Insect Pest Management on Tomato

Celeste Welty
October 2011
Tomato Pests

• Identification
• Management tactics
• Thresholds
# Tomato Pests

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<tr>
<th>Key</th>
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Stink Bugs

• 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:
  • 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

Yellow blotch  Cloudy spot
Life History of the One-Spotted Stink Bug, *Euschistus variolarius*

- overwinter in alfalfa (?)
- one generation in wheat, May-June
- move to tomatoes (or soybeans) in July, August
Stink bug development in tomato field

Fremont Ohio, 1999

- Adult
- Nymph
- Fruit damage

Spray
- 8/3
- 8/23

Total number of all plots

- 10 plants @ 32 plots
- 100 fruit @ 32 plots

Stink Bug Management

• **Scout:**
  – **weekly in July, August**
  – **examine 10 fruit at 40 locations/field**

• **Threshold:** 0.5 - 1% fruit damage
  (2 - 4 damaged out of 400 fruit)

• **Insecticides:**
  – Spinosad for nymphs
  – Pyrethrins for adults (but weak)
A New Crop Pest:
Brown Marmorated Stink Bug

[Images of different stages of the brown marmorated stink bug: adult and nymph.]
Brown marmorated stink bug: injury on vegetables

- tomato
- pepper
- beans
Life Cycle of B. M. stink bug

- 5 instars within nymph stage
- 1 or 2 generations per year

Eggs & 1\textsuperscript{st} instar nymphs

\begin{tabular}{cccccc}
2\textsuperscript{nd} instar & 3\textsuperscript{rd} & 4\textsuperscript{th} & 5\textsuperscript{th} & adult male & adult female \\
\end{tabular}
Natural enemies of brown marmorated stink bug

• Egg parasitoid, *Trissolcus halyomorphae*
  – Found in Asia
  – Specific to BMSB
  – Parasitizes up to 70% of eggs in China

• 4 *Trissolcus* species collected in Asia
  – Quarantine & screening by USDA, Newark DE
  – Test if also attack beneficials
Hornworms

- Tobacco hornworm
- Tomato hornworm
Hornworms

• Tobacco hornworm (red horn)
• Tomato hornworm (black horn)
Hornworm damage

• Beware of camouflage
• Look for canopy top mowed off
Hornworm biocontrol

• *Cotesia congregata*
Hornworm damage

• Easily killed by B.t. (e.g. Dipel)
• Adult is a large hawk moth
• Pheromone trap not available
• Adults detected in blacklight traps
Potato Aphid

• Appearance:
  – Small, soft, 2 ‘tailpipes’
  – Both winged & wingless forms

• Damage:
  – Suck sap, cause leaf puckers
  – Deposit honeydew
  – Transmit viruses

• Many natural enemies
Natural enemies of aphids

- Ladybugs
- Midge
- Parasitoids
- Hover flies
- Lace-wings
Aphid control

• Encourage natural enemies by avoiding use of broad-spectrum insecticides
• Suffocate with spray of insecticidal soap
• Reflective mulch to prevent colonization by winged aphids
Potato Aphid
tested on tomato leaves, 10/3/2006
3 replicates/treatment, 10 aphids/replicate
Melon Aphid
tested on pumpkin leaves, 10/5/05;
3 replicates/treatment, 10 aphids/replicate

Mean % Mortality after 24 hours

- pyrethrins+PBO (A)
- endosulfan (A)
- oil (Mite-X) (A)
- esfenvalerate (AB)
- carbaryl (AB)
- soap (ABC)
- permethrin (BC)
- neem oil (CD)
- garlic (D)
- capsaicin (D)
- water (control) (D)
- spinosad (D)
- azadirachtin (D)

10/5/05
Two-spotted spider mite

- Tiny, white with 2 black spots, 8 legs
- Suck sap from leaves
- Webbing usually present
- Thrive in hot dry weather
- Many natural predators
- Control: soap or oil sprays
Two-spotted spider mite

tested on snap bean leaves, 10/26/05;
3 replicates/treatment, 30 mites/replicate

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**Graph:**

- **dicofol:** A
- **soap:** B
- **oil (Mite-X):** B
- **pyrethrins+PBO:** BC
- **permethrin:** CD
- **water (control):** D

**Mean % Mortality after 24 hours**

TSSM 10/26/05
Variegated Cutworm

- A climbing cutworm
- Nocturnal
- Common species
- Many host plants
- Serious in tomatoes once every 20 years
Trap for variegated cutworm: pheromone attracts male moth
Variegated cutworm: Seasonal trends in pheromone traps, Columbus, 3 years

Number of moths / trap / week

Week

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

May June July August Sept.

Variegated cutworm

• Scout for damage if adults caught in traps
  – Nibbling on edge of leaves
  – Holes in fruit
  – Look for worm after sunset or early morning
Tomato fruitworm = Corn earworm

- Does not overwinter in Ohio
- Migrates, usually > mid-August
- In fruit day & night
- Worm appearance:
  - light brown head
  - body with long stripes
  - covered with short microspines
Trap to Monitor Tomato Fruitworm (Corn Earworm)

- Pheromone lure
- Attracts male moths
- Highly effective
Tomato Fruitworm trapping study, 1998

<table>
<thead>
<tr>
<th>Date (end wk)</th>
<th>Columbus (1 trap)</th>
<th>Miami Co. (1 trap)</th>
<th>Darke Co. (3 traps @ 3 farms)</th>
<th>Sandusky Co. (1 trap @ 3 farms)</th>
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<td>39</td>
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<td>9/23</td>
<td>275</td>
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<td>-</td>
<td>175</td>
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</table>
Yellow striped armyworm

Also: fall armyworm, beet armyworm
Whiteflies

• Suck sap
• Produce honeydew
• Some transmit viruses
Whiteflies

Need magnifier to see eggs & nymphs!

Life stages:
- Adult
- Egg
- Crawler (1st instar)
- Sessile nymphs
- Pupa

Life stages:
- Adult
- Egg
- Crawler (1st instar)
- Sessile nymphs
- Pupa

Adults (0.8 to 1.2 mm)
Egg to adult 18 to 28 days in warm weather
Eggs (0.2 mm)
4th instar or red eye pupae (0.6 to 0.8 mm)
2 - 3rd instar nymphs (0.4 to 0.6 mm)
1st instar nymphs (0.3 mm)
Whiteflies

- Damage done by nymphs from leaf undersides
- Control by soap sprays
Whiteflies: i.d. of adults

- **Greenhouse whitefly**
  - Wings held flat

- **Banded-winged whitefly**
  - Wings zig-zag pattern

- **Silverleaf (=sweetpotato) whitefly**
  - Wings held roof-like
Silverleaf whitefly
(a.k.a. biotype B of sweetpotato whitefly)

- Key pest in Florida
- Suspected in Ohio (fields with Florida-grown transplants)
- Tomato:
  - Irregular ripening
  - Feeds on leaves
  - Symptoms only on fruit
Banded-winged whitefly

- On many veg crops
- Common on velvetleaf, ragweed, beggarticks, Geranium, Petunia
- Not as harmful as silverleaf
- Not as difficult to control
Stalk Borer

- Look for drooping branch tips
- Control by pruning infested stems
Blister beetles

- Defoliate
- Avoid touching them!
Colorado potato beetle

Larvae of the Colorado potato beetle on tomato.
Colorado potato beetle

- Critical on plants < 8”
- Damage: chewed leaves
  - By adults & larvae
- 2 generations/yr on potato
- 1 generation/yr on tomato
- Control:
  - Hand removal (tapping)
  - Spray larvae with spinosad
Flea beetles

• Chew small holes in leaves
• Damage critical to seedlings if plants growing slowly
• Management:
  – Hand removal (aspirate)
  – Row covers over seedlings
Tomato spotted wilt virus

• Vector:
  western flower thrips

• A “persistent” virus
  – Acquire by feeding on infected plants
    • acquire virus as larvae
    • transmit virus as adults
  – Virus can be passed from infected females through eggs to offspring

• Avoid growing tomato plug plants in same greenhouse as flowers
Monitoring Tomato Pests

• Moth trapping
  – Variegated cutworm
  – Tomato fruitworm
• Weekly scouting
## Scouting Tomato Pests

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<tr>
<th>Time</th>
<th>Sample (per field)</th>
<th>What to look for</th>
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| Pre-fruiting (June)     | 40 whole plants             | • Defoliation  
• Wilted branches  
• Aphids on young terminal leaflets                                              |
|                         |                             |                                                                                 |
| After fruit set (July-Sept.) | 40 sets of 10 fruit        | • Fruit damage  
• Pests present                                                                   |
|                         | 40 leaflets                 | • Webbing  
• Whitefly, aphids                                                                |
|                         | 40 canopy taps (onto tray or pan) | • Stink bugs  
• Caterpillars                                                                 |
# Thresholds for tomato pests

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<th>Target pest</th>
<th>Threshold (in 40 samples)</th>
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<tbody>
<tr>
<td>stink bug</td>
<td>1 plant with fresh damage</td>
</tr>
<tr>
<td>variegated cutworm</td>
<td>1-4 plants with damage</td>
</tr>
<tr>
<td>tomato fruitworm</td>
<td>1 infested plant</td>
</tr>
<tr>
<td>hornworms</td>
<td>2 hornworm larvae</td>
</tr>
<tr>
<td>aphids</td>
<td>0.5 aphid per leaflet</td>
</tr>
<tr>
<td>Colorado potato beetle</td>
<td>0.5 adult per young plant</td>
</tr>
<tr>
<td>flea beetles</td>
<td>4 per young plant</td>
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