

Integrated Pest Management for Brown Marmorated Stink Bug in Vineyards

A synopsis of what researchers have learned so far and management recommendations using an integrated approach

Authored by the BMSB SCRI CAP Vineyard Crop Commodity Team:

Anne L. Nielsen, Monique Rivera, and Dean Polk (Rutgers University), Tracy Leskey and Rob Morrison (USDA ARS Kearneysville, WV), Daniel Dalton, Chris Hedstrom, Elizabeth Tomasino, Vaughn Walton, Nik Wiman (Oregon State University), Michael Saunders (PSU), and Doug Pfeiffer (Virginia Tech)

Basic Biology and Life Cycle of BMSB

- References herein to specific points in the growing season are based on information from the mid-Atlantic and Willamette Valley regions, where the seasonal biology of BMSB is currently understood best, and may vary in other regions.
- BMSB is a serious agricultural pest of numerous crops during the late spring through early fall.
- After emerging from overwintering sites in May and June, BMSB adults begin mating and laying eggs on various host plants (Fig. 1).
- In most of its range in North America, BMSB completes one to two generations per year, progressing from the egg stage through five nymphal stages (instars) before molting into a winged adult (Fig. 2).

Vineyard Crops at Risk / Crops Not at Risk

- BMSB may move frequently among different wild and cultivated host plant species, feeding alternately among them (Fig. 3).
- As with most crops, there is a strong edge effect, with higher populations found in rows near the edge of the block.
- BMSB nymphs and adults feed by inserting their piercing-sucking mouthparts into developing berries and the rachis but appear to prefer reproductive structures.
- Older nymphs and adults may cause more injury than young nymphs.
- To date, BMSB has been found infesting wine grapes in New Jersey, Oregon, and Virginia. Significant populations have not been recorded in juice grape production areas such as Erie, Pennsylvania.
- Vineyards neighboring alternative host crops and non-crop plants such as peach, apple, wheat, broadleaf maple, English holly, catalpa, tree of heaven, and empress tree may experience dispersal into grape when the alternative host is harvested or when the daylength decreases into August–October. Alternatively,

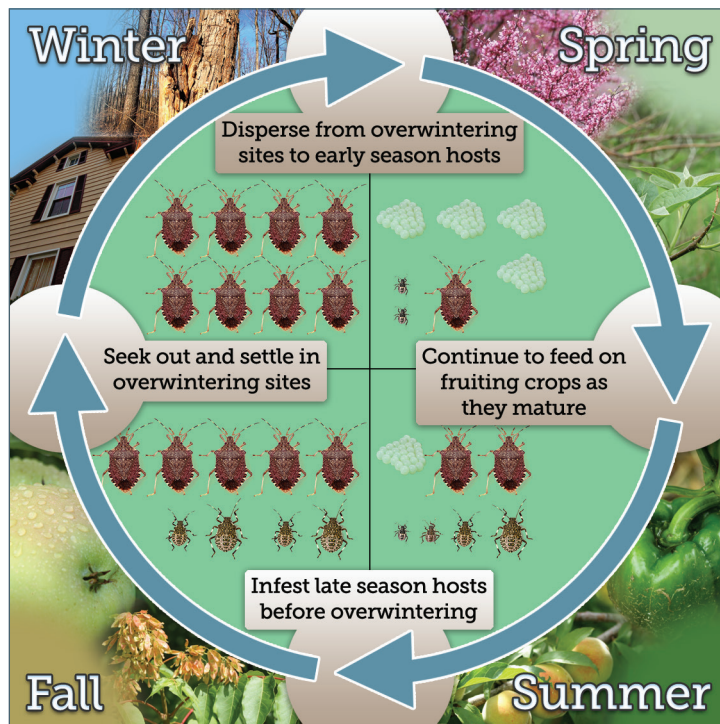


Fig. 1. Typical seasonal biology of brown marmorated stink bug.

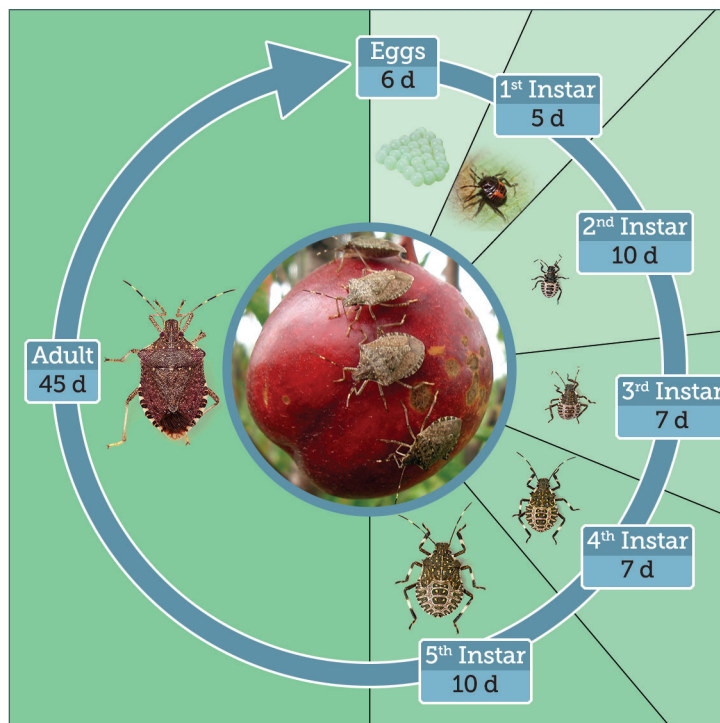


Fig. 2. Life cycle of brown marmorated stink bug.

if neighboring soybean or corn fields reach suitable maturation stages, BMSB has been shown to leave the vineyard into those fields.

Grape Injury Diagnostics

- BMSB feeding may cause direct damage to clusters and injury may include an increase in berry drop, soft and discolored/necrotic berries (Figs. 4–8).
- There is some evidence suggesting that BMSB feeding can result in higher levels of plant diseases like sour rot and injury may facilitate spotted wing drosophila infestations, especially in thin skinned varieties.
- There is a trend toward numerical lower berry and cluster weights.
- No impact on Brix at harvest has been identified.

Period of Risk/Susceptibility

- BMSB adults and nymphs have a strong dispersal capacity and can fly or walk into crops from surrounding habitat and host plants through most or all of the fruiting period. In general, highest populations in vineyards have been recorded in August and October.
- In the mid-Atlantic region and in the Willamette Valley, Oregon, Pinot Noir grapes are most susceptible to injury from veraison through harvest (Figs. 4–8).
- Feeding results in necrotic spots on the berries (Figs. 4–6), berry drop, or softening of the berry. In some cases, an increase in sour rot pathogen infected berries have been associated with feeding injury (Fig. 8).
- White varieties are more susceptible to injury than red varieties in New Jersey. Traminette was the most susceptible to BMSB feeding injury (Fig. 7). Laboratory trials however indicate that the red varietal Chambourcin had the highest levels of feeding injury.
- BMSB presence in the clusters at harvest can cause wine to be tainted. This is dependent on the varietal and fermentation style. In Virginia, freshly pressed juice can have a discernible taint. Taint has been detectable in Pinot Noir after bottling.
- Taint or off-flavors were not detectable in grape juice made from Concord grapes pressed with live adult BMSB.

Provisional Monitoring and Scouting Recommendations

- Pyramid traps baited with a commercial lure containing the BMSB aggregation pheromone and the pheromone synergist, methyl decatrienoate, can be an excellent monitoring tool and are effective at capturing BMSB adults and nymphs season-long, even when populations are low (Fig. 9).
- Scouting clusters is difficult because BMSB may be lodged in between tightly packed clusters. Varieties with tight clusters make

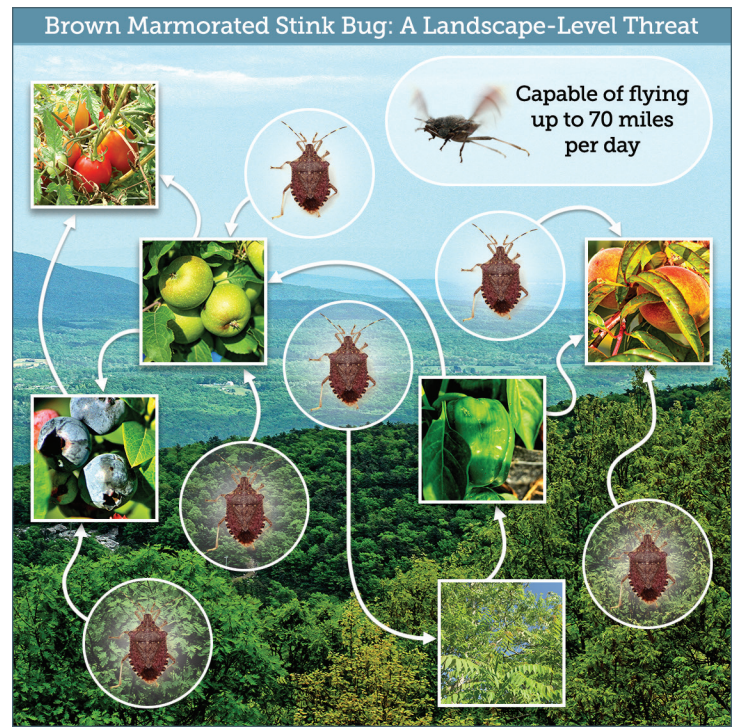


Fig. 3. BMSB is a landscape-level threat that can invade vineyards from wooded habitats and other nearby crops.

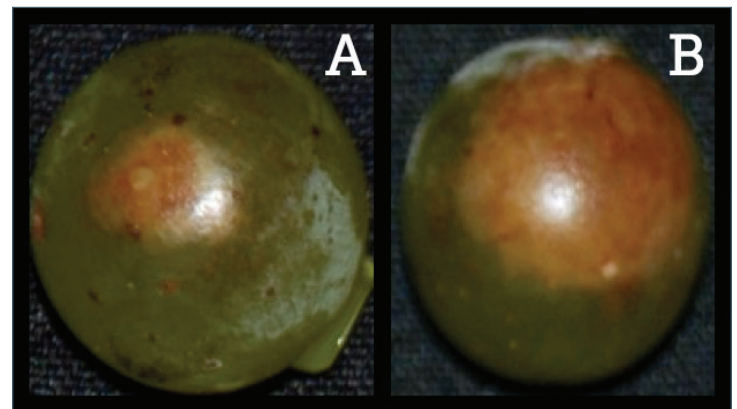


Fig. 4. In Vidal Blanc, (A) a small necrotic spot around the feeding site, and (B) size increase of the necrotic spot.



Fig. 5. BMSB feeding on Cabernet Sauvignon at veraison.

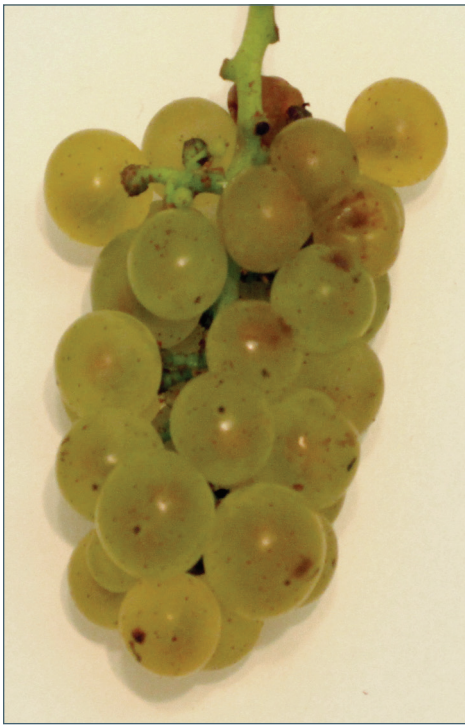


Fig. 6. BMSB feeding on Chardonnay at pre-harvest causing necrotic berries.



Fig. 7. BMSB feeding on Traminette at pre-harvest period.



Fig. 8. BMSB feeding causing sour rot infection in Chardonnay at veraison.



Fig. 9. Commercial stink bug pheromone trap.

scouting very difficult. Shaking or beating samples onto a cloth sheet is recommended.

- Data suggest that 1–2 adults feeding on clusters for 1 week can reduce berry quality, although a specific threshold has not been developed.

Provisional Management Strategies

- BMSB is a landscape-level threat that can invade vineyards from wooded habitats, other nearby crops, and in the spring, potentially from human-made structures (Fig. 3).
- BMSB does not reside permanently in any crop; pest pressure from it is often highest along the edge.
- The intensity of BMSB management required during each growing season can vary according to the size of the adult population that survives the winter.
- If chemical management is needed, spraying only the vineyard border may result in sufficient population reduction. Avoid using pyrethroids, which can cause populations of mealybugs, scale insects, and mites to increase.
- If clusters are infested at harvest and taint is a concern, a knock-down material such as Pyganic or Belay (Od PHI) may reduce the number of BMSB in the clusters if applied the evening before harvest.
- ALWAYS read the label before applying any insecticide.

Period of Risk/Susceptibility

- Various species of tiny wasps that parasitize the eggs of most native stink bug pests are key natural enemies that can reduce populations. However, parasitism levels of BMSB eggs by these North American species have been low and have not significantly impacted BMSB populations. An Asian egg parasitoid of BMSB eggs was recently detected in the eastern and western USA. This species shows high levels of BMSB egg parasitism in Asia and may eventually have significant impacts on BMSB here.
- Various generalist predatory insects will feed on BMSB eggs and nymphs, and also may provide important biological control services against this pest (Fig. 10).
- In grapes, predators caused 13–15% biological control of sentinel egg masses. Minimal parasitism of egg masses was observable in 2013–2014.

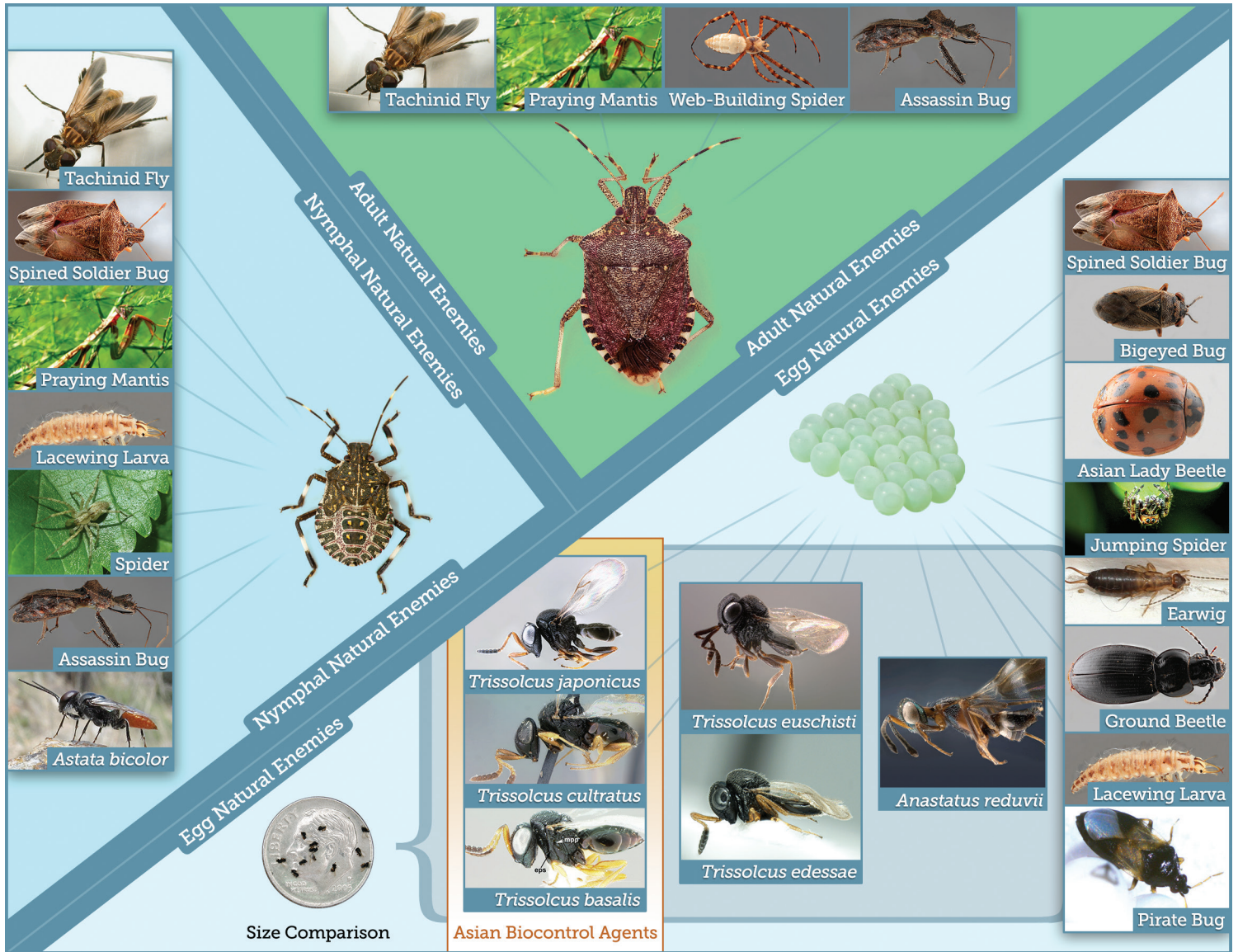


Fig. 10. Arthropod natural enemies of BMSB.

