Synergistic impact of *Phytophthora nicotianae* and huanglongbing in grapefruit groves under field conditions in South Texas

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Phytophthora nicotianae is endemic to most citrus groves in South Texas and its population can reach high levels under favorable conditions leading to significant damages to the fibrous roots of trees. Fibrous root damage caused by huanglongbing (HLB) may further accelerate damage caused by *P. nicotianae* as reported recently in a study conducted in Florida with sweet orange trees growing on citrumelo rootstocks. To assess the interaction between HLB and *P. nicotianae* under field conditions in South Texas, six pairs of HLB-positive and HLB-negative trees of the same age and with or without visible symptoms of *Phytophthora* infection were selected from four grapefruit groves. All experimental trees are on sour orange rootstock and were uniformly maintained using standard grove care practices. Soil propagule counts of *P. nicotianae* were measured from samples taken around the drip line of each experimental tree and root health was assessed by measuring root density, root length density and fibrous root density. The trees were then categorized into high (>8 propagules/cm3 soil) and low (≤8 propagule/cm3 soil) *P. nicotianae* counts. Fibrous root density was significantly lower in HLB-positive trees with high soil propagule counts of *Phytophthora* when compared with HLB-positive trees with low soil propagule counts. Highly significant negative correlation was also observed between root densities and Fibrous root density with *P.nicotiana* propagule levels in the soil. However all three measured parameters were not significantly different between HLB positive and HLB negative trees. The results suggests some level of synergistic interaction between HLB and *P. nicotianae* when both are present in an infected tree leading to negative impact on root health. This is likely to work in opposite direction where HLB infection might predispose trees to *Phytophthora.*
The results of this study can be used to educate growers on the need to intensify management of *P. nicotianae* propagule levels in groves with history of HLB to reduce the negative impact of both diseases.