Stink Bug Management and Insecticide Efficacy

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Stink Bug Damage in Fresno County
Stink Bugs Associated with Fresno Co. Tomatoes from 2013-2017 were Consperse

Photos by E. Hannon, Fresno County Ag Commissioner’s Entomologist, 2014
Damage
Consperse Stink Bug
Schematic Life Cycle

Goodell, 2014
Conspersse Stink Bug
Schematic Life Cycle

Diapause
Weeds
Tomato
June
Summer Solstice

Diapause
Leaf Litter

December
Winter Solstice

Diapause
Leaf Litter

Tomato
June
Summer Solstice

Goodell, 2014
**Consperse Stink Bug**

**Schematic Life Cycle**

- **Weed Hosts**
  - Mustard
  - Mullein
  - Dock

- **Crop Hosts**
  - Small grains
  - Alfalfa
  - Broccoli

Goodell, 2014
Consperse Stink Bug Schematic Life Cycle

Goodell, 2014
Early Detection in Tomatoes

- Live insect trap Sterling International, Inc. with AlphaScents Consperse stink bug lure
- Plant Shake method with 18 x 12 in (45 x 30 cm) tray

2014

<table>
<thead>
<tr>
<th>Date</th>
<th>Trap</th>
<th>Plant Shake</th>
</tr>
</thead>
<tbody>
<tr>
<td>31-May</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>30-Jun</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>30-Jul</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>29-Aug</td>
<td>12</td>
<td>2</td>
</tr>
</tbody>
</table>

2015

<table>
<thead>
<tr>
<th>Date</th>
<th>Trap</th>
<th>Plant Shake</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-Jun</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5-Jul</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>4-Aug</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>3-Sep</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3-Oct</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

2016: Detection of stinkbugs in tomatoes prior to capture in trap
Developmental Rates of Consperse Stink Bug are Known and Degree Day Models are Available

### 53.6°F Developmental Threshold

<table>
<thead>
<tr>
<th>Stage</th>
<th>Degree Days (DD) &gt; 54°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egg development</td>
<td>150 DD &gt; 54°F</td>
</tr>
<tr>
<td>1st-3rd instar (small nymph)</td>
<td>408 DD &gt; 54°F</td>
</tr>
<tr>
<td>4th – 5th instar (large nymph)</td>
<td>386 DD &gt; 54°F</td>
</tr>
<tr>
<td>Adult to Egg Laying*</td>
<td>275 DD &gt; 54°F</td>
</tr>
<tr>
<td>Total</td>
<td>1219 DD &gt; 54°F</td>
</tr>
</tbody>
</table>

F. Zalom
Target nymphs with applications

Calculate nymph presence based on:

- detection of adults
- developmental rates
- degree day accumulation

http://www.ipm.ucdavis.edu/calludt.cgi/DD MODEL?MODEL=CSB&CROP=tomatoes
Insecticide Trials
2014-17

Location: West Side Research and Extension Center – Fresno County
Plot size: single 60 inch bed x 75 ft
Untreated buffer between each treated row
Experimental design: 4 Replication Randomized Complete Block
Variety: H5608

Application details:
CO₂-powered backpack sprayer
50 gallons per acre
35 psi
3 Teejet 8004 EVS 19-in spacing
8 and 29 Aug 2014
18, 28 Jul, and 18 Aug 2015
25 Aug and 8 Sep 2016
14 and 25 Aug 2017
<table>
<thead>
<tr>
<th>IRAC #*</th>
<th>Trade name</th>
<th>Common name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td>Lannate</td>
<td>methomyl</td>
</tr>
<tr>
<td>1B</td>
<td>Dibrom 8E</td>
<td>naled</td>
</tr>
<tr>
<td>1B</td>
<td>Dimethoate</td>
<td>dimethoate</td>
</tr>
<tr>
<td>1B</td>
<td>Thionex</td>
<td>endosulfan</td>
</tr>
<tr>
<td>3A</td>
<td>Danitol</td>
<td>fenpropathrin</td>
</tr>
<tr>
<td>3A</td>
<td>Warrior II</td>
<td>lambda-cyhalothrin</td>
</tr>
<tr>
<td>3A</td>
<td>Danitol</td>
<td>fenpropathrin</td>
</tr>
<tr>
<td>3A + 4A</td>
<td>Brigadier</td>
<td>bifenthrin + imidicloprid</td>
</tr>
<tr>
<td>3A + 4A</td>
<td>Endigo ZCX</td>
<td>lambda-cyhalothrin + thiamethoxam</td>
</tr>
<tr>
<td>3A + 4A</td>
<td>Leverage</td>
<td>beta-cyfluthrin + imidicloprid</td>
</tr>
<tr>
<td>4A</td>
<td>Belay</td>
<td>clothianidin</td>
</tr>
<tr>
<td>4A + 15</td>
<td>Cormoran</td>
<td>acetamiprid + novaluron</td>
</tr>
<tr>
<td>4C</td>
<td>Sequoia</td>
<td>sulfoxaflor</td>
</tr>
<tr>
<td>4D</td>
<td>Silvanto</td>
<td>flupyradifurone</td>
</tr>
<tr>
<td>7C</td>
<td>Knack</td>
<td>pyriproxyfen</td>
</tr>
<tr>
<td>9C</td>
<td>Beleaf</td>
<td>flonicamid</td>
</tr>
<tr>
<td>15</td>
<td>Rimon</td>
<td>novaluron</td>
</tr>
<tr>
<td>21A</td>
<td>Torac</td>
<td>tolfenpyrad</td>
</tr>
<tr>
<td>28</td>
<td>Exirel</td>
<td>chlorantraniliprole</td>
</tr>
</tbody>
</table>

* IRAC# mode of action as assigned by the Insecticide Resistance Action Committee
Insecticide Trial Evaluations 2014-17

In-season: Three evaluations of fruit damage and stink bug counts of 4 feet under one side of canopy.

At harvest:
Harvest: 20 ft (6 m) weigh all fruit
Hand sort of 25 to 35 lbs (13.6 to 18.9 kg) of fruit by quality (red, green, sunburn, rot & stink bug damage)
Lab analysis of 50 red fruit at Processing Tomato Advisory Board (PTAB)
Influence of Insecticide Treatments on Stink Bug Damage, 2014

- Untreated
- Dimethoate 1 pt
- Dibrom 8E 1.0 pts
- Endigo ZCX 4.5 fl oz
- Dibrom 8E 1.0 pts trap
- Lannate SP 1 lb Asana 9.6 fl oz
- Warrior II 1.92 oz
- Torac 21.0 fl oz
- Endigo CX 4.5 fl oz
- Belay 4 oz + Warrior II 1.92 oz
- Danitol 10.67 oz
- Leverage 2.7 3.75 oz
- Thionex 1 1/3 qts
- Leverage 2.7 3.75 oz trap
- Venom 70 SG 4 oz

LSD\textsubscript{0.05} = 12.357
Influence of Insecticide Treatments on Stink Bug Damage, 2015

- Untreated
- Venom 70 SG 4 oz
- Torac 21.0 fl oz
- Belay 4 oz + Beleaf 50SG 4.28 fl oz
- Exirel 20.5 fl oz
- Silvanto 14 fl oz
- Leverage 2.7 3.75 oz
- Dimethoate 4EL 1.0 pts + Leverage 2.7 3.75 fl oz
- Sequoia 4.5 fl oz
- Beleaf 50SG 4.28 fl oz
- Endigo CX 4.5 fl oz
- Danitol 10.67 oz + Knack 8.0 fl oz
- Warrior II 1.92 oz + Rimon 0.83EC 12.0 fl oz
- Warrior II 1.92 fl oz
- Warrior II 1.92 oz + Beleaf 50SG 2.8 fl oz

Stink bug damaged fruit (%)
Influence of Insecticide Treatments on Stink Bug Damage, 2016

- Untreated
- Leverage 2.7 3.75 oz
- Exirel 20.5 fl oz
- Silvanto 14 fl oz
- Belay 4 oz + Beleaf 50SG 4.28 fl oz
- Warrior II 1.92 oz + Beleaf 50SG 4.28 fl oz
- Danitol 10.67 oz + Belay 4 oz
- Torac 21.0 fl oz
- Endigo ZC 4.5 fl oz
- Venom 70 SG 4 oz
- Warrior II 1.92 oz + Rimon 0.83EC 12.0 fl oz
- Sequoia 4.5 fl oz + Warrior II 1.92 fl oz
- Dimethoate 4EL 1.0 pts + Brigadier 9.85 fl oz
- Warrior II 1.92 fl oz
- Warrior II 1.92 oz + Brigadier 9.85 fl oz + Beleaf...

LSD$_{0.05} = 9.458$
Influence of Insecticide Treatments on Stink Bug Damage, 2017

Stink bug damaged fruit (%)

LSD$_{0.05}$ = 11.458

- Cormoran 12 oz/a
- Exirel 20.5 fl oz
- Exirel 16.9 fl oz
- Exirel 13.5 fl oz
- Warrior II 1.92 oz + Brigadier 9.85 fl oz
- Untreated

Stink bug damaged fruit (%)
Comparison of Three Sprayers, 2016

**Standard conventional sprayer**
- 40 gallons per acre
- 50 psi
- Three Teejet 8003VS nozzles

**Bed drench sprayer**
- 200 gpa

**Untreated Control**

**CONDITIONS AT EXPERIMENTAL SITE**
- **Location:** West Side Research and Extension Center
- **Plot size:** three 60 inch bed x 130 ft
- **Experimental design:** Five Replication Randomized Complete Block
- **Plant Date:** 24 May 2016
- **Variety:** H5608

**Application**
- **Date:** 31 Aug
- **Tank Mix:** Warrior II 1.92 fl oz + Brigadier 9.85 fl oz + Beleaf 50SG 4.28 oz
Sprayer Comparison Evaluations 2016

Water sensitive paper was used for determination of canopy penetration and coverage

Placed into sprayed area immediately before treating on the soil surface at 3 to 4 inches above the soil surface and at 10 to 12 inches above the soil surface
### Water Sensitive Cards

<table>
<thead>
<tr>
<th>Berm Blower Sprayer @ 40 gpa</th>
<th>Conventional sprayer @ 40 gpa</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-12”</td>
<td></td>
</tr>
<tr>
<td>3-4”</td>
<td></td>
</tr>
<tr>
<td>Ground, under canopy</td>
<td></td>
</tr>
</tbody>
</table>

Berm Blower Sprayer @ 200 gpa not replicated
## Coverage Comparison (3 replications)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Gross yield (tons/acre)</th>
<th>Red (%)</th>
<th>Green (%)</th>
<th>Sun burn (%)</th>
<th>Rot (%)</th>
<th>Stink bug (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>52.867</td>
<td>38.26</td>
<td>9.95</td>
<td>3.16</td>
<td>17.80</td>
<td>30.86</td>
</tr>
<tr>
<td>Berm blower</td>
<td>50.501</td>
<td>51.24</td>
<td>7.73</td>
<td>4.04</td>
<td>15.01</td>
<td>21.97</td>
</tr>
<tr>
<td>Untreated</td>
<td>52.029</td>
<td>31.22</td>
<td>8.61</td>
<td>2.68</td>
<td>19.26</td>
<td>38.24</td>
</tr>
<tr>
<td>LSD&lt;sub&gt;0.05&lt;/sub&gt;</td>
<td>NS</td>
<td>8.07</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>10.92</td>
</tr>
<tr>
<td>CV (%)</td>
<td>12.19</td>
<td>14.84</td>
<td>43.92</td>
<td>59.14</td>
<td>23.53</td>
<td>24.66</td>
</tr>
</tbody>
</table>

Fruit quality is based on hand sort of 25-35 lbs fruit and percentage is calculated based on weight per category.
Management Overview

• Limit presence of overwintering sites in production area
• Reduce weed population densities
• Use a combination of traps and canopy monitoring for early detection
• Treat with pyrethroid + neonicotinoid insecticides
• Maximize canopy and soil coverage
Acknowledgements

• California Tomato Research Institute
• Daniel Delgado
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• Jose Mandajano (CPS)
• Pete Goodell
• Frank Zalom
• Les Ehler
• UC WSREC staff
Questions

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