSM) of 1,131 µg. g^{-1} of dry weight. Tree height and trunk diameter presented significant differences across sampling times in both HLB and non HLB-affected trees in 2019. The 11.2 kg Mn ha^{-1} rate increased tree height in HLB-affected trees across sampling-time, while the 22.4 kg Mn ha^{-1} rate increased the trunk diameter of HLB-affected trees. The results presented in this study show that HLB-affected trees would require higher Mn concentrations than healthy trees (non HLB), for similar physiological functions. The results from this study support higher Mn treatments; specifically, 11.2- and 22.4- kg Mn ha^{-1} 2x and 4x the UF/IFAS recommendation for better tree growth in HLB-affected trees.

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