Stink Bugs and Their Soybean Obsession

Dr. Cerruti R. R. Hooks, Extension Entomologist

True Players For Real
At least three species of stinkbugs [i.e., the green stinkbug (GSB), Acrosternum hilare (Say), the brown stinkbug (BSB), Euschistus servus (Say), and the new kid on the block, brown marmorated stinkbug (BMSB), Halyomorpha halys (Stal)] have an unyielding love affair with soybean. Another soybean groupie, the southern green stinkbug (SGSB), Nezara viridula L. is more popular in southern states. Though they have a great attraction to soybean, stink bugs are true players (polyphagous) in the insect world and, as such, don’t limit sowing their wild oats in soybean fields. By true players we mean these guys have an incredible host range. If a plant has a fruiting body there is a good chance it is going to be hit on by one or more stinkbug species. Often, you will find several species sharing the same fruiting body. The GSB occurs throughout the soybean growing regions of the United States but the distribution range of the BMSB, a true player with greater than 300 known host species is more limited though they are spreading at breakneck speed. Unfortunately, stinkbugs are abusive to plants and too much love from these Casanovas can cause severe losses in soybean crops. Prior to the arrival of BMSB, most Mid-Atlantic region soybean farmers were probably not too concerned with stinkbugs on their soybean plants as they had plenty of help from their field friends (natural enemies of stinkbugs). These natural enemies served as chaperones in soybean fields often protecting soybeans from the stinkbugs.

What Type Of Damage Is Credited To Stinkbug Feeding?
Several studies have been conducted to evaluate the impacts of stinkbug feeding on soybean. Stinkbugs cause both quantitative and qualitative damage to soybean seeds. Feeding by stinkbugs when pods are young and seeds are small can result in underdeveloped or aborted seeds. For seed beans, their feeding can decrease germination, emergence and survival of plants originating from stinkbug damaged seeds. Other characteristics of stinkbug damaged soybean are green stem syndrome, reductions in pod fill, seed vigor and viability, and yield. Further, a reduction in the storage stability of harvested seeds has been associated with stinkbug infested soybean. A secondary impact of stinkbug feeding is that the puncture created during feeding provides an opportunity for plant pathogen colonization, an outcome which can further reduce seed quality and yield. Stink bugs may also impact the nutritional content of soybean seeds as damaged seeds may contain decreased oil and increased protein contents. This nutritional change in the seed may favor stinkbugs’ development. This is because, when fed upon, soybean plants of similar age which have
higher protein and lower oil contents can speed the time required for development of certain stinkbug instars and increase the fresh body weight of stinkbug adults. Stinkbugs’ impact on seed yield and quality parameters are typically greatest during (R3-R5.5) pod set through late bean fill. Little or no noticeable reduction in seed quality may occur if stinkbugs colonize plants at the R8 (maturity) stage.

**Can Soybean Compensate From Stink Bug Injury?**
I think most people are familiar with the ability of soybean to compensate from stand loss and defoliation. However, soybean also has the capability to compensate from stinkbug damage. How? The weights of undamaged seeds from soybean plants with high stinkbug infestations are greater than weights of seeds from soybean plants with low infestations. This demonstrates the ability of soybean to compensate for stinkbug-damaged seeds by increasing weights of undamaged seeds. As such, low levels of stinkbugs may increase overall seed size as soybean plants can compensate for minor stink bug injury by increasing seed size on the lower plant canopy. The likely explanation for this is the reallocation of photosynthate from damaged to undamaged seeds within the plant. Japanese scientists found that small seeded soybean varieties with many pods, suffered less stinkbug and other pod-feeding bug damage at harvest than large seeded varieties. They attributed the field tolerance of the small seeded varieties to large numbers of “spare” seeds that could compensate for the damaged seeds.

**What Causes Delayed Maturity in Soybean Fields**
You may have noticed that many soybean fields in MD retain their leaves and remain green long after the harvest date (green stem syndrome). One cause of this delayed maturity is excessive stinkbug feeding damage. This phenomenon occurs when soybean plants are compensating due to high stinkbug infestations. Under low levels of stinkbug infestation, soybean will compensate by directing photosynthate to undamaged seeds as described above. However, under extremely high stinkbug numbers, very few undamaged seeds are present reducing the compensation potential. As such, photosynthate must be diverted to the vegetative portion of plants, resulting in “overcompensation” or increased plant growth and the associated maturity delay. In other words, fewer undamaged pods and seeds would result in more photosynthate being directed into vegetative rather than reproductive tissues resulting in delayed maturity. This delayed maturity (i.e., leaf retention) is not unique to the BMSB. As early as the 1960s, feeding injury to soybean by the SGSB was reported to cause delayed maturity. Delayed maturity has also been associated with the BSB and the redbanded stinkbug (RBSB), _Piezodorus guildinii_ (Westwood), a stinkbug that has limited distribution and economic importance in the United States.

A study conducted on the SGSB, indicated that the delayed maturity resulted exclusively during pod set and bean fill stages (R3-R5.5), and infestations during these stages resulted in delayed maturity more consistently than did infestation at R5.5 or later. Results also showed that infestation levels of six stinkbugs per foot of row generally were required to cause a consistent delay in soybean maturity. This infestation level is equal to 3 or 6 times the economic threshold for stinkbugs depending on whether you use a conservative threshold of 1 per foot of row or the more liberal threshold of 2 stinkbugs per foot of row. Some have reported that BSB at population levels of ~ 4 to 5.3 stinkbugs per foot of row resulted in plants remaining green and actively growing until killed by frost. Again, this level is above the recommended threshold. When both delayed maturity and yield reduction are considered, pod establishment and elongation (R3-R4) through bean fill (R5.5) may be the critical stages for giving consideration to protection of your soybeans from stinkbugs.

**When Does Soybean Become A Stink Bug Magnet?**
During vegetative and early reproductive (flowering or R1 and R2) growth, stinkbug densities on soybean are generally low. Stinkbug populations will begin to increase during early pod development (R3) and full pod (R4) but their reproduction will probably still be low during these stages and there will be a low nymph to adult ratio. The population will begin to increase several fold at pod fill-beginning seed (R4-R5) stages. Though stinkbugs may start to inhabit
soybean fields at R4-R5 stages and more nymphs than adults will be found, these soybean growth stages may not be the best for their development. Studies have shown that stinkbugs generally find soybean most appealing during full seed (R6) through R8 (maturity) stages. Pods without seeds (R3-R4) or with seeds initiating development (R5) may not be an adequate food source for either the nymphs or the adults. However, nymphs that hatch onto soybean during early R5 growth stage and survive will eventually be feeding on the more lucrative full seed (R6) pods available during their later instar stages. The soft, immature seeds present during the (R5.5-R6) stages are more susceptible to stinkbug feeding and if the pest’s numbers are too high for the plant to compensate, the result will be high levels of damage and associated yield loss. Stinkbug population will likely peak between full seed and early maturity stages (R6-R7). Maturing pods (R7) are likely the most suitable food, particularly for adult stinkbugs. Stinkbug population in soybean may start to decline after R7 as the crop senesces. The R8 growth stage has seeds that have a hardy pod wall and pods that are dry and hairy and thus less suitable for stinkbug survival. Pod maturation may contribute to the inability of stinkbugs to induce yield loss after growth stage R8. The tougher, well developed seed that is present at full maturity (R8) would be more likely to withstand feeding by stinkbugs without reaching damage levels that can be found in plants with younger seeds. In summary, the probability of stinkbugs reaching economic threshold increases at soybean growth stages R5 through R7. As such, soybean fields should definitely be scouted for stinkbugs during these stages but my recommendation is that fields be scouted and sampled weekly initiating at early pod development (R3).

Stink Bugs Favorite Hangout
A study was conducted in Louisiana during mid-1980’s to examine effects of stinkbug infestation on yield and other soybean parameters. During that study, yields were separated into two parts, those from the upper and the lower canopy. Researchers found that stinkbugs likely inhabited the upper canopy because yield loss under high infestations was confined primarily to the upper half of plants. Seed yields from the lower canopy remained essentially unchanged and similar to the yield loss associated with low infestation. Others have reported similar feeding patterns for stinkbugs with preference for the upper and middle thirds of the canopy. This tendency of stinkbugs to remain in the upper soybean canopy may be considered a “weak link” in their behavior. As shown by two researchers at the UMD, as the soybean canopy closes, sprayed pesticides are less effective in killing stinkbugs. This presumably occurs because it is more difficult to get good spray coverage in a closed canopy of beans. However, if stinkbugs maintain this tendency to be in the upper canopy, there may be a greater opportunity for them to come in contact with the sprayed pesticide. My research team has been monitoring the fate of BMSB eggs in soybean plots and has noted that eggs are also generally deposited in the upper canopy. In order to take advantage of this stinkbug “weak link”, a pesticide or other management option would need to be administered before they begin to migrate to lower portions of the canopy, forced there by either crowding or reductions in food quantity or quality.

Stinkbugs Favorite Soybean Growth Stage
Not only are maturing pods (R7) a favorite food for stinkbugs but the reproductive performance of some species may be enhanced if they feed on soybean pods during the R7 stage of development. Research has shown that when stinkbugs feed on R7 beans, their reproductive capability is enhanced. Thus, it is easy to imagine the danger of having neighboring areas loaded with both early and late maturing beans. This scenario could provide reproducing stinkbugs an extended period of time to take full advantage of easily accessible and highly desirable R7 pods. If the earlier planted soybeans represented a large percentage of the soybean crop in the area, stinkbugs’ population could build up on the earlier maturing beans and then become highly concentrated on the later soybeans as the early soybeans begin to senesce.

Threshold levels for stinkbugs
Studies have generally concluded that 1 or more stinkbugs per foot of row or nine stinkbugs per 25 sweeps can cause yield reduction. And, lower counts can sometimes cause significant qualitative damage to soybean seeds. However, these levels are considered by some to be a very conservative threshold which has led to the suggestion of a threshold of 2 stink bugs per foot of row. Stinkbugs will typically not exceed economic densities from vegetative growth through flowering (R2). However, early infestations at R3 of 2 GSB per foot of row can cause significant yield reductions and reduce seed germination. Populations at this level that occur at R6 can significantly reduce seed size and germination but may not result in yield reduction. Additionally, the economic threshold for stink bugs may be lower when soybean is grown for seed as opposed to its usual oil and meal purposes. This is due to the impact on seed quality (i.e., vigor, germination, shelf life, etc.) that feeding can cause. All stink bug stages, with the exception of the 1st instar which tend not to feed on the host plants, can damage
soybean. However, studies with respect to the GSB have shown that only the 5th instar may cause significantly more damage compared to non-infested plants. It has also been suggested that 5th instar GSB may do more damage per day than adult GSB. Still, adults may cause more cumulative damage than 5th instars, because they remain adults longer than the period of time they spend in the 5th instar stage. Generally, only stinkbug nymphs > 6 mm are included in injury threshold determinations.

One question that may arise is what to do if, in addition to stink bugs, your soybean foliage and pods are being eaten by other pests such as the green cloverworm, Plathypena scabra (F) or the corn earworm, Helicoverpa zea (Boddie). Unfortunately, the combined injuries caused by stinkbugs and caterpillars can be additive. Thus, if any one of these pests is above threshold, control is suggested. However, if both stinkbugs and caterpillars are at densities representing fractions of their respective economic thresholds, both should be summed to determine if treatment is warranted. Caterpillars and other pests that defoliate soybean and eat pods may impact yield but, unlike stinkbugs, their influence on seed quality is less important. Thus, unlike pod feeders, it is customary to use the same threshold for foliages feeders on soybean grown for seed, oil or meal.

A New Soybean Pest to Consider: Trochanter Mealybug

Dr. John Tooker, Entomologist, Penn State University

A new pest of soybeans has been found feeding on roots of plants in Kentucky, Ohio, and Iowa. This pest is the trochanter mealybug, *Pseudococcus sorghiellus* (Forbes) (Fig. 1 and 2), and it has been found in association with fields that exhibit symptoms similar to potassium deficiency (Fig. 3; e.g., yellowed leaf margins and stunted plants), often in fields that recently hosted alfalfa. Much remains to be learned about this pest species including whether mealybugs cause the yellowing or are more likely to colonize already-stressed plants.

This pest was initially found on soybean roots in Kentucky in 2008 by Dr. Lee Townsend (Kentucky Pest News, No. 1176, Aug 25, 2008). Dr. Townsend reported observing yellowed leaf symptoms that were similar to either potassium deficiency or to the yellowing often associated with soybean aphids. It seems that from reports from Indiana, Illinois, and Pennsylvania, this mealybug species is fairly common on other plant species. The original record of this mealybug species was from sorghum in Illinois. It is most commonly reported found on legumes including alfalfa, red clover, and white clover, but it also has been found on corn, Johnsongrass, and sorghum. In addition, it has been collected from curly dock, milkweed, and plantain; and, there are some trees on the host list, too. This mealybug species is often found to be tended by ants, which eat the honeydew the bugs excrete and in turn protect the mealybugs from predators.

We are working on a project lead by entomologists at Ohio State University to determine if trochanter mealybug is feeding on soybeans in Pennsylvania. If you find a soybean field with apparent potassium deficiency but the soil tests look normal, consider scouting for mealybugs. Dig 10-20 plants with yellowing symptoms and search the roots for mealybugs (see Figures for reference). Fields with a recent history of alfalfa would be particularly good candidates for scouting.
Cover Crops – Frequently Asked Questions (FAQ’s)

Dr. Bob Kratochvil, Extension Agronomist

Governor O’Malley recently announced a record signup (~550,000 acres) for participation in Maryland’s cover crop program for 2011. Since so many of you are going to plant cover crops this fall, I want to address some of the FAQ’s.

1. Which cereal cover crop is best, rye, wheat or barley?

Rye is typically the best scavenger of residual nutrients. However, in a number of research trials I have conducted, I have seen wheat perform comparable to rye. I measure performance by the amount of nitrogen that the different species can sequester. Planted early (prior to mid-October), a good stand of wheat is capable of consuming as much nitrogen as rye. If the planting date is after mid-October, rye will typically do better than wheat. Barley generally will not perform as well as either rye or wheat unless it is planted very early (mid-September).

2. What is the best date for planting a cover crop?

This question has an easy answer, the earlier a cover crop is planted, the better opportunity it will have to sequester nutrients. Crop growth (no matter what the crop) is related to temperature. Temperatures during mid-late September are warmer (and daylength is longer) compared to one month later. The more heat-units that a cover crop can accumulate per day, the more growth it will attain during the fall. Plant as early as possible but don’t rush harvesting your corn when it is too wet just to get the cover crop planted.

3. Does this mean planting during late October is a poor practice?

No. The late planted cover crop will not attain as much growth but it will still consume some of the nitrogen that otherwise would be lost during the winter and early spring. This is particularly true for cover crops that are planted behind drought-stressed corn. Drought results in more residual nitrogen remaining than during years when your yield goal is either met or exceeded. It is to your benefit to trap as much of the residual nutrients in the cover crop as possible. You will get these nutrients back as the organic matter decomposes and mineralizes. Think of a cover crop like an advance purchase of a slow release fertilizer.

4. What is the best planting method for cover crops?

You will get the most from your cover crop if you ensure that you get good seed to soil contact when you plant it. I know that many of you do not dragging steel through the field but doing so is still the best way to get a good cover crop stand. Now, this can be accomplished in different ways; i.e. planting with your no-till drill, broadcasting the seed and lightly disking, or broadcasting the seed and using a vertical tillage implement are all planting methods that can give you good seed to soil contact if done correctly. The amount of residue you have remaining following the previous crop can make a difference in the performance of these various techniques so no matter what method you use, be sure to have the equipment properly adjusted so you can attain your goal of holding on to those residual nutrients.

5. If the soil is excessively dry when I want to plant, should I wait for rain?

No, go ahead and plant. I have seen small grain seed that has been planted into extremely dry soil, germinate and establish a good stand. Seed of cereal species need to imbibe a very small amount of moisture to initiate germination. It is better to get the seed planted than to wait. I have seen “waiting for rain” to result in a 2-3 week delay while awaiting field conditions to again become suitable for planting.

6. What is the best kill date?

The cover crop program does not allow the termination of the crop before March 1. Allowing cereal species to grow beyond this date will increase the amount of nutrients that are sequestered. It is my observation that you generally have gotten the lion’s share of the benefit from the cover crop if you allow it to grow until early to mid-April.
Crop Reports

Western
Over the past week, we have received anywhere from ¼ to 3 inches of rain. With that said, we are still a little dry. Peach harvest is progressing nicely and apple harvest has begun. Orchardists are reporting little Brown Marmorated Stink Bug damage at this point. We expect peak infestation to occur in the next two to three weeks so stay tuned. In the fields, corn silage harvest has begun and cover crop planting in those fields will soon follow. Both soybean and corn crops are looking about average but we are bracing for potential stink bug damage in both crops. Once the corn dents, it is presumed the stink bugs will move on to the soybeans. Soybeans are showing damage in pods and beans. Hay crops are going to be short and winter cereals and oats will be planted to fill in the gaps. The extreme heat has abated but more rain would be welcomed.

Central
Continued dry weather is causing poor pod fill in soybeans. Sweet corn was hurt by the heat and dry conditions resulting in poor pollination, and the same is true for some field corn. Corn silage harvest is underway. Scattered rains fell across the region last week causing major improvements to late planted beans and corn. Some early planted fields of corn have been harvested with moisture reported around 21-22%. The majority of producers anticipate starting harvest next week. Pastures and hayfields are starting to green-up again. Defoliators are very active in bean fields. There is heavy worm pressure in many vegetable crops and concern is rising over pod, flower and foliage feeding damage from the corn earworm in soybean fields. Damage has been limited so far, but producers are scouting given the high counts in Virginia. Fall armyworm activity remains high in sweet corn fields.

North East
Generally about 1.5 inches of rain on Saturday and Sunday have replenished surface soil moisture and soybeans, hay and pastures have responded very well. Weed pressure has been high in pastures forcing many growers to mow their pastures in the last few weeks. No significant disease pressures have been reported in crops. Some BM stinkbug population increases have been noted in corn and soybeans. Corn is advancing to maturity but no harvest activity has been reported.

Southern
Rains finally fell across the region with some consistency last week. Amounts vary from 1.5 to 5 inches across the region. Some early planted fields of corn have been harvested with moisture reported around 21-22%. The majority of producers anticipate starting harvest next week. Pastures and hayfields are starting to green-up again. Defoliators are very active in bean fields. There is heavy worm pressure in many vegetable crops and concern is rising over pod, flower and foliage feeding damage from the corn earworm in soybean fields. Damage has been limited so far, but producers are scouting given the high counts in Virginia. Fall armyworm activity remains high in sweet corn fields.

Upper Eastern Shore
The region received much needed rain over the past weekend. Totals ranged from 2 to 12 inches. While it is too late for most of the corn, it will help most of the beans, especially doublecrop beans. Shorter season varieties of corn are nearing harvest, which will likely start by the time you receive this newsletter. Longer season varieties are nearing black layer. There are high levels of disease present in some corn fields. Check stalk quality as harvest nears and prioritize those fields with weak stalks. Like most years when corn is drought stressed and beans are not thick and canopied over, earworm moths are targeting beans instead of corn. Populations have reached threshold levels in southern parts of the region with fields being sprayed. Luckily, the heavy rains in most areas knocked spider mites off the beans and growing conditions are less conducive for increase in mite populations. Stink bug populations are variable in soybeans with some fields needing treatment and others not. Hay and pastures are starting to grow again.

Lower Eastern Shore
This past week we received scattered rain ranging from ¼ to 3 inches. This will help the soybean crop. Dryland corn harvest has started in some areas and early yield reports are indicating a range from 60 -90 bushels, a clear indication that the ill effects of drought are very much evident. Soybean podworms can be found at the threshold levels in some fields. Spraying is underway for podworms in soybeans. Although many growers lost the third cutting, pastures have begun to rebound after the recent rains.

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NO questions asked.
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Open to all agricultural operations (farm, forest, nursery, greenhouse, etc) throughout Maryland.
Aronia Twilight Tour on August 23rd
Aronia (Chokeberry) is a new alternative crop which has high concentrations of flavonoids and several nutraceutical qualities. University of Maryland Extension will conduct a Twilight Tour of the Aronia research orchard on August 23rd, 5.30 pm at Wye Research and Education Center, 211 Farm Lane, Queenstown MD, 21658. Participants will learn about highly nutritive Aronia berries; varieties and yield; plant densities and propagation; cultural and production methods; fertility practices; and experience ripe Aronia fruit. The event is free, however, registration is requested. Please contact Debby Dant: 410-827-8056 X 115, ddant@umd.edu, if you need any additional information and/or to register.

Mid-Atlantic Precision Agriculture Equipment Day
Please join us and learn how to make precision agriculture pay in your operation. Among the practical and informative presentations that will be given are sprayer and planter section control, variable rate seeding, the economics and practical implementation of RTK and GPS, soil mapping, using technology for on-farm research, and developing variable rate prescriptions.

Tuesday, August 30, 2011
8:30 a.m. - 4:30 p.m.
Caroline County 4-H Park

Applications are available online at www.mda.state.md.us/pdf/regform.pdf. Applications will also be available at your County Extension Office or by calling the Maryland Department of Agriculture at 410-841-5710. Applications must be received by January 16, 2012. Pick-up to begin April/May, 2012. While MDA anticipates being able to conduct collections throughout Maryland, registration does not guarantee pick-up. MDA will review registrations and determine which areas of the State will be serviced. Operations not chosen for the current program will be notified and placed on a waiting list. Sponsored and funded by the Maryland Department of Agriculture.

Upcoming Events

Green Building Institute 2011 Certification Series: Permaculture
The Permaculture Design Certificate Course goal is to achieve a working knowledge in ecologically-based planning, site design and management.

Friday, September 16: Intro to Permaculture, 5:30pm – 7:30pm
$25 GBI Members & Organizational Partner Members! $45 Non Member
Enjoy wine & cheese while getting to know about the benefits of Permaculture.

Sept 17 – Sept 24: 8 Days to a Permaculture Design Certificate
$1,250 Early Bird Registration - GBI members. $1,350 Non Member
9am – 5pm, class & field training, course materials, breakfast & lunch included!

Location: The ENVIRO CENTER, 7761 Waterloo Rd., Jessup, MD 20794 · 443.733.1234

Info & Registration Online: www.greenbuildinginstitute.org/pages/courses/permacultureproject.html
A Big Thank You!!

Maryland Grain Producers’ Utilization Board and Maryland Soybean Board are both recognized for their financial contributions that support the publication and distribution of this newsletter. This is another example of the “checkoff dollars” at work.

Agronomy News QR

Shannon Dill

Want to see agronomy news on your smartphone or view the pictures in color?

A QR code (Quick Response) is a specific code that is readable by QR readers and camera phones. The code includes black graphics arranged in a square pattern on a white background. The information encoded may be text, website or other data.

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2. Once it is downloaded go to that app and select the scan feature. Point the camera at the code and click. For the QR code above, it will take you to the Agronomy News website.
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Did You Know

More than 50% of production agriculture land is dedicated to growing corn and soybeans in the US.

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This edition of Agronomy News is brought to you by:

University of Maryland Extension Field Faculty:

Ben Beale, Ag & Natural Resources Educator, St. Mary’s County
Dave Martin, Ag & Natural Resources Educator, Baltimore County
Jeff Semler, Ag & Natural Resources Educator, Washington County
Jim Lewis, Ag & Natural Resources Educator, Caroline County
Stanley Fultz, Dairy Science Educator, Frederick County
Sudeep Mathew, Ag & Natural Resources Educator, Dorchester County

University of Maryland Extension Specialists:

Dr. Cerruti R. R. Hooks, Extension Entomologist
Dr. Robert Kratochvil, Agronomic Crop Production

University Partners:

Dr. John Tooker, Extension Entomologist, PennState University