Ambrosia and Bark Beetle Fauna in Avocado Groves: 1983-2009

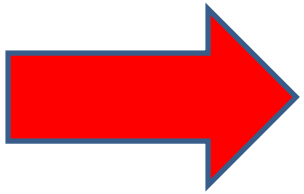
Hypothenemus spp.

Theoborus solitariceps

Scolytids collected in Miami-Dade, 1983-2009, Peña, Thomas & Duncan, unpubl.

Xylosandrus crassiusculus

X. compactus



Regularly affecting only stressed Trees

X. glabratus (RAB) & Disease: Obligatory Relationship

The Adult female constructs a tunnel

Lays eggs

Fungus grows in galleries

Inoculate spores from the mycangium

Larvae feeds on fungus

RAB ATTACKS HEALTHY HOSTS ONLY???

Summary of Projects in Entomology: Red Bay Ambrosia Beetle

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Project Area	Expected Output
Life cycle, Development in different hosts at different temperatures	Number of generations expected from a host/year
Seasonality	Peaks of emergence of RAB to predict times for dispersion
Chemical Control	Effective Chemical control methods selected
Repellents	Repellents Assessed> Useful or not?
Attractants	Commercial & exp. Attractants Determined. Effective or not?
RAB as vector of Rl	Minimum number of RAB to cause disease
Other Beetles as vectors of Rl	Determine potential Rl vectors
Microbial Control	Feasible or not?
Biological Control	Feasible or not?

Life cycle, Monitoring, Behavior

Activity	Output
Generation time	30-35 days
Emergence Time	60-240 days after initial boring
Number of Beetles/host plant	Avocado: RedBay: SwampBay 7 : 33 : 106
Beetle Activity	4-7 PM Uni-modal Flight
Beetle movement	Highest at 1- 3 ft from the ground
Seasonality	Highest Peaks Flying: Feb-March Lowest: Nov-Dec (Gainesville)
Time for RAB to observe LW symptoms: Avocado vs. swampbay	14 days in avocado days in swamp bay
Developmental Threshold	No development at 16°C
Number of beetles to cause symptoms?	1 in small plants, research needed

Chemical Control

Activity	Output
25 Tests conducted based on commercial doses (2009-2010)	Contact Insecticides, basically pyrethroids: more tests needed?
Lethal Dose 90: 12 commercial insecticides	Bifenthrin, Danitol, Endigo, Hero, Malathion, Permethrin
Persistence in the field	Malathion and Hero persist 15 days after application (Homestead Field Conditions)
Adjuvants to increase insecticide persistence	On Going: Waxes, oils
Effect of insecticides on Pest Resurgence in Avocado	To start, August 2012
Effectiveness of Insecticides on beetles inhabiting chipped wood (avocado)	On Going
Systemic Insecticides	Imidacloprid, not effective, only when mixed with pyrethroids; OTHERS??
Application Methods	On Going (volume, spot)

Repellents

Activity	Output	Needed
Experimental vs. Commercial Repellents	13 tested, only 3 protected wood from RAB boring (lab)	On Going Field Testing
Oleic Acid as repellent	So far, not effective 100% phytotoxicity	?????????
Non Host Volatiles L. Stelinski/Kuhn/ Peña	On Going Research Not promising Results	Discontinue or long range goal

Attractants & Trap and Kill

Activity	Output	Assessment
Manuka lure	Weak, lasts only 15 days in the field.	Inefficient
Essential Oils (Kendra)	On Going Research	Pending; funding needed
Volatiles from R. lauricola (Stelinski)	Capture as good as Manuka lure, price similar	Pending; funding needed
Synergism Essential Oils and R. lauricola volatiles	Capture more beetles than current commercial lure	Good Potential, funding needed
Trap and kill system	Traps and kills at least 30% of the RAB	Funding Needed

Other Beetles Vectoring Rl

Activity	Output
Identify beetles associated with avocado	16 species of beetles are associated with avocado
Beetles other than RAB carrying RL? (coop with RP lab)	At least six species of beetles other than RAB can carry RL
Beetles other than RAB can transmit RL to healthy plants (coop with RP lab)	Under controlled conditions YES, but more likely to occur in redbay than in avocado.
Can other beetles attack healthy avocado plants under field conditions?	On Going Research; funds needed

Microbial, Natural Control

Activity	Output	Needs
Entomopathogenic fungi	Could Fungi reduce infestation in natural areas? CBB model?	Not tested yet; not funds available
Natural Control	Three potential parasitoids of Scolytinae found in a 1 year survey across Florida/ Predators Present?	Too premature; no funds to determine if these are indeed parasitoids /predators of RAB or other: Only works at high beetle densities (Long Term)
Classical Biological Control	No Natural RAB enemies found in Taiwan during 1 week survey	Longer Surveys need to be conducted : Problem : Long Term

SUMMARY

Project Area	Expected Output	Future Work
Life cycle, Development in different hosts at different temperatures	Number of generations expected from a host/year	Model to predict infestations . Not funds available
Seasonality	Peaks of emergence of RAB to predict times for dispersion	Model to predict infestations. Not funds available
Chemical Control	Effective Chemical control methods selected	Adjuvants & Avermectins??? Other?
Repellents	Repellents Assessed> Useful or not?	Adjuvants to increase persistence
Attractants	Commercial Attractants Determined. Effective or not?	A mix of powerful plant and fungal and species specific attractant needed
RAB as vector of Rl	Minimum number of RAB to cause disease	Verify results obtained during 2010 for all cvs.

Project area	Expected output	Future work
Other beetles as vectors of RI	RAB major vector, others with lower importance depending on avocado health conditions	Verify under caged field avocado conditions
Microbial Control	Feasible but minor role in reducing infestations? CBB model; Natural areas?	Verify which entomo-pathogen is best?
Natural Control	Parasitoids /predators effective but when densities are high	Test on RAB if positive worth as long range: natural areas
Classical Biological Control	A parasitoid found in areas where RAB is low	Intensive surveys; long range

Conclusions

- IPM of RAB as a Disease Vector demands a higher funding in order to be effective and fast in similar manner than is currently in place for other fruit crops disease vectors in Florida, i.e., Citrus psyllid.
- RAB IPM NEEDS: A POWERFUL AND EFFECTIVE TRAP SYSTEM, A PERSISTANT INSECTICIDE (SHORT TERM) AND A POWERFUL AND PERSISTENT REPELLENT (SHORT TERM)