

A recent study from the University of Florida (UF) might help explain the speed at which citrus greening has spread around the globe, after it was found the bacterium alters the behavior of the disease vector.

Five UF researchers have discovered Asian citrus psyllids (ACP) fly earlier in their life cycles, more frequently and farther when they are infected with the citrus greening bacterium, also known as Huanglongbing (HLB).

And if that weren't enough to encourage the disease, Dr. Kirsten Pelz-Stelinski of the UF Institute of Food and Agricultural Sciences' (IFAS) Citrus Research and Education Center says male adult psyllids are more attracted to females when they are carrying the HLB bacterium.



An Asian citrus psyllid feeds on a citrus tree, leaving the citrus greening bacteria. The bacteria will starve the tree of nutrients and eventually kill it. Photo: UF

The conclusions have international implications for understanding how the disease spreads and developing ways to control it.

"To our knowledge, this is the first description of direct changes to insect behavior caused by a bacterial pathogen in an insect-plant-pathogen system," says Pelz-Stelinski.

"These newly discovered behavior changes seem to increase dispersal of the insect - and thus the disease."

After entering a citrus tree via the psyllid, citrus greening sucks on leaf sap and leaves behind bacteria which move through the tree via its veins, known as phloem. The disease starves the tree of nutrients, damages its roots and leads to fruits that are green and misshapen; unsuitable for sale as fresh fruit or, for the most part, juice.

HLB is currently present in most of South Asia, stretching to Iran, and also a swathe of land along the east coast of the African continent. The disease hit the world's leading citrus-growing region Sao Paulo in 2004, and was shortly followed by Florida in late 2005. Citrus greening can also be found in Mexico, some southern U.S. states and a few detections have been made in recent years in California, where the disease has not yet caused any drastic damages.

While California is the USA's hub for fresh citrus, Florida is the biggest grower and a global powerhouse in the production of citrus concentrate. Between 2004 and 2011, the state's commercial citrus acreage and its number of trees fell by 28% with greening as a major factor.

Early fruit drop can cause up to 30% losses in orange crops, and is another consequence of HLB in Florida. Calculations from UF/IFAS estimate the state has lost 100,000 citrus acres and US\$3.6 billion in revenues since 2007.

Adult psyllids have a lifespan of about 40 days at 77°F, reaching sexual maturity and maximum flight capacity four days after emerging from their nymphal stage. Pelz-Stelinski and her team used psyllids ranging in age from five to 15 days after emergence for their experiments in a controlled, quarantined lab.

On the issue of making female psyllids becoming more 'attractive' after HLB infection, Pelz Stelinski clarifies that females are more attracted to plant odors than to males and prefer uninfested new vegetation over infested vegetation because it is more nutritional. In addition, females are repelled by high densities of other psyllid females.

Other researchers on the study are Xavier Martini, Mark Hoffmann, Monique R. Coy, Lukasz L. Stelinski. They are hoping to conduct further testing and mathematical modeling to explore how greening is spread.

Photo: UF

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