Florida Citrus Advanced Technology Program

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

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2009-2010 REPORT	CATEGORY (drop-down)	TODAY'S DATE (m/d/yr)
● *Quarterly Report* ○ *Annual Report* ○ *Final*	Psyllid	6/25/09

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

Insect growth regulators have impact Asian citrus psyllid mortality and imidacloprid has strong sub-lethal effects

TITLE and CONTACT INFORMATION

Proposal Title Development and optimization of biorational tactics for Asian citrus psyllid control and decreasing huanglongbing incidence.

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Organization University of Florida/IFAS	*Total Direct Funds (current year)* 92778

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

The purpose of this investigation is to develop, evaluate, and optimize biorational management tools for Asian citrus psyllid (ACP) including insect growth regulators and antifeedants. In our first set of laboratory studies with insect growth regulators, we investigated the activity of pyriproxyfen, a juvenile hormone mimic, on ACP eggs, nymphs and adults to evaluate its potential usefulness as a biorational insecticide for inclusion into an integrated pest management (IPM) strategy for ACP control. Pyriproxyfen exhibited strong ovicidal and larvicidal activity against ACP eggs and nymphs, respectively, in age- and concentration-dependent manners. Irrespective of egg age and timing of treatment, a significantly lower percentage of eggs (5-29%) hatched into nymphs at the higher concentrations tested (64 and 128 µg mL-1). A significantly lower percentage of early instar nymphs (first, second and third) survived and emerged into adults (0-36%) at the three higher concentrations tested (16, 32, and 64 µg mL-1) compared with late instar nymphs (fourth and fifth) (25-74%). However, 15-20% of those adults that emerged from late instar nymphs exhibited morphological abnormalities. Furthermore, pyriproxyfen exhibited transovarial activity by significantly reducing the fecundity of females and viability of eggs deposited by females that emerged from treated fifth instar nymphs. Topical application of pyriproxyfen to adults at 100 µg mL-1 also significantly reduced fecundity and egg viability. Application of pyriproxyfen at 64 µg mL-1 results in the highest inhibition of egg hatch in younger eggs (0-48 h old) laid before or after treatment and strongest suppression of adult emergence from early instar nymphs compared with other rates tested. Pyriproxyfen also markedly reduced female fecundity and egg viability for adults that were exposed either directly or indirectly. The direct (ovicidal and larvicidal) and indirect (transovarial) effects of pyriproxyfen against immature and adult ACP, respectively, suggest that integration of this insecticide as part of an IPM strategy should negatively impact ACP populations over time. Future studies are needed to determine the effects of field aged residues. Also, further field scale testing is needed to determine how to best incorporate pyriproxyfen into an integrated management program for ACP. We are now moving onto detailed investigations of other insect growth regulators including buprofezin, and diflubenzuron. In a separate investigation, we have been studying the sub-lethal effects of various insecticides. Given the broad use of imidacloprid for management of ACP, particularly on young trees, we investigated it's possible sub-lethal effects first. Because of the variation in spatial and temporal uptake and systemic distribution of imidacloprid applied to citrus trees and its degradation over time in citrus trees, ACP adults and nymphs are exposed to concentrations that may not cause immediate mortality but rather sublethal effects. The objective of this laboratory study was to determine the effects of sublethal concentrations of imidacloprid on ACP life stages. Feeding by ACP adults and nymphs on plants treated daily with a sublethal concentration (0.1 µg mL-1) of imidacloprid significantly decreased adult longevity (8 d), fecundity (33%), and fertility (6%) as well as nymph survival (12%) and developmental rate compared with untreated controls. The magnitude of these negative effects was directly related to exposure duration and concentration. Furthermore, ACP adults that fed on citrus leaves treated systemically with lethal and sublethal concentrations of imidacloprid excreted significantly less honeydew (7-94%) compared with controls in a concentration-dependent manner suggesting antifeedant activity of imidacloprid. Sublethal concentrations of imidacloprid negatively affect development, reproduction, survival, and longevity of ACP which likely contributes to population reductions over time. Also, reduced feeding by ACP adults on plants treated with sublethal concentrations of imidacloprid may potentially decrease the capacity of ACP to successfully acquire and transmit the HLB causal pathogen. Ongoing investigations include the effects of feeding inhibitors on HLB transmission.