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Entomological Notes

Department of Entomology

BROWN MARMORATED STINK BUG AS A PEST OF CORN AND SOYBEANS

Halyomorpha halys Stål

The brown marmorated stink bug (BMSB; Fig. 1) is a highly polyphagous invasive species that was accidentally introduced from Asia to the US. It was first found near Allentown, PA in the late 1990's, but has now spread across much of the US. Unfortunately for residents of Pennsylvania and adjacent states, its heaviest populations are found in the mid-Atlantic region, centering on southern Pennsylvania, New Jersey, Maryland, Delaware, Virginia, and West Virginia. In this region, BMSB first gained attention as a nuisance pest due to its tendency to overwinter in homes, but it soon became a severe pest of fruits, vegetables, and ornamental plants. Beginning in 2009 and 2010, populations really started building in corn and soybean fields and growers experienced yield losses.

Figure 1. Brown marmorated stink bug adult. Image by Steve Jacobs, Dept. of Entomology, Penn State University

DESCRIPTION

Brown marmorated stink bug is a true bug (Order Hemiptera) and is similar in size and shape to other stink bugs (Family Pentatomidae). Adult BMSB are about three-quarters of an inch long and have a characteristic shield-like shape. They are, of course, brown, but both nymphs and adults can be distinguished from other brown stink bugs by whitish bands on the antennae (Fig. 1, 2). Adults also show a distictive pattern around the edge of their abdomen (Fig. 1), although this can be confused with adults of the brown stink bug (*Euschistus servus*), which has a similar but less distinct pattern. They can usually also be identified by their abundance; few stink bug species aggregate in such numbers, particularly as adults. Adults produce an odor when they are disturbed, accounting for the "stink" in stink bug. This defensive odor is meant to repel predators. Some people find the smell bothersome whereas claim it is somewhat pleasant, smelling like cilantro.

Brown marmorated stink bug nymphs look similar to adults but do not have wings so their abdomens are exposed and they can not fly (Fig 2). First instar nymphs remain clustered around their egg masses, but second, third, fourth, and fifth instar nymphs are free feeding and walk to find food. Adults have wings and can fly to find food or mates.

Figure 2. Brown marmorated stink bug nymph. Note the whole abdomen is visible due to the absence of wings, which only develop in adults. Image by Steve Jacobs, Dept. of Entomology, Penn State University

LIFE HISTORY

Depending on their location and how warm of a year it is, BMSB can have one or two generations per year. There is some evidence that southern Pennsylvania has two generations per year, but this basic scientific detail has not been settled. If there are two generations per year, the timing of the lifecycle would be as follows. Eggs are typically laid in May by adults that emerge from overwintering, feed for a few weeks and then mate. These

eggs hatch, and nymphs develop through June to become adults in July and lay eggs. Nymphs from these eggs become adults in September when they look for places to spend the winter. Overwintering adults are sexually immature and typically are not able to lay eggs until they feed and mate in spring.

If there is just one generation per year, of course, there would not be a distinct batch of egg laying in July; rather adults would feed through August and seek overwintering locations in September. An alternative to two generations per year that could explain finding eggs and young nymphs in July is that overwintering adults may emerge in Spring over a long period of time, mate and lay eggs, which could account for finding different life stages at the same time of year.

Brown marmorated stink bugs tend to appear in field corn once the ear has developed and bugs can feed upon developing kernels, and occasionally even tassel tissue. We have seen some limited circumstantial evidence that bug feeding on vegetative stage corn can prevent ear formation, but this apparent damage has not been common. Thus, developing ears appear to be the main attraction in field corn, but it is likely they feed on corn stems or other plant parts. Hardened corn kernels (dent stage) may not be preferred by stink bugs and when kernels become difficult to pierce, they may move to adjacent soybean field with their developing pods. When they are available, stink bugs appear to prefer feeding upon soybean when seeds are actively growing inside pods (growth stages R2 – R5).

Brown marmorated stink bugs appear to spend a lot of time in wooded areas or hedgerows and then move out into crop fields. Thus, we recommend first scouting for populations in corn fields along margins with woods before exploring other corn fields. Then later in the season watch soybean fields along wood margins, but also along corn margins in proximity to woods.

Figure 3. Brown marmorated stink bugs aggregating on an ear of field corn. Bug feeds through the husk on developing kernels. Image by Jeff Graybill, Penn State Extension, Lancaster Co.

Figure 4. Damage to field corn kernels by brown marmorated stink bugs feeding through the husk. Image by Image by Jeff Graybill, Penn State Extension, Lancaster Co.

DAMAGE

Brown marmorated stink bugs tend to be problematic because they prefer to feed upon reproductive tissues, those tissues that will be harvested. In corn and soybean, this means that BMSB feeds upon corn ears and soybean pods. In corn, bugs mostly rest on the ears and feed through the husk (Fig. 3), piercing individual kernel and sucking out moisture. This feeding damage leaves behind shriveled kernels (Fig. 4). In soybeans, they feed through the pods on individual seeds, leaving behind flattened pods (Fig. 5).

Figure 5. Flattened soybean pods caused by feeding of brown marmorated stink bug. Image by Jeff Graybill, Penn State Extension, Lancaster Co.

In both corn and soybeans, BMSB tend to be an "edge" species, meaning that they accumulate on the edge of fields, but do not spread very much toward the interior. This tendency to accumulate on edges can be visualized in some well-infested soybeans fields because stink bug feeding will induce a "stay green" syndrome in soybean plants where those that suffered significant feeding damage remain green later into the season, whereas undamaged plants senesce as usual (Fig 6). (This same phenomenon has not been reported in corn.) This inconsistency in maturity across fields can be problematic because it can delay harvest. A benefit of stink bugs being an "edge" species is that if chemical treatments are required, growers may be able to apply a one-boom wide spray around the field perimeter, targeting the bugs where they are concentrated rather than treating an entire field, saving product, beneficial species, fuel, and time.

The economic impact of BMSB feeding in grain crops is poorly defined. In corn, there has been no research to determine what density of bugs results in yield loss. Until this research is conducted, growers must estimate if the populations in their fields are significant enough to cause economic injury. It must be recognized, however, that there are logistical challenges to treating for stink bugs in field corn in July through September; thus, even if spraying is required it may be difficult to deliver insecticides through the canopy down to the ear where bugs accumulate. In soybeans, research with native stink bug species has established economic thresholds that appear appropriate for BMSB. The thresholds are as follows: for scouting with a sweep net, 2.5 stink bugs per 15 sweeps in narrow-row beans or 3.5 stink bugs per 15 sweeps in 30" beans. An alternative to using a sweep net to gauge population size is a visual search. The economic threshold for a visual search is one bug per foot of row for beans of any row width. In soybeans, it is also relevant that the R4 growth stage is most susceptible to stink bug damage. If stink bug populations are high during later growth stages, it is not as much of a concern.

CONTROL

Chemical control of BMSB can be challenging. Adults are harder to kill than nymphs, but both life stages present challenges because, unless they are hit directly with the spray, bugs will only be exposed to insecticides via their feet and feeding stylet, their narrow straw-like beak. Chewing insects are easier to kill because they can consume large amounts of plant tissue that has been dosed with insecticide. Stink bugs insert their mouthparts into fruits or plant stems and by-pass most of the insecticide residue on the plant surface. Thus, residual activity of insecticides against stink bugs tends to be weak, and adult bug populations may reinvade fields following treatment.

If a control measure is warranted, consult the current issue of the Penn State Agronomy Guide for recommended insecticides and dosage rates. You may also consult with your county agricultural Extension agent or farm supply dealer for suggested control measures.

Figure 6. Stay-green syndrome on a field edge induced by heavy populations of Brown marmorated stink bug. Note that the middle of the field is senescing regularly, but the edge shows few signs of maturity. Image by Jeff Graybill, Penn State Extension, Lancaster Co.

John Tooker, Assistant Professor and Extension Specialist
Department of Entomology
December 2012

This publication is available in alternative media on request.

Issued in furtherance of Cooperative Extension Works, Acts of Congress May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture and the Pennsylvania Legislature. D. Jackson, Director of Cooperative Extension, The Pennsylvania State University.