Brown Marmorated Stink Bug: Management Strategies for a New New England Pest

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History of the BMSB

*Halyomorpha halys*

- From Asia
- First discovered in PA in 1999
- Nuisance in homes, buildings
- 2010 became ag pest
- In Connecticut since at least 2011
- Moving north

Photo: T. Leskey
Look-a-Likes

Spined soldier bug
*Podisus maculiventris*
Photo: Marlin Rice

Brown Stink Bug
*Euschistus servus*
Photo: Bugguide.net

Dusky Stink Bug
*Euschistus tristigmus*
Photo: Bugguide.net

BMSB
*Halyomorpha halys*
Photo: Bugguide.net

Rough Stink Bug
*Brochymena quadripustulata*
Photo: Bugguide.net
Identification

Brown stinkbug

Shoulder
Brown stinkbug

Antennae
Distinct white & black pattern around abdomen
Life Cycle

• Overwinters as adults
• Female lays up to 250 eggs into the summer
  – Clustered 25-30
Life Cycle

• 5 nymphal stages
• 2 generations/year

Photo: StopBMSB.org
Life Cycle of BMSB

Jan-Feb  March-April  May-June  July-Aug  Sept-Oct  Nov-Dec

Overwinter as adults

Adults emerge early spring. Move to host plants.

Adults lay eggs into summer.

Flightless nymphs hatch, feed. 5 nymphal stages

Nymphs become adults. Continue feeding

2nd generation egg laying, nymph development begins

Jan-Feb  March-April  May-June  July-Aug  Sept-Oct  Nov-Dec
Host Range

• Over 170 known plants
  – Fruit
    • Apple
    • Peach
    • Grape
    • Caneberries
  – Vegetables
  – Field crops
  – Ornamentals
Host Range

• Over 170 known plants
  – Fruit
  – Vegetables
    • Peppers
    • Tomato
    • Sweet Corn
    • Beans
    • Eggplant
    • Swiss Chard
  – Field crops
  – Ornamentals

Photo M. Concklin
# Specialty Crops at Risk to BMSB Damage

<table>
<thead>
<tr>
<th>HIGH RISK</th>
<th>apple, Asian pear, beans (green, pole, snap), bee-bee tree, edamame, eggplant, European pear, grape¹, hazelnut, Japanese pagoda tree, nectarine, okra, peach², Peking tree lilac, pepper, redbud, sweet corn, Swiss chard, tomato</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODERATE RISK</td>
<td>apricot, asparagus, blueberries¹³, broccoli, cauliflower, cherry², collard, cucumber, flowering dogwood, horseradish, lima bean, littleleaf linden, serviceberry, tomatillo</td>
</tr>
<tr>
<td>LOW RISK</td>
<td>blackgum, carrot, cranberries, garlic, ginkgo, greens, Japanese maple, kohlrabi, kousa dogwood, leeks, lettuce, many gymnosperms, onion, potato, spinach, sweet potato, turnip</td>
</tr>
<tr>
<td>UNKNOWN</td>
<td>almond, citrus, hops, kiwi, olive, pistachio, plum, strawberries, walnut</td>
</tr>
</tbody>
</table>

**HOSTS**

Non-Specialty Crop BMSB Hosts Contributing to Specialty Crops Risk

- field corn, soybean

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1—Potential risk of taint/contamination. 2—Additional risk potential due to bark feeding. 3—Considered moderate-high risk.

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**About BMSB**

The brown marmorated stink bug, *Halyomorpha halys* (Stål), is a voracious eater that damages fruit, vegetable, and ornamental crops in North America. With funding from USDA’s Specialty Crop Research Initiative, our team of more than 50 researchers is uncovering the pest’s secrets to find management solutions that will protect our food, our environment, and our farms.

Learn more at [StopBMSB.org](http://StopBMSB.org).

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**Funded by USDA-NIFASCRI Coordinated Agricultural Project, grant #2011-51181-30937. Image credits—sweet corn: Joe Zinnola; eggplant: Howard E Schwartz, Colorado State University, Bugwood.org; apple, carrots: morpethgirl.com/creativecommons/kekahboo42; flowering dogwood: Richard Floyd, Creative Ideas LLC, Bugwood.org; blueberries, cauliflower: Gerald Holmes, California Polytechnic State University at San Luis Obispo, Bugwood.org; ginkgo: Jan Sunkel, State Phytosanitary Administration, Bugwood.org; cranberries: GJfootgl (GC-BY3.0). Printed May 2013.**
Damage / Injury

- Nymphs and adults feed
- Piercing, sucking mouthparts
  - Removes plant sap
  - Injects secretions
Damage / Injury

• Nymphs and adults feed
• Piercing, sucking mouthparts
  – Removes plant sap
  – Injects secretions
Damage / Injury

- Injury appears 7-10 days later as distortion, discoloration

Photos: P. Jentsch, Cornell
Brown Marmorated Stink Bug Feeding Injury

Surface and Internal Injury
‘Loring’ Peach at ~15 mm
Appalachian Fruit Research Station
Kearneysville, WV 25430
16 May 2011

Example 1

Example 2

Example 3
Photo: P. Jentsch, Cornell
Stink bug injury to Pink Lady apple on 4 September, 2012
Look-a-Like Damage

- Ca deficiency/Bitter Pit

Photos: M. Concklin
Determination of Stink Bug Injury

- Bitter pit lesions clustered
- Corking beneath skin surface with separation from Skin.

- Stink bug feeding site always visible
- Corking up to skin surface

Photo: P. Jentsch, Cornell
Look-a-Like Damage

- Ca deficiency/Bitter Pit
- Boron deficiency

Photos: M. Concklin
Look-a-Like Damage

- Ca deficiency/Bitter Pit
- Boron deficiency
- Hail injury

Photo: P. Jentsch, Cornell
Look-a-Like Damage

- Ca deficiency/Bitter Pit
- Boron deficiency
- Hail injury
- TPB/ Cat-facing insects

Photo: Utah State Univ.
Look-a-Like Damage

- Ca deficiency/Bitter Pit
- Boron deficiency
- Hail injury
- TPB/ Cat-facing insects
- Apple Maggot

Photo: P. Jentsch, Cornell
Damage / Injury

- Role of drought in movement of BMSB

Photos M. Concklin
Monitoring

• Rescue traps
  – Not for trapping out
  – Hang in tree or on border
Monitoring

• Tedder traps
  – Not for trapping out
  – Modify top

Photo: M. Concklin
Monitoring

• Tedder traps
  – Not for trapping out
  – Modify top

• Placement
  – Border vegetation
  – Orchard border row
  – Orchard center
Monitoring

• Lures
  – MDT for mid-late season
  – USDA for early season
  – Combo lures
  – Lure placement: in or out

• Vaportape
Monitoring

- Visual monitoring
  - Border vegetation
  - Border fruit trees
  - Leaves, between fruit
  - On fruit
Thresholds: Provisional for Tree Fruit

- 2013 – none
- 2014:
  - 40/trap
  - 10 adults/trap
  - 1/100’ of perimeter orchard linear row
CT Trapping

• 2011: Traps, no lures
  – 14 farms

• 2012: Black light
CT Trapping

• 2013: Traps with lures
  – USDA lure trials
• 2014 & 2015: Traps with lures
  – Entire state
• 2016: additional lure trials with USDA
2015

# BMSB Adults

Perimeter spray, 9/5  Follow-up spray, 9/14

PHs N  PHs hill  X Rd E
Management Options

• Chemicals for BMSB that are present
  – Impact on IPM programs
    • Spray schedule
  – Impact on beneficials
    • Pyrethroids highly toxic, Very effective
Most effective insecticides against BMSB
(based on combined bioassays data from T. Leskey, T. Kuchar and G. Krawczyk

Effect on beneficial insects

- **Highly toxic**
- **Moderate toxic**
- **Safe**

### PYRETHROIDs
**IRAC Group 3A**
- bifenthrin (*Brigade*)
- fenpropathrin (*Danitol*)
- cyfluthrin (*Baythroid*)
- \(\lambda\)-cyhalothrin (*Warrior*)

### NEONICOTINOIDs
**IRAC Group 4A**
- dinotefuran (*Venom, Scorpion*)
- thiametoxam (*Actara*)
- clothianidin (*Belay*)
- imidacloprid (*Provado, Admire Pro*)
- acetamiprid (*Assail*)

### OTHER
**IRAC Groups 1A, 1B, 2A**
- methomyl (*carbamate*)
  - (*Lannate LV and SP*)
- endosulfan (*organochlorine*)
  - (*Thionex*)
- acephate (*organophosphate*)
  - (*Acephate*)

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Greg Krawczyk, PSU FREC 2014
<table>
<thead>
<tr>
<th>Product</th>
<th>Active ingredient</th>
<th>IRAC Code</th>
<th>REI (hrs)</th>
<th>PHI (days) Pome</th>
<th>PHI (days) Stone</th>
<th>Efficacy</th>
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<tbody>
<tr>
<td>Actara</td>
<td>Thiamethoxam</td>
<td>4A</td>
<td>12</td>
<td>35</td>
<td>14</td>
<td>***</td>
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<tr>
<td>Asana XL</td>
<td>Esfenvalerate</td>
<td>3A</td>
<td>12</td>
<td>21</td>
<td>14</td>
<td>**</td>
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<tr>
<td>Baythroid XL</td>
<td>Beta-Cyfluthrin</td>
<td>3A</td>
<td>12</td>
<td>7</td>
<td>7</td>
<td>**</td>
</tr>
<tr>
<td>Bifenture</td>
<td>Bifenthrin</td>
<td>3A</td>
<td>12</td>
<td>14 (Pear)</td>
<td>n/a</td>
<td>***</td>
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<tr>
<td>Brigade</td>
<td>Bifenthrin</td>
<td>3A</td>
<td>12</td>
<td>14 (Pear)</td>
<td>n/a</td>
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<tr>
<td>Danitol</td>
<td>Fenpropathrin</td>
<td>3A</td>
<td>24</td>
<td>14</td>
<td>3</td>
<td>***</td>
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<tr>
<td>Endigo ZC</td>
<td>Thiamethoxam/ Lambda-cyhalothrin</td>
<td>3A/4A</td>
<td>24</td>
<td>35</td>
<td>14</td>
<td>****</td>
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<tr>
<td>Gladiator</td>
<td>Zeta-Cypermethrin</td>
<td>3/6</td>
<td>12</td>
<td>28</td>
<td>21</td>
<td>***</td>
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<tr>
<td>Lannate</td>
<td>Methomyl</td>
<td>1A</td>
<td></td>
<td>72 apple, 48 pear, 96 peach</td>
<td>14 apple, 7 pear</td>
<td>****</td>
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<tr>
<td>Leverage 360</td>
<td>Beta-Cyfluthrin/ Imidacloprid</td>
<td>4A/3A</td>
<td>12</td>
<td>7</td>
<td></td>
<td>***</td>
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<tr>
<td>Scorpion</td>
<td>Dinotefuran</td>
<td>4A</td>
<td>12</td>
<td>n/a</td>
<td>3</td>
<td>****</td>
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<tr>
<td>Surround</td>
<td>Kaolin clay</td>
<td>NA</td>
<td>4</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Voliam Xpress</td>
<td>Chlorantraniliprole/ Lambda-cyhalothrin</td>
<td>3A/28</td>
<td>24</td>
<td>21</td>
<td>14</td>
<td>***</td>
</tr>
<tr>
<td>Voliam Flexi</td>
<td>Thiamethoxam - Chlorantraniliprole</td>
<td>4A/28</td>
<td>12</td>
<td>35</td>
<td>14</td>
<td>***</td>
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<tr>
<td>Vydate(1)</td>
<td>Oxamyl</td>
<td>1A</td>
<td>48</td>
<td>14</td>
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<tr>
<td>Warrior</td>
<td>Lambda-cyhalothrin</td>
<td>3</td>
<td>24</td>
<td>21</td>
<td>14</td>
<td>**</td>
</tr>
</tbody>
</table>

** low efficacy to **** high efficacy
1. 2ee all NE states except NH
Management Options

• Chemicals for BMSB that are present
  – Impact on IPM programs
  – Impact on beneficials

• Alternate middle versus Every middle versus Perimeter

• Beware of border vegetation sprays
Management Options

- *Trissolcus japonicas*
- High parasitism rates of 60%-80%
- Multiple generations
Brown marmorated stink bug, *Halyomorpha halys* (Stål)

**Eggs:** White to pale green and deposited in clusters of approximately 25; appear somewhat shiny.

**Nymphs:** Early instars have a dark head and pronotum; abdomen is orange and red with black stripes on the outer edges and down the center. Later instars have a mostly black head and pronotum; abdomen is rust-colored with black spots on the outer edges and down the center; antennae and legs have white bands.

**Adults:** Speckled brown-gray; antennae have alternating dark and white bands; dark and white bands around the outer edges of the abdomen; small round coppery patches on or near the head; the underside is light gray, brown, or tan (not green or yellow).
Final advice . . .

**Wizard Of Id** By Johnny Hart and Brant Parker

**Ask a Wizard**

Dear Wizard, What advice do you have for young aspiring wizards?

- Bob

Never cast a spell in anger. That's how we ended up with stink bugs.

- The Wizard

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