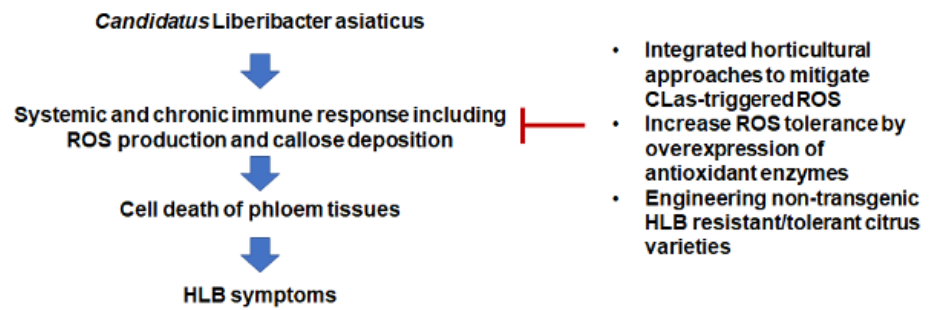


# Development, Evaluation, and Delivery of Citrus Huanglongbing Management Approaches by Targeting its Nature as a Pathogen-Triggered Immune Disease

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## Take Home Message:

- Field trials of testing different horticultural approaches to manipulate oxidative stress are ongoing.
- At least 14 different transgenic lines overexpressing antioxidant enzymes were generated and will be tested in the field starting in 2023.
- Multiple transgene-free genome editing tools were developed and are being used to generate transgene-free HLB resistant or tolerant citrus varieties.

**Summary:** Citrus huanglongbing (HLB) is a pathogen-triggered immune disease similar to sepsis in

humans. Recent work led by project director Wang demonstrated that CLAs stimulates a systemic and chronic immune response in citrus phloem including reactive oxygen species (ROS) production and callose deposition, which causes systemic phloem cell death and subsequent HLB disease symptoms. Our central hypothesis is that HLB can be controlled by managing CLAs-triggered systemic and chronic immune responses including ROS production. We will control HLB with three approaches: develop integrated horticultural approaches to mitigate CLAs-triggered ROS; conduct optimization of combined applications

of micronutrients, gibberellic acid (GA), and antioxidants to mitigate CLAs-triggered ROS production, phloem cell death and HLB symptoms; protect citrus plants from CLAs-triggered ROS via citrus tristeza virus (CTV)-mediated expression of antioxidant enzymes and silencing of key genes involved in CLAs-triggered ROS production; and generate non-transgenic HLB resistant or tolerant citrus varieties. We will conduct genome editing of key genes required for HLB disease development to generate non-transgenic genome edited citrus varieties.

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