

# Making Transgenic Huanglongbing-tolerant Citrus Lines Available to the Citrus Industry

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*Planting the transgenic trees in the field.*

**Summary:** Huanglongbing (HLB) is a devastating citrus disease caused by the bacterial pathogen *Candidatus Liberibacter asiaticus* (CLAs). There is currently no cure for this disease. In this project, we will make several transgenic lines that are highly tolerant to HLB available to the citrus industry. These transgenic lines express the Arabidopsis NPR1 (AtNPR1) protein. AtNPR1 is a key positive regulator of systemic acquired resistance (SAR) and has been shown to increase disease resistance in multiple crops. We have found a tight correlation between HLB tolerance and AtNPR1 protein levels in transgenic citrus plants. After being infected by CLAs, transgenic plants

with high levels of AtNPR1 protein develop no or mild leaf symptoms and continue growing normally, even though CLAs titers can rise to high levels in the plants. The original lines have been propagated multiple times by grafting and all the progeny plants exhibited the same level of tolerance. Importantly, the AtNPR1 protein is not toxic or allergenic and can be easily digested by the stomach enzyme pepsin and the small intestine enzyme trypsin. Furthermore, the AtNPR1 protein does not accumulate in the juice from the fruits produced by the transgenic citrus plants. Our current work focuses on first, prepare and submit application documents to United States Department of

Agriculture (USDA), Environmental Protection Agency (EPA), and Food and Drug Administration (FDA) for deregulation of the AtNPR1 transgenic lines and secondly, propagate the transgenic lines and establish large scale field trials to showcase the transgenic lines.

## **Take Home Message:**

- Transgenic citrus plants accumulating high levels of AtNPR1 are highly tolerant to HLB.
- The AtNPR1 protein does not accumulate in the juice and pulps from the transgenic plants.
- The AtNPR1 protein can be quickly digested in the stomach and the small intestine.

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