CITRUS ADVANCED TECHNOLOGY PROGRAM

QUARTERLY & FINAL REPORTS: Control of Citrus Greening, Canker & Emerging Diseases of Citrus

▶ INSTRUCTIONS

○ *Quarterly Report* ◉ *Annual Report* ○ *Final*

Required: What is the "headline" for this report (e.g. a one-sentence "newspaper headline" describing what you accomplished)

Psyllids initially prefer HLB plants, but finally settle on healthy

Proposal Title

How does Liberibacter infection of psyllids affect the behavioral response of this vector to healthy versus HLB-infected citrus trees?

Today's Date	Sponsoring Organization (drop-down)	Category (drop down)
10/23/11	Citrus Research and Development Foundation	Vector Monitoring, Behavior, Cultivation

REPORT UPDATE (500 words; summarize your accomplishments)

The goal of this project has been to determine if infection by Candidatus Liberibacter affects the response of Asian citrus psyllid (ACP) to its citrus host plants to understand a critical component of disease spread. In this project we evaluated if healthy psyllids are attracted more to HLB infected or healthy trees. Also, we determined whether this behavior changes when the ACP vector becomes infected with the pathogen. We conducted a series of behavioral experiments to investigate whether HLB-infected citrus plants are differentially attractive to ACP as compared with healthy citrus plants. We also examined if psyllids known to be infected with the pathogen behaved differently from uninfected controls in response to both healthy and HLB-infected plants. Our preliminary results indicated that HLB-infected citrus plants are more attractive to ACP adults than healthy plants in two-choice olfactometer experiments. More ACP were attracted to HLB-infected plants than to healthy plants in open-air cage experiments. However, subsequent dispersal of ACP adults to healthy plants following their initial choice indicated that final settling preference was for healthy rather than diseased plants.

We hypothesized that initial movement of ACP to infected plants and further dispersal to healthy plants may be explained by production of deceptive volatile compounds by HLB-infected plants to attract ACP adults in the field to facilitate the spread of bacteria as occurs with apple phytoplasma Candidatus Phytoplasma mali, responsible for apple proliferation disease. Ca.P. mali hijacks the apple trees to produce specific chemical that attracts the plant-sap sucking psyllid vector to infected trees. This is a major factor for facilitating disease spread in apple. Alternatively, the yellow color of HLB-diseased plants due to chlorosis and yellowing of shoots may attract the ACP initially but psyllids move to healthy plants after sampling the phloem of diseased trees. The movement to new plants could be due to poor nutritional status of HLB infected plants. It is known that ACP adults are attracted to yellow color; therefore, initial attraction of ACP adults to diseased plants may be due to chlorosis of leaves caused by HLB. Also HLB-infected plants are deficient in zinc, iron, manganese, calcium, sulfur and/or boron and hence the subsequent movement of psyllids to healthy plants could be due the poor host suitability of HLB-infected plants. Settling experiments with HLB-infected and healthy plants in complete dark conditions produced similar results to the ones under full light conditions suggesting that initial movement of psyllids to HLB-infected plants is not due to the yellow color but to some other factors. Head space analysis of volatiles from HLB-infected and healthy citrus plants indicated that these plants had significantly different chemical profiles. For example, HLB-infected plants produced significantly more methyl salicylate (MeSA) than healthy plants while healthy plants produced higher amounts of methyl anthranilate (MA). Furthermore, we recently discovered that HLB-infected plants produce significantly more trans-β-ocimene than uninfected counterparts. Importantly, we also found that trans-β-ocimene is highly attractive to psyllids. Thus, the current working hypothesis is that infected plants initially produce large quantities of trans-β-ocimene to attract psyllids and then subsequently produce large amounts of MeSA to repel them and this mechanism facilitates spread of disease. We are currently verifying this hypothesis and continuing research on the effects of nutrient deficiencies on pysllid behavior. The ultimate goal of this research is to gain understanding how to develop citrus varieties that are not attractive to ACP.

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Organization University of Florida

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SUBMIT REPORT

CITRUS RESEARCH AND DEVELOPMENT FOUNDATION, INC.