Florida Citrus Advanced Technology Program

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

Instructions Complete the fields based on your project specs. When finished, save the form to your local disk using a unique name. Then, go to **http://research.fcprac.com**, and log in with your user name and password using Researcher Login in the lower left. Find this project title and click on **Submit a Report**. Update your profile information if needed, then upload this report as directed.

2009-2010 REPORT	CATEGORY (drop-down)	TODAY'S DATE (m/d/yr)
◉ *Quarterly Report* ○ *Annual Report* ○ *Final*	Psyllid	7/14/10

WHAT IS THE "HEADLINE" FOR THIS REPORT (e.g. a one-sentence "newspaper headline" describing what you accomplished)

Candidatus Liberibacter asiaticus infection increases susceptibility of Asian citrus psyllid to selected insecticides

TITLE and CONTACT INFORMATION

Proposal Title Maintaining the effectiveness of our current and most important psyllid management tools (insecticides) by preventing insecticide resistance

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Organization University of Florida/IFAS	*Total Direct Funds (current year)* 61308

REPORT UPDATE (650 words; provide details about your headline)

The objective of this project is to elucidate mechanisms of resistance in ACP to insecticides and to develop appropriate resistance management strategies. Microorganisms are known to alter insect host physiology, which may benefit or harm the host. Most recently, we determined the effect of Candidatus Liberibacter asiaticus (Las), the bacterium presumably responsible for causing huanglongbing (HLB) disease, on the physiology of its vector, the Asian citrus psyllid (ACP). Specifically, we determined the effects of Las infection on susceptibility of ACP to selected insecticides. Furthermore, total protein content, general esterase, glutathione S-transferase (GST) and cytochrome P450 activities were quantified in Las-infected and uninfected ACP to gain insight into the possible mechanism(s) responsible for altered susceptibility to insecticides due to Las infection.

LC50 values were significantly lower for Las-infected than uninfected ACP adults for chlorpyriphos and spinetoram. Furthermore, there was a general trend for lower LC50 values for three other insecticides for Las-infected ACP; however, the differences were not statistically significant. Total protein content (µg ml-1) was significantly lower in Las-infected (23.5 ± 1.3 in head + thorax; 27.7 ± 1.9 in abdomen) than uninfected (29.7 ± 2.1 in head + thorax; 35.0 ± 2.3 in abdomen) ACP. Likewise, mean (± SEM) general esterase enzyme activity (nmol min-1 mg-1 protein) was significantly lower in Las-infected (111.6 ± 4.5 in head + thorax; 109.5 ± 3.7 in abdomen) than uninfected (135.9 ± 7.5 in head + thorax; 206.1 ± 23.7 in abdomen) ACP. GST activity (µmol/min/mg protein) was found to be significantly lower in Las-infected ACP (468.23 ± 26.87) when compared to the corresponding uninfected adults (757.63 ± 59.46). Likewise, mean P450 activity (EU of cytochrome P450/mg of protein) was significantly higher among the uninfected (0.49 ± 0.05) than in Las-infected (0.23 ± 0.02) ACP.

Susceptibility of ACP to selected insecticides from five major chemistries was greater in Las-infected than uninfected ACP. The lower total protein content, and reduced general esterase, GST and P450 activities in Las-infected than uninfected ACP may partly explain the observed higher insecticide susceptibility of Las-infected ACP. Therefore, the results of our study indicate that Las infection may be detrimental to ACP suggesting a non-symbiotic relationship. Higher mortality of Las-infected than uninfected ACP suggests that Las-infected psyllids may be selected against under commercial ACP management practices relying on insecticides. Selection against Las-infected ACP may limit spread of HLB. This hypothesis is consistent with the notion that insecticide resistance contributes to the spread of vector-borne disease. Our subsequent investigations should help elucidate the mechanisms of altered host physiology with respect to insecticide resistance management programs for ACP.

In other concurrent investigations, we have recently determined baseline toxicity of various insecticides to late nymphal instar (4th) ACP to determine if resistance levels differ between ACP adults and nymphs. Baseline data were collected using an ACP culture maintained at a CREC greenhouse for 5 commonly used insecticides. LC50 (mg ai/l) values of the susceptible greenhouse population were compared with those of field collected populations from 2 sites. LC50 of carbaryl (50.71) and spinetoram (3.88) was significantly higher for the population collected from one of the field sites when compared to the greenhouse population (carbaryl: 17.59; spinetoram: 0.66). Immature psyllids collected from two field sites were significantly less susceptible to imidacloprid (with LC50 values of 0.84 and 0.50) than the susceptible lab population (0.22). Our results show that immature psyllid nymphs exhibit resistance levels similar to those previously documented for adults.