Least Wanted: Brown Marmorated Stink Bug

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Background

The brown marmorated stink bug (BMSB), *Halyomorpha halys* (Stål), is an invasive alien insect native to Japan, Korea, Taiwan and China. The first official North American detection of this pest occurred in Pennsylvania (PA) in 2001, but it has now spread to over 27 states including several bordering Ontario, Quebec and British Columbia. Large populations are now established in Pennsylvania, New Jersey, Delaware, Maryland, West Virginia, and Virginia, where they are considered significant agricultural and nuisance pests. In 2010, BMSB emerged as a pest of unprecedented importance in orchard crops, small fruit, grape, vegetables, row crops, and ornamentals, causing severe losses in areas where it has become well-established.

BMSB is an excellent hitchhiker and can be moved with shipping containers, cargo and vehicles across large distances. It has been intercepted on a wide variety of trade goods coming into Ontario and other provinces from infested areas. Homeowner reports of overwintering adults have led to the identification of an established population in the Hamilton, ON area. Populations of BMSB tend to become established in urban areas first then spread out to cause damage to agricultural crops. Field surveys conducted for BMSB in 2011 and 2012 did not identify the pest in crops.

Why is BMSB such a serious threat?

BMSB has a very broad host range (over 300 plants are mentioned in the literature), including numerous specialty crops, field crops, and wild hosts that can support tremendous populations. These include stone fruit, pome fruit, tree nuts, grapes, berry crops, peppers, tomatoes, sweet and field corn, soybeans, and ornamental trees and shrubs. Other stink bugs have wide host ranges as adults. What makes BMSB different is that is uses so many plants as reproductive hosts – which means injury is caused by both adults and nymphs. The adults are highly mobile and are capable of moving between crops throughout the growing season. The cumulative damage and the extended activity within a crop, coupled with the pests' mobility, translate to additional monitoring and more intensive management.

Biology

BMSB overwinters as an adult. In northern climates, there is a single generation per year. The adults emerge in the spring, mate and begin to move into crops, where they feed and eventually lay eggs. The adults are long-lived, with females laying eggs over an extended time period and resulting in seemingly overlapping generations with all life stages (eggs, nymphs and adults) present. A single female may lay several hundred eggs. Adults migrate between host crops throughout the growing season. Adults move back to overwintering sites (woodlots and rocky out croppings, human built structures) in the fall.

BMSB and IPM

The presence of BMSB has devastated many well-established IPM programs. Although monitoring is possible with aggregation pheromones and by scouting, there are no reliable thresholds linking numbers to crop damage. Seemingly small numbers of nymphs and adults can cause considerable damage over the course of the growing season. Many of the reduced-risk or softer chemistries are ineffective, requiring the use of broad-spectrum products that include organophosphates and pyrethroids, and with negative impacts to biological control of other crop pests. Despite weekly sprays

beginning early in the growing season and continuing through harvest, cumulative damage to tree fruit in some areas can be as high as 50-60%. Heavy losses have been also reported in sweet corn, tomato, pepper and squash, particularly under organic production.

What does BMSB look like?

Stink bugs are shield-shaped insects with piercing-sucking mouthparts. Common stink bugs and other similar looking insects are easily confused with the BMSB (Figure 1), including several "brown" stink bugs (Figure 2), rough stink bugs (Figure 3), western conifer seed bugs (which also end up in homes)(Figure 4), squash bugs (Figure 5), and the predatory spined soldier bug (Figure 6, 7). All of these bugs have obvious alternating light and dark checked patterns on the edge of the abdomen. The BMSB is relatively large (up to 17 mm), with a marbled brown appearance. It has smooth "shoulders" (edges of the prothorax, the area behind the head) with only a single tooth-like projection just behind the eye (Figure 8). The immature stages, called nymphs, are oval-shaped and have a somewhat tick-like appearance (Figure 9). There are two white bands on each antenna that are not found on other common stink bugs; this feature is obvious on adults and on older nymphs.

What does damage look like?

Stink bugs use their piercing-sucking mouthparts to insert digestive enzymes and to remove plant fluids. Feeding damage by the BMSB is not easily distinguished from those of other stink bug species found in fruit and vegetable crops. Feeding on young plants can result in stunted growth and distortions. In tomatoes, stink bug damage appears as cloudy spots on the surface of the fruit (Figure 10); when the skin of the fruit is pulled back, these areas appear as light, spongy / pithy masses of tissue. Similar damage occurs in peppers. In corn and soybeans, damage to kernels (or leaves) and seeds may not be obvious until the husk or pod is opened (Figure 11).

In tree fruit, early season feeding may result in abortion. Mid- and late-season feeding on peach results in cat facing, gummosis and pithy flesh (Figure 12). In apples, damage by stink bugs is easily confused with bitter pit (Figure 13). To distinguish between bitter pit and stink bug damage, look for a feeding puncture within the area of depression on the fruit skin. BMSB activity in orchards occurs pre-bloom through to harvest, with nymphs appearing after bloom. "Normal" stink bugs do not appear in orchards until mid-season, and then only as adults. Because the seasonal activity differs from "normal" stink bugs, unusual patterns of stink bug damage may be another indicator of BMSB presence in the field.

BMSB is a home invader, too

BMSB adults overwinter in sheltered areas that may include homes and other heated structures. As they can aggregate in very large numbers, the BMSB has become a considerable nuisance pest for home owners where established. While the bugs do not bite humans, they will release a foul smell when handled or otherwise disturbed. Aggregation in artificial structures is not common among stink bugs, and is a behaviour that may provide an early warning that BMSB has become established in Ontario.

How you can help

Timely identification of this insect while populations are low will facilitate response and allow for the implementation of management strategies to limit damage to agricultural crops. Lots of eyes will help with the early detection of BMSB. If you find suspect damage or suspect stink bugs, please submit a sample to the University of Guelph Pest Diagnostic Clinic, the CFIA, the National Insect Collection Identification Service in Ottawa, or an OMAFRA office.

Useful links:

- PennState - http://ento.psu.edu/extension/factsheets/brown-marmorated-stink-bug
- National Identification Service: http://www.canacoll.org/NIS/NIS.html
- Pest Diagnostic Clinic: http://www.guelphlabservices.com/AFL/Service_Growers.aspx
- Hudson Valley Regional Fruit Program (slide show on BMSB): http://hudsonvf.cce.cornell.edu/bmsb1.html

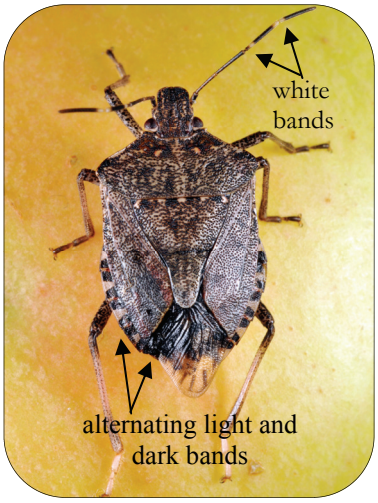

Figure 1. BMSB adults (12-17 mm) have a mottled brown appearance with two white bands on each antenna *(Photo credit: Purdue Extension Entomology)*

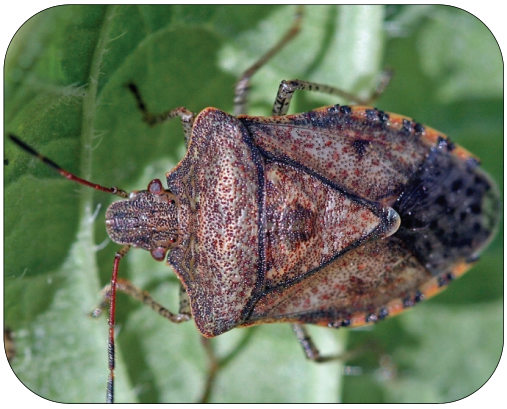

Figure 2. Common brown stink bugs (*Euschistus* spp.) have similar markings on the margins of the abdomen but lack the white bands on the antennae. *(Photo credit: David Cappaert, Michigan State University)*

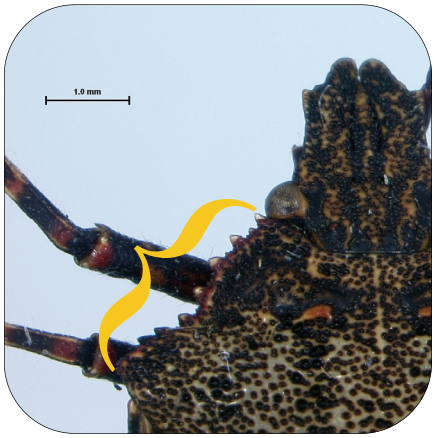

Figure 3. Rough stink bugs (common in orchards) have serrated projections on the margins of the shoulders and lack the bands on the antennae *(Photo credit: Antonia Guidotti, Royal Ontario Museum)*

Figure 4. Western conifer seed bugs have more elongated bodies than BMSB. They often find their way inside structures in the fall. *(Photo credit: David Cappaert, Michigan State University)*

Figure 5. Squash bug adult

Figure 6. Spined soldier bug, a common predatory stink bug. See figure 7 below. *Photo credit: S.A. Marshall, School of Environmental Sciences, University of Guelph*

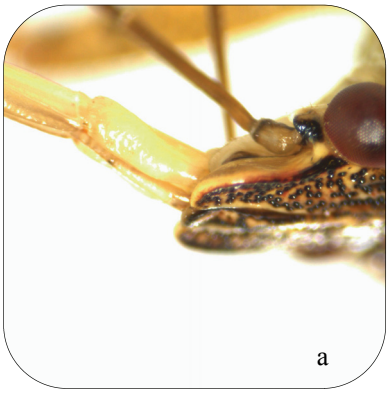

Figure 7. a. The beak or proboscis of predatory stink bugs is short, thick, and free moving. It is attached only its base and can be used to harpoon prey. b. The beak of plant feeding stink bugs is long, slender and the first segment is fused to the head.

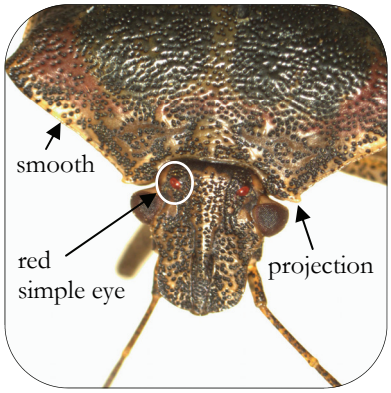

Figure 8. The margins of the BMSB shoulders are smooth, with only a single projection just behind the eye. Note the pair of small bright red simple eyes

Figure 9. Nymphs have a tick-like appearance and have the same banding patterns on the antennae as the adults. *Photo credit: Gary Bernon, APHIS-USDA)*

Figure 10. Feeding damage on tomatoes and peppers appears as cloudy spots on the surface that are spongy/pithy under the skin. *Photo credit: David Wright, Virginia Tech*

Figure 11. Damage to corn may not always be evident until the husk is opened to reveal deflated kernals. *Photo credit: Thomas Kunar, Virginia Tech*

Figure 12. Late season damage in peach appears corky. *Photo credit: Starker Wright, ARS-USDA*

Figure 13. Late season damage to apple can be confused with bitter pit (cork spot). Look for the diagnostic feeding puncture within the depression on the fruit surface. *Photo credit: Starker Wright, ARS-USDA*

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