

BERMUDAGRASS STEM MAGGOT RESEARCH UPDATE

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Since the first sign of the bermudagrass stem maggot (*Atherigona reversura* Villeneuve) in Ben Hill County in July of 2010, we have been working hard to develop good solutions for this exotic pest. In this article, we provide an overview of what is currently known about this insect. We also report on some of our most recent research, which was funded by the beef and dairy cattlemen in Georgia via the Agricultural Commodity Commission for Beef (also known as the Georgia Beef Commission).

Overview

The bermudagrass stem maggot (BSM; *Atherigona reversura*) is native to Central and Southeast Asia, and very little was known about it before it showed up here just four years ago. Since it first showed up in Georgia, it has infested and damaged forage bermudagrass throughout the southeastern United States. The adult form of this new, invasive species is a small, muscid fly. However, it is the larvae that does the damage.

The adult fly of the BSM lays its eggs on bermudagrass leaves. Upon hatching, the BSM larva (or maggot) slips into the sheath, down the stem, and macerates the vascular tissue at the first node from the top. There, it feeds on bacteria that grow in the microbial soup that forms following the damage to the veins of the stem. Signs of damage are observed between 1-3 days later. Between the time when chlorosis is first observed and the top 2-3 leaves are completely chlorotic or necrotic, the larva exits the stem. The BSM larva moves to the soil for pupation. After pupating for 7-10 days, the adult fly emerges. This complete process occurs in as little as 10-12 days. It is the larval feeding that causes the top 2-3 leaves to die. The affected leaves are easily pulled out of the sheath and show obvious damage near the affected node. In severe infestations, over 80% of the tillers in a given area may be affected.

The degree to which the BSM overwinters in the SE USA remains unclear. We have observed that populations increase progressively from south to north, with high populations developing as early as mid-June in Central Florida, early July in South Georgia, mid-July in Central Georgia, and late July in North Georgia and points further north. This would lead one to believe that overwintering is, at a minimum, much more successful in more southern regions. However, we have collected flies as early as mid-May in areas near Athens, GA, so we presume they have at least some ability to overwinter at this latitude. We expect that damaging populations will develop toward the middle stages of the second cutting for most producers in Georgia. We expect this to be an annual occurrence. It is likely impossible to fully eradicate *Atherigona* populations through mechanical and/or chemical means. However, the use of mechanical and/or chemical controls may suppress the population and keep it from causing economic damage.

Management Recommendations

If signs of BSM damage occur near the end of a regrowth cycle (within 2.5-3 weeks after cutting or grazing), the producer should harvest or graze the field as soon as conditions become favorable. Damage seen earlier in the growth cycle will very likely substantially reduce agronomic performance of the crop.

Once a stand that is 6 inches or taller has been damaged by BSM feeding, the only option is to cut and/or graze the stand to a height of 3-4 inches and encourage regrowth to occur because the bermudagrass crop is unlikely to further develop. Instead of having a low-yielding, severely damaged crop that provides a haven for a large fly population build up, it is better to cut the field early and accept the loss.

Ideally, the infected material should be removed from the field to prevent shading of any regrowth. The larvae do not appear to remain in cut stems. Within hours of cutting, larvae will exit damaged stems and travel to the soil. Those larvae that are mature enough to progress will pupate and emerge from the soil approximately

10 days later. Flies in fields that have been harvested escape to field margins and neighboring bermudagrass fields.

Chemical control of the BSM larva is challenging because it is inside the pseudostem and no systemic insecticides are approved for use in pastures or hay crops. Suppression of the BSM fly is also challenging because the flies are mobile. In addition, one must consider the limits of a chemical application in canopy penetration. In general, the BSM flies tend to remain deep in the canopy except to move from one location to another or in response to a disturbance.

The recommended chemical suppression technique is to apply an insecticide after the bermudagrass has begun to regrow (7-10 days after cutting) following an affected harvest. A second application can be made 7-10 days later to suppress any flies that have emerged or arrived since the last application. Specific insecticides recommended for use are available in the UGA Pest Management Handbook (<http://www.ent.uga.edu/pest-management/>). Chemical actions should be taken if there is a known history of BSM damage to the bermudagrass and the expense of the applications (usually less than \$15/acre for both applications) is justified by the forage yield saved. Populations have not yet been high enough to warrant chemical suppression prior to the first bermudagrass hay cutting (or equivalent timing if the crop is to be grazed). Usually, the chemical suppression technique is not necessary until after the second cutting. In general, one application of insecticide 7-10 days after the second and third cutting (and any subsequent cuttings) has kept the damage to below economically significant levels.

Our early research generally demonstrated that the BSM tends to prefer the finer textured varieties ('common', 'Alicia', 'Coastal', 'Russell', 'Tifton 44,' etc.) over the coarser varieties ('Tifton 85' and 'Coastcross-II'). In 2015, we conducted small plot trials where we sprayed half of each of the replications with insecticide repeatedly to ensure that damage was minimized. By doing so, we could calculate relative yield loss with the five varieties we evaluated. Damaging populations did not build up to cause measurable yield loss until August and September (Fig. 1). In both harvests, all varieties were significantly damaged. But, the BSM generally did more damage to the finer textured varieties. Fine textured varieties usually suffered a 35-65% yield loss, while coarse textured varieties rarely suffered more than a 25% yield loss.

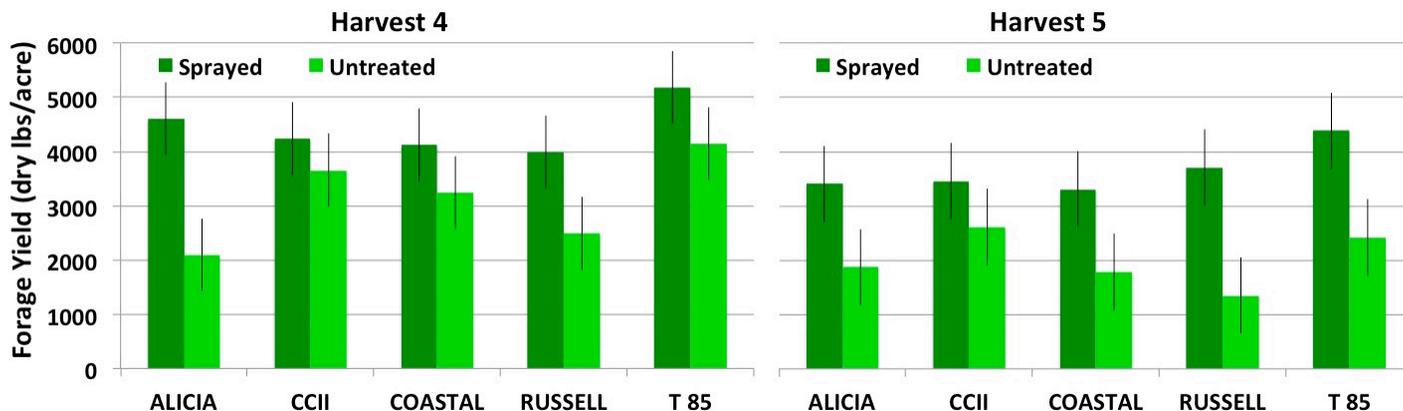


Figure 1. Forage yield of Alicia, Coastcross-II (CCII), Coastal, Russell, and Tifton 85 (T 85) bermudagrass varieties in the sprayed and untreated plots in late August (Harvest 4) and September (Harvest 5) of 2015. Black lines represent the Least Significant Difference ($LSD_{0.10}$).

We also observed that the percentage of stems that were damaged in an area was fairly similar to the yield loss that we observed when the plots were not sprayed. For example, we observed that 54% and 46% of the stems were damaged in the Alicia plots in the fourth and fifth harvest, respectively. The yield reduction that we observed was 54% and 45% in those same Alicia plots for the fourth and fifth harvest, respectively. This was true in other varieties, as well. More research is needed, however, before we can conclude that this is a reasonable estimate of yield loss.

We are also attempting to assess how many flies are too many. The ideal would be that we would develop a treatment threshold where, if the fly population is “greater than XX per 10 sweeps with the sweep net,” then spray. This will take some time to truly refine. However, we have confirmed that fly populations build up rapidly between 7 and 15 days after cutting, regardless of variety (Fig. 2). By adhering to our suppression protocol of spraying 7-10 days after cutting, producers should be able to stay ahead of this rapid growth rate.

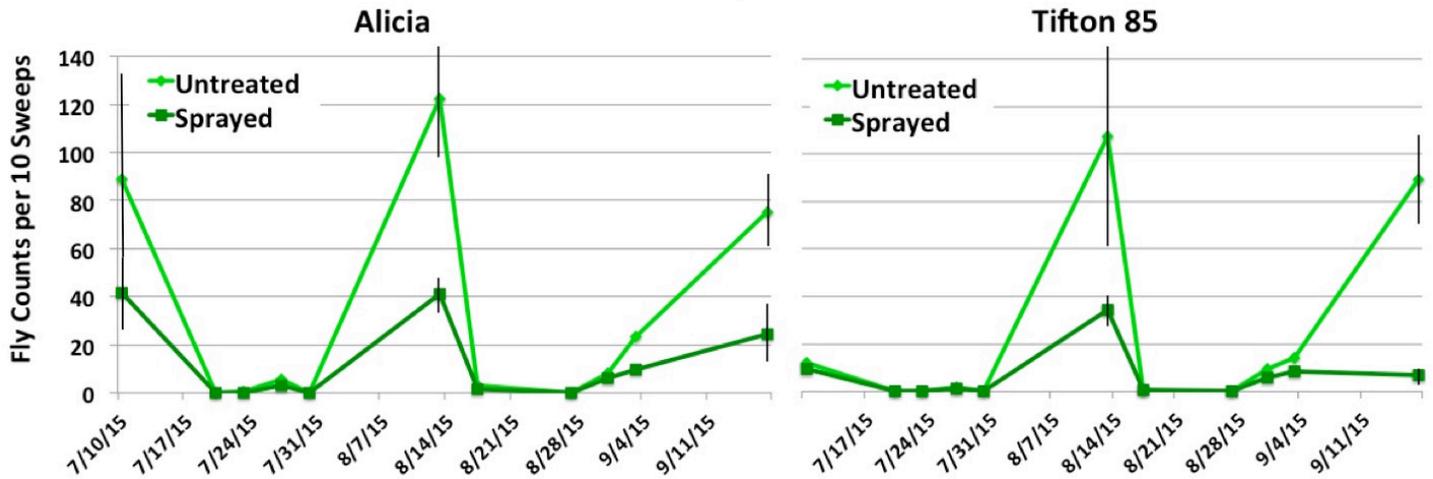


Figure 2. Average fly counts (per 10 sweeps with a sweep net) in in the sprayed and untreated Alicia and Tifton 85 plots in July through September of 2015. All plots were harvested on July 15, August 18, and September 24. Black lines represent 95% Confidence Intervals for the dates where significant differences in the spray treatment data were observed.

Much remains unanswered about the BSM. Our work to date has only just begun to evaluate this issue, and much more work is being planned. We have received \$35,876 from the Georgia Beef Commission for the first 2 years of this research. Our early research has resulted in practices that are being applied on an estimated 40,000 acres of bermudagrass in Georgia, and we conservatively estimate that this has saved Georgia bermudagrass producers \$800,000 worth of hay in the past 2 years. We also have leveraged this funding for additional research funds from USDA, and an announcement about that will be coming sometime this summer.

For more information on the bermudagrass stem maggot, visit our website, www.georgiaforages.com. If you have additional forage management questions, visit or contact your local University of Georgia Cooperative Extension office by dialing 1-800-ASK-UGA1.