UNIVERSITY OF FLORIDA
Institute of Food and Agricultural Sciences

Practical Pest Management for Muscadine Grapes

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Muscadine grape (*Vitis rotundifolia* Michx.)

- native to the southeastern United States
- more than 100 cultivars of muscadines exist today
- tolerant of insect and disease pests

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Occasional Pests of grapes

Pre-Bloom

- Aphids
- Flea beetles
- Thrips

Post-Bloom

- Grape mealybug
- Lecanium scales
- Root borer
- Leafhopper
- Spidermites

Insecticide Tactics

- Malathion, Assail, Danitol,
- Mustang Max, Danitol, Malathion
- Malathion, Delegate, Assail

- Assail, Movento, Malathion, Hort oils
- Malathion, Assail Hort. Oils, Movento
- Chlorpyrifos (Lorsban 4E)
- Brigade, Malathion, Sivanto, Danitol
- Agri-Mek, Acramite, Vendex, Nealta

Outline

- Status of muscadine grapes in relation to pests
- Grape root borer injury, and life cycle
- Study 1: Evaluation of trap designs
  - Wing vs. Bucket traps
- Study 2: Evaluation of trap color
- Grape Root Borer phenology
- Conclusions
- Grapevine aphid introduction
- Population abundance study
- Field efficacy trial with reduced-risk pesticides
- Effects of reduced-risk pesticides on biological control agents
- Conclusions
- Acknowledgements

Grape Root Borer

Grape Root Borer
Vitacea polistiformis Harris

Grape Root Borer adult female

Grape Root Borer adult male

Paper wasp *Polistes* sp.

Predator, pollinator

Hymenoptera, Vespidae

Grape root borer *Vitacea polistiformis* (Harris)

Pest

Grape Root Borer Injury

Larvae and galleries in grape rootstock

Larvae and damage

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Grape Root Borer Life Cycle

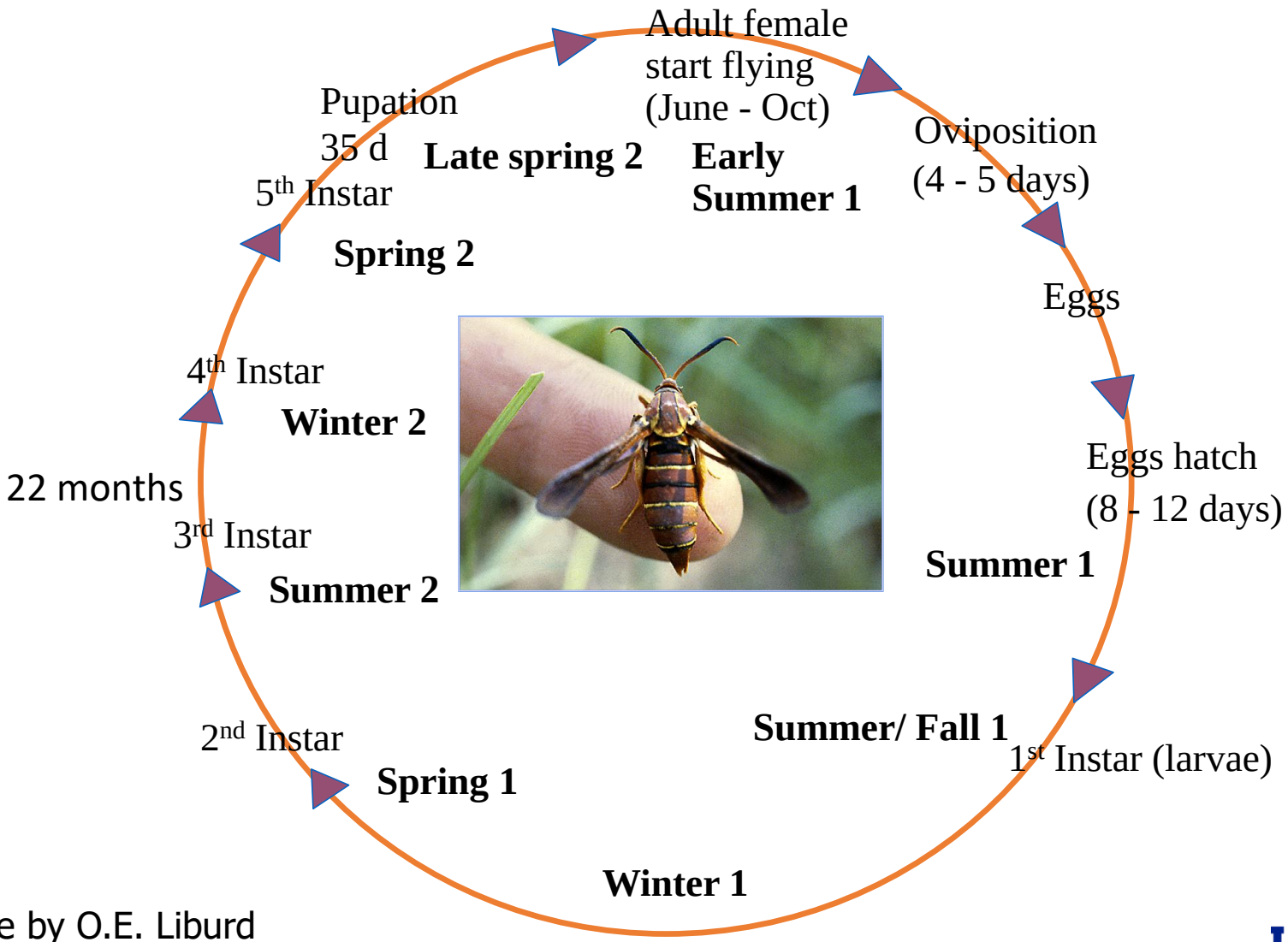

Figure by O.E. Liburd

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Grape root borer injury cont'd

- Restrict nutrients and water transportation from roots to the rest of the plant
- Reduce vine vigor

- Vines become more susceptible to freeze damage, drought, and pathogens
- A single larva can reduce the yield of a grape vine by 50%
- Two to three larvae are capable of killing an entire vine

** Chlorpyrifos (Lorsban 4E) 4.5 pints in 100 g water
Classified as a carcinogen, negative on soil predators

Study 1: Trap Design Study

- Objective: determine which trap type is most effective at catching GRB males
- Traps placed in three vineyards
- Both traps baited with GRB pheromone
  - 99% (E,Z)-2,13 octadecadienyl acetate
  - 1% (Z,Z)-3,13 octadecadienyl acetate

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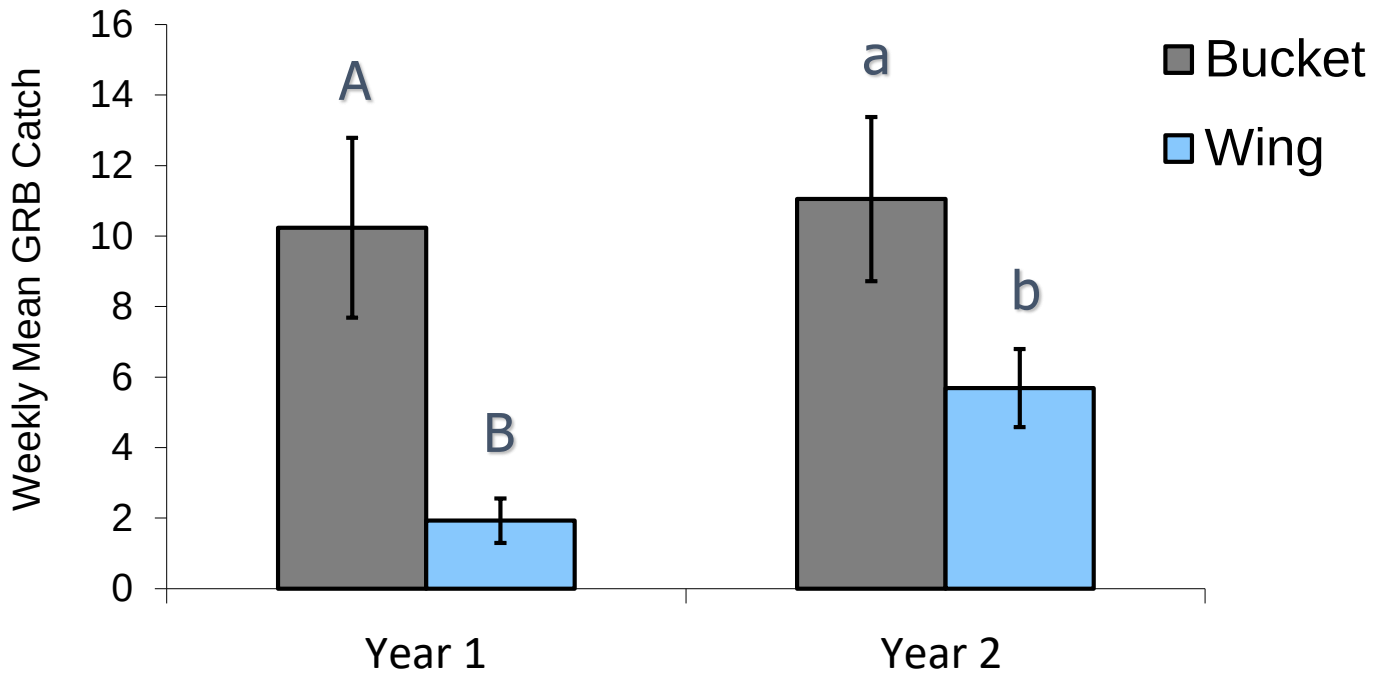
Study 1: Trap Design Results



Year 1: t =1.99; df =1,106, P =0.002

Year 2: t =0.98; df =1,158; P =0.039

Means with the same letter are not significantly different (P > 0.05, LSD test)

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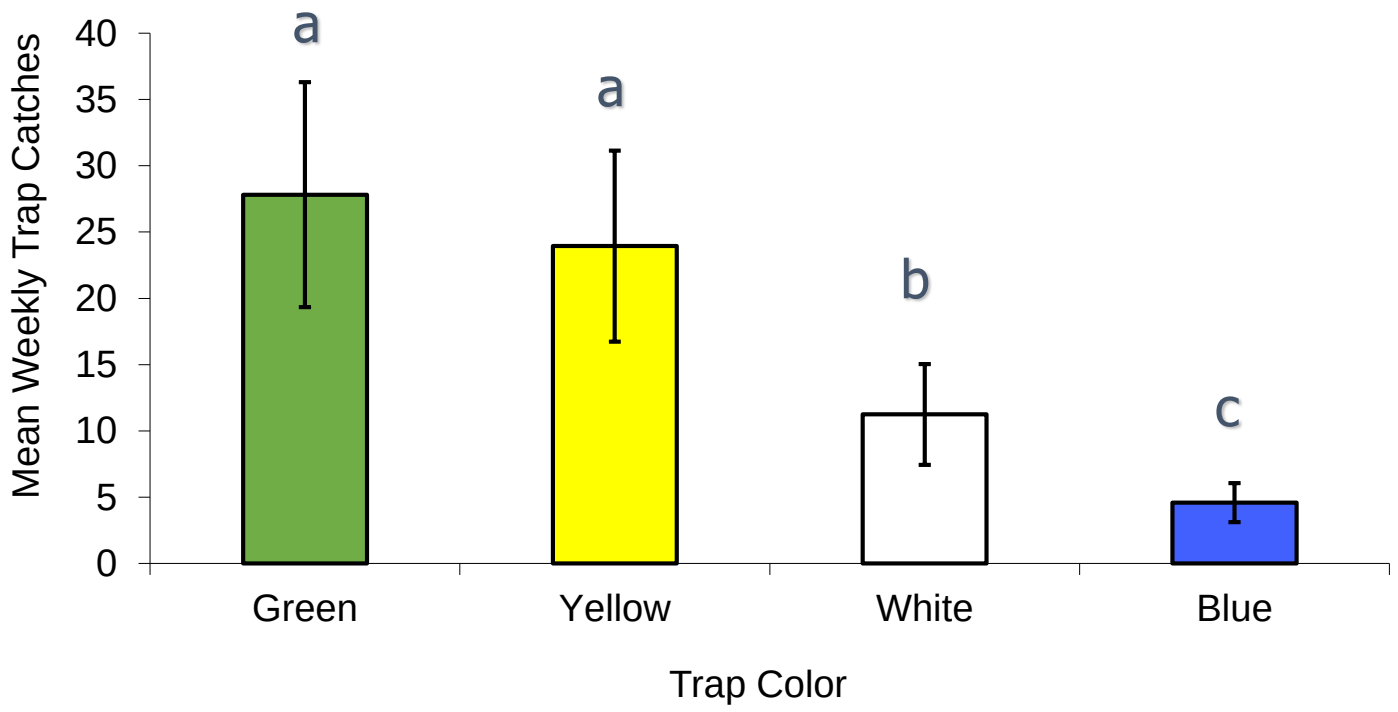
Study 2: Trap Color Study

- Objective: determine which color of bucket trap is most attractive to GRB males
- Study conducted in one vineyard in Putnam Co., Florida

- Traps arranged in randomized complete block design and rotated one position within blocks each week

Study 2: Trap Color



$F = 17.24$; df = 3,48; $P < 0.0001$

Means with the same letter are not significantly different ($P < 0.05$, LSD test)

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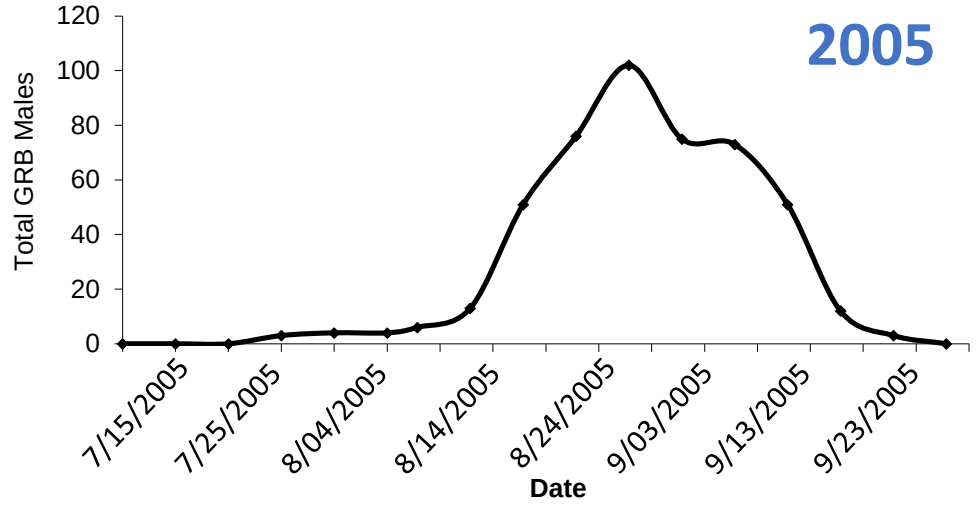
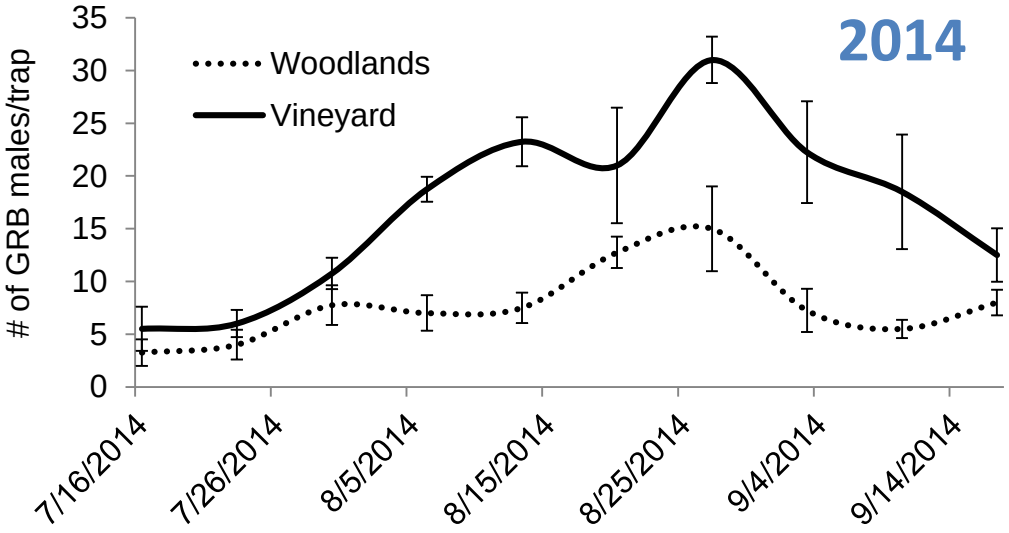
GRB Seasonal Activity





First emergence: 1st week August

Peak emergence: 3rd week September

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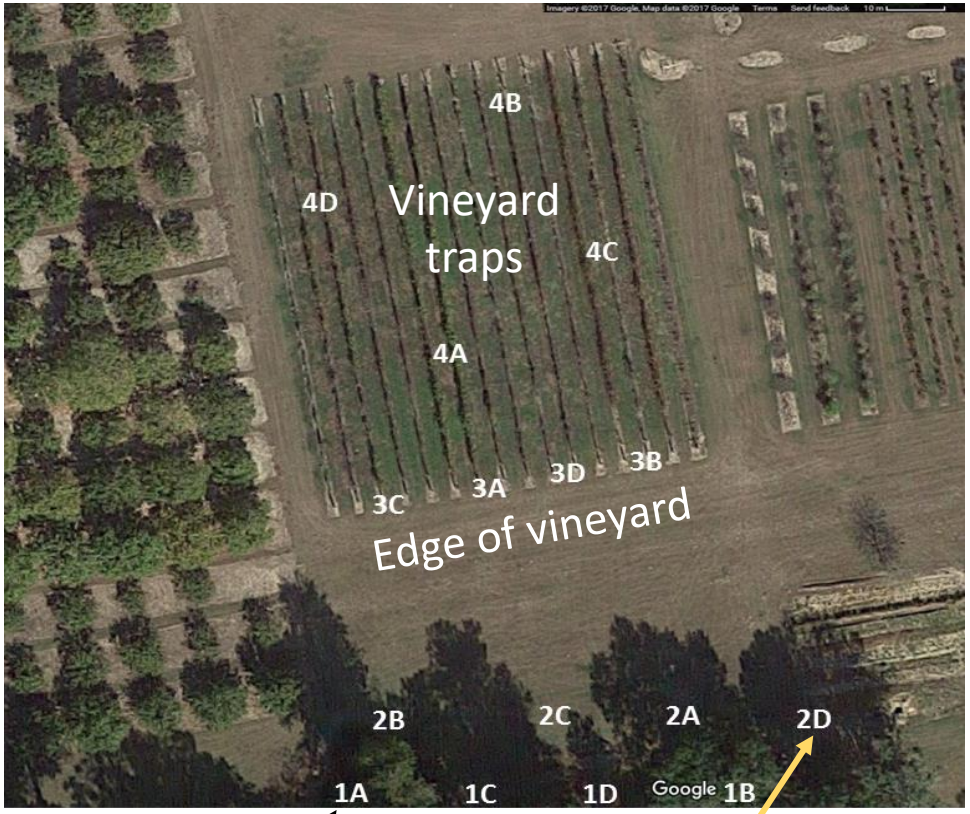
GRB distribution study

- Treatments =4 trap-distance
  1) 10 m into the woodlands,
  2) along the edge of the woodlands,
  3) along the edge of the vineyard, and
  4) in the vineyard

- Study conducted at the University of Florida Suwannee Valley Agricultural Extension Center (SVAEC) in Live Oak, FL.

- The letters (A-D) indicate the replicate for each treatment.



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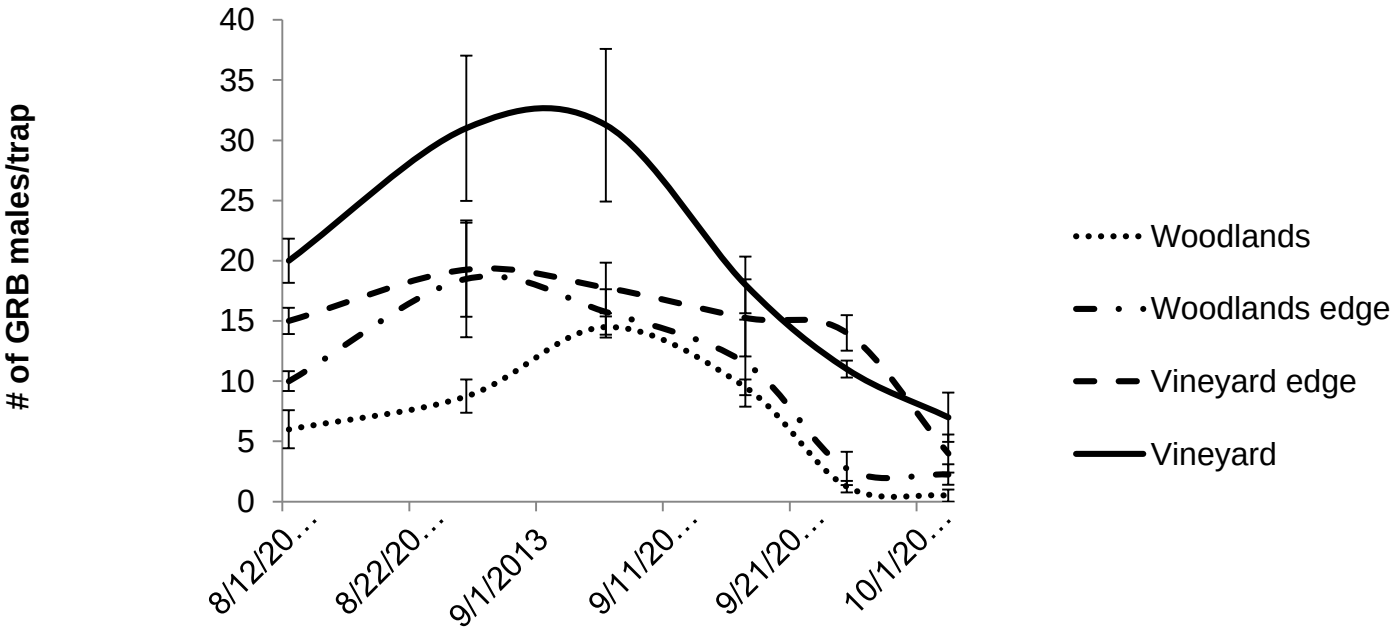
Results

Mean (±SE) number of adult male GRB per trap observed over two months for the GRB distribution study in **2013** collected from traps placed in four locations: woodlands, edge of woodlands, edge of vineyard, and in the vineyard.



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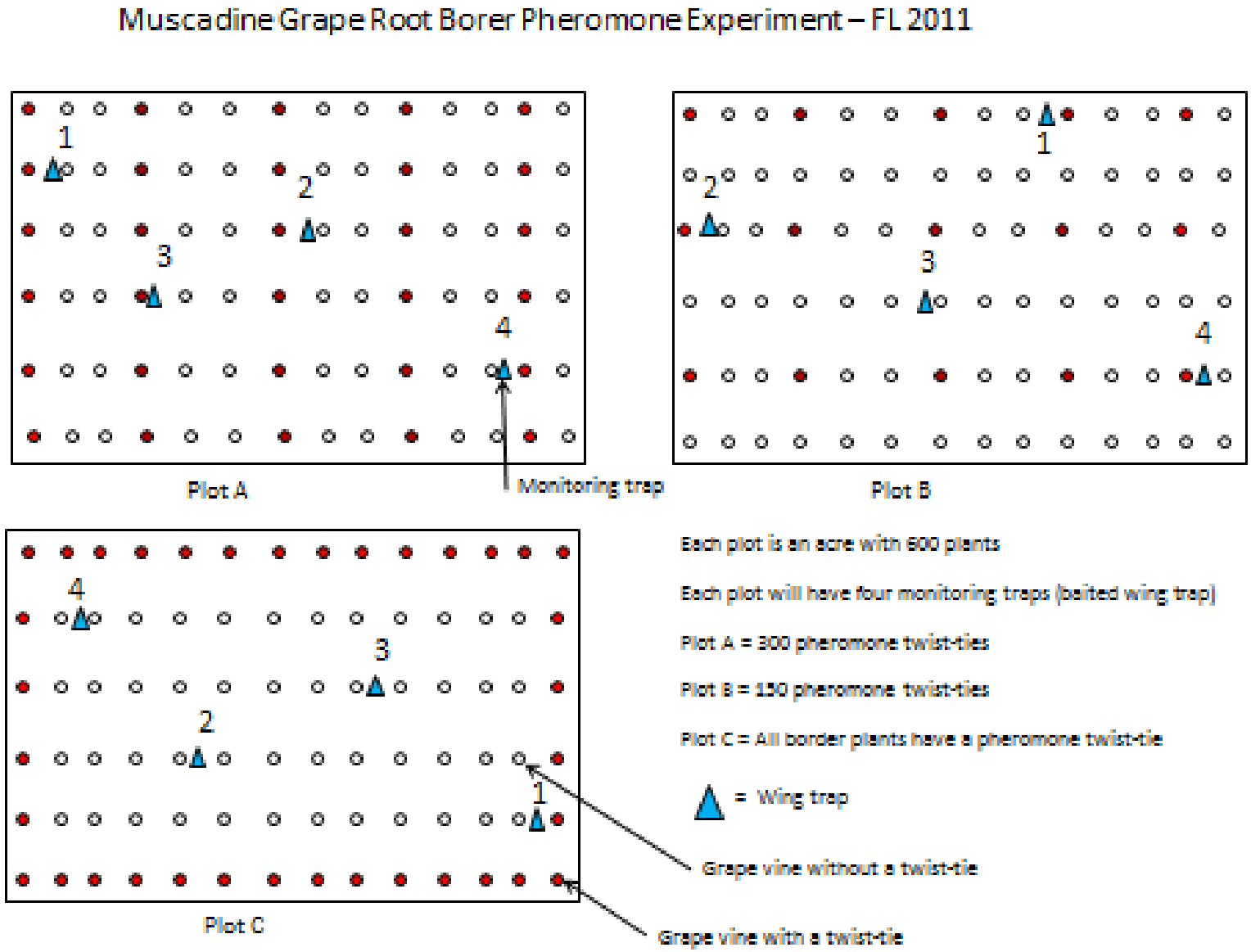
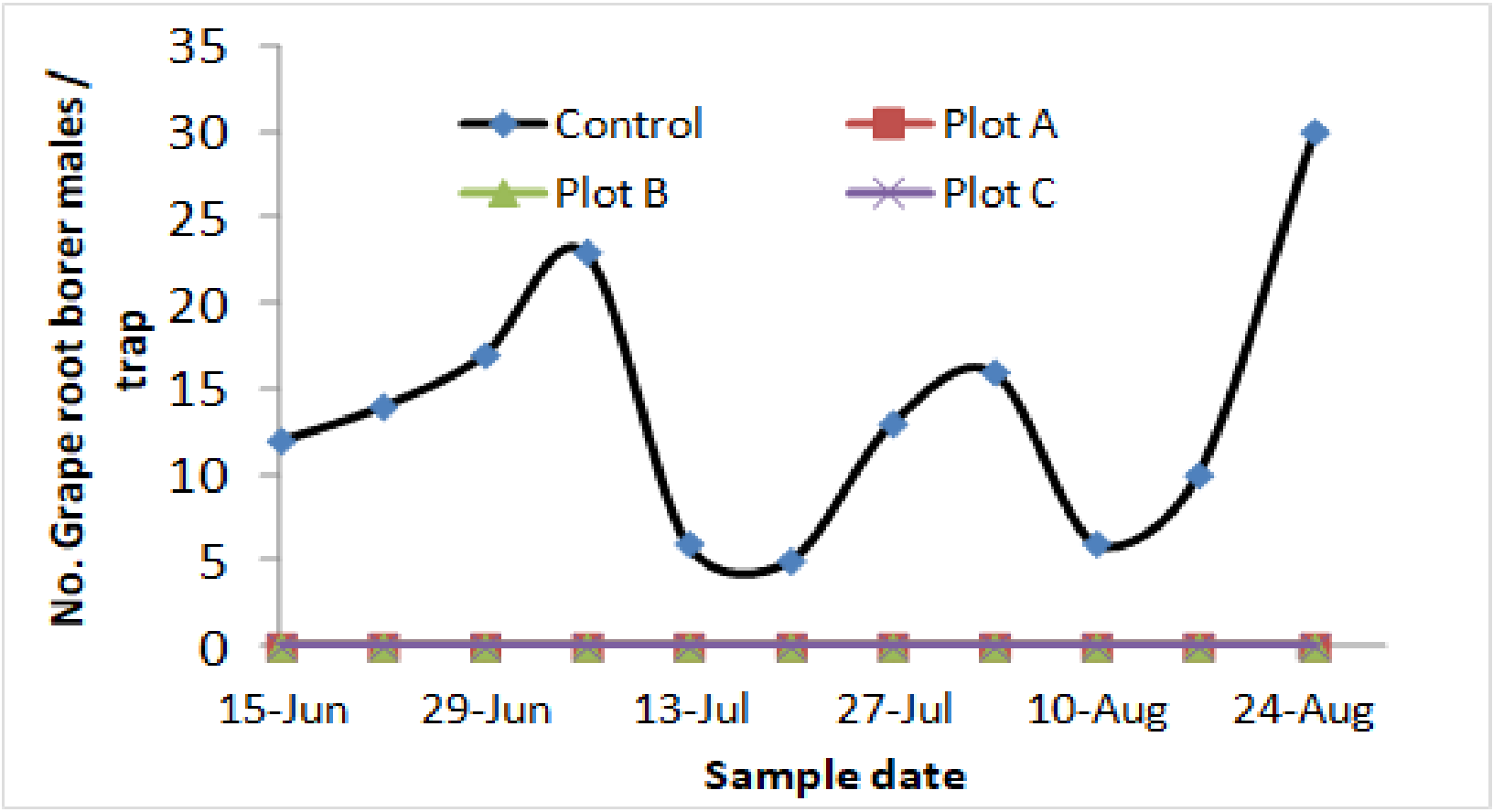
Deployment strategies using Leopard moth pheromone twist ties (Isonet-Z)



Mean number of grape root borer males caught in winged traps in vineyard with Leopard moth pheromone twist ties



Conclusions

- Bucket trap baited with GRB pheromone was more effective than baited wing trap
- Green and yellow bucket traps were more effective than white or blue traps
- Grape Root Borer adults were active from late July to early November with peak activity in mid-September
- Highest GRB captures were in vineyard and lowest in the woodlands in both years.
- Isonet-Z-Leopard moth pheromone twist ties can be used to disrupt grape root borer in vineyard.

Grapevine Aphid

GRAPEVINE APHID

- *Aphis illinoisensis* is native to USA, Central and South America

- Abundant in wild grapes (*Vitis* spp.) as well as cultivated varieties

- In north-central Florida it has been recorded from April when young shoots appear and until October when temperature begins to fall

winged form

wingless form

GRAPEVINE APHIDS INJURY

Feeds on young leaves and shoots of grapevines eventually reducing the number of grapes produced

They suck cell sap and increase vine susceptibility to secondary infections (sooty mold, powdery mildew??)

Some researches revealed they are capable of transmitting aphid borne viruses (watermelon mosaic virus-2) (Webb et al, 1994)

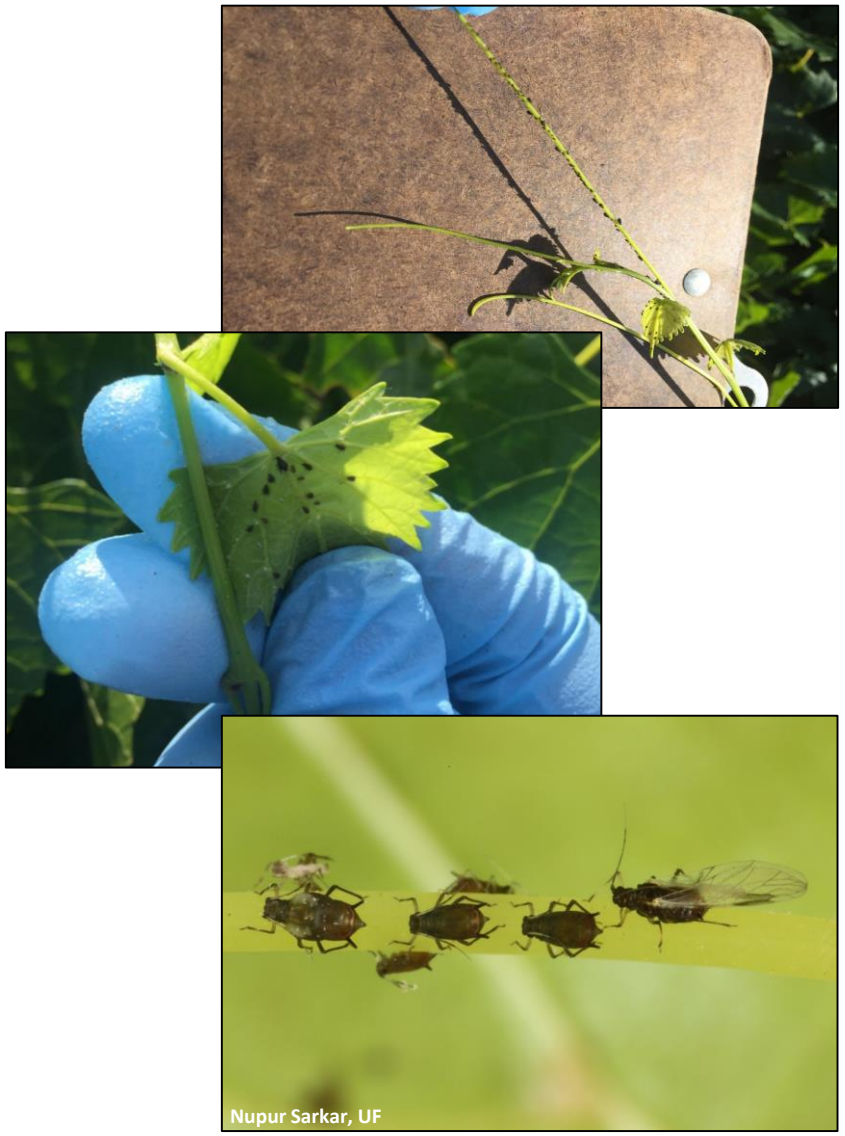
infected shoot, leaf and tendril

Objectives

- Population abundance throughout the year
- Field-based bioassay to identify reduced-risk pesticides for control of grapevine aphids
- Identification of biological control agents and effect of reduced risk pesticides on them

Population abundance study:

- *In-situ* count- once /week; young vines with 5 young leaves; 20 random samples/ cultivar
- 4 cultivars- Alachua, Carlos, Noble and Triumph
- Study conducted at Plant Science Research and Education Unit (PSREU), Citra, Florida



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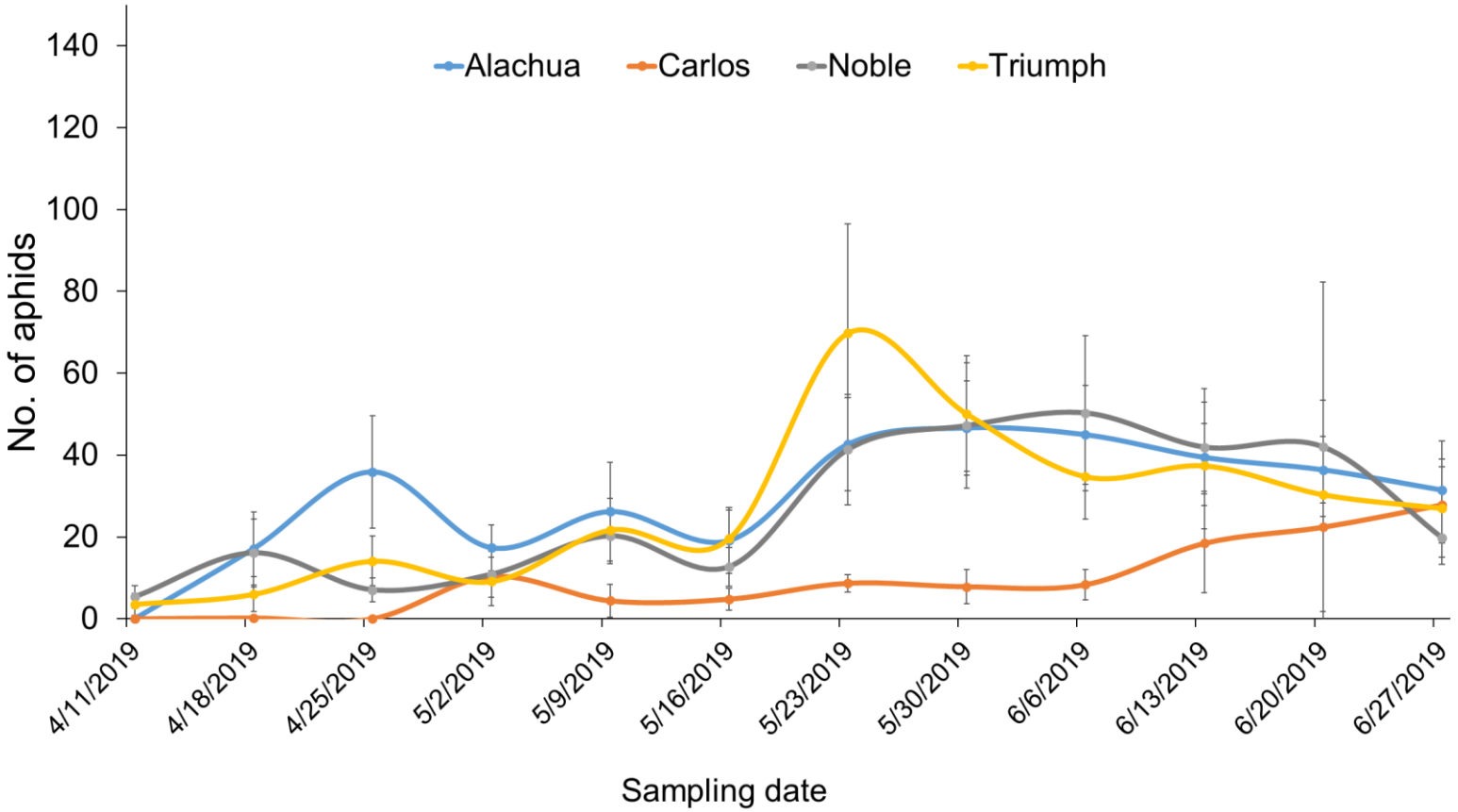
Population abundance



* Carlos

Carlos appears not to be first choice

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Field trial with reduced-risk pesticides

- Randomized complete block with 5 treatments and 4 replicates.

- Treatments:

1) Exirel (Cyazypyr®)
2) Delegate® (Spinetoram)
3) Movento® (Spirotetramat)
4) Malathion (positive control) and
5) Untreated (negative control)

- Applied at manufacturers recommended rate using a CO_2 sprayer.

- Study conducted at PSREU, Citra, Florida

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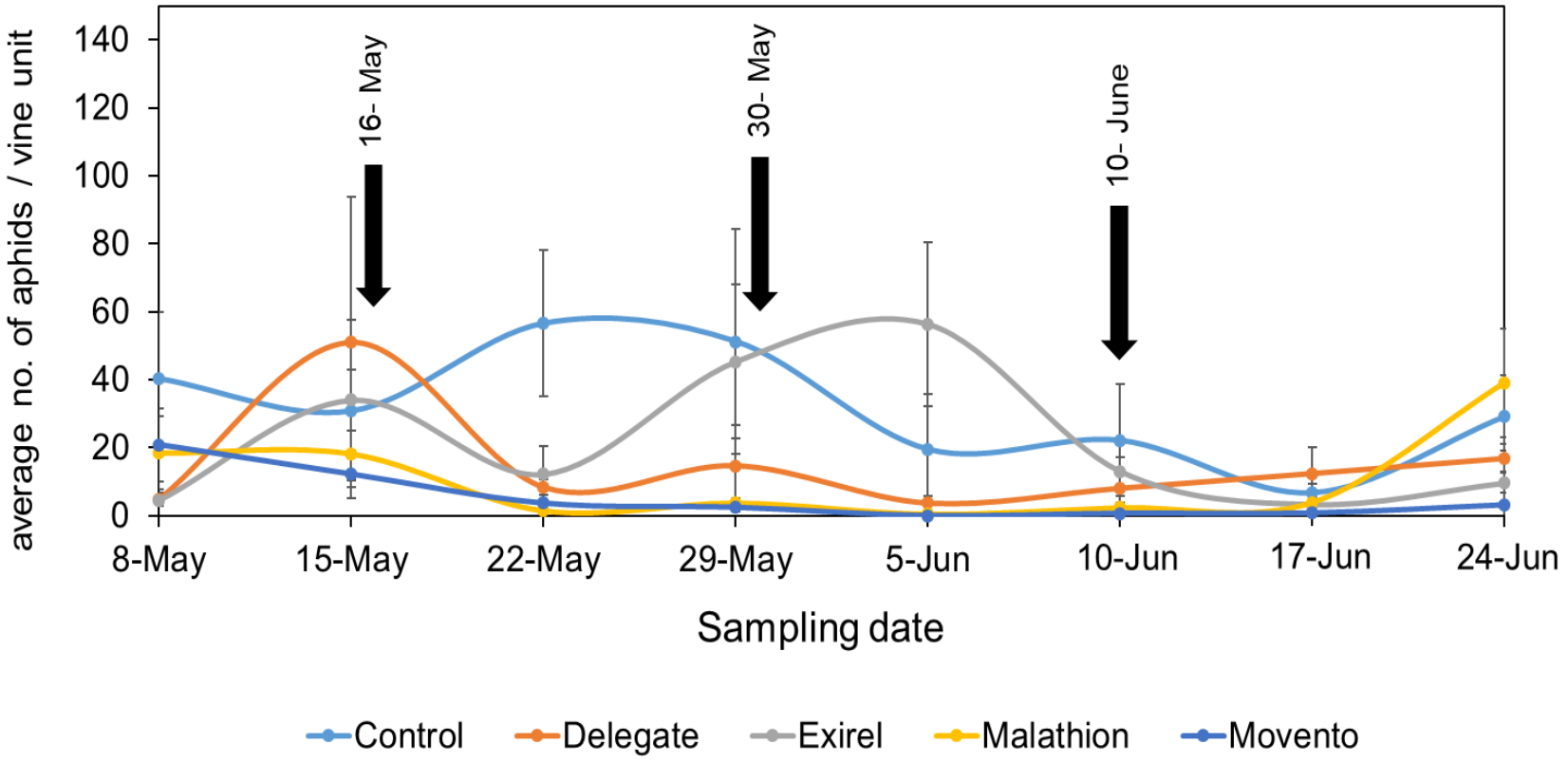
Result: Field trial with reduced-risk pesticides



Reduced-risk options

- Movento provided sustainable control
- Delegate performed well
- Exirel did not provide sustainable control

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biological control study

- ***Lysiphlebus testaceipes*** **(parasitoid)**

- ***Orius insidiosus*** **(predator)**

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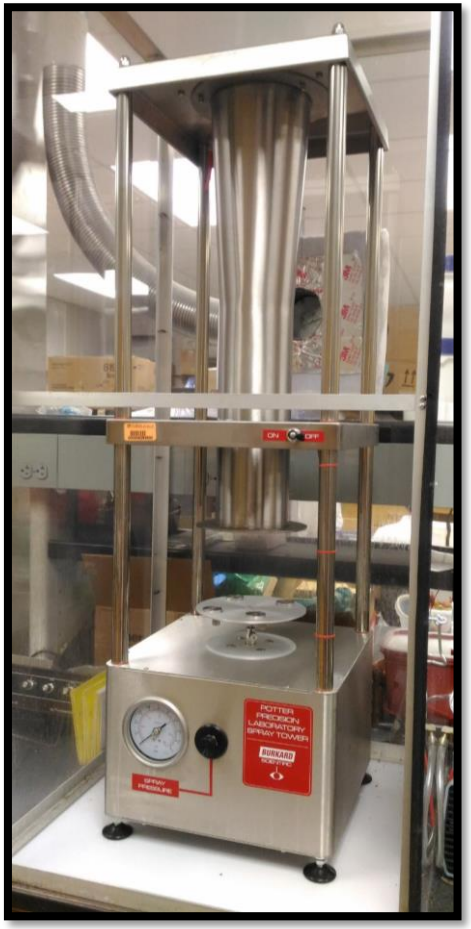
Effect of reduced-risk pesticides on biological control

5 treatments Exirel, Delegate, Movento, Malathion, Control

Residue ages

- **0 DAT**- X **5** Replications
- **3 DAT** X **5** Replications
- **7 DAT** X **5** Replications



- **Mortality was assessed at 24, 48, and 72 h**
- **Data were arcsine transformed and analyzed using repeated measures ANOVA**

sas

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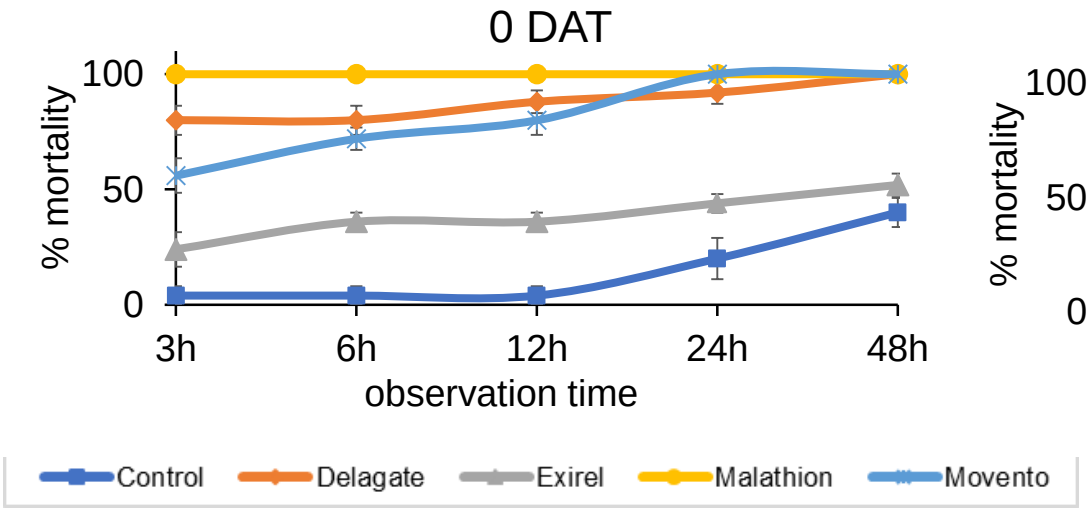
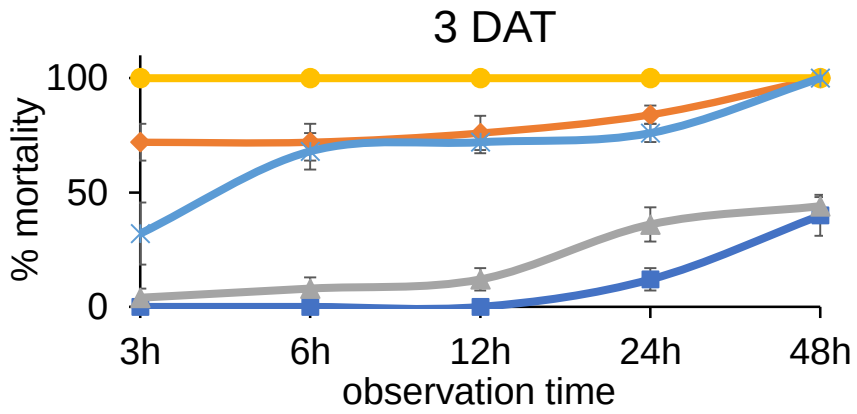
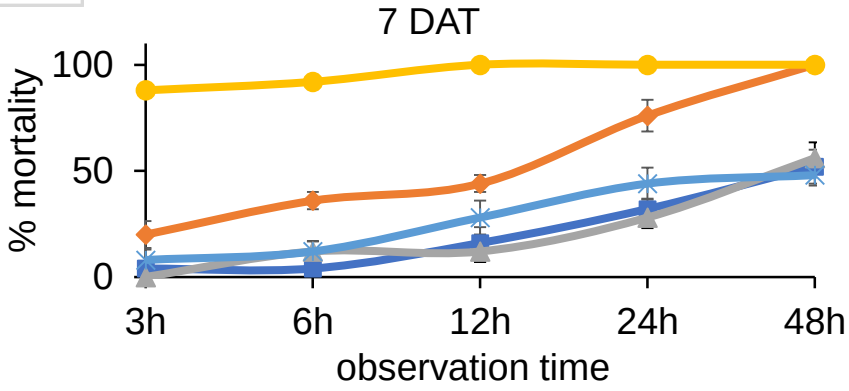
Results: effect of reduced-risk pesticides on *L. testaceipes*







0 DAT: $F = 123.14$; df = 4,16; $P < 0.0001$

3 DAT: $F = F = 135.71$; df = 4, 16; $P < 0.0001$

7 DAT: $F = 98.72$; df =4, 16; $P < 0.0001$

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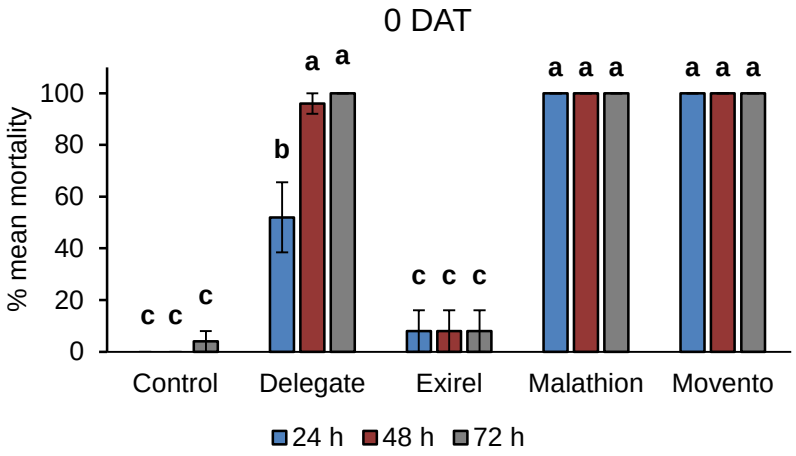
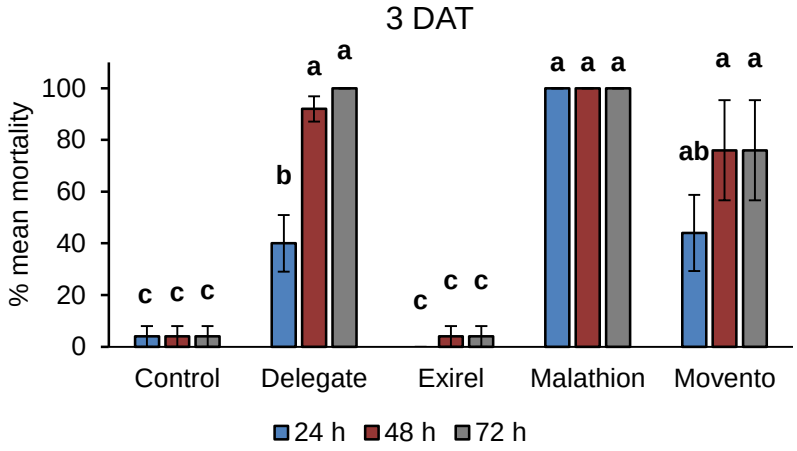
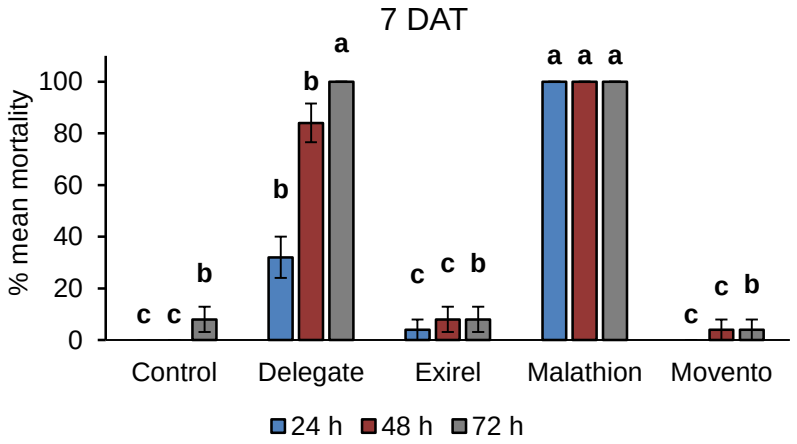
Results: effect of reduced-risk pesticides on *O. insidiosus*





0 DAT*: F* = 178.12; df = 4,16; *P* < 0.0001
3 DAT: *F* = 23.89; df = 4,16; *P* < 0.0001
7 DAT: *F* = 279.72; df = 4,16; *P* < 0.0001



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Conclusions

- Lower number of aphids were recorded from the cultivar Carlos, indicating it's less susceptibility to aphid infection.

- Spirotetramat (Movento®) can provide effective control to grapevine aphid population even after two weeks of application.

- Except Cyazypyr® (Exirel) all the 'reduced risk' pesticides appeared to be very toxic for the two biological control agents, *L. testaceipes* and *O. insidiosus* in the laboratory bioassays.

- When using biological control, extra precautions should be taken before applying some reduced-risk pesticides.

- Movento can be used with biological control agents 7 days after application

Acknowledgements

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Thank you