Bermudagrass Stem Maggot in Hay and Pasture, Document Revision 2025
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The spread of the Bermudagrass stem maggot (BSM), *Atherigona reversura*, has raised significant concerns in Texas's agricultural landscape, particularly in regions where bermudagrass (*Cynodon dactylon*) is an essential forage and hay crop. Understanding the biology and life cycle of this pest is crucial for developing effective management strategies to safeguard crop yields, especially in high-production areas.

In Texas, BSM are most active and cause the most damage from late spring to late summer, with peak damage usually occurring between July and September when heat and humidity are at their highest and the plant is actively growing vegetatively. Adult flies seem to lay more eggs when conditions are optimal for luscious Bermudagrass, which often means higher humidity and adequate rainfall.

Biology

Their life cycle begins when an adult BSM fly, which are small and metallic in color, lays elongated white eggs on the surface of a Bermudagrass leaf or near its sheath. This typically occurs during the warmer months (April-May) when Bermudagrass is in its peak growing phase. The nearly invisible eggs incubate for about 2 to 3 days, with hatching being influenced by temperature (ideally between 25-30°C) and humidity (ideally >60%), which vary significantly across Texas.

The maggots thrive in warm, moist conditions, and once hatched, the larva emerges as a tiny, white, legless maggot that seeks the central whorl of the plants pseudo-stem, either descending the leaf sheath or burrowing into the softer tissue with its mouthparts. This larval stage lasts between 7 to 10 days and is marked by vigorous feeding, where the larva damages the vascular tissue at the first node below the growing point, disrupting sap flow. In major forage regions like the Blackland Prairie, this damage becomes evident quickly, with the top leaves showing chlorosis within 1 to 2 days, leading to necrosis (death of the tissue) and a reduction in plant growth & development.

The larva then continues developing through three *instars*, during which the maggot grows from <1 mm to about 5-7 mm. Subsequent molts will increase the feeding capacity of the maggots. Notably for bermudagrass, if the pseudostem is cut, which is common during hay harvests or when grazing, the larvae will exit prematurely and continue its' metamorphosis.

Following the larval stage is the prepupal phase, which is a brief transition where the larva exits the pseudostem and burrows into the soil, typically between 1-5 cm deep, depending on soil type and moisture content. This behavior is crucial given Texas's diverse soil conditions, from the sandy loams of South Texas to the clay-heavy Blackland Prairie, preparing for the next stage: pupation.

During the pupal stage, the larva forms an orange-brown casing known as a puparium, a hardened shell measuring around 4-5 mm. Inside this casing, the transformation from a maggot into an adult fly occurs over the course of 7 to 10 days. The duration of this stage can vary based on environmental conditions and will be shorter in warm regions like the Rio Grande Valley and longer in cooler areas such as the Rolling Plains.

The life cycle concludes when the adult fly emerges. In Texas, the emergence of adults typically peaks 7 to 10 days after cutting, leading to population surges in regions such as the High Plains following hay production. These slender, metallic flies have a lifespan of 14 to 21 days, during which they feed on

sugars from various sources and mate multiple times, producing 30-50 eggs per female in a cycle that spans about 3 to 4 weeks, resulting in overlapping generations. The population dynamics align with Texas's climate patterns, showing peaks in late spring in South Texas, early summer in Central Texas, and mid-summer in the High Plains. Although the specifics of overwintering are not fully understood, early sightings in temperate regions suggest that some larvae or pupae survive milder winters and resume activity as temperatures warm.

This comprehensive understanding of the BSM life cycle aids in developing targeted management strategies, enabling precise timing of insecticide applications tailored to the varying growing seasons and cutting schedules across Texas. Such strategies are vital for minimizing the impact of BSM, fostering vigorous Bermudagrass stands, and promoting the best agricultural practices throughout the state.

IPM

The decision to spray should be based on scouting and the level of damage observed in the previous cutting, as BSM populations tend to build up over the growing season, with greater impact typically seen in later cuttings rather than the first. Early in the season, populations are usually lower, and treatment may not be economically justified unless damage exceeds thresholds based on yield loss of ~9 lbs of plant matter per acre per 1% of stems damaged. In summer and late summer, when fly populations peak, timely applications become more critical.

To effectively reduce BSM populations, pesticide applications must be timed to align with the pest's life cycle and the seasonal dynamics of different regions in Texas. The focus should be on two critical points: the adult stage (to prevent egg-laying) and the early larval stage (to halt feeding damage). Key factors influencing timing include cutting schedules, temperature-driven development rates, and regional population dynamics.

Post-Cutting Window (Targeting Adults): 7-14 Days After Cutting

After cutting bermudagrass, mature larvae are forced to exit the pseudostem and pupate in the soil. Adults typically emerge 7 to 10 days after this cutting, making this period crucial for targeting pesticide applications to disrupt the next generation and prevent further crop damage. A single application of a pyrethroid (such as beta-cyfluthrin, cyfluthrin, lambda-cyhalothrin, or zeta-cypermethrin) during this window can suppress the adult fly population and reduce egg-laying, thereby protecting the regrowth phase. If regrowth is slow due to poor growing conditions (e.g., drought or low soil fertility), or if fly pressure remains high, a second application can be warranted about 7 days after the first (approximately 14-17 days after cutting).

Maintain Optimal Growing Conditions

Healthy stands of Bermudagrass are less susceptible to damage from the Bermudagrass stem maggot. To promote robust growth, ensure good soil fertility and moisture by implementing balanced fertilization. It's important to avoid high nitrogen levels combined with low potassium, as this combination can increase susceptibility to damage. Additionally, make sure to irrigate, especially during dry periods. Research indicates that when conditions are optimal, the loss of the top 2–3 leaves due to BSM feeding has minimal impact on yield. However, poor conditions such as drought or low fertility can significantly worsen losses.

Timely Harvesting

If you notice BSM (Bermudagrass stem maggot) damage in your hayfields, such as bronzing or 10–15% stem damage, it's important to harvest early. Early cutting removes infested stems, prevents larvae from

completing their life cycle, and promotes regrowth. After cutting, be sure to remove the cut material from the field to avoid shading the new growth, as larvae exit the stems after harvest and pupate in the soil.

For grazing management, encourage consistent grazing in pastures to keep bermudagrass short. Livestock will consume BSM eggs and larvae while grazing, disrupting the pest's life cycle and helping to prevent population buildup. However, this method is less effective if grazing pressure is light, which allows the pest to persist.

Varietal Selection

Choose Bermudagrass varieties that are less susceptible to Bermudagrass Stem Maggot (BSM). Finer-stemmed cultivars, such as Coastal, Alicia, and common Bermudagrass, are more vulnerable to damage, while coarser varieties like Tifton-85 experience less economic impact. Selecting resistant varieties can help reduce damage, although all cultivars will be affected to some extent.

Inter-seeding with alfalfa has proven to significantly reduce or eliminate BSM damage in Bermudagrass fields. This practice also offers additional benefits, including a reduced need for nitrogen fertilizer, lower costs, and improved forage quality. It is particularly effective in fields that are prone to heavy infestations. This method is somewhat practical for growers in Central to West Texas, allowing for cost-effective establishment by planting alfalfa in the fall or early spring into existing Bermudagrass. Beyond controlling BSM, interseeding also improves soil structure, reduces fertilizer expenses, and enhances hay quality. However, successful establishment depends on proper irrigation in drier areas, and careful management is necessary to ensure alfalfa's persistence. Growers in these areas can adopt interseeding by planting alfalfa at 10–15 lbs/acre in late fall, ensuring good seed-to-soil contact, and managing irrigation to establish a mixed stand.

Minimize Disease Pressure

Fields with heavy disease pressure are more susceptible to BSM. To maintain a healthy grass stand, it's important to implement effective disease management practices, such as proper fertilization and avoiding over-irrigation. In non-hay settings like lawns and sports fields, frequent mowing every 1 to 2 weeks helps prevent BSM from completing its 3 to 4-week life cycle. Since larvae cannot survive in dry grass clippings, regular mowing is an effective strategy for controlling their populations in these areas.