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Insects, Mites, And Nematodes

Brown Marmorated Stink Bug: Potentially Serious Pest Found in Indiana - (Rick Foster and Christian Krupke)

An insect sample received by the Purdue Plant & Pest Diagnostic lab from a homeowner in Elkhart County on October 19, 2010 was confirmed to be the brown marmorated stink bug, *Halyomorpha halys*. Since then, there has been an additional confirmed find in Tippecanoe Co (Oct. 25). These are the first confirmed records of this insect in Indiana – it has been found in Ohio this year for the first time as well and will continue expanding its range eastward. The brown marmorated stink bug (marmorated means “having a marbled or streaked appearance”) is a native of Japan, Korea, and China and was first reported in the US in Pennsylvania in 1998. This insect has the potential to be a pest in two ways. First, it invades houses in fall to overwinter in large aggregations, much like the dreaded multicolored Asian lady beetle. The stink bugs will not do any damage while in/on houses, although many people find them unpleasant to look at and they do emit a strong odor when disturbed. Stink bugs get their name because they release a pungent chemical as a defensive mechanism when threatened. The more important concern is that the brown marmorated stink bug can become a serious crop pest. They use their sucking mouthparts to feed on a wide variety of plants found here in Indiana, including most fruit crops, a number of vegetables, corn, soybeans, and various ornamental plants.

Feeding by the brown marmorated stink bug on fruit crops causes small spots of dead tissue that can result in misshapen fruit if feeding occurs early in the season. Feeding on apples can result in pithy, pale tissue underneath the feeding wound that may turn brown and allow pathogen entry. Feeding later in the season can result in water-soaked lesions. This pest can also feed on fruiting vegetables such as tomatoes and peppers, beans pods, and corn kernels. In some areas of the Eastern US, this stink bug has become a



Brown marmorated stink bug next to apple stem

very serious pest. The most effective insecticides for control are the pyrethroids such as bifenthrin, cyhalothrin, cyfluthrin, cypermethrin, etc. Most fruit crop growers prefer to avoid using these insecticides because they kill natural enemies that keep pests such as mites under control. One fear is that if and when the brown marmorated stink bug becomes a serious pest problem, reliance on the pyrethroid insecticides for control will additional pest problems, requiring additional pesticide applications.

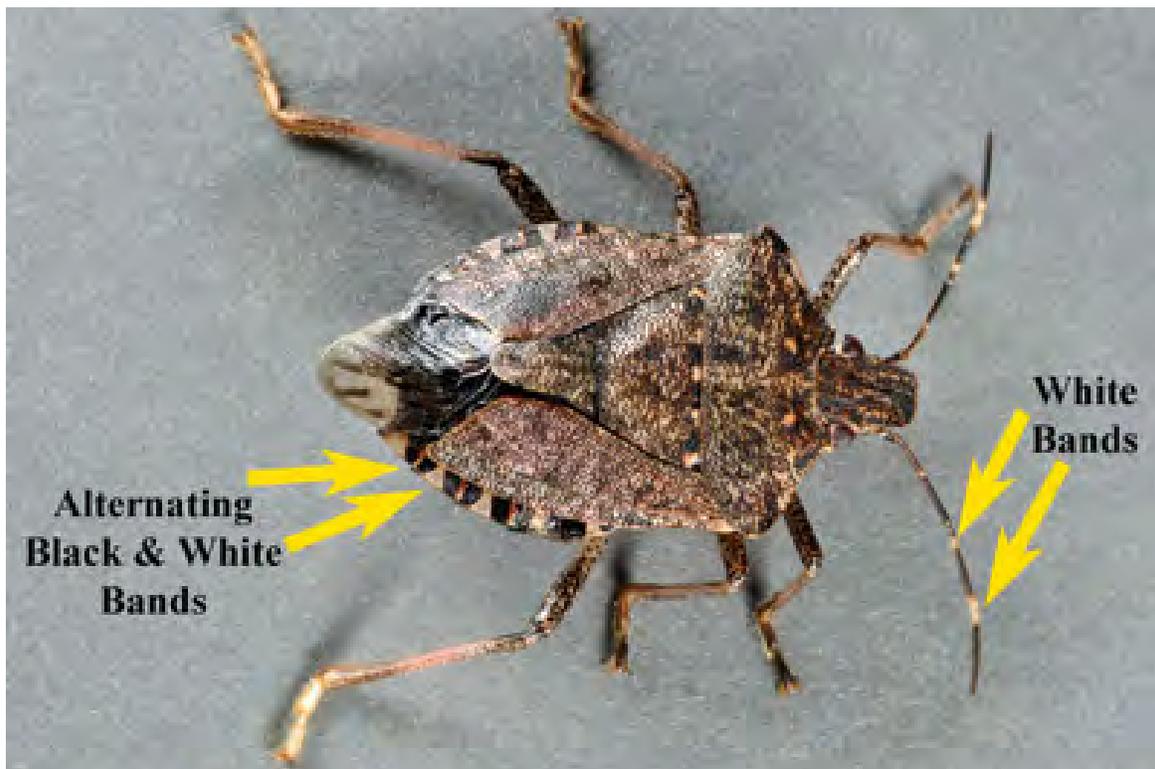
The adult stage of the brown marmorated stink bug has the 5-sided shield-shape common to most stink bugs. They are about 5/8 inch long and 3/8 inch wide. The upper body is mottled brown and grey with alternating light and dark bands on the edges of the abdomen. One of the diagnostic characters for this stink bug is that **the antennae have two light bands on the last two segments**. Eggs are laid in clusters and are barrel-shaped and green. Nymphs are oval with yellow, brown, black and red coloration.

If experiences in states in the eastern U.S. are any indication, this pest is likely to become far more common here in Indiana over the next few years. Experiences in other parts of the country indicate that the brown marmorated stink bug will become a pest in homes before it builds up numbers to become a serious crop pest. Just as with the Asian lady beetle, homeowners should do use tactics to prevent invasion of their homes by the stink bugs. This includes caulking/sealing around windows, repairing screens, etc. Insecticides may be used on the exterior of the home to limit invasion of the house, but this should be only be done after the home has been sealed as well as is practically possible. Insecti-

cides should **not** be used indoors to control this insect. Once the stink bugs are inside, they can be vacuumed up and disposed of. Homeowners should discard vacuum cleaner bag immediately after use because the dead and dying insects will stink while in the bags.



Size of the brown marmorated stink bug



Key identification characteristics, both abdominal and antennal, of the brown marmorated stink bug

Weeds

Is The Beefsteak Plant (Perilla Mint) a New Pasture Issue In Indiana? – (Glenn Nice, Bill Johnson and Brad Shelton)

The Short Story

Beefsteak plant (*Perilla frutescens* (L.) Britton), also known as perilla mint, is an annual mint that can sometimes be found in pastures in Southern Indiana. Beefsteak plant is considered to be toxic, inducing respiratory distress syndrome or panting disease in cattle. Due to possible toxicity, it is important to control this plant either by pulling, digging up plant, mowing or using herbicides. The products 2,4-D, Milestone, Forefront, Weedmaster and glyphosate have been reported to provide good control.

The Rest of the Story

Recently a new weed has appeared at Lawrence County Feldun Purdue Ag Center in a pasture; however, this is not the first time this plant has been found in Indiana. The annual mint, *Perilla frutescens* (L.) Britton, is known by many names: perilla mint, beefsteak plant, Chinese basil, purple mint and rattlesnake, weed to name a few. For the purpose of this article we shall refer to it as beefsteak plant. In Indiana, beefsteak plant has been documented in 15 counties mostly in the Southeast and South-Central quadrants of the State (figure 1).



Figure 1. Documented cases of beefsteak plant in Indiana. Graphic source: USDA Plant Database. Accessed Sept. 14th, 2010. <http://plants.usda.gov/java/county?state_name=Indiana&statefips=18&symbol=PEFR4>

Identification

One of the most noticeable things about beefsteak plant is the variable color of the leaves and stem. Leaves can be purple to green or have combinations of green tinged with purple. Leaves are opposite and have long petioles. Leaves are somewhat wide at the base narrowing to a tip, approximately three to seven inches long and nearly as wide. The margins of the leaves are saw-like, having a sharp serrated appearance; however, this can be somewhat variable. The stems can be up to three feet tall, are hairy and can be green to dark purple. As do most plants belonging to the mint family, perilla mint has a square stem. Flowers bloom from July to October and are white to purple (figure 2).

For more images of beefsteak plant please see the following links:

Virginia Tech Weed ID Guide <http://www.ppws.vt.edu/scott/weed_id/prjfr.htm>

Missouriplants.com <http://www.missouriplants.com/Pinkopp/Perilla_frutescens_page.html>



Figure 2. Beefsteak plant. (Photo Credit: William S. Justice @ USDA-NRCS PLANTS Database)

Toxicity

There have been some toxicity issues associated with the beefsteak plant. In a 1990 article in the Journal of Animal Science, the authors reported on a personal communication that told of a herd of 70 cows in Illinois being poisoned by the beefsteak plant. In this report none of the animals died. In The University of Tennessee Extension publication W135, the authors state that the beefsteak plant causes more cattle deaths in Tennessee than any other toxic plant. Beefsteak plants contain ketones that have been associated with an acute respiratory distress syndrome or panting disease in

cattle, this is an inflammation of the lungs impairing gas exchange. Although all of the plant can contain these ketones, the flowering structures are considered to be the most dangerous. Other ruminants and horses are also at risk and it is reported to still be toxic in the hay.

Wilson and others reported that ketones extracted from the beefsteak plant produced pulmonary disease in mice. Samples taken from Tennessee stream banks all contained the perilla ketone. However, the ketone was not found in seed from plants collected in Oklahoma or samples commercially available in Japan.

Wilson and others were able to induce pathology in cattle with a synthesized perilla ketone. Synthetic ketone injected at a total of 0.1 oz into two 706 lb (0.0001 oz/lb) Angus heifers did not produce pathology. In a separate experiment, approximately 0.3 oz in the blood of a 600 lb heifer did induce illness 10 hours after exposure. Similar amounts caused illness in a 123 lb male sheep. It appears that these compounds are not always present or the pathology is not always induced.

History

Certain varieties of the beefsteak plant are grown as a crop in Asia and most likely arrived into the U.S. as a garden plant. The plants attractive colors and leaf serration, may also have contributed to its use as an ornamental. The variety *frutescens* has been used as an oil crop and the variety *crispa* used as a spicy vegetable in both China and Japan. Varieties have also been used for medicinal purposes. However, weedy relatives of these varieties can be found on roadsides and wastelands in these same countries.

Although there have been toxicity issues identified in this species, mention of its uses are widespread. Present and historical accounts mention varieties of this plant been used for some time. In the article "Perilla Ketone: A Potent Lung Toxin from the Mint Plant, *Perilla frutescens* Britton" by Wilson and others, the authors end with concerns about its use. The contradictions found regarding its toxicity and its documented uses need to be investigated further. Is it a varietal issue where some varieties express the toxins and others do not, or is this some kind of environmental queue that induces toxicity in some plants? Nonetheless, if found in a pasture, control measures should be implemented.

Control

Because of the potential poisoning risks, it is essential that the beefsteak plant be controlled in a pasture. Typically,

livestock will selectively graze the forages, but in some cases if forages are limited, livestock may graze this plant. Also, beefsteak plant may come in contact with livestock through the hay. Control should be implemented early in the season to prevent flower formation, because of the increased toxicity of the flowers.

At the present point in time, there has been no research at Purdue on the control of beefsteak plant. However, there is some information available from other sources. Mowing before flowering may reduce the beefsteak plant's spread. There are several herbicides reported to have activity on beefsteak plant. In the 2010 Weed Control Manual for Tennessee (PB 1580) the products 2,4-D, Forefront, Milestone and Weedmaster are all rated eight out of ten, providing approximately 80% to 90% control for beefsteak plant. In one of the USDA's "Weed of the Week" articles, glyphosate is also provided as a possibility of a control measure. However, glyphosate's use would injure the forages, while 2,4-D, Forefront, Milestone and Weedmaster would not injury grass forages.

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Plant Diseases

U of I Confirms Soybean Pathogen's Resistance to Fungicides – (News Source: Carl Bradley and News Writer: Jennifer Shike, University of Illinois)

URBANA – Research conducted by the University of Illinois and the University of Tennessee confirms that the fungus that causes frog-eye leaf spot (FLS) of soybean, *Cercospora sojina*, has shown resistance to strobilurin fungicides in a Tennessee soybean field.

“Strobilurin fungicides belong to the chemistry class known as the quinone outside inhibitors (QoIs), which are the most widely used group of foliar fungicides applied to field crops to manage plant diseases,” said Carl Bradley, U of I Extension plant pathologist.

These fungicides can be sold as one-active ingredient products such as Headline (BASF Corporation) or Quadris (Syngenta Crop Protection) or in products that combine them with a fungicide in a different chemistry class known as the demethylation inhibitors, sometimes referred to as triazoles, he said. Products that include a strobilurin-triazole combination of active ingredients include Quilt (Syngenta Crop Protection) and Stratego (Bayer CropScience).

Strobilurin fungicides have been deemed high risk for fungal pathogens developing resistance to them. This high-risk status has been determined by the Fungicide Resistance Action Committee (FRAC), an international committee that evaluates fungicides' likelihood of developing resistance.

“Plant pathogenic fungi developing resistance to strobilurin fungicides is not new,” Bradley said. “This has already occurred in potatoes and other crop and disease systems where multiple fungicide applications occur during the growing season.”

In the major soybean production areas in the United States, soybean fields are generally treated once during the season with a fungicide (if treated at all), Bradley said.

“However, we were somewhat surprised to find resistance so soon,” he added. “Every time you apply a fungicide, you increase the selection pressure and the opportunity to select out individuals in the pathogen population that have resistance or reduced sensitivity to the fungicide.”

In 2008, Bradley's laboratory began a project funded by the Illinois Soybean Association to develop a fungicide resistance monitoring program. Since then, his lab has been obtaining samples, conducting tests and monitoring isolates collected from Illinois.

“This year, we decided to cast our net a little farther, particularly in the South,” he said. “In Tennessee, FLS is a major soybean foliar disease. Dr. Melvin Newman of the University of Tennessee sent me samples from a field that had been

sprayed twice with strobilurin fungicides, but still continued to have high levels of FLS, which was an indication of potential fungicide resistance.”

Bradley's team confirmed that the sensitivity of the Tennessee isolates was reduced as compared to the sensitivity of baseline isolates.

In petri dish tests conducted at the U of I, spores from isolates of *Cercospora sojina* germinated in the presence of high concentrations of azoxystrobin, pyraclostrobin, and trifloxystrobin, which are the strobilurin active ingredients found in Quadris, Headline, and Stratego

“This proved we were dealing with isolates that have reduced sensitivity to strobilurin fungicides,” he said. “Currently, Tennessee is the only state in which we have documented isolates like these, but we are continuing to perform tests on isolates collected from fields in Illinois and other states.”

U of I's research will continue into the 2011 season with funding from the Illinois Soybean Association.

In the meantime, Bradley reminds growers that FLS can be controlled with other management tactics such as planting soybean varieties that have high levels of resistance to FLS or using effective triazole fungicides.

“Dr. Newman's work has shown that some triazole fungicides provide good control of FLS and can be used alone, or tank-mixed with strobilurin fungicides if the grower is concerned with more than just FLS,” he said.

The most effective manner to slow the spread of resistant isolates is to only use a fungicide when needed.

“If we overuse fungicide products, we won't be able to use them for very long because we will select out resistant populations,” he said. “There's a lot of marketing to use fungicides for yield increases, but little talk about where those increases come from. They come from protection of yield from diseases. In some cases they pay off because conditions have been favorable for diseases. But in years where conditions aren't favorable for disease, we generally don't see a big yield increase.”

Bradley's crew is expanding their work in monitoring fungicide resistance in pathogens of corn. They are currently developing strobilurin sensitivity baselines for the gray leaf spot and northern corn leaf blight pathogens.

For more information on FLS, read *The Bulletin*, an online publication written by U of I Extension specialists in crop science, at <http://ipm.illinois.edu/bulletin/>

Agronomy Tips

Dry Weather Can Affect Some Soil Tests, But Do Not Stop Soil Sampling - (Jim Camberato¹)

The accurate analysis of representative soil samples to determine lime and fertilizer needs is fundamental to crop production. Unfortunately persistent dry weather resulting in prolonged periods of low soil moisture can affect soil test potassium (K) and pH, resulting in somewhat misleading results. Even so, dry weather soil tests can still be useful if one understands the potential impact of low soil moisture on soil test K and pH and uses this knowledge to adjust the interpretation of soil test results.

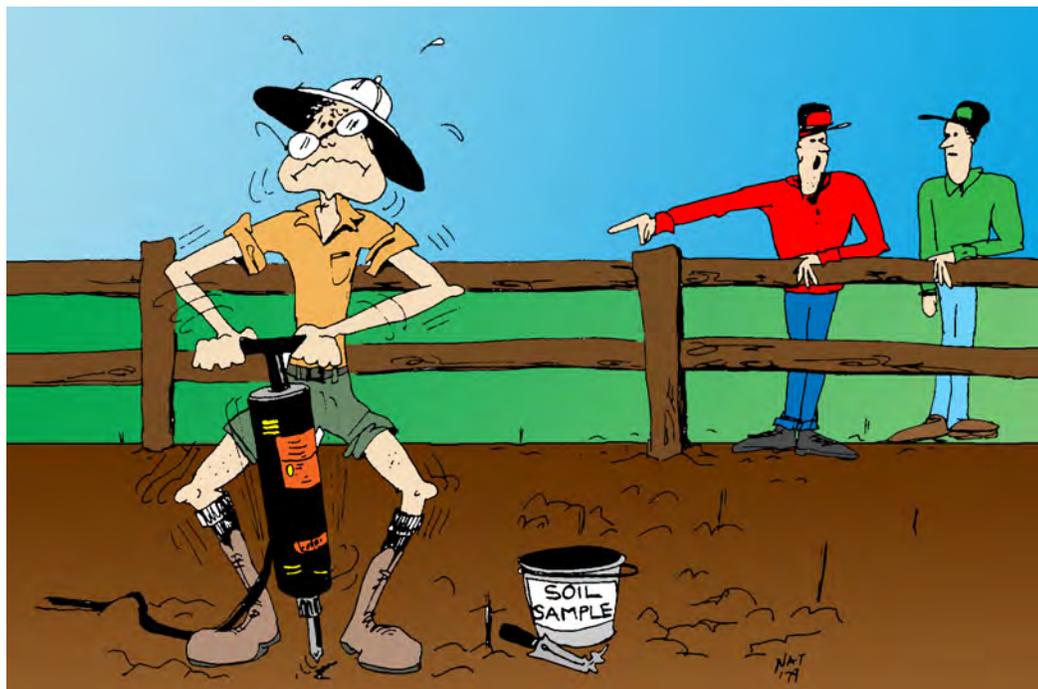
Typically soil test K levels are lower than expected in a dry fall. One factor contributing to low soil test K is most of the K taken up by the crop during the growing season remains in the residue and has not been returned to the soil by rainfall. This is a larger issue with corn than soybean because corn stover contains much more K than soybean straw. Stover from a 200 bushel per acre corn crop contains 220 pounds of K₂O per acre whereas straw from 55 bushel per acre soybeans only contain 35 pounds of K₂O per acre. For every 100 pounds of K₂O per acre retained in the stover soil test K in a typical 8" deep soil sample would be lowered about 8-30 parts per million (ppm) dependent on soil type, texture, and a host of other soil factors.

Low rainfall during the entire growing season can also result in lower than expected soil pH measurements. In dry years a lower soil pH reading is often a result of a high level of fertilizer salts remaining in the soil at the end of the growing season. The salts affect the electrode used to measure pH and result in an inaccurate, slightly lower pH measurement. Although the end of this growing season has been dry the early rainfall received in most of Indiana and normal crop uptake of fertilizer should have been sufficient in most cases to leave little fertilizer salt in the soil at sampling time and result in accurate soil pH measurements.

Bottom line, take advantage of the early harvest and dry soil conditions and continue soil sampling and fertilizing and liming where needed. Most of the K taken up by the crop remains in the residues so do not be alarmed if soil test K levels are a little lower than expected.

¹For more information, contact Jim Camberato (765-496-9338, jcambera@purdue.edu).

Bug Scout



“Hey Bug Scout, I think a little rain would help with the soil sampling!”

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