Stink Bug on Tomato

Celeste Welty
Extension Entomologist
March 2015
Stink bug work in Ohio

- Native stink bugs, 1996-2000
- New invasive, brown marmorated stink bug, 2011-2015
Stink Bug as a Tomato Pest

• Bugs suck on fruit
• **Damage** seen more often than bug itself
• Damage often not noticed until harvest
• Problem on whole-pack & fresh market varieties
Stink Bug Damage on Tomato

- Obvious yellow blotch:
Stink Bug Damage on Tomato

- Obvious yellow blotch:
  - Develops after fruit ripens if bugs fed on green fruit
Stink Bug Damage on Tomato

- **Obvious yellow blotch:**
  - Develops after fruit ripens if bugs fed on **green** fruit

- **Subtle white cloudy-spot:**
  - Seen after bugs fed on **red** fruit
Stink Bug Damage on Tomato

- Diagnose by plugs of white tissue under the peel
Stink Bug Damage on Tomato

- Diagnose by plugs of white tissue under the peel

yellow blotch   cloudy spot
Stink Bug Damage on Tomato

- Diagnose by plugs of white tissue under the peel

yellow blotch  cloudy spot
Most common species in tomato fields: the one-spotted stink bug
(\textit{Euschistus variolarius})

- Adult
  - The spot (underside of abdomen) on male
  - No spot on female
Stink bug life stages

• Eggs

• Nymphs (5 instars)

• Adult
Do they prefer red or green fruit? How do nymphs compare with adults?

- Lab study, 1996
- Start with hatching egg, end with new adult
- One bug per dish with:
  - 1 green fruit
  - 1 red fruit
  - 1 leaf
- Fresh set-up every 4 days
Test arena for feeding preference study
Stink bug behavior on tomato: Location in observation arena

Mean % of time

Instar

Red fruit
Green fruit
Leaf
Dish

0 10 20 30 40 50 60 70 80 90 100

1 2 3 4 5 6 (adult)
% of tomato fruit surface damaged by stink bugs during 4-day periods from egg hatch to adult eclosion.

Corresponding instar:
- Time period 1: I-II
- Time period 2: II-III
- Time period 3: II-III
- Time period 4: III-IV
- Time period 5: III-V
- Time period 6: IV-V
- Time period 7: V-Ad
- Time period 8: V-Ad
- Time period 9: V-Ad
Depth of feeding damage by stink bugs on tomato during 4-day periods from egg hatch to adult eclosion

<table>
<thead>
<tr>
<th>Time period</th>
<th>Damage depth rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Green fruit</td>
</tr>
<tr>
<td>2</td>
<td>Red fruit</td>
</tr>
<tr>
<td>3</td>
<td>Green fruit</td>
</tr>
<tr>
<td>4</td>
<td>Red fruit</td>
</tr>
<tr>
<td>5</td>
<td>Green fruit</td>
</tr>
<tr>
<td>6</td>
<td>Red fruit</td>
</tr>
<tr>
<td>7</td>
<td>Green fruit</td>
</tr>
<tr>
<td>8</td>
<td>Red fruit</td>
</tr>
<tr>
<td>9</td>
<td>Green fruit</td>
</tr>
</tbody>
</table>

Corresponding instar:
I-II  II-III  II-III  III-IV  III-V  IV-V  V-Ad  V-Ad  V-Ad
Similar 2-week test with addition of tarnished plant bug, 1997

- SBA, wk1
- SBA, wk2
- SBN, wk1
- SBNA, wk2
- TPB, wk1
- TPB, wk2

<table>
<thead>
<tr>
<th>% of surface affected</th>
<th>green fruit</th>
<th>red fruit</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBA, wk1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SBA, wk2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SBN, wk1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SBNA, wk2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TPB, wk1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TPB, wk2</td>
<td></td>
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</tr>
</tbody>
</table>

- stink bug adult
- stink bug nymph to adult
- tarnished plant bug
Stink Bug Feeding Behavior: conclusions

• **Fruit preference:**
  • Bugs prefer green fruit over red fruit

• **Life stages:**
  • Adults & all nymph stages feed on fruit
  • Older nymphs and new adults feed more than younger nymphs and older adults

• **Tarnished plant bug:** rarely feeds on tomato fruit even if starved
Stink bug in tomato fields

• when does it enter tomato fields?
• where does it come from?
## Stink Bug Scouting

<table>
<thead>
<tr>
<th>Site</th>
<th>First damage (1998)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Central Ohio:</strong></td>
<td></td>
</tr>
<tr>
<td>Columbus</td>
<td>7/2</td>
</tr>
<tr>
<td>Miami Co.</td>
<td>7/16</td>
</tr>
<tr>
<td>Darke-D</td>
<td>7/15</td>
</tr>
<tr>
<td>Darke-K</td>
<td>7/15</td>
</tr>
<tr>
<td>Darke-H</td>
<td>8/12 (latest)</td>
</tr>
<tr>
<td><strong>Northern Ohio:</strong></td>
<td></td>
</tr>
<tr>
<td>Sandusky-H</td>
<td>6/22 (earliest)</td>
</tr>
<tr>
<td>Sandusky-B</td>
<td>7/8</td>
</tr>
<tr>
<td>Sandusky-V</td>
<td>7/6</td>
</tr>
</tbody>
</table>
One-Spotted Stink Bug: the wheat connection

1998 observations in wheat, Fremont:

• 15 - 29 May: Stink bug adults (old)
• 14 - 24 June: Stink bug nymphs
• 29 Jun.-1 Jul.: Nymphs & adults (new)
• 1-2 July: Adults in combined wheat
# Stink Bug Dispersal from Wheat to Tomato

<table>
<thead>
<tr>
<th>Wheat</th>
<th>Tomatoes</th>
<th>Soybean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bed #1</td>
<td>Bed #5</td>
</tr>
<tr>
<td>Bed</td>
<td>Bed #10</td>
<td>Bed #20</td>
</tr>
<tr>
<td>#10</td>
<td>Bed #20</td>
<td>Bed #37</td>
</tr>
<tr>
<td>#20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>#37</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Stink Bug Dispersal from Wheat to Tomato

Fremont, 1998: % of samples damaged (10 samples/ bed)

<table>
<thead>
<tr>
<th></th>
<th>Wheat</th>
<th>Tomatoes</th>
<th>Soybean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bed</td>
<td>Bed</td>
<td>Bed</td>
</tr>
<tr>
<td></td>
<td>#1</td>
<td>#5</td>
<td>#10</td>
</tr>
<tr>
<td>6/22</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>7/1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>7/2-3 harvest</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7/6</td>
<td>20%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>7/15</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>7/20</td>
<td>20%</td>
<td>50%</td>
<td>20%</td>
</tr>
<tr>
<td>7/29</td>
<td>80%</td>
<td>70%</td>
<td>40%</td>
</tr>
<tr>
<td>8/3</td>
<td>30%</td>
<td>50%</td>
<td>40%</td>
</tr>
<tr>
<td>8/14</td>
<td>10%</td>
<td>50%</td>
<td>60%</td>
</tr>
</tbody>
</table>
Life History of the One-Spotted Stink Bug

• overwinter in alfalfa?
• one generation in wheat, May-June
• move to tomatoes (or soybeans) in July, August
Stink bug control with insecticide

• Scouting procedure?
• Action threshold?
• Which products?
Scouting for stink bug

• Weekly
• June, July: shake canopy over tray
  • Early: 1 whole plant
  • Later: 1 foot of row
  • 40 samples per field
• July, August: examine fruit
  • 10 fruit @ 40 locations/field
• attention to fields by wheat
• early morning or evening best
Stink bug development in tomato research field
Fremont Ohio, 1999

Total number in all plots

- adult
- nymph
- fruit damage

Spray 8/3
Spray 8/23

10 plants @ 32 plots
100 fruit @ 32 plots
Thresholds for stink bug?

• Trial in 1999 compared 2 thresholds
  • Low: 0.5% (2 sprays)
  • High: 1.0% (1 spray)

• Field scouting vs harvest ratings:
  • Untreated check plots (year 2000)
  • 22% injury on 8 Sep in field
  • 44% injury on 11 Sep in harvest rating
  • By experienced scout

• Field threshold: 0.75 % fruit damage
  (3 damaged out of 400 fruit)
Stink bug insecticide trials

• 5 trials:
  • 1996 & 1997, Hillsboro
  • 1998, Columbus
  • 1999 & 2000, Fremont

• Products tested:
  • methyl parathion (Penncap-M) [lost ‘99]
  • lambda-cyhalothrin (Warrior/Matador)
  • endosulfan (Thionex)
  • cyfluthrin (Baythroid)
  • thiamethoxam (Actara)

• All products equally effective
Stink Bug Insecticide Trial, 2000

Fremont, Ohio
variety = Peto 696
Treated 11 & 24 August
Harvested 11 September

<table>
<thead>
<tr>
<th>Insecticide</th>
<th>% damaged</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warrior 3.2 oz</td>
<td>Red fruit</td>
</tr>
<tr>
<td>Actara 5 oz</td>
<td>Breaker fruit</td>
</tr>
<tr>
<td>Actara 4 oz</td>
<td>Green fruit</td>
</tr>
<tr>
<td>Baythroid 2.4 oz</td>
<td>Total fruit</td>
</tr>
<tr>
<td>Avaunt 3.5 oz</td>
<td></td>
</tr>
<tr>
<td>Untreated check</td>
<td></td>
</tr>
</tbody>
</table>
## Stink bug control on tomato

<table>
<thead>
<tr>
<th>Product</th>
<th>Rate</th>
<th>Limit (@ max rate)</th>
<th>PHI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warrior (Matador)</td>
<td>1.28-1.92 fl oz/A</td>
<td>12 aps</td>
<td>5 days</td>
</tr>
<tr>
<td>Actara 25WDG</td>
<td>3.0-5.5 oz/A</td>
<td>2 aps</td>
<td>0 days</td>
</tr>
<tr>
<td>Baythroid XL</td>
<td>1.6-2.8 fl oz/A</td>
<td>6 aps</td>
<td>0 days</td>
</tr>
<tr>
<td>Thionex 3EC</td>
<td>1-1.3 qt/A</td>
<td>2 aps</td>
<td>4 days</td>
</tr>
<tr>
<td>Lannate LV</td>
<td>1.5-3 pt/A</td>
<td>7 aps</td>
<td>1 day</td>
</tr>
<tr>
<td>Venom 70WP</td>
<td>1-4 oz/A</td>
<td>1 ap</td>
<td>1 day</td>
</tr>
<tr>
<td>Scorpion 35SL</td>
<td>2-7 fl oz/A</td>
<td>1 ap</td>
<td>1 day</td>
</tr>
<tr>
<td>Brigade 2EC</td>
<td>2.1-5.2 fl oz/A</td>
<td>4 aps</td>
<td>1 day</td>
</tr>
<tr>
<td>Mustang Max</td>
<td>3.2-4 fl oz/A</td>
<td>6 aps</td>
<td>1 day</td>
</tr>
<tr>
<td>Belay 2.13SC</td>
<td>3-4 fl oz/A</td>
<td>3 aps</td>
<td>7 days</td>
</tr>
</tbody>
</table>
Which species?
Which species?

Most common in Ohio tomato fields, 1996-2000
Which species?

The new invasive species, in Ohio since 2007
Brown marmorated stink bug

- New exotic invasive species
- Attacks fruits & seed pods
- Also nuisance: invades homes
Their favorite foods: study in Maryland

<table>
<thead>
<tr>
<th>Host plant (planted 17-21 May)</th>
<th>Date of first sustained activity</th>
<th>mean #SB per m²</th>
<th>Weeks of sustained activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweet corn</td>
<td>26-Jun</td>
<td>1.08</td>
<td>7</td>
</tr>
<tr>
<td>Eggplant</td>
<td>17-Jul</td>
<td>0.52</td>
<td>7</td>
</tr>
<tr>
<td>Green beans</td>
<td>17-Jul</td>
<td>0.06</td>
<td>4 (low)</td>
</tr>
<tr>
<td>Okra</td>
<td>3-Jul</td>
<td>0.57</td>
<td>9</td>
</tr>
<tr>
<td>Bell pepper</td>
<td>24-Jul</td>
<td>1.37</td>
<td>6</td>
</tr>
<tr>
<td>Sunflower</td>
<td>3-Jul</td>
<td>1.24</td>
<td>7</td>
</tr>
<tr>
<td>Edamame*</td>
<td>17-Jul</td>
<td>1.05</td>
<td>4 (medium)</td>
</tr>
<tr>
<td>Sweet sorghum</td>
<td>7-Aug</td>
<td>0.42</td>
<td>2</td>
</tr>
<tr>
<td>Tomato</td>
<td>24-Jul</td>
<td>0.07</td>
<td>6</td>
</tr>
</tbody>
</table>
BMSB monitoring by blacklight trap, 2013

Brown marmorated stink bug in blacklight trap
OSU's Waterman Farm, Columbus, Ohio
2013

First bug: 20 May
Last bug: 3 October
Most: 15 July

Number of bugs per night

May/19  Jun/16  Jul/14  Aug/11  Sep/8  Oct/6
Trap availability

- **Trap from AgBio:**
  4-foot pyramid, black corrugated plastic, $30

- **Lures:**
  - @ $ 3 - 8 (30-day)
  - AgBio
  - Trécé
  - Alpha Scents
  - Sterling
Alternative Trap: PVC pipe topped by small yellow Dead Inn trap: black vs yellow; plain vs netted
Alternative Trap: PVC pipe topped by small yellow Dead Inn trap: black vs yellow; plain vs netted
the end

Questions?

e-mail: welty.1@osu.edu
office phone: 614-292-2803
website: bugs.osu.edu/welty/