

CLM research and management

Lukasz Stelinski, UF/IFAS CREC

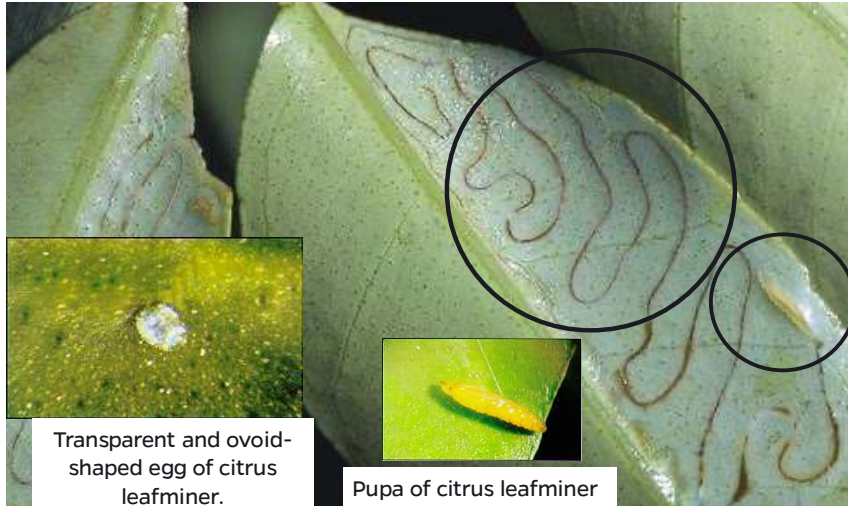


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Citrus leafminer: A living infestation



Transparent and ovoid-shaped egg of citrus leafminer.

Pupa of citrus leafminer



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Damage heaviest during flush;

Direct damage greatest to young trees;

Reduced photosynthesis, tree growth;

Mines provide entry for pathogens.



UC Statewide IPM Program
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Association of injury with canker:

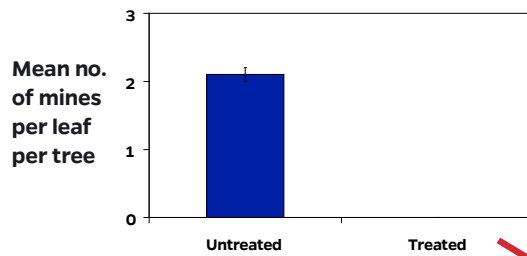


Photos: D. Hall

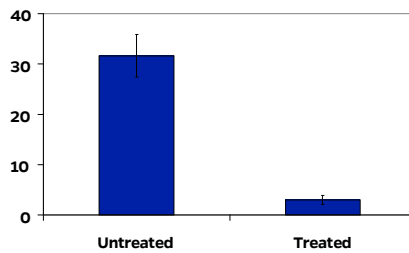


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More leaf mines = More canker



Mean no. of canker lesions per leaf per tree



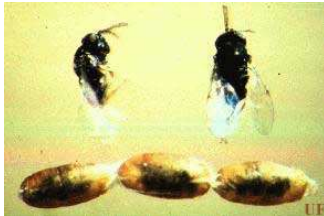
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Biological control of citrus leafminer

Zagrammosoma multilineatum, a native parasite of citrus leafminer



Green lacewing (*Chrysoperla rufilabris*), a predator of citrus leafminers



←
Adult females and pupae of *Ageniaspis citricola*

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Biological control: *Ageniaspis citricola*

Imported 1994;
Parasitism ~100% in some areas;
Ageniaspis citricola was well established in FL

IPM compatible:

Oil (3%), azadirachtin (+ 0.4% oil), and diflubenzuron (+ 0.4% oil)
Avermectin + 0.4% oil was **not**



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Chemical Tool Box

- Agri-Mek 0.15 EC
- Micromite
 - ACP immatures
- Delegate WG
- Intrepid 2F
 - No effect on ACP
- Exirel
 - Good for ACP
- Agri-Flex
 - Good for ACP
- Soil neonics (Admire Pro and Platinum 75 SG) for non-bearing trees



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- Agri-Mek 0.15 EC
- Micromite
- Delegate WG
- Admire Pro and 2F
- Platinum 75 SG
- Intrepid 2F
- These insecticides only control mining larvae
- Will provide no control of flying CLM adults
- Should be well timed with major flushes to get maximum effect
- If you get a heavy new flush a week or 2 after application, it will likely be unprotected



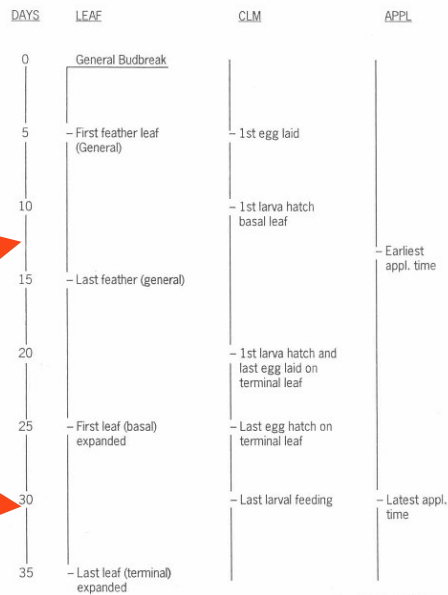
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Timing of application for leafminer control

--FOLIAR APPLICATIONS

13 days from general budbreak is earliest time for application

Last potential date for leafminer application is 31 days after budbreak



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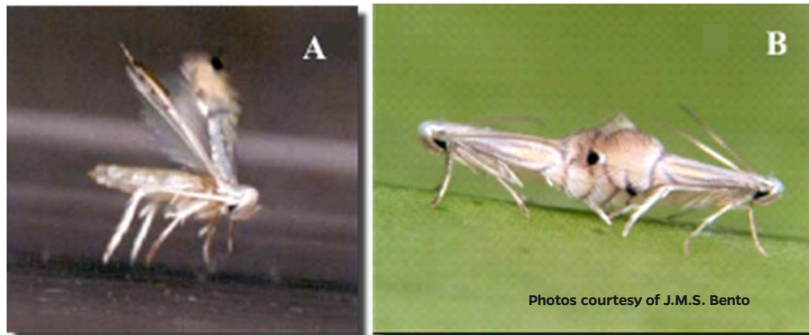
Timing of soil applications of systemic neonicotinoids and cyantraniliprole (Verimark) for small, non-bearing trees

- Soil-applied systemic insecticides are a good option
- These can be applied before leaf flush (10-14 d) because it takes time for the concentration of insecticide to build up
- The duration of control with these (up to 8 week) is often longer than with foliar sprays



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Citrus leafminer pheromone



Female sex pheromone:

30 (Z,Z,E)-7,11,13-hexadecatrienal

10 (Z,Z)-7,11-hexadecadienal

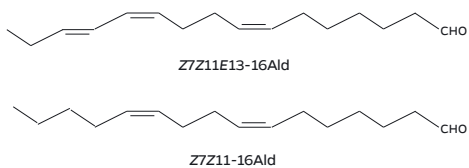
1 (Z)-7-hexadecenal



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Pheromone traps

1.



→
Pheromone in rubber
release device



2.



=



Rubber septum
releases pheromone
just like live female

3.



Insert rubber septum
into sticky trap. Males fly
to and are caught
in trap



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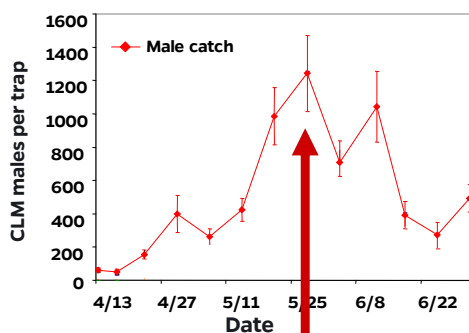
How can pheromones be used for pest monitoring and how can monitoring improve management practices?

- Pheromones are highly attractive and selective allowing precise detection of a particular target pest
- Often used to predict abundance of larval infestation by trapping adults before they mate and reproduce
- Predicting larval infestation by monitoring the adults can improve timing of pesticide applications—can perhaps reduce unnecessary calendar sprays



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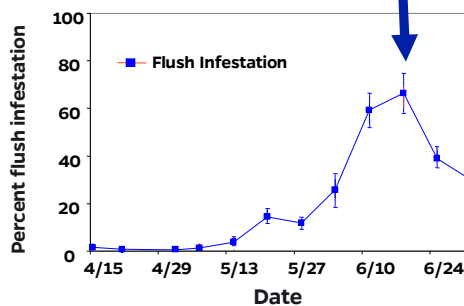
Moth catch in pheromone-baited traps



Peak catch in Monitoring traps

But, the peak infestation was observed almost one month later

CLM infestation



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Potential for monitoring spray efficacy



Control



Intrepid



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How to monitor citrus leafminer?

- Synthetic pheromone lures for CLM are available from ISCA Technologies www.iscotech.com Tel: (951) 686-5008
- Monitoring traps are also available from ISCA or Trécé Inc. www.trece.com
- For optimal CLM catch, place trap on edge of tree canopy just below mid-canopy height
- Male moth catch is greater on the grove edge than in the grove interior
- Check traps weekly—males fly and search for females on calm nights



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Summary and conclusions

- Window for spraying against CLM is between 13-31 days after budbreak.
- **Apply soil systemics before leaf flush (10-14 d) because it takes time for the concentration of insecticide to build up.**
- **Pheromone traps can be used to predict future infestations and tell you if you have leafminer.**

