Comparing trap design and location for corn earworm monitoring in strawberry
Corn Earworm

- Serious pest of strawberries
- Adults lay eggs under strawberry calyx, eggs emerge and larvae begin to bore into fruit – may feed on foliage
- Highest # in Mid-March to June and in fall (mid-Aug to November)
  - During this time, growers spray every 3-4 wks in low pressure and every 2 wks in high pressure
- Fazing out Lorsban
- CEW usually come with Santa Ana’s
- Parents write letters
Driscoll’s CEW monitoring

- 4-5 yrs ago got hit hard on frozen fruit: started trapping and reporting counts to growers
- Look at spray records and materials available
- Working with growers 1 on 1
- 3 warnings for rejected fruit, then strip or juice fruit, treat with 3 day PHI product (e.g., Assail, Actara)

Traps for adult moths in green containers with pheromone and insecticidal strip
Chemical options

**Organic sprays:**
Bt (with every tank mix, e.g., Javelin), spinosad (Entrust), oils

**Gemstar:** Heliothis virus causes worms to stop feeding after 2 days

**Conventional sprays:**
0 day PHI: bifenthrin (Brigade)
1 day PHI: spinetoram (Radiant), acetamiprid (Assail), chlorantraniliprole (Coragen)
2 day PHI: fenpropatrin (Danitol)
3 day PHI: malathion, methoxyfenozide (Intrepid)
Does Coragen kill CEW in fruit? No, only on foliage!

(A) Leaves

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Rate (kg ai/ha)</th>
<th>4 DAT</th>
<th>7 DAT</th>
<th>14 DAT</th>
<th>22 DAT</th>
<th>53 DAT</th>
<th>66 DAT</th>
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<tbody>
<tr>
<td>Untreated</td>
<td>-</td>
<td>3.1 b</td>
<td>18.8 b</td>
<td>18.8 b</td>
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<tr>
<td>Chlorantraniliprole</td>
<td>0.074</td>
<td>87.5 a</td>
<td>70.3 a</td>
<td>92.2 a</td>
<td>70.3 a</td>
<td>96.9 a</td>
<td>72.0 a</td>
</tr>
<tr>
<td>Chlorantraniliprole</td>
<td>0.112</td>
<td>95.3 a</td>
<td>87.5 a</td>
<td>96.9 a</td>
<td>75.0 a</td>
<td>79.7 a</td>
<td>59.4 a</td>
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</tbody>
</table>

(B) Blossoms and fruit (at 22 DAT)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Rate (kg ai/ha)</th>
<th>% dead or Moribund larvae on blossoms</th>
<th>% of fruit with feeding scars</th>
<th>% of fruit with larval tunnels</th>
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</thead>
<tbody>
<tr>
<td>Untreated</td>
<td>-</td>
<td>6.3 b</td>
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<td>62.5 a</td>
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<tr>
<td>Chlorantraniliprole</td>
<td>0.112</td>
<td>68.8 a</td>
<td>76.7 a</td>
<td>96.7 a</td>
</tr>
</tbody>
</table>

Note: .074 kg ai/ha is equivalent to 5ozs per acre
      .112 kg ai/ha is equivalent to 7.5ozs per acre

Tough to find infested fruit

- Cut fruit
- Larvae can be very small
- At what stage does it enter fruit?
  - Entering green fruit
Literature Cited

- Overwinter survival is south of 40th parallel (Blanchard 1942)
- In Davis, adults emerged 4 April – 1 June (Velez 1970)
- Moon phase did not influence male capture (Hoffman et al 91 UC DAVIS paper)
- Higher trap catches in full moon – they changed traps more frequently (Hartstack et al 1978)
  - 5% of moths captured were *H. phloxiphaga*
    - Smaller size, different color patterns than *H. zea*
- Negative relationship between trap catch and wind velocity, but positive between trap catch and temp and trap catch and moon illumination – also trapped frequently (Parajulee et al 1998)
What’s the deal with the moon? Fall Captures 2015

2015 Season: Corn Earworm (CEW) Adult Moth & Drosophila Fruitfly Trapping Station Counts
(Approximately 7-day count intervals)

<table>
<thead>
<tr>
<th>W.E</th>
<th>Farm A</th>
<th>Farm B</th>
<th>Farm C</th>
<th>Farm D</th>
<th>Farm E</th>
<th>Farm F</th>
<th>Farm G</th>
<th>Farm H</th>
<th>Farm I</th>
<th>Farm J</th>
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</thead>
<tbody>
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</table>

* TER = to be reported later

Updated: 10/31/15 Saturday

- Full moons: 8/29, 9/27, 10/27
What’s the deal with the moon? Spring 2016

<table>
<thead>
<tr>
<th>W.E.</th>
<th>Farm A</th>
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<th>Farm D</th>
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</tr>
</tbody>
</table>

* TBR = to be reported later / n/a = not applicable

Updated: 4/30/16 Saturday

- Full moons: 3/23, 4/22
Trap placement

- Keep out of way from tractor
- Pheromones replaced every 3 weeks in hot weather and 6 in cold weather
- With insecticide kill strip
- Place on north, east, south, west or center of field?
Experimental Design

Trial 1: Trap Testing
- 2 field sites
- 4 or 5 traps with CEW pheromone (maybe no Texas trap)
- 5 reps of each trap per site

Trial 2: Lure testing
- 2 field sites
- 4 lures in best trap from trial 1
- 5 reps
Heliothis traps in the center catches more

Date

- 02/22/2016
- 03/09/2016
- 03/18/2016
- 03/30/2016
- 04/11/2016
- 04/18/2016
- 04/25/2016
- 05/02/2016

CEW/day

Direction / Trap

- Bucket
- Delta
- Heliothis
- Winged
What do trap numbers mean?

- Spray efficacy
- Spray frequency
- Do they correlate with damage?
- More counts in full moon?
Other control options

• Mating disruption
  • Plant volatiles synergize sex pheromones (Ochieng et al 2002)

• Attract and Kill
  • Heliothis attracted to synthetic plant volatiles and killed with small amount of toxicant (Del Socorro et al 2003)

• Smart Trap (Trapview)
  • Automated pest monitoring

Kills moths and has minimal effect on beneficials