Brown Marmorated Stink Bug, *Halyomorpha halys* (Hemiptera: Pentatomidae), a New Invasive Insect Pest in Florida

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Brown marmorated stink bug (BMSB), *Halyomorpha halys* (Stål) (Hemiptera: Pentatomidae), is an invasive pest new to Florida. First specimens of the pest in Leon County, Tallahassee were collected by us in the Center for Viticulture and Small Fruit Research (CVSFR), Florida A&M University on June 15 and 19, 2020 from the chestnuts and persimmons. Later, on June 26, the species identification and new county record was confirmed by Susan E. Halbert of Florida Department of Agriculture and Consumer Services, Division of Plant Industry (FDACS, DPI). Since introduction into Allentown, Pennsylvania in the mid 1990s, the pest has spread to at least 46 States. The species is native to Eastern Asia and is a highly polyphagous (feeds on > 300 reported plants). Since its arrival in the United States, it has caused millions of dollars damage to several economically important crops including vegetables, fruits, nuts, ornamentals, and row crops. Also, it is extremely nuisance pest in and around the buildings. Physical damage to fruit crops includes pitting and scarring, sometimes leading to a mealy texture. This injury makes the fruit unmarketable as a fresh product and in severe cases can even render the crop unusable for processed products. The BMSB feeds on leaves too, which show a characteristic symptom of leaf injury stippled areas approximately 0.30 cm in diameter around the feeding sites. In the field crops, damage caused by the BMSB is not usually evident immediately upon visual inspection. The presence of the BMSB is concerning for farmers because it feeds on a large number of high-value crops and ornamental plants. In north Florida, our current research focus is on pest biology, ecology, and behavior leading to the development of potential long-term integrated pest management strategies and landscape level management solutions. This commodity-based pest information was developed to support stakeholders and clientele to properly identify, monitor, and manage this serious pest.

Eggs and Freshly Emerged 1st Instars of BMSB

BMSB Adult on a Developing Blackberry Fruit Notice Antennae (black and white bands)

BMSB Tedder/Pyramid Trap in Chestnuts (Pheromone Lure)

Identification: An adult of the BMSB is 1.5 cm in length and mottled brownish grey in color. Females are usually larger than the males. They have a shield shaped body. The species resemble the native brown stink bugs; however, its antennae have black and white bands. Shoulders are smooth. Abdomen edges have light and dark bands. Legs with faint white bandings. The BMSB has five nymphal instars (size ranges 2.4 mm to 12 mm). First instars are not very active and remain around the hatched egg mass. Nymphs have dark reddish eyes and a yellow-red striped with black abdomen. Eggs are often laid on the underside of leaves and are usually light green in color. They are elliptical in shape and are often deposited in masses. Each egg mass usually contains 20-28 eggs.

Host Plants: The BMSB is reported to feed on more than 300 host plants (Kriticos et al., 2017). The pest prefers numerous tree fruits, nut trees, shade trees, vegetables, ornamentals and leguminous crops. The crops most affected are citrus, apple, pear, peach, plum, nectarine, persimmon, lima bean, snap pea, tomato, pepper, sweet corn, field corn, and soybean. Other identified host crops include raspberry, blueberry, grape, hazelnut, pecan, chestnut, cucumber, okra, cabbage, collards, and hemp.

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Distribution: The species is native to Eastern Asia (South Korea, Japan, China, and Taiwan). Currently, it is distributed in > 40 countries (CABI, 2019). In the United States, it is reported from 46 States including Florida.

Damage and Injury: In fruits, there is discoloration and necrotic spots appear after the BMSBs feeding. Dimpling feeding sites. Feeding on developing fruit may result in fruit drop. The BMSBs can act as contaminants, such as in grapevine clusters, when pressed for juices and bugs are crushed. In vegetables, large number of BMSBs can build up in the open fields resulting in fruit rot and abortion. Injury to tomatoes and peppers will produce spongy areas on the skin and tissues are damaged internally where feeding occurs into the fruits. Feeding injury to beans may result in scarred, faded out sunken areas, and deformed pods. In the blueberry and blackberry, the sugar contents are lowered due to its feeding. In corn, the pest's immature and adult stages pierce the tender kernels, which may cause them to be aborted, collapsed or discolored. In the pecan, the pest causes nut drop during the water stage and black spots on kernels at harvest. Unfortunately, most producers do not realize the kernel damage until harvest. In the winter, pest invade dwellings in large numbers to seek overwintering sites and can cause nuisance.

Monitoring and Detection: Monitoring for the BMSB can be accomplished several ways, including using beat sheets, pheromone traps, and visual observations. In specialty crops, the likelihood of finding the BMSB is increased when monitoring efforts are focused on preferred habitats adjacent to the crop and crop borders near potential sources of the BMSB (Wiman et al., 2016). Pheromone trapping can be used effectively to detect the BMSBs on a weekly basis in open fields and landscape. The 4-foot yellow pyramid trap is commonly used to capture the pest. This trap has fins that taper up to a collection jar installed on top of the trap.

Biology and Ecology: Before the winter, the BMSB adults aggregate in large numbers on the sides of buildings or on perennial trees. Then, they move and hide in the protected places and overwinter in adult stages. Adult bugs become active in the Spring; and after feeding for about 2 weeks, they start mating. The female begins to lay eggs in clusters of 20 to 28 with a range of 212 to 486 per lifetime (Ingels, 2014). In mid-Atlantic States, there are one to two generations per year. The number of generations in various ecological zone of Florida is unknown; however, more generations generally can occur in warmer regions.

Pest Management Strategies: No action thresholds have been developed to control the BMSB. Managing this serious pest species is challenging because there are currently a few effective pesticides that are labeled to control. Traps with aggregation pheromone and lures could be used to reduce pest density in open fields and landscape. Predators and parasitoids have been documented feeding on various life stages of the BMSB; including a tachinid fly, samurai wasps, assassin bugs, earwigs, and green lacewing larvae (Lara et al., 2016). The BMSB is not harmful to people, houses or pets. They do not bite, sting, or suck blood or spread any animal diseases. Also, the species do not bore or feed on any wooden structures. Indoor sprays are not recommended due to their ineffectiveness. The best possible pest control for the dwellings is sealing the entry points of bugs and use of screen doors and windows.

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