Mating Disruption – an Areawide Approach to Controlling the Borer Complex in cherry

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Borer Complex

• Pest complex consists of three species:
  – Peachtree borer
  – Lesser peachtree borer
  – American plum borer
• Most MI cherries are harvested mechanically and shakers can cause damage to trunks
• Trunk damage increases potential for borer egg laying
• Borers have become a major pest to cherries
  – APB does not need damage to bore into trunks
• All three species have similar lifecycles
  – Larval stage causes the primary damage

• Controlling all species can be difficult because they are active at different times throughout the season
Flight period

PTB

LPTB

APB

Date

Moths per trap

15-May 4-Jun 24-Jun 14-Jul 3-Aug 23-Aug 12-Sep 2-Oct
Control Options

• Primary control strategy:
  – Trunk sprays with OP chlorpyrifos (Lorsban)
  – EPA is reviewing OP use
    • Reviews can be a first step phase down

• Pheromone mating disruption
  – Only available for PTB and LPTB
  – Preliminary work suggests mating disruption not effective in small blocks (10A)
Preliminary Trial with Borer MD

- Three year trial (2009-2011)
- Two farms, 10 acre blocks divided into 3 sections:
  - UTC, ½ rate of MD, full rate of MD
- Trapped for all three borers in ‘09,’10, and ‘11
- Trunk sampled 3x per season in ’10 and ‘11
# Trap shutdown in treated areas

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<th>GPTB</th>
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<th>APB</th>
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|                | 1/2 rate   | 0            | 0          | 0            | 0          | 0            |
|                | full rate  | 0            | 0          | 0            | 0          | 0            |

|                | 55         | 70           | 208        | 277          |
|                | 44         | 37           | 133        | 185          |
|                | 65         | 55           | 145        | 156          |
Trunk samples for PTB larvae + exuvia

- Total larvae + exuvia

**Farm A**
- 2010: 9 (UTC), 6 (1/2 rate), 9 (full rate)
- 2011: 5 (UTC), 5 (1/2 rate), 5 (full rate)

**Farm B**
- 2010: 10 (UTC), 2 (1/2 rate), 3 (full rate)
- 2011: 2 (UTC), 1 (1/2 rate), 1 (full rate)
Trunk samples for LPTB larvae + exuvia

- **UTC**
- **1/2 rate**
- **full rate**

<table>
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<tr>
<th>Year</th>
<th>Farm A</th>
<th>Farm B</th>
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<td>2010</td>
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<td>2011</td>
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The bar chart shows the total number of larvae and exuvia for Farm A and Farm B in 2010 and 2011, under different rates (UTC, 1/2 rate, full rate).
Area-wide Approach

• Three year study (2011 – 2013)
• Conducted on 3 farms
  – In sweets and tarts
• Disrupted majority of contiguous stone fruit acreage
  – 60 acres on Farm A
  – 66 acres on Farm B
  – 60 acres on Farm C
  – 30 acres UTC on farm B
Areawide Borer Mating Disruption Map

Treated Area = Black (~150 acres)

Untreated Area = Blue (~30 acres)
Methods

• Hang pheromone ties
  ~ May 1
• 150 ties/acre
• Treated area:
  – 34 baited traps for APB, LPTB, and PTB
• UTC
  – 18 baited traps for 3 species
  – Traps were located adjacent to treated area (6), halfway into UTC block (6), and at furthest edge of UTC block (6)
Methods, cont.

• Traps checked weekly from May 15 to Sept. 15
• Larval sampling conducted 3x per season
  – Invasive yet non-destructive sample of trunk, lower scaffolds and graft union
  – #’s of APB, LPTB and PTB larvae, exuvia, and pupae were recorded
2013 flight pattern in the UTC

Weekly trapcatch

APB
GPTB
LPTB
Moths Trapped 2011 - 2013
Larval Samples: PTB

Total GPTB larvae + exuvia + pupae

- Farm A
- Farm B
- Farm C
- UTC

- 2011
- 2012
- 2013
Larval Samples: LPTB

![Bar chart showing total LPTB larvae + exuvia + pupae from 2011 to 2013 for Farm A, Farm B, Farm C, and UTC.]
Percent of Trees Infested with PTB

![Bar chart showing the percent of trees infested with PTB across UTC, A, B, and C for 2011, 2012, and 2013.](chart.png)
Percentage of Trees Infested with LPTB

![Bar chart showing the percentage of trees infested with LPTB for different years and locations. The chart includes bars for UTC, A, B, and C, with data points for 2011, 2012, and 2013.]
Percentage of Trees Infested with APB

![Percentage of Trees Infested with APB](image)
Economic Considerations

• Economics of MD:
  – MD ties: ~$50/acre
  – Labor to hang ties:
    • Trained technicians
      ~80 hours to cover 185 acres
    • 1 tie/tree
    • 0.44 hrs/A x $12/hr = $5.28/A
    • Total: $55.28/acre

• Lorsban application:
  – 3qt/acre: $31.68/acre
  – One application may not be sufficient to control all three borers due to differences in life cycle
    • May need multiple annual sprays
  – Worker protection issues with spraying OP to run-off
Other Considerations

- Hedging later in the season can remove ties
  - Ties typically hung on outside of canopy

- Ties ended up on fruit processing line at harvest
  - Shook ties off trees in 2013
    - 3 years of ties built up on trees in project
    - Processing line was able to pick out ties with high powered magnet
Conclusions

• In three years of testing, there were NO differences between orchards with MD compared with the UTC
  – Documented adult trap shut down
  – No reduction in larval infestation for PTB and LPTB

• Based on these results, MD does not appear to be a valid option
  – Additionally, MD does not control APB which seems to be most prevalent larvae in this 200+ acres of cherry
Future Work

• Documented that all borer adults are extremely attracted to their pheromones
  – Future work may include large scale plots with attract and kill that targeting adult moths
Thank you!

• **Funding**
  – Michigan Cherry Committee
  – Grand Traverse Fruit Growers’ Council

• **Grower Collaborators**
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  – David White

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