Brown Marmorated Stink Bug

(*Halyomorpha halys*)

Photo: Susan Ellis, Bugwood.org #5369380
Brown marmorated stink bugs are native to China, Japan, Korea, Myanmar, Taiwan, and Vietnam. In 2001, this species was first detected in the United States in Allentown, Pennsylvania. Although the means of introduction is not certain, they were likely introduced by accident via imported cargo from China, Japan, or Korea. Since then they have spread throughout the country and are found in 46 states and 4 Canadian provinces.

In 2010, populations of this invasive species increased dramatically, causing widespread injury to many crops throughout the mid-Atlantic region. Trees and stone fruit were particularly affected and some growers lost entire crops. Total losses for apple growers in the mid-Atlantic (for the 2010 apple crop) totaled over 37 million dollars.

[Halyomorpha halys (Stal) (Hemiptera: Pentatomidae)]
The Brown Marmorated Stink Bug is important to identify and control for multiple reasons.

The first reason is that the BMSB has a very limited number of natural predators. With the lack of natural predators, the BMSB population has the ability to rapidly grow and spread across the country.

The BMSB is also known to cause major crop damage in the Mid-Atlantic region, but has now been found in the Southeast. By wilting, deforming, and depleting moisture of many of these crops, yields are drastically reduced causing significant agricultural economic impacts.

Due to climate differences, many of the techniques for management of BMSB in the home are not as effective in Florida. In Florida, the common BMSB behaviors such as overwintering in the home are unlikely to occur.

The BMSB is extremely important to identify due to its very extensive host range. The BMSB has can cause major crop damage to a long-list of plants. This makes the pest very difficult to contain and control.
The brown marmorated stink bug is a highly polyphagous plant feeder with a wide range of host plants. The nymphs will typically feed on the leaves and stems of host plants, while the adults will feed on the leaves and stems as well as the fruit and seeds.

In Florida, some of the most susceptible host plants for the BMSB are peach (*Prunus persica*), grapes (*Vitis* spp.), citrus, elderberry, bitter melon (*Momordica charantia*), cabbage (*Brassica oleracea var. capitata*), broccoli (*Brassica oleracea var. italica*), chili peppers (*Capsicum annuum*), and cauliflower (*Brassica oleracea var. botrytis*).


Within Florida, the BMSB is currently found to only be established in Lake County, Florida, a region in North Central Florida with a high concentration of citrus crops. For a pest to become established, there must be active mating and reproduction between the population, with located egg masses.

The BMSB is known to be a prominent hitchhiker pest, meaning that it has the potential to navigate itself outside of Lake County and into other surrounding areas in Florida. Because of this, monitoring for the BMSB is important to prevent the spread of the pest into neighboring fields.

Beginning in 2008, tracking of the BMSB has occurred all across Florida with collections being sent to UF DPI. As of February 2020, the following additional counties have found BMSB, but this does not mean it is established in those areas. The only county that it is established in is Lake County – as demonstrated in the map.  

- Alachua – 13  
- Bradford – 1  
- Broward – 1  
- Citrus = 1  
- Collier – 3  
- Duval – 6  
- Gulf – 1
Hamilton – 2
Highlands – 1
Hillborough – 6
Lee – 1
Marion – 1
Monroe – 1
Nassau – 9
Orange – 1
Osceola – 1
Palm Beach 1
Pasco – 1
Polk – 9
St Johns – 1
St Lucie – 1
Wakulla – 2
In much of the U.S., including Mid-Atlantic states, Pennsylvania and Minnesota, brown marmorated stink bugs have one generation per year. But, two complete generations have been observed further south in West Virginia, and in tropical climates they can have up to five generations per year.

Overwintering adults emerge from diapause in March-April. Between June and September adult females oviposit clusters of 20 – 30 eggs on the underside of leaves. First instar nymphs hatch four or five days after the eggs are deposited.

Like many stink bug species, they grow through five nymphal instars each lasting five to ten days. Sexual maturity is reached 2 weeks after the final molt. Nymphs are present during summer and molt into adults. Autumn adults feed until September-October, and then seek overwintering sites.

It is critically important to recognize the different stages of the BMSB life cycle in order to properly identify these pests and prevent plant damage.
Egg masses are deposited in triangular clusters of 20 – 30 eggs on the underside of leaves.

Eggs are small (about 1mm diameter), pale green to white in color, and spherically shaped.

After the nymphs emerge, the eggs are opaque and white in color. The top of the eggs have a circular operculum (green arrow) and a black-framed triangle (red arrow) at the top used by the nymphs to burst out of the egg.
First instar nymphs are typically black with orange abdomens and aggregate around the egg mass until molting into second instars.

Second instar nymphs are darker than first instar nymphs and may resemble a tick due to the small size and lack of wings.

Third, fourth, and fifth instars are dark colored and larger in size with visible wing pads on the thorax (red arrow).
Adults have a dark marbled brown color on the dorsal side, a pale color on the ventral side, and are typically 12 – 17 mm in length. The most distinguishing feature is the two light colored bands on the fourth and fifth segments of the antennae. The sides of the pronotum, often referred to as the “shoulders”, are rounded and smooth. Alternating light and dark bands occur along the lateral edges of the abdomen. The same banding is often present on the legs as well.
Brown marmorated stink bugs can easily be confused with numerous other hemipterans in the United States, including: the dusty stink bug (*Euschistus tristigmus*), brown stink bug (*Euschistus servus*), rough stink bug (*Brochymena quadripustulata*) and the spined soldier bug (*Podisus maculiventris*).

Brown marmorated stink bugs have rounded and smooth shoulders, two light colored bands on the antennal segments, and alternating light and dark bands along the edges of the abdomen.

Dusky stink bugs have pointed shoulders but do not have two light colored bands on the antennal segments. They also have alternating light and dark bands along the edges of the abdomen.

Brown stink bugs have rounded shoulders but do not have two light colored bands on the antennal segments. They also have alternating light and dark bands along the edges of the abdomen.
Brown marmorated stink bugs have rounded and smooth shoulders, two light colored bands on the antennal segments, and alternating light and dark bands along the edges of the abdomen.

Rough stink bugs have rounded shoulders but do not have two light colored bands on the antennal segments. They also have alternating light and dark bands along the edges of the abdomen.

Spined soldier bugs have pointed shoulders but do not have two light colored bands on the antennal segments. They also have alternating light and dark bands along the edges of the abdomen.
Plant damage is typically confined to fruiting structures as adults feed mostly on fruit. However, nymphs tend to feed on leaves, stems, petioles, flowers, and seeds. Feeding damage to fruit crops is obvious visually, and is characterized by brown and white spots caused by the saliva injected into the fruiting body.

In the U.S., damage to host plants ranges from mild with no impact on yield, to severe with complete crop loss.

Additionally, BMSB are considered a nuisance pest because they overwinter on manmade structures in large aggregations. Adults aggregate in large numbers on the side of buildings, eventually entering attics, garages and other structures to overwinter.
Monitoring and Management

• Black and yellow pyramid traps
• Bait
  – Methyl (2E, 4E, 6Z)-decatrienoate lure
• Black light traps
• Chemical management
• Biological controls

Black or yellow pyramid-shaped traps baited Methyl (2E, 4E, 6Z)-decatrienoate and black light traps can be used for monitoring adults and nymphs of BMSB. The BMSB pheromone has been identifying by researchers in order to improve monitoring tools.

If BMSB infestations are overwhelming, chemical control might be considered. Several insecticides with ingredients: Acetamiprid, ß-cyfluthrin, Cyfluthrinare, Bifenthrin, Cyfluthrin, Deltamethrin, Dinotefuran, Fenpropathrin, and A-cyhalothrin caused significant mortality against BMSB in laboratory bioassays.

Following label instructions with proper application procedures may be effective against BMSB. Be sure to check with your local county agent to see which chemical can be used and for which crop it can be used for.

Behaviorally based management strategies including attract-and kill and biological control programs are underway to reduce the insecticides use. In Asia, several species of parasitoid wasps and tachinid flies are thought to be natural enemies of BMSB, parasitizing eggs and adults, respectively. Ophiocordyceps nutans, an entomopathogenic fungus, was reported to cause BMSB infection in Japan. Biological controls using these Asian natural enemies above may provide the long-term
solutions for reduction of BMSB populations.

If you find a BMSB, please reference the following slides for directions on the Florida reporting guidelines
The UF/IFAS faculty is responsible for reporting diseases, insects, weeds, nematodes, or any other invasive species to the Florida Department Agriculture and Consumer Services, Division of Plant Industry (FDACS, DPI). Reporting this information is essential to protect Florida agriculture, communities and natural areas.

Local county extension agents can assist in identifying plant pest or assist in submitting a pest sample to the correct department or agency for identification. Attached is a link to find the closest extension agent near you.

If you need a insect identified, Dr. Lyle Buss at is the director of the Insect ID Lab at the University of Florida. The link attached will direct you to the insect ID Lab for further instructions for contact, questions, and submission forms.

If a diseased plant needs identification, the link to the UF/IFAS Plant Diagnostic Center is provided.
Center run by Dr. Carrie Harmon is attached to assist in reporting and identifying the correct pest.

The diagnosticians and identifiers in each area will also provide management strategies for the pest identified to help eliminate the damage caused on the plants. If an invasive pest is found, they will send it FDACS, DPI for further testing.
The DDIS system connects the UF/IFAS faculty mentioned before to provide quick and accurate identification throughout Florida. This reporting collaboration tool enhances screening, early detection, monitoring, pest mapping, and rapid communication to protect agriculture. The site provides training, media of pest, equipment, and diagnostic labs in Florida.
Florida Department of Agriculture and Consumer Services: Division of Plant Industry is a regulatory agency that detects, intercepts, and controls Florida’s native and commercially grown plants. Announcing the establishment of new invasive species can affect Florida’s agricultural producers and trade of agricultural products.

FDACS, DPI provides online submission forms to fill out and send into the agency for proper identification. Additionally, DPI provides useful videos of how to properly handle the specimens before shipping them for identification.
FDACS, DPI Contact

• Dr. Leroy Whilby, Bureau Chief-Entomology, Nematology and Plant Pathology
  – 352-395-4661
  – Leroy.whilby@freshfromflorida.com

• Dr. Paul Skelley, Assistant Chief-Entomology, Nematology, Coleoptery, and Plant Pathology
  – 352-395-4678
  – Paul.skelley@freshfromflorida.com

• Division of Plant Industry Hotline
  • 1-888-397-1517
  • DPIHelpline@FDACS.gov

The DPI contacts provided will assist in determining the next steps if the pest found is of regulatory concern. Additionally, FDACS, DPI has a hotline with both a phone number and email for questions and concerns.
Authors

Ashley V. Poplin, M.S.
Former Graduate Student, Department of Entomology and Nematology, University of Florida

Matthew D. Smith, Ph.D.
Former Postdoctoral Associate, Department of Entomology and Nematology, University of Florida

Amanda Hodges, Ph.D.
Associate Extension Scientist, Department of Entomology and Nematology, University of Florida
Editors

Trevor Forsberg, B.S.
Department of Entomology and Nematology, University of Florida

Stephanie Stocks, M.S.
Former Assistant-In, Extension Scientist, Department of Entomology and Nematology, University of Florida

Keumchul Shin, M.S.
Former Graduate Student, Doctor of Plant Medicine Program, University of Florida
Reviewers

Brad Danner, M.S.
Pest Survey Specialist, Cooperative Agricultural Pest Survey Program Coordinator

Leroy Whilby, DPM
Bureau Chief of Entomology, Nematology, and Plant Pathology, State Survey Coordinator, Cooperative Agricultural Pest Survey Program

Smriti Bhotika, Ph.D.
Postdoctoral Associate, Department of Entomology and Nematology, University of Florida
Collaborating Agencies

• U.S. Department of Agriculture Animal and Plant Health Inspection Service (USDA-APHIS)
• Cooperative Agricultural Pest Survey Program (CAPS)
• Florida Department of Agriculture and Consumer Services (FDACS)
• National Plant Diagnostic Network (NPDN)
• Sentinel Plant Network (SPN)
• Protect U.S.
• University of Florida Institute of Food and Agricultural Sciences (UF-IFAS)
Educational Disclaimer and Citation

• This presentation can be used for educational purposes for NON-PROFIT workshops, trainings, etc.

• Citation:
References

  – http://ento.psu.edu/extension/factsheets/brown-marmorated-stink-bug#section-5


References

  - http://njaes.rutgers.edu/stinkbug/pesticides.asp
  - http://www.usapple.org/PDF/Media/BMSBDamageMidAtlantic.pdf
References