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)

New information on pathogen transmission by ACP

Proposal Title

Huanglongbing: Understanding the vector-pathogen interaction for disease management

Today's Date	Sponsoring Organization (drop-down)	Category (drop down)
1/15/11	Citrus Research and Development Foundation	Vector Management

REPORT UPDATE (500 words; summarize your accomplishments)

Based on the analysis of more than 78,000 psyllids collected monthly from commercial citrus groves in Florida, we have identified certain times of the year when psyllids are more likely to be carrying the Las pathogen with Oct-Dec having the highest likelihood of Las+ psyllids being present. However, our results also suggest that risk of pathogen transmission can be present at any time of the year which we can not yet predict. Further work is ongoing to correlate plant related factors with psyllid transmission of the pathogen for more reliable prediction of risk and need for increased psyllid control efforts. The effects of insecticide applications on the ability of psyllids to successfully transmit Las were investigated using Electrical penetration graph (EPG) monitors. Certain groups of insecticides (particularly Pyrethroids and certain OPs) were able to prevent pathogen transmission by disrupting psyllid feeding behavior while some of the more selective insecticide groups had no discernible effect on pathogen transmission. The effects of three soil-applied neonicotinoid insecticides were also examined and despite some differences, all three were shown to provide benefit in preventing or reducing pathogen transmission. EPG investigations are continuing with additional products as well as looking at the extended duration of protection provided by these insecticides. Development of new approaches to managing pathogen spread requires a better understanding of the factors responsible for pathogen survival in the vector. For this reason, psyllid populations from various locations in Florida, Texas, Hawaii, South America, and Asia have been collected for analysis of endosymbiont populations. To determine the associations between psyllid populations and the frequency of their associated bacterial endosymbionts, 16S clone libraries obtained from these samples have been sequenced and are being subjected to DNA homology searches. PCR results from these samples indicated that Wolbachia infection differs considerably among psyllid populations within and outside of Florida. In addition, laboratory experiments indicated that there is no apparent effect of temperature on ACP endosymbiont populations. As a follow-up to this study, we analyzed additional psyllid samples to determine whether specific endosymbionts are associated with changes in Las- infection rates within ACP populations over time. Finally, we have successfully developed a psyllid microinjection system for inoculating psyllids with antibiotics. Initial injections with rifampicin were unsuccessful, as subsequent PCR analysis with 16S primers failed to identify aposymbiotic psyllids. Injections with tetracycline are currently being conducted to obtain axenic psyllids for studies of the biological functions of psyllid endosymbionts. Experiments evaluating the effect of temperature on Las acquisition and inoculation were completed. Peak acquisition (approximately 50%) occurred at 25oC. Significantly fewer ACP (< 10%) acquired Las below 22.5oC and above 30oC. We have begun assessing plants used in inoculation studies initiated five months ago. Thus far, none of these plants have tested positive for Las. Previously we reported that psyllid survival decreases when the insects are infected with Las. In experiments to determine the effect of Las on psyllid fitness, we have determined that nymphs reared on Las-infected plants develop faster than nymphs reared on healthy plants and that there are no differences in fertility among infected and healthy psyllids. Severinia buxifolia (box orange) was shown to be a non citrus rutaceous host for Ca. L. asiaticus. Psyllid transmissions from S. buxifolia to citrus were successful with a transmission rate of 46% and to S. buxifolia at a rate of 54%. A newly devised qPCR method that will determine live versus dead bacteria is being utilized for studies with inoculative psyllids.

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SUBMIT REPORT

CITRUS RESEARCH AND DEVELOPMENT FOUNDATION, INC.