Acquisition of Candidatus liberibacter asiaticus in the Asian citrus psyllid (Diaphorina citri Kuwayama)

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Currently, the California Department of Food and Agriculture requires confirmation of Candidatus liberibacter asiaticus (CLas) in a citrus tree as the legal basis prompting regulatory action, such as mandatory tree removal or expansion of the huanglongbing quarantine boundary. However, confirmation of CLas infection in trees is difficult due to a lack of visual symptoms, non-uniform distribution of the pathogen throughout the tree, and the low probability of selecting the infected tissue for analysis (Gottwald, Graca, and Bassanezi, 2007). This low-likelihood of CLas detection, combined with the requirement of confirming infection before regulatory actions can take place, is allowing CLas-infected trees to remain in the ground in Southern California and contributing to the spread of CLas over a rapidly expanding geographic area.

One possible solution could help address this problem: allow the find of an Asian citrus psyllid (ACP) nymph infected with CLas to provide an alternative prompt for regulatory action.

Currently, detection of an infected adult ACP on a citrus tree, although a cause for alarm, does not prompt regulatory tree removal. The mobility of adult ACP is the key rationale for this. An adult could have acquired the bacterium in a different location than where it was captured; additionally, if it has not fed (or possibly, oviposited - Halbert and Manjunath, 2004) then it has not yet had a chance to infect the tree it was found on. In contrast, nymphs cannot fly, are reported to move only when disturbed or over-crowded (Tsai and Lui, 2000), and are unlikely to walk between trees. Because of this, the only mechanism by which a nymph can acquire CLas is via feeding on the tree where it is found, or from an infected parent.

Current scientific consensus appears to be that the most probable method of CLas-acquisition by a psyllid is via feeding on infected tissue, and that transovarial transmission of CLas from adult to progeny occurs with such negligible frequency as to be irrelevant for management considerations. Pelz-Stelinski et al. (2010) conducted a robust study using modern methodology and determined transovarial transmission to occur in 2-5% of offspring. Another study by Mann et al. (2011) also observed low numbers of infection in offspring. In that study, 5% of eggs produced by infected adults tested positive for CLas by PCR, and only 0.8% of adult offspring produced from CLas+ males mated with CLas- females. It is most likely, therefore, that an infected nymph acquired the bacterium from the tree it is found on.
References


