COMBATING CITRUS GREENING DISEASE

ARS combats citrus greening disease (also known as Huanglongbing, or HLB) through disease detection, prevention, and mitigation research. Citrus greening represents the greatest threat to the $3.35 billion U.S. citrus industry. It is caused by a bacterial pathogen, *Candidatus* Liberibacter asiaticus (CLas), which is spread by the Asian citrus psyllid. Since the psyllid's discovery in Florida in 1998, the industry has lost 60 percent of acreage and closed about 80 percent of juice plants and packinghouses. The disease has spread to Texas, California, Georgia, Arizona, and Louisiana. The following advancements in FY 2019 highlight ARS's ongoing citrus greening response efforts.

Canine detection of citrus greening in California to mitigate an impending statewide epidemic. The key to mitigating citrus greening is early detection and rapid response. ARS researchers in Fort Pierce, Florida, have trained 20 dogs to detect citrus greening within 2 to 4 weeks after infection and with 99 percent accuracy. This surpasses the prior molecular-based methods that could detect citrus greening only months after infection and with 30 to 35 percent accuracy. The California Department of Food and Agriculture is now deploying the canines for early response and tree removal efforts.

New citrus trees for U.S. growers. ARS researchers in Fort Pierce, Florida, released three citrus greening-tolerant citrus rootstocks that produced sweet orange trees with improved health, fruit yield, and fruit quality over multiple years where citrus greening is endemic. ARS researchers have also released the first scion cultivar with tolerance to citrus greening, 'US SunDragon', for niche fruit and home-owner plantings. Initial tests of juice quality show promise for 'US SunDragon' in orange juice blends.

New treatment for citrus greening. Many bacterial pathogens in plants protect themselves with biofilms. ARS scientists in Fort Pierce, Florida, discovered that a novel set of molecules can penetrate the biofilms protecting CLas and subsequently kill the bacterium. This strategy, which also worked in potato against zebra chip disease, is now patented by ARS and represents a new means to protect fruit, nut trees, and vegetables from numerous important plant diseases.

Improved protocol for detecting citrus greening infections. Early detection of CLas in citrus trees is critical for disease management. However, detection of CLas in citrus trees is prone to false negatives. ARS scientists in Fort Pierce, Florida, developed a sampling strategy that reduces the probability of false negative diagnoses of CLas and is capable of detecting CLas infections within 24 hours after infection. These results will help APHIS improve official protocols for monitoring CLas in citrus groves.

A new sensitive method to detect low concentration samples of CLas. ARS researchers in Parlier, California, along with a scientist in the Central California Tristeza Eradication Agency, developed a new DNA-based test capable of detecting the HLB pathogen at even low concentrations and with increased accuracy. This new test can be used to confirm otherwise questionable results obtained through the standard regulatory industry protocols.

Citrus greening strains in southern California have different origins. Citrus greening has been detected in more than 1,400 citrus trees in urban southern California. ARS researchers in Parlier, California, along with scientists from the California Department of Food and Agriculture, APHIS, and South China Agricultural University, discovered that the CLas strains found in California were more closely related to the strains in Asia rather than Florida, indicating multiple introductions of the pathogen. This information is important for formulating citrus greening management strategies.