Early Season Control of Citrus Leafminer, *Phyllocnistis citrella* (Stainton) Lepidoptera: Gracillariidae)

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IFAS/UF-SWFREC

SWFREC, Immokalee FL
Citrus leafminer – *Phyllocnistis citrella* Stainton (CLM) – Why is it important?

- Damage by leafmining leads to:
  - Reduction in photosynthetic capacity (Pena et al. 2000)
  - Malformation of leaves
Overall Project Objectives

- Evaluate effectiveness of early season sprays for CLM to reduce subsequent generations of CLM
- Evaluate insecticides and application methods in field trials
Pheromone Traps

- Monitor adult flight and peaks
- Assess how well management programs are working
- Trap uses:
  - Correlate leafminer damage to moth trap captures
  - Provide a ‘baseline’ for future management decisions
  - Determine if any changes need to be made in management practices.
Methods: Trap monitoring and Damage Assessment

- 4 groves (oranges/grapefruit)
  - Trial 1: Compared applications of Intrepid 28 Feb (first flush) 14 March (peak flight) and grower standard. 15 traps/block. 1 trap/ac.
  - Trial 2: Compared 2 spray timings of Intrepid before and after peak flight activity. 20 traps/block. 1 trap/ac.
  - Trial 3. Compared trap densities: 1 trap/2.5 ac (Flame grapefruit), 1 trap/3.5 ac (Ray Ruby grapefruit), 1 trap/5 ac (Ray Ruby grapefruit)
  - Replicated trial: Compared aerial and ground applications of Intrepid to Delegate and Untreated (Hamlins), 3 traps/13 ac plot

- Moth flight monitored to determine seasonal spatial and temporal flight patterns, and relative density

- CLM damage assessed by using modified Horsfall Barratt Scale
  - Randomly selected 50 trees/stop; two stops per pheromone trap row
  - Graded damage on upper/lower surfaces of 5 terminal leaves of flush

Count these 20 squares, multiply by 4.5
Three Application Timings of Intrepid

- **Treatment 1:** Sprayed at first spring flush Intrepid 2F + 435oil (2/28)
- **Treatment 2:** Sprayed according to trap count Intrepid 2F + 435 oil (3/14)
- **Grower standard**

**CLM Damage - April**

<table>
<thead>
<tr>
<th>Date</th>
<th>Mean CLM Damage Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>FlushSpray</td>
<td>0.154</td>
</tr>
<tr>
<td>PeakSpray</td>
<td>0.053</td>
</tr>
<tr>
<td>Grower Standard</td>
<td>0.201</td>
</tr>
</tbody>
</table>

**Peak Flight vs Flush Spray Comparison**

- **Peak Sprayed**
- **Grower Standard**
- **Flush Sprayed**

- April 12: 95, 267, 268
- April 8: 93, 321, 214
- April 10: 148, 353, 181

Moths/Trap/Day vs Date
Two Spray Timings - Before and After Peak Flights

- Each block 20 acres
- Treatment: Sprayed according to pheromone trap counts
- Grower Standard: Sprayed according to calendar
- 1 rep, 20 traps each block

![Graph showing July CLM Damage and CLM Flight with Two Spray Timings]

- July CLM Damage:
  - Peak Sprayed
  - Grower Standard

- CLM Flight with Two Spray Timings:
  - Grower Standard
  - Peak Sprayed
Efficacy of Pheromone Trap Spacing

- No difference in spray application
- 3 sized blocks – one 60ac, 7ac, and 2.5ac
- Traps spaced 5ac, 3.5ac, and 2.5ac
- Sprayed according to peak flight

CLM Damage - June

Trap Density Comparison

Moths/Trap/Day
Aerial vs Ground Applications of Intrepid

- Delegate WG + 435 Oil (aerial) = Red
- Intrepid 2F + 435 oil (aerial) = Yellow
- Ground application of Intrepid 2F + 435 oil = Pink
- Untreated check = White
- 3 reps

**CLM Damage - July 2011**

<table>
<thead>
<tr>
<th>Date and Treatment</th>
<th>Intrepid Aerial</th>
<th>Intrepid Ground</th>
<th>Delegate Aerial</th>
<th>Untreated</th>
<th>Intrepid Aerial</th>
<th>Intrepid Ground</th>
<th>Delegate Aerial</th>
<th>Untreated</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-Jul</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29-Jul</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Graph Details:**
- X-axis: Date
- Y-axis: Moths/Trap/Day
- Line Colors:
  - Delegate
  - Aerial Intrepid
  - Ground Intrepid
  - Untreated

**Legend:**
- Delegate
- Aerial Intrepid
- Ground Intrepid
- Untreated
Evaluation of Spray Volume & Sprayer Type on Efficacy of Insecticides

- Trial conducted by: Barry Kostyk and Scott Croxton
- Pringle Farm, Immokalee FL; 22 yo Murcott trees @ 151 trees/acre
- Sprayers – Airblast (100gpa) vs Proptec (5gpa)
- Treatments – Delegate, Untreated, Intrepid 2F (with and without Latron B1956)
- Rates – 4oz and 8oz
- Larvae examined 3dat (21 Jul), 10dat (28 Jul), and 17dat (4 Aug)
  - 10 randomly selected new shoots
  - 5 leaves per shoot
- Leaf surface damage rated – 0 = none
  1 = < 10%
  2 = 11 – 25%
  3 = 26 – 50%
  4 = > 51%
Evaluation of Spray Volume & Sprayer Type on Efficacy of Insecticides - Results

- Significantly fewer larvae observed with all treatments compared to untreated at 3 and 10 DAT

- Only the 2 Delegate treatments and Intrepid sprayed with Latron B1956 at 5gpa had significantly fewer larvae at 17 DAT

- All treatments reduced leaf damage caused by CLM
  - Least damage – Delegate
  - Intrepid (100gpa) with or without Latron or at 5gpa with Latron
  - Generally better results spraying Intrepid with Airblast compared to Prop Tec
## CLM Management – Recommended Products

<table>
<thead>
<tr>
<th>A.I.</th>
<th>Product</th>
<th>Restricted Entry Interval</th>
<th>Pre-harvest Interval</th>
<th>Psyllid</th>
<th>Leafminer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abamectin + oil</td>
<td>Agri-mek 0.15EC</td>
<td>12h</td>
<td>7d</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td>Diflubenzuron + oil</td>
<td>Micromite 80WGS</td>
<td>12h</td>
<td>21d</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td>Methoxyfenozide</td>
<td>Intrepid 2F</td>
<td>4h</td>
<td>1d</td>
<td></td>
<td>+++</td>
</tr>
<tr>
<td>Petroleum oil</td>
<td>435</td>
<td>12h</td>
<td>0</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>Spinetoram + oil</td>
<td>Delegate WG</td>
<td>4h</td>
<td>1d</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td>Thiamethoxam</td>
<td>Actara 25WG</td>
<td>12h</td>
<td>0</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td>Thiamethoxam</td>
<td>Platinum 75SG</td>
<td>12h</td>
<td>0</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td>Imidacloprid (soil drench)</td>
<td>Admire Pro</td>
<td>12h</td>
<td>0</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td>Thiamethoxam + Abamectin + oil</td>
<td>Agri-Flex</td>
<td>12h</td>
<td>7d</td>
<td>??</td>
<td>??</td>
</tr>
<tr>
<td>Chlorantraniliprole + Thiamethoxam</td>
<td>Voliam-Flexi</td>
<td>12h</td>
<td>1d</td>
<td>??</td>
<td>??</td>
</tr>
</tbody>
</table>
Preliminary Conclusions

- An early spray (March) of Intrepid 2F lowered numbers of adult moths caught for 2 months.

- Timing CLM sprays at first flush or at first peak flight significantly lowered adult moth catch. There was also significantly less CLM damage in spring flush assessment.

- Pheromone traps spaced between 1 per 2.5ac - 5ac can be used to time insecticide sprays.

- Aerial applications of Intrepid worked almost as well as ground applications in controlling CLM.

- Moth flight and CLM damage information can be used as a baseline for future management decisions.

- Intrepid performed best when applied at 100gpa or at 5gpa with a non-ionic surfactant.
Thanks to:

- Bryant Cawley
- Robert Riefer
- Miriam Ortez
- Kat Perez
- Zack Lahey

Bryant
Robert
Zack
Kat
Bryant
Miriam
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Coffee!!! ☕️
Questions?