

Natural Enemies of the Invasive Brown Marmorated Stink Bug

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Brown Marmorated Stink Bug (BMSB)

- Invasive from Asia
- Severe agricultural pest and urban nuisance
- Advantageous Traits
 - Polyphagous
 - Long distance dispersal
 - Overwinters in/on human structures



Urban Landscape

- First detection 2012
- Wasatch Front
- Agricultural Proximity



Plant Damage

- Cat-facing
- Necrotic tissue
- Corking damage
- Utah 2017
 - apple, peach, squash, corn



Berry Damage

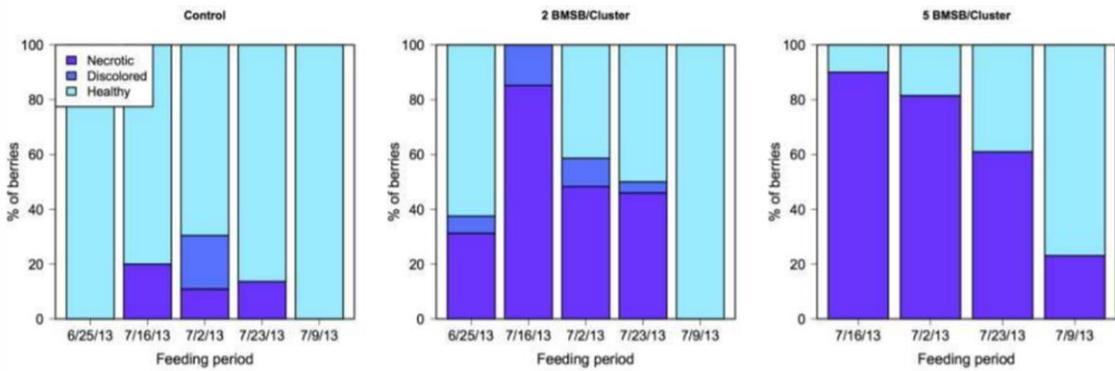
- No reports of BMSB feeding on berries in Utah
- Potential for damage on black berries
 - Black Diamond variety (OSU Research; Dr. Wiman)
 - Necrosis
 - Sugar content unaffected
 - Berry weight only affected by heavy feeding



Blackberry Management in Utah

| Insect | Identification |
|--|---|
| Larger Raspberry Aphid <i>Amphorophora agathonica</i> | Soft-bodied, fluid sucking insect that deplete plant nutrients and spread diseases. Overwinter on canes. Many generations. |
| Dryberry Mite <i>Phyllocoptes gracilis</i> | Tiny, yellow/brown mites on the undersides of leaves cause yellow blotching. Overwinter in buds. |
| Redberry Mite <i>Acalitus essigi</i> | Very tiny mites (20x magnification) overwinter under bud scales. Feeding during summer that prevents ripening, leaves stay hard, red or green. |
| Rose Leafhopper <i>Edwardsiana rosae</i> | Adults are slender, green. Nymphs are small and move quickly. They feed on the underside of leaves, causing stippling. Heavy infestations cause leaves to curl. |
| Raspberry Crown Borer <i>Pennisetia marginata</i> | Adults are clear with a white stripe. Larvae look like a yellowish white with a brown stripe. They bore into canes and cause breakage at the base. |
| Spotted Winged Drosophila <i>Drosophila suzukii</i> | This new pest resembles a vinegar fly. They lay eggs in unripe fruit. Not reported across Utah, but has been reported in Davis County. |

Damage timing – BLACK DIAMOND



It takes some time for necrosis to develop.

N.G. Wiman OSU Horticulture

Monitor for Stink Bugs

- Detection
- Pest status
- Inform management decisions
 - Fact sheets



Chemical Control

- Commercial insecticides for BMSB
 - Broad spectrum chemicals such as neonicotinoids, pyrethroids and carbamates
 - Border sprays found to be most effective
 - Negative bi-products: IPM disruption and BMSB requires increased spray
- Less toxic chemical options
 - neem oil, pyrethrins, kaolin clay, and insecticidal soaps



Effective Insecticides for Controlling BMSB on Small Fruit Crops

The following is a list of insecticides registered for use on small fruit crops in the U.S. that have demonstrated efficacy against BMSB as part of an integrated pest management (IPM) plan. Before using any pesticide, make sure the product is registered for use on the crop in your state. This list is not a substitute for pesticide labeling. Always read, understand, and follow the label directions before using any pesticide. For certain states, also make sure that the product selected is labeled for use against stink bugs.

| Crops listed on pesticide label with pre-harvest interval (days). "NL" indicates not labeled on that crop. | | | | |
|---|------------------------------------|--------------------|-------------------|-------------|
| Active Ingredient (IRAC class*) | Product Name(s) | Highbush Blueberry | Lowbush Blueberry | Caneberries |
| bifenthrin (3A) | Bifenture, Brigade, Sniper, others | 1 | 1 | 3 |
| clothianidin (4A) | Belay | NL | 21** | NL |
| imidacloprid (4A) | Admire Pro, Alias, Wrangler | 3-7 | 3-7 | 7 |
| fenpropathrin (3A) | Danitol | 3 | 3 | NL |
| methomyl (1A) | Lannate IV | 3 | 3 | 3 |
| thiamethoxam (4A) | Actara 25WDG | 3 | 3 | 3*** |
| zeta-cypermethrin (3A) | Mustang Maxx | 1 | 1 | 1 |
| zeta-cypermethrin + bifenthrin (3A) | Hero EC | 1 | 1 | 3 |

Most products labeled for these crops do not include stink bugs as target pests except where noted (**, ***).

* – IRAC (Insecticide Resistance Action Committee) class: 1A = carbamates, 3A = pyrethroids, 4A = neonicotinoids.

** – labeled for stink bugs in lowbush blueberries only, but not in California.

*** – labeled for stink bugs in caneberries only.

Product names are mentioned for convenience only. No endorsement of products is intended, nor is criticism of unnamed products implied.



Authored by the BMSB SCRI CAP Small Fruit Commodity Team:
Nik Wiman and Vaughn Walton (Oregon State University), Cesar Rodriguez-Saona (Rutgers University), Doug Pfeiffer (Virginia Tech), William R. Morrison III and Tracy C. Leskey (USDA-ARS)

Cultural Control

⊘ Northern Catalpa ⊘

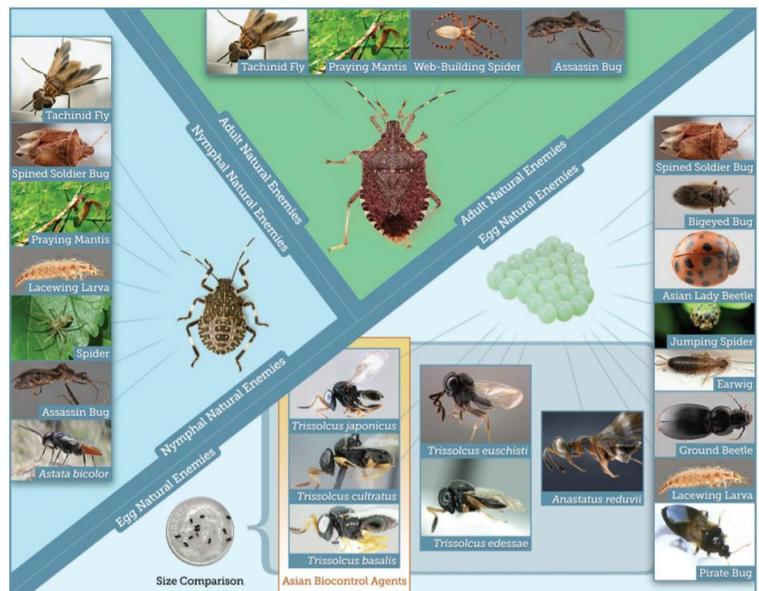


- Plant selection or weed control
- Home gardeners may be best suited in mechanical exclusion
 - Floating row covers
 - Mesh bags over fruit tree branches



Biological Control

- Generalists predators
 - All life stages
 - Moderate control



Biological Control

- Generalists attacking adult BMSB
 - Assassin bugs
 - Praying mantis
 - Spiders



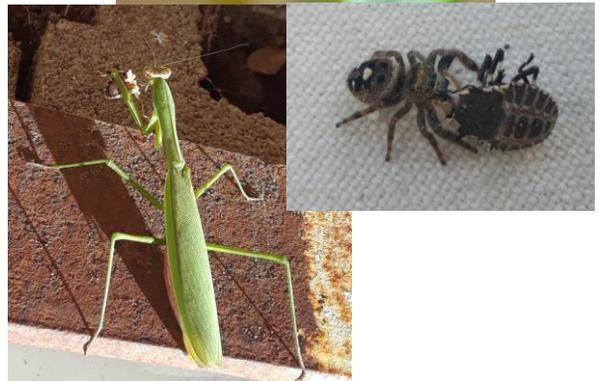
Biological Control
Volume 97, June 2016, Pages 120-130



Frequency, efficiency, and physical characteristics of predation by generalist predators of brown marmorated stink bug (Hemiptera: Pentatomidae) eggs

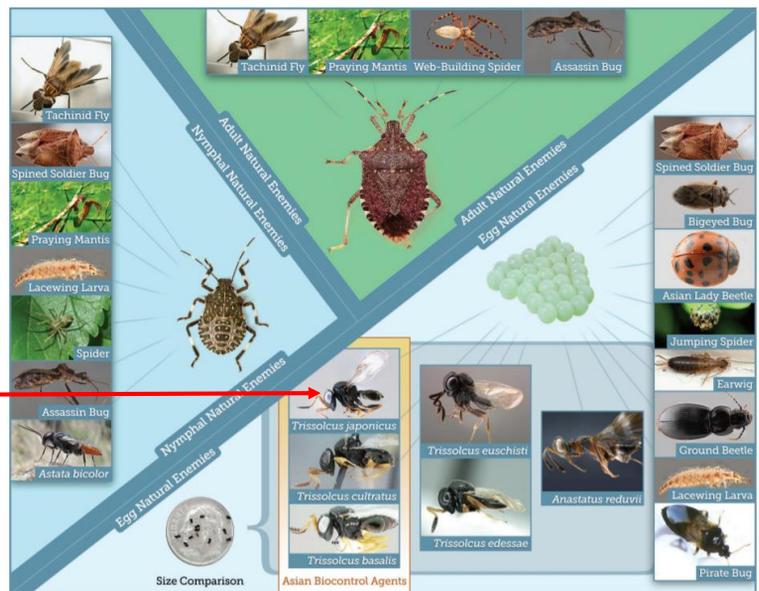
William R. Morrison III^a & ¹✉, Clarissa R. Mathews^{b,1}, Tracy C. Leskey^a

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Biological Control

- Generalists predators
 - All life stages
 - Moderate control
- Specialist predators
 - Parasitoid wasps
 - Kill eggs
 - Prevent BMSB feeding
 - **Samurai wasp**
 - **Extremely effective**
 - Native species
 - Moderate control



Parasitoid Wasps



- Extremely beneficial to pest management
- Parasite vs. Parasitoid?
 - Parasitoid development eventually kills host
- Female inserts or attaches eggs to host
- Stink bug egg parasitoids
 - Sting healthy eggs
 - Wasp larval development prevents stink bug emergence from eggs



Healthy Egg Mass

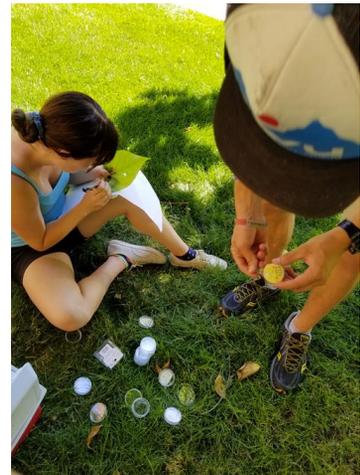


Parasitized Egg Mass



Parasitoid Field Surveys in Utah

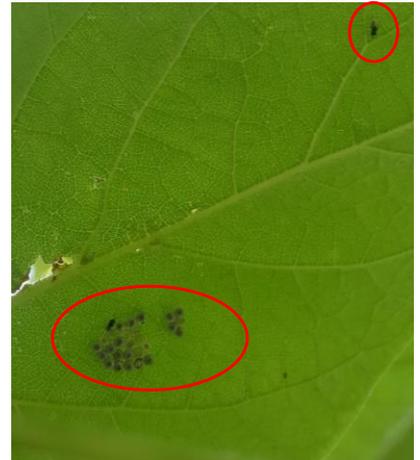
- Urban and agricultural sites along the Wasatch Front
- Egg mass types
 - Lab-reared
 - Wild collected
- June through September 2017-2019



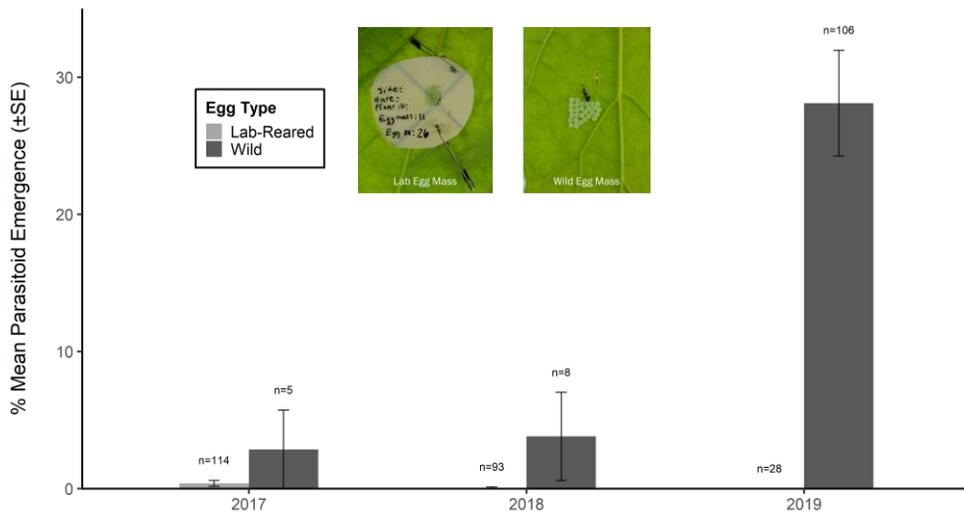
Parasitoid Wasps in Utah



- Variety of native species
 - Extension fact sheet by Zachary Schumm
- Most natives offered little control
 - Few egg masses found with natives present
 - Adult wasp emergence was rare
- Samurai wasp discovered in 2019
 - Many egg masses found with Samurai wasp present
 - Emergence was observed consistently that season



Rate of Wasp Emergence $\frac{\text{Emerged Wasps}}{\text{Total Eggs}}$

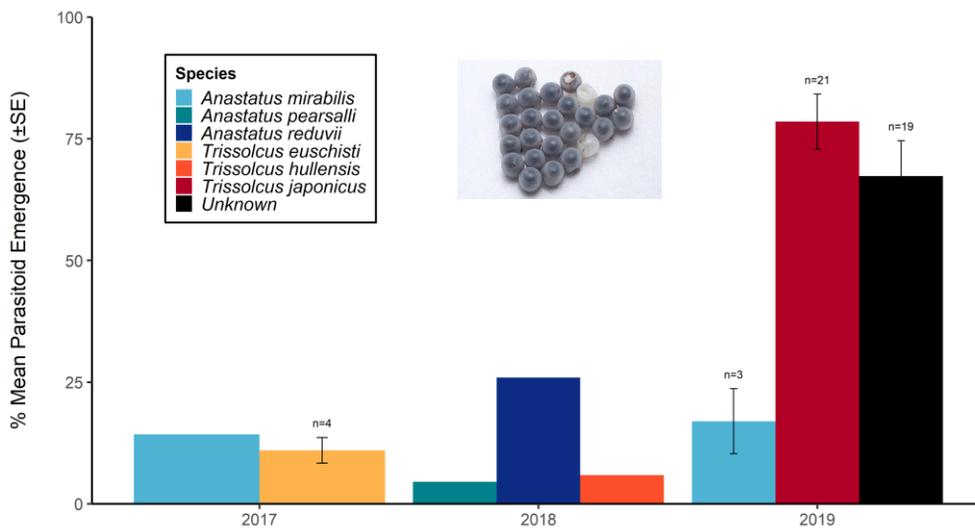


How Effective are these Emerging Species?



Rate of Wasp Emergence by Species

Emerged Wasps
Total Eggs
(only those parasitized egg masses)



Conclusions

- Biological control of BMSB is effective, affordable, and long term
 - Especially for relatively small BMSB populations, as in Utah
- Egg parasitoids are very effective
 - Natives offer moderate control
 - Samurai wasp offers optimal control
 - Identify and preserve parasitized egg masses



Questions?



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