Managing the Brown Marmorated Stink Bug, *Halyomorpha halys* (Stål) in New York State

589th Meeting of the New England Vegetable and Berry Growers’ Association
And New England Cooperative Extension
Saturday, January 31, 2015
Hudson Lodge of Elks, Hudson, MA

*Peter Jentsch*
Senior Extension Associate – Entomology
Brown Marmorated Stink Bug: History


- First NY BMSB confirmed in 2007, Hudson Valley in December of 2008.

- Economic injury caused by BMSB in the mid-Atlantic occurred in commercial apple in 2009; extensive injury in 2010 causing 37 million dollars in pome fruit damage.

- In 2012, economic damage to apple and pepper was assessed on three Hudson Valley Farms in Ulster and Orange Counties.

- BMSB remains a significant urban pest.
Move Over, Bedbugs: Stink Bugs Have Landed

Maryland 2010

Kelli Wilson and her father, Richard Lee Pry, cleared stink bugs from her porch Friday in Burkittsville, Md. The shield-shaped invaders have damaged fruit and vegetable crops.

By KEN MAGUIRE
Published: September 26, 2010
The Brown Marmorated Stink Bug in the Urban Environment

Brown Marmorated Stink Bugs in a Knoxville, Maryland Home
January 1, 2011-February 27, 2011

>22,000 BMSB collected from 1 home in Maryland 2011
BMSB Presence
December 2014
Brown Marmorated Stink Bug, Halyomorpha halys (Stal) in NY State

2 Generations in NYS

Overwintering adult

1st generation

1st gen. mid-season adult

Overwintering adult
Egg cluster (=28)
1st instar
2nd instar
3rd instar
4th instar
5th instar
Adult

May  June  July  August  September  October
Brown Marmorated Stink Bug, Halyomorpha halys (Stal) in NY State

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Adult

Mating

May June July August September October
Brown Marmorated Stink Bug, *Halyomorpha halys* (Stal) in NY State

2 Generations in NYS

- **Overwintering adult**
- **1st generation**
  - Mid-season adult
- **2nd generation**
  - Late season OW adult

**Overwintering adult**
- Egg cluster (#28)
- 1st instar
- 2nd instar
- 3rd instar
- 4th instar
- 5th instar
- Adult

**1st generation**
- 1st instar
- 2nd instar
- 3rd instar
- 4th instar
- 5th instar
- Adult

**2nd generation**
- 1st instar
- 2nd instar
- 3rd instar
- 4th instar
- 5th instar
- Adult

**Mating**

May June July August September October
Overwintering

$1^{st}$ generation

$2^{nd}$ generation

adults

adults

adults

Trap Captures of BMSB Adults and Nymphs
Apple and Peach Block, Warwick, NY
Brown Marmorated Stink Bug: Identification of Life Stages

- **Eggs:** Average 28/cluster; light green to white
- **1st instar:** black & red; cluster near eggs
- **2nd instar:** striped antennae; ~3.7 mm
- **3rd instar:** striped antennae and legs; ~5.5 mm

- **4th instar:** thoracic spur; striped antennae & legs; ~8.5 mm
- **5th instar:** wing pads; striped antennae & legs; ~12.0 mm

**BMSB Adults:** red eyes, 4 cream colored dots on shoulders; banding on legs and antenna, smooth blunt shoulders. Banded abdomen; 14 -17 mm in length.
Brown Marmorated Stink Bug: Adult Identification

**Antenna:**
- light & dark banding

**2 sets of 4**
- Cream colored dots on thorax

**Wing pads & Legs:**
- light & dark banding

Photo by David J. Shetlar
Ohio State University
Figure 1: Risk maps displaying the relative density of field, vegetable, and fruit crop hosts plants of BMSB throughout the United States.
Brown Marmorated Stink Bug. Host Plants - Food for Success

Polyphagous insect with an expansive host range
- 133 listed plant species hosts
- Observed on over 300 plants
- Deciduous tree, legumes and tree fruit

### Table 2: Reported host list for BMSB. This pest's host range is likely larger than what has been reported in the literature and likely includes a wide variety of ornamentals and weeds that have not been specifically documented in the literature. (*) indicates hosts used to develop the risk maps in Figure 1 and 2.

<table>
<thead>
<tr>
<th>Host</th>
<th>Common name</th>
<th>Reference</th>
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<tbody>
<tr>
<td>Abelis x grandis (André-Rhead)</td>
<td>&lt;i&gt;Glossy abelia&lt;/i&gt;</td>
<td>Bernon, 2004</td>
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<tr>
<td>Acer campestre L.</td>
<td>&lt;i&gt;Hedge maple&lt;/i&gt;</td>
<td>Bernon, 2004</td>
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<td>Acer palmatum Thunb.</td>
<td>&lt;i&gt;Japanese maple&lt;/i&gt;</td>
<td>Bernon, 2004</td>
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<td>Acer platanoides L.</td>
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<td>Acer pseudoplatanus L.</td>
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<td>Acer rubrum L.</td>
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<tr>
<td>Acer spp.*</td>
<td>&lt;i&gt;Maple&lt;/i&gt;</td>
<td>Hooebeke and Carter, 2003; Wormelinger et al., 2008</td>
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<tr>
<td>Amelanchier spp.</td>
<td>&lt;i&gt;Shadbush&lt;/i&gt;</td>
<td>Bernon, 2004; Hooebeke and Carter, 2003</td>
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<tr>
<td>Arctium minus Bernh.</td>
<td>&lt;i&gt;Burdock&lt;/i&gt;</td>
<td>Bernon, 2004</td>
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<td>Arctium spp.</td>
<td>&lt;i&gt;Wormelinger et al., 2008&lt;/i&gt;</td>
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<td>Asparagus officinalis L.*</td>
<td>&lt;i&gt;Asparagus&lt;/i&gt;</td>
<td>Hamilton and Sheaer, 2003</td>
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<td>&lt;i&gt;Wormelinger et al., 2008&lt;/i&gt;</td>
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<tr>
<td>Basella rubra Linn.</td>
<td>&lt;i&gt;Tang tsoi or Climbing spinach&lt;/i&gt;</td>
<td>Hoffmans, 1931</td>
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<tr>
<td>Beta vulgaris L.</td>
<td>&lt;i&gt;Beet Root&lt;/i&gt;</td>
<td>Hua, 2000</td>
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<td>Betula spp.</td>
<td>&lt;i&gt;Birch&lt;/i&gt;</td>
<td>Bernon, 2004</td>
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<tr>
<td>Buddleja davidii Franch.</td>
<td>&lt;i&gt;Butterfly bush&lt;/i&gt;</td>
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<td>Camellia oliviera C. Abel</td>
<td>&lt;i&gt;Tea-oli camellia&lt;/i&gt;</td>
<td>Hua, 2000</td>
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<tr>
<td>Capsicum annuum L.*</td>
<td>&lt;i&gt;Bell pepper&lt;/i&gt;</td>
<td>Bernon, 2004; Leskey, 2010a, 2010b</td>
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<td>Caragana arborescens Lam.</td>
<td>&lt;i&gt;Siberian pea shrub&lt;/i&gt;</td>
<td>Bernon, 2004; Nielsen and Hamilton, 2009</td>
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<td>Carya spp.</td>
<td>&lt;i&gt;Pecan&lt;/i&gt;</td>
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<td>Celtis spp.</td>
<td>&lt;i&gt;Bitternoot&lt;/i&gt;</td>
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<tr>
<td>Cephalis argentea L.</td>
<td>&lt;i&gt;Princess feather or Cock's comb&lt;/i&gt;</td>
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<td>Celtis ocidentalis L.</td>
<td>&lt;i&gt;Hackberry&lt;/i&gt;</td>
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<td>Ceris canadensis L.</td>
<td>&lt;i&gt;Redbud&lt;/i&gt;</td>
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<td>Cleome spp.</td>
<td>&lt;i&gt;Cleome&lt;/i&gt;</td>
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<tr>
<td>Citrus spp.*</td>
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<td>Filius americana L.</td>
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<td>Filius spp.*</td>
<td>&lt;i&gt;Basswood&lt;/i&gt;</td>
<td>Hooebeke and Carter, 2003</td>
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<td>Prunus serrulata L.</td>
<td>&lt;i&gt;Wheat&lt;/i&gt;</td>
<td>Hua, 2000</td>
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<td>&lt;i&gt;Wormelinger et al., 2008&lt;/i&gt;</td>
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<td>Ulmus spp.</td>
<td>&lt;i&gt;Elm&lt;/i&gt;</td>
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</tr>
<tr>
<td>Uncultivated hedges</td>
<td>&lt;i&gt;Nielsen and Hamilton, 2009&lt;/i&gt;</td>
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<td>Viburnum opulus var. americanum All.</td>
<td>&lt;i&gt;Highbush cranberry&lt;/i&gt;</td>
<td>Nielses and Hamilton, 2009</td>
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<tr>
<td>Viburnum prunifolium L.</td>
<td>&lt;i&gt;Blackhaw viburnum&lt;/i&gt;</td>
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<td>Viburnum setigerum Hance</td>
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<td>Vigna sesquipedalis L.</td>
<td>&lt;i&gt;Chinese long bean&lt;/i&gt;</td>
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<td>Vitis vinifera L.</td>
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<td>Tilia americana L.</td>
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Tree of Heaven: *Ailanthus altissima*

Female *A. altissima*

Seed pod cluster

BMSB eggs deposited on a single seed

A primary food and reproductive host plant of brown marmorated stink bug in NY State
Urban Monitoring BMSB: Citizen Scientist Submissions
iMapinvasive: New York Invasive Species Public Map

Halyomorpha halys

Ailanthus altissima

33 NY Counties  http://imapinvasives.org/nyimi/map/  32 NY Counties
Monitoring BMSB in Urban Agricultural Systems
EDDMapS: Early Detection Mapping System for Invasives
State-wide Trap Monitoring of BMSB in NY
USDA #10 Lure & MDT Using Tedders Traps

Vented trap container:
- clip holding 1 #10 & 1 MDT lure

Cone base
Killing strip of Vapona; bungi cord straps

Plywood triangle base painted black

Screened base to reduce weeds and provide contrast for crawling SB

NOT placed in the orchard but along deciduous woodland

AgBio-inc.com
Trap, lures, kill strip
NYS BMSB Trap Locations: 2014
Tree Fruit, Vegetable / Sweet Corn, Grape
State-wide Trap Monitoring of BMSB in NY
USDA #10 Lure & MDT Using Tedders Traps

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- 20 Trap Sites in 14 NYS counties
State-wide Trap Monitoring of BMSB in NY
USDA #10 Lure & MDT Using Tedders Traps

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BMSB Total

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- 20 Trap Sites in 14 NYS counties
- 7 Sites @ Threshold In 3 NY Counties

Cornell University
Hudson Valley Research Laboratory
- 20 Trap Sites in 14 NYS counties
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**Management**
Threshold 10 adult/trap

1st Threshold date ranged from 19 Aug. to 1 Sept.

Maintain coverage until harvest of each variety if traps > 10/wk.
Threshold:  
August 20\textsuperscript{th}, 2014

1\textsuperscript{st} application
BMSB Management Threshold: Communication

Jentsch Lab Site: Developed 2014

Insect Alerts & Recommendations (E-mail Subscription)
BMSB Management Threshold: Communication

Jentsch Lab Site: Developed 2014

http://blogs.cornell.edu/jentsch/
BMSB Management Threshold: Communication

Timely Pest Management Updates
• Information to growers ‘today’
  • Insect pest updates in tree fruit, veg, grape and small fruit
  • BMSB Biology
  • Trapping summary & Trends
  • Management Recommendation
  • Insecticide Efficacy Charts
  • Mapping
BMSB Management Threshold: Communication

Brown Marmorated Stink Bug: August 15th Update

Brown Marmorated Stink Bug (BMSB) numbers last week show continued increase of last instar nymph movement to pheromone baited Tedders traps. The late start to the season may have pushed forward the emergence of the

BMSB Update: August 20. Confirmed Late Season Feeding to Apple, Peach and Pepper

by PJJS@CORNELL.EDU posted on AUGUST 20, 2014

Extensive damage from BMSB Observed On Peach in Highland, NY: August 25th

by PJJS@CORNELL.EDU posted on AUGUST 25, 2014
BMSB Management Threshold: Communication

Partnered with EEDMaps to extend outreach

- Early Detection & Distribution Mapping of Invasive Insects
- Provide regional and nation invasive species tracking
- Provide customized data outputs for threshold development

By County: Weekly update
Trap data per county
Presence in degrees of risk
Threshold levels
BMSB Management: Migration to Orchard

Campbell Hall, Orange Co., NY
BMSB Management: Migration from Deciduous Trees

Mid-September 2012
Campbell Hall, Orange Co., NY
Scouting Observation
Mid-September 2012
Campbell Hall, Orange Co., NY
Pheromone Tedders Trap Captures of BMSB Using MDT & USDA #10 lures
Red Delicious & Rome Apple

No. adults / trap

BMSB

Stink Bug Survey:
100 acre Orchard;
5 acre block; Pink Lady
Fruit damage survey
September 10, 2012

Evaluation of var. ‘Pink Lady’

• Trees @ 3’ x 12’ spacing
• 10 fruit / tree = 100 fruit /30’
• Wooded edge toward the interior
• 9 sections; 240’ row
Elongate depression with two feeding punctures.
Degrees of stink bug feeding injury and corking beneath the skin.
Bitter Pit

Stink Bug Injury
Bitter Pit
**BMSB Management: Insecticide Control**

- Employ traps to determine presence of BMSB on the farm
- **AND scout** to determine presence of BMSB in crop
- Use 1 adult / 100’ of crop edge as *treatment threshold* and/or 10 adults / trap using #10 plus MDT
- Applications will be needed upon reaching *weekly treatment threshold* (reset trap and scouting observations to 0 after Trmt.)
- **Employ the most effective insecticide available**
  - *1st* application: perimeter tree row applications
  - *2nd* application: alternate row middle
  - *3rd* application: Whole orchard
  - Repeat
- **Maintain coverage through to harvest if populations are present** as late varieties increase in risk as crop diminishes.
# BMSB Management: Insecticide Control

<table>
<thead>
<tr>
<th>Product</th>
<th>Active Ingredient</th>
<th>Rate / A</th>
<th>REI Hrs.</th>
<th>PHI Days</th>
<th>Efficacy (USDA)</th>
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<th>App. Interval</th>
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</thead>
<tbody>
<tr>
<td>Actara 25WDG</td>
<td>Thiamethoxam</td>
<td>2.0-5.5 oz/A</td>
<td>12</td>
<td>35</td>
<td>+++</td>
<td>16.5 oz./A (0.258 lb. a.i./A)</td>
<td>10d</td>
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<tr>
<td>Asana XL 0.66EC</td>
<td>Esfenvalerate</td>
<td>4.8-14.5 fl oz/A</td>
<td>12</td>
<td>21</td>
<td>++</td>
<td>101 fl oz/A (0.525 lb Al/A)</td>
<td>NA</td>
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<tr>
<td>Baythroid XL 1EC</td>
<td>Beta-Cyfluthrin</td>
<td>1.4-2.8 fl oz/A</td>
<td>12</td>
<td>7</td>
<td>++</td>
<td>2.8 fl oz/A (0.022 lb Al/A)</td>
<td>14d</td>
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<tr>
<td>Bifenture EC</td>
<td>Bifenthrin</td>
<td>5.2-12.8 fl oz/A</td>
<td>12</td>
<td>14</td>
<td>+++</td>
<td>32 fl oz (0.50 lbs ai)</td>
<td>30d</td>
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<tr>
<td>Bifenture 10DF</td>
<td>Bifenthrin</td>
<td>12.8-32.0 oz/A</td>
<td>12</td>
<td>14</td>
<td>+++</td>
<td>80 oz (0.50 lbs ai)</td>
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<tr>
<td>Brigade WSB</td>
<td>Bifenthrin</td>
<td>12.8-32.0 oz/A</td>
<td>12</td>
<td>14</td>
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<tr>
<td>Danitol 2.4EC</td>
<td>Fenpropidrin</td>
<td>10.66-21.33 fl oz/A</td>
<td>24</td>
<td>14</td>
<td>+++</td>
<td>42.56 fl oz (0.80 lbs ai)</td>
<td>10d</td>
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<td>Indigo EC</td>
<td>Thiamethoxam / Lambda-cyhalothrin</td>
<td>5-6 fl fl oz/A</td>
<td>24</td>
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<td>19 fl oz./A (0.172 lb ai) NY</td>
<td>10d</td>
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<tr>
<td>Lannate 2.4LV*</td>
<td>Methomyl</td>
<td>2.25 pt/A</td>
<td>72</td>
<td>14</td>
<td>+++</td>
<td>240 oz (0.50 lbs ai)</td>
<td>7d</td>
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<tr>
<td>Lannate 90SP*</td>
<td>Methomyl</td>
<td>8-16 oz/A</td>
<td>72</td>
<td>14</td>
<td>+++</td>
<td>5.0 lbs</td>
<td>7d</td>
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<td>Leverage 360</td>
<td>Beta-Cyfluthrin / imidacloprid</td>
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<tr>
<td>Surround 95WP</td>
<td>Kaolin</td>
<td>25-50 lb/A</td>
<td>4</td>
<td>0</td>
<td>+</td>
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<tr>
<td>Thionex 50WP</td>
<td>Endosulfan</td>
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<td>Voliam Xpress EC</td>
<td>Chlorantraniliprole / Lambda-cyhalothrin</td>
<td>6-12 fl oz/A</td>
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<td>Vydate 2L*</td>
<td>Oxamyl</td>
<td>4-8 pt/A</td>
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<tr>
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<td>Lambda-cyhalothrin</td>
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* Although these materials have excellent topical ratings in lab bioassay studies, field efficacy studies have shown economic fruit injury from BMSB feeding, suggesting low residual levels.

** Post bloom applications

BMSB Resources page

http://blogs.cornell.edu/jentsch/
BMSB Management: Insecticide Control

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• Scorpian & Venom (dinoteferan; neonic) labeled in MA
  ****

http://blogs.cornell.edu/jentsch/
- BMSB Resources page
## BMSB Management: Insecticide Control

### BMSB Field-Based Residual Trials

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<td>Actara (24 h)</td>
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<td>38.5</td>
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<tr>
<td>1</td>
<td>Actara (4.5 h)</td>
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<td>25.6</td>
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<td>7.1</td>
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O = Overwintering Adult BMSB more susceptible
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N = 1\textsuperscript{st} and 2\textsuperscript{nd} Gen Adult BMSB much less susceptible
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Lethality Indices

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<td>11.0</td>
<td>6.7</td>
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<tr>
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<td>Control</td>
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<td>0</td>
<td>0.8</td>
<td>N, E, R</td>
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<tr>
<td>3</td>
<td>Danitol</td>
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<td>0</td>
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N = 1st and 2nd Gen Adult BMSB much less susceptible
BMSB Adult Exposure to Insecticide Residue of Apple Foliage

72h Old Residue @ 1 d

BMSB Adult Exposure to Insecticide Residue of Apple Foliage

72h Old Residue @ 3 d
Brown Marmorated Stink Bug: Conclusion

• Brown Marmorated Stink Bug in low urban populations have not caused significant or economic agricultural injury.

• However, BMSB observed in low numbers in Ag crops (tree fruit, pepper and tomato) have caused economic injury.

• Identification of the stink bug is critical in management.

• Traps are necessary to determine presence prior to economic injury as scouting alone is ineffective.

• Perimeter applications to the crop are effective in reducing BMSB damage.

• Maintain insecticide residue if traps are above threshold AND observed in trees.
Thanks to the staff at the HVL for all their support:

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