

Citrus Huanglongbing is an Immune-Mediated Plant Disease and its Implications in HLB Management

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Our recent study demonstrates that citrus huanglongbing is a pathogen-triggered immune disease. We discovered that CLas infection of citrus stimulates systemic and chronic immune response in phloem tissues including reactive oxygen species (ROS) production. Systemic cell death of phloem tissues is caused by excessive and chronic ROS production triggered by CLAs. Consequently, cell death of phloem tissues causes HLB symptoms. The finding of citrus HLB as an immune-mediated plant disease helps guide the battle against this notorious disease. It seems likely that horticultural and genetic

approaches that suppress ROS damages can manage HLB. These approaches include: 1) Inducing the activities of antioxidant enzymes via application of micronutrients (B, Fe, Mo, Ni, and Zn). 2) Promoting plant growth using plant growth hormones, such as gibberellin. 3) Suppressing reactive oxygen species (ROS) damages using antioxidants, such as uric acid which is yet to be labeled on citrus. 4) Genetic improvements that enhance plant tolerance of ROS. 5) Prevent overproduction of ROS. This can be done by editing the promoter or coding regions of respiratory burst oxidative homolog D (RBOHD) genes to

reduce their induction by CLAs. 6) Evade recognition of CLAs. This can be done by editing the promoter or coding regions of key genes that are responsible for RbohD activation.

Genetic improvements that enhance plant tolerance of ROS, prevent overproduction of ROS, or evade recognition of CLAs are likely to generate HLB resistant/tolerant citrus varieties. In summary, citrus HLB is an immune-mediated disease and mitigating ROS via antioxidant mechanisms and promoting new growth both can reduce cell death of phloem tissues, thus controlling HLB.

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