# Researcher seeks solution to the spread of citrus greening disease

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The entire California citrus industry is counting on Cornell vector biologist Michelle Cilia to quickly come up with a solution to stop the spread of a deadly disease that could decimate domestic citrus production.

Cilia, assistant professor of plant pathology and plant-microbe biology based at the Boyce Thompson Institute for Plant Research and a scientist in the U.S. Department of Agriculture's Agricultural Research Service on campus, is helping to tackle the problem from every angle.

Citrus greening disease, or huanglongbing (HLB), results in unmarketable bitter green fruit before killing the trees. The bacteria implicated in causing HLB, C. Liberibacter asiaticus, has never been cultured. The insect that spreads it, the Asian citrus psyllid, is nearly impossible to spot with the naked eye. It takes 18 to 36 months before a tree shows signs of infection, and by then it is too late.

With a $456,757 grant from the California Citrus Research Board, Cilia and researchers at the University of Washington and University of California, Davis, are developing biomarkers and measuring other factors to find early infection markers, well before visual symptoms appear, said Cilia, who hopes to have preliminary results within the year.

"We are working around the clock to get some effective solutions to the growers," Cilia said.

First, Cilia had to get permits from the USDA to grow infected citrus trees and psyllids in her lab, a process that took six months, making Cornell one of only a handful of sites with such permission. Researchers in Cilia's lab are studying tree samples obtained from the Hacienda Heights neighborhood, where California's only confirmed HLB-positive tree was detected and removed in 2012.

Although the disease is not as widespread in California as it is in Florida, the proliferation of citrus trees in backyards near commercial groves may make the disease even more difficult to control. The nature of the disease also makes it difficult to diagnose – a sample from one part of a tree may not contain enough of the bacteria to trigger a positive reaction in the state-accepted test.

By testing for a systemic response to infection, Cilia believes her approach will be sensitive and specific. She also hopes to develop a way to stage the disease, which could help growers and the government decide how to manage infections.

"We want to give growers a robust set of tools to help them make an informed decision about whether to pull out an infected tree, which is not an easy one. Their livelihoods are at stake," Cilia said.

## Orange juice threatened

Drink up now, orange juice lovers: The beverage may become unavailable if a disease that is devastating the $9 billion Florida citrus industry is not stopped in its tracks.

Ricke Kress '73, president of Southern Gardens Citrus, one of the nation's largest citrus growers, thinks his company could be well on the way to finding a solution to citrus greening, which has already cost Florida millions of dollars since 2005. But he worries it will take

considerable effort to get consumers on board with accepting juice from genetically modified trees.

"There's no research to date that suggests this can be solved without genetically improved citrus trees," Kress said at two presentations on campus Feb. 5 and 6. "We may not have a choice. We are faced with a potential disaster on a scale that has never been seen before."

The approach so far has involved an expensive large-scale removal of infected trees – Kress lost 800,000 – and liberal application of insecticides, with potentially damaging environmental impacts.

"We are putting so many approved chemicals to control the insect into the trees that our groves may become sterile," Kress said.

Kress has enlisted the help of scientists to attack the menace, from producing insect- or disease-resistant trees and investigating synthetic resistance genes and gene delivery systems to testing a technique that might temporarily "cure" infected trees by inoculating them with bacteria-fighting genes using viruses as vectors.

But a solution could be a decade away, given the time required for regulatory approval and tree maturation, and it might be too late by then, Kress said. He is trying to speed up the process by using specially designed greenhouses to test promising trees, which may knock up to two years off the process, and providing preliminary evidence for success in three to six months.

"We're going to figure it out, but it's going to be a challenge. The final test will be due to the education and acceptance of the consumer," Kress said.