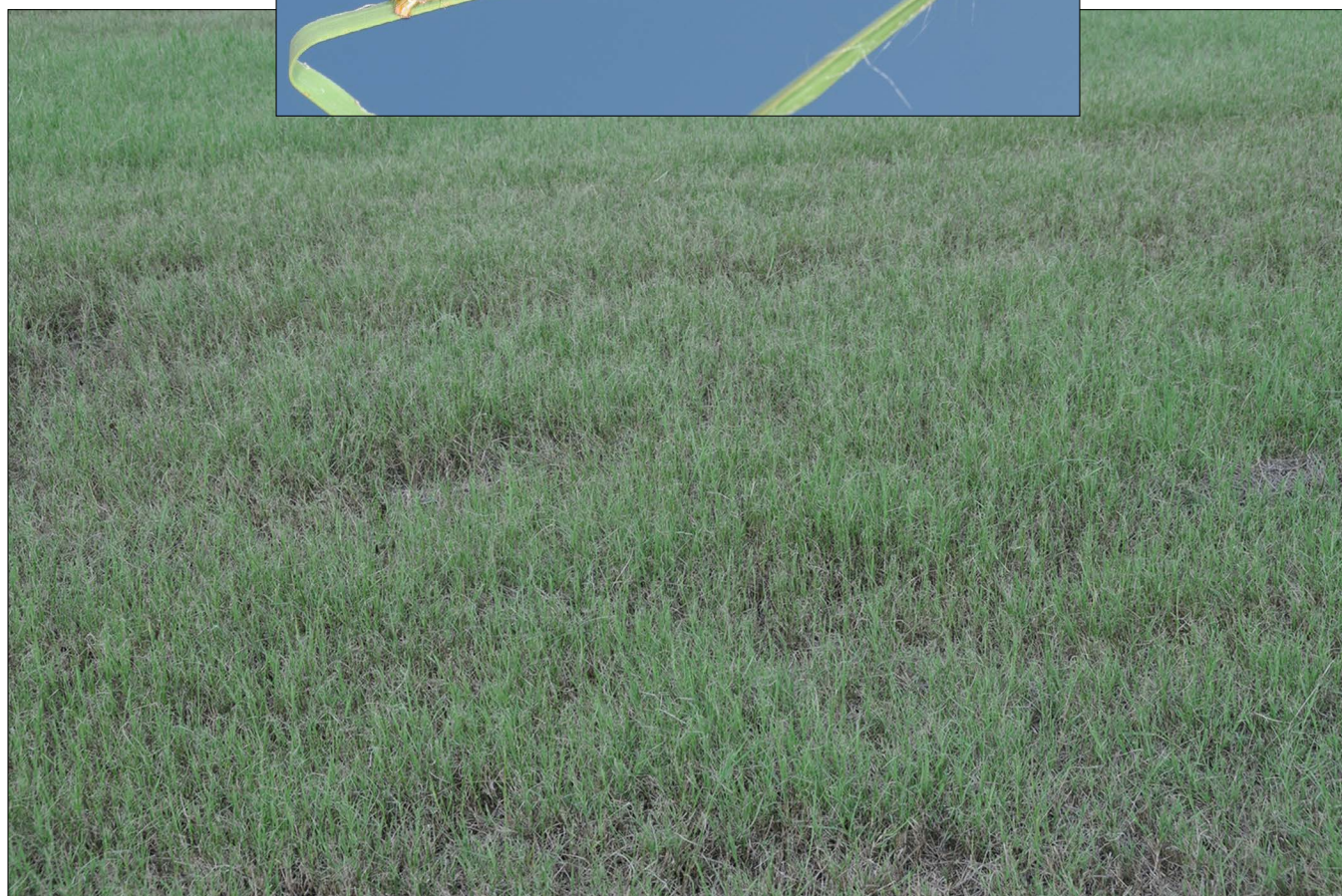


Fall Armyworms in Hayfields and Pastures



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EXTENSION

Fall armyworms are the most damaging insect pests of Mississippi hayfields and pastures. These caterpillars can destroy a cutting of bermudagrass in just a few days, and good bermudagrass can produce a few hundred dollars' worth of hay per acre! Experienced cattle and hay producers know to look for fall armyworms throughout the growing season and to be ready to treat quickly when damaging infestations occur.

Fall armyworms are unpredictable pests. Some years, high populations do not occur until early fall, and the most heavily infested fields require only one or two sprays. Other years, damaging infestations appear as early as June, and some fields require six or more treatments. One reason they are so unpredictable is that fall armyworms cannot survive the winter here in Mississippi. Populations rebuild every year from moths that fly in from locations farther south, such as South America, the Caribbean Islands, and southern Florida. Some years, the moths arrive earlier than others or find better growing conditions once they get here. This is also the reason infestations usually occur earlier and more often in the southern part of the state and populations are highest in late summer and fall. After they fly in from the south, it usually takes them a few generations to build to damaging numbers.

Identification

Fall armyworm caterpillars vary in color depending on their stage of development and diet. Most are green or tan, but some can be dark brown to almost black, especially late in the year when numbers are high (Figure 1). The body is punctuated with dark spots. Most notably, there are four spots at the rear of the body that form a square. Mature caterpillars are about 1½ inch long and are mostly slick-bodied with a few small, stiff hairs visible up close. The head capsule ranges from light brown to dark brown, and, on larger specimens, there is a distinct white inverted Y shape on the head. This Y and the square of four spots on the rear are two of the best ways to identify fall armyworm caterpillars (Figure 2).



Figure 1. Fall armyworm caterpillars vary considerably in color, ranging from light green to nearly black.



Figure 2. Fall armyworm caterpillars have smooth bodies with a few stiff hairs. Note the inverted, white Y or V shape on the head. All caterpillars have this structure, but it is particularly obvious on fall armyworms.

Fall armyworm moths are about three-fourths of an inch long when resting with their wings folded. The forewings are gray to dark brown, but the underwings are white, which causes the moths to appear pale when in flight. Males have more white markings on their forewings than females do (Figure 3). Moths are active at night and spend the day resting in foliage. You will not often see the moths unless you go out at night with a spotlight to look for them or happen to flush one from its daytime resting place.



Figure 3. Male fall armyworm moths have light-colored markings on their forewings. Forewings of female moths are more uniformly gray. Moths of both sexes have light-colored hindwings. (Lyle Buss, Univ. of Florida, Bugwood.org)

Biology

Fall armyworm moths lay their eggs in clusters, or masses, containing around 50 eggs each. They cover each egg mass with light-colored scales from their bodies, giving the egg mass a white, fuzzy appearance. Eggs hatch in 2–5 days, and the newly emerged larvae scatter out and begin feeding (Table 1). They usually begin by feeding on the underside of the leaf blade, and at first they do not feed through the clear upper epidermis. Their feeding habits result in tiny, white “windowpanes” in the leaf blades or a white frizzing of the leaf tips. Experienced cattle producers watch for this white frosting or frizzing of the leaf tips as an early warning of fall armyworm infestation.

Table 1. Fall armyworm life cycle.

Stage of development	Duration (days)*
Egg	2–5
Caterpillar	10–22
Pupa	6–15
Adult pre-oviposition	4
Total time for one generation	22–46

Female moths live about 14 days and lay 1,000–2,000 eggs.

*Development rate depends on temperature.

Caterpillars take about 14 days to complete their larval development, and it takes about a month to complete a generation, but development rate varies considerably depending on temperature and other factors. As with most caterpillars, about 80 percent of total leaf consumption occurs in the last 2–3 days of the caterpillar stage. This is why fall armyworm damage can occur so quickly; grass that looked fine Friday morning can be nothing but stems by Monday afternoon.

Fall armyworm caterpillars pupate by digging about an inch into the soil and forming a pupal chamber. Newly emerged female moths use pheromones to attract males. Mating occurs a few days after emergence, and females lay eggs about 4 days after emergence. Female moths live a couple of weeks and deposit around 1,500 eggs during their lifetimes.

Depending on how early in the season fall armyworms arrive in an area, there can be two to five generations per year. Populations grow larger, often exponentially larger, with each generation. The moth flight of a given generation lasts a couple of weeks, and generations overlap by late summer. During heavy outbreaks, there can be almost continuous pressure, with new egg masses deposited every night.

Food Plants

Fall armyworms are primarily pests of grasses, including agricultural crops such as corn, sorghum, rice, and millet. They especially like bermudagrass, regardless of whether it is a dwarf variety on a golf green or sports field or a forage variety being grown for hay. Lush, well-fertilized grass is particularly attractive to egg-laying moths, so infestations are common in well-managed bermudagrass hay fields. Fall armyworms will eat other types of forage grass, but infestations are much less common in dallisgrass and bahiagrass. They like some wide-leafed weedy grasses, such as barnyardgrass and broadleaf signalgrass, more than they like bermudagrass, and stands of these grasses can serve as early indicators of fall armyworm problems. Fall armyworms will also attack early-planted winter grazing crops, such as wheat and ryegrass, and can destroy stands as these crops are emerging.

Just how much grass does a fall armyworm caterpillar eat in its life? In one experiment, fall armyworms ate an average of 28 square inches of crabgrass leaves per caterpillar. That area is slightly larger than the area covered by a 4-by-6-inch index card. In other words, a few fall armyworms will not cause much damage, but hundreds of thousands of caterpillars per acre can quickly strip a field.

Be Prepared

Don't wait until the hayfield is teeming with big caterpillars to start thinking about the equipment you are going to use to spray them. Get your sprayer ready early in the season: be sure it is cleaned, repaired, and calibrated. Then you can act quickly when it is time to treat. It is also a good idea to know ahead of time what insecticide you plan to use, where you can buy it, how much it costs, and how quickly you can get it. If you plan to use one of the pyrethroid insecticides, be sure your pesticide applicator certification is up-to-date.

Warning Signs

Experienced forage producers learn to recognize the early signs of fall armyworm feeding. Newly hatched caterpillars are too small to feed all the way through a leaf blade. They begin by feeding on the underside of the leaf but leave the clear upper epidermis intact. This creates tiny "windowpanes" in the grass blades that

appear silver or white (Figure 4). When large numbers of small larvae are just beginning to damage a field, the grass often has a subtle "frosted" appearance because of these windowpanes. This is easier to see on the wide leaf blades of barnyard grass, which is a favorite food of fall armyworms. Learning what this looks like on barnyard grass can help you recognize it on bermudagrass. Recognizing this early sign of infestation can help save a cutting of hay.

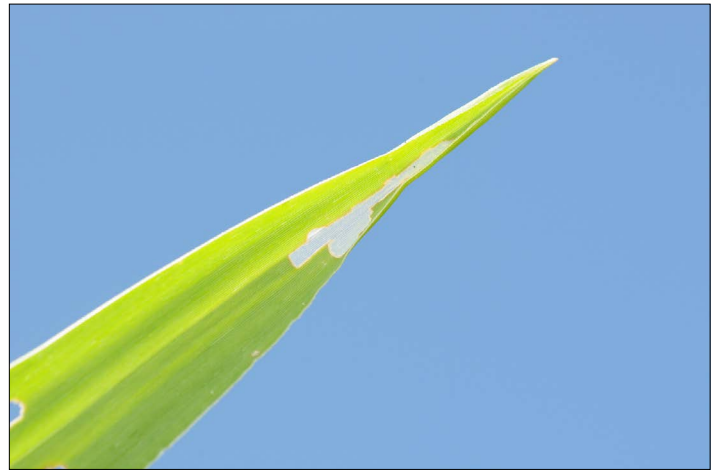


Figure 4. "Windowpanes" in grass blades are an early warning sign of fall armyworm infestations. These are caused by newly hatched caterpillars feeding on the undersides of leaves and leaving the clear, upper epidermis intact.

Many producers watch for egrets and other birds feeding in a field as an indicator of fall armyworm problems. If you see birds in the pasture, you definitely want to check out what they are feeding on, but do not use this as your only way to check for armyworms. This sign often comes too late to avoid damage because the birds don't show up until the caterpillars are big enough to attract their attention.

Producers also become concerned about fall armyworms if they notice large numbers of moths flying in the headlights as they are driving through a field after dark. However, there are many other species of moths that occur in and around grass fields, sometimes in large numbers. Seeing large numbers of moths flying around your pasture or hay field is not sufficient reason to start spraying, but it is a good reason to start checking the field more closely for caterpillars.

Scouting and Treatment Threshold

The best way to avoid losing a cutting of hay to fall armyworms is to visit fields every 3 or 4 days and check for fall armyworms. Get out of the truck, get down on your hands and knees, and look closely. Scout for fall armyworms by vigorously ruffling the grass with your fingers and carefully counting the larvae that have fallen to the ground in a 1-square-foot area. Do this at several locations in the field and average your results. Treatment is recommended when counts exceed three caterpillars that are one-fourth inch or longer per square foot (Figure 5). Be sure to look carefully for small caterpillars. You want to find and treat them when they are small because small caterpillars are easier to control and, more importantly, have not eaten nearly as much as they are going to eat.



Figure 5. Treatment is recommended when counts exceed three caterpillars per square foot (do not count caterpillars that are less than one-fourth inch long).



Figure 6. Heavy infestations of big caterpillars can consume large amounts of grass in a single day.

Like most caterpillars, fall armyworms do about 80 percent of their eating during their last two to three days as larvae—when they are “teenage” caterpillars. Therefore, if a field has reached threshold on Friday but is not scheduled to be cut until the next week, it needs to be treated as soon as possible. A moderate to heavy population of large fall armyworm caterpillars can eat a whole field of grass in just a couple of days (Figure 6). Be sure to pay attention to preharvest intervals when choosing an insecticide to use on a field that is near cutting!

Deciding Whether to Spray or to Cut

One option for dealing with an infestation of fall armyworms in hay fields is to just go ahead and cut the field. This can be a good choice, but only if the field is nearly ready to cut anyway and the forecast promises good hay-curing weather. Be careful with this decision. If there are a lot of big caterpillars, they will “cut the field” for you in another couple of days. If you decide to go ahead and cut the field, you need to do it that day or the next morning. If there are threshold numbers of caterpillars and it will be 2 days or more before you can cut the field, you probably need to go ahead and spray.

When to Stop Scouting for Fall Armyworms

They are called fall armyworms because their populations are usually highest in the fall. In other words, they can damage the last cutting of hay if you stop scouting too early. During heavy outbreak years, fall armyworms will even destroy stands of early-planted winter grass crops, such as wheat and ryegrass. Delaying planting until later in the fall is one way to avoid this problem. If you do plant winter grazing crops in early fall, check fields often and treat promptly if you detect an infestation. Be especially vigilant during years when fall armyworm pressure has been high in hayfields and pastures. It takes fewer caterpillars to destroy a field of emerging ryegrass than to eat a lush field of bermudagrass.

Like all insects, fall armyworm development rate is greatly affected by temperature. In one laboratory study, conducted with caterpillars feeding on corn leaves at constant temperatures, the larval stage lasted about 22 days at 70°F, 14 days at 80°F, and 10 days at 90°F. As you can see, development rate is faster at higher temperatures, although it does begin to decline at temperatures above 93°F. Fall armyworms cannot survive freezing temperatures. Populations usually begin to decline a little before first frost because fall armyworms cannot develop at temperatures below about 50°F.

The bottom line here is that you need to be concerned about fall armyworms in late fall hayfields and early-planted winter grazing pastures until you stop seeing fall armyworms. Some years the threat of fall armyworm infestations lasts longer than others. It depends on the weather, and late infestations are more likely during warm, “late” falls.

Insecticides for Fall Armyworms

Over the past few years, there have been significant improvements in treatment options for fall armyworms. Some traditional fall armyworm products, like Sevin and malathion, are still available, but there are new products that are cheaper, more effective, longer-lasting, or have better preharvest intervals. These include several pyrethroid insecticides (Mustang Max, Baythroid, and Karate), as well as Blackhawk and Coragen and the insect growth disruptors Intrepid and Dimilin. Note that the pyrethroid insecticides are all restricted-use products, which means you must have a current pesticide applicator certification card to buy and use them. If you have significant acreage, it is worth the time and effort to get this certification because pyrethroids are effective, low-cost fall armyworm treatments. The primary reason for the restricted use classification is because of buffer zones along streams and around other bodies of water. See labels for specific details.

Table 2 lists treatment options for fall armyworms in hay fields and pastures. Although a rate range is given for most products, a low- to mid-range rate is adequate in most situations. When selecting insecticides, pay close attention to the preharvest interval. Note that preharvest intervals can vary depending on whether the grass will be grazed or cut for hay. Also note that “days to harvest” means days until cutting, not bailing. You may also want to consider the number of acres 1 gallon of product will cover, the size of container the product is sold in, and the size of field you need to spray. Often the most economical option is to choose a product and container size that will best “fit the field.”

It is also worthwhile to compare costs on a per-acre basis. When comparing costs, keep in mind some products provide longer residual control than others. During years of heavy fall armyworm pressure, residual control can make the difference between having to spray once or twice rather than two or three times to make a cutting of hay. In general, the growth-disruptor products (Intrepid and Dimilin) provide longer control than the pyrethroids (Mustang Max, Baythroid, and Karate). But growth regulators are slower-acting and best used when caterpillars are small. Few treatments will provide more than about 2 weeks of control because rapidly growing grass results in new, untreated leaf area and dilutes insecticide residues. Residual control may be shorter during heavy outbreaks or following frequent or heavy rainfall.

In some situations, it may be beneficial to apply a tank mix of two different products, with the first component of the tank mix being one of the pyrethroid insecticides (zeta-cypermethrin, beta-cyfluthrin, or lambda-cyhalothrin) and the second component being one of the growth disruptors (diflbenzuron or methoxyfenozide). This takes advantage of the fast-killing effect of the pyrethroid and the longer residual control provided by the growth disruptor. For example, if you have to spray a field you expect to harvest within 10–14 days or so, including a growth disruptor with the pyrethroid may help you avoid having to spray again before harvest.

Table 2. Insecticides for control of fall armyworms in hay fields and pastures.*

Active ingredient (brand name)	Rate of formulated product per acre	Acres 1 gallon (or pound) of product will treat	Pregrazing interval	Preharvest interval (wait to cut hay)
methoxyfenozide (Intrepid 2F)	4–8 fl oz	32–16	0 days	7 days
diflubenzuron (Dimilin 2L)	2 fl oz	64	0 days	1 day
spinosad (Blackhawk 36% WDG)	1.1–2.2 fl oz	14.5–7.3	until spray dries	3 days
rynaxypyr (Prevathon 0.43SC)	14–20 fl oz	9.1–6.4	0 days	0 days
rynaxypyr (Coragen 1.67SC)	3.5–5 fl oz	36–26	0 days	0 days
zeta-cypermethrin (Mustang Max 0.8 EC) restricted use	2.8–4.0 fl oz	45–32	0 days	0 days
beta-cyfluthrin (Baythroid XL, 1 lb/gal) restricted use	1.6–1.9 fl oz	80–67	0 days	0 days
lambda-cyhalothrin (Karate Z, 2.08 lb/gal) restricted use	1.28–1.92 fl oz	100–67	0 days	7 days
carbaryl (Sevin 80 S)	1.25–1.88 lb	–	14 days	14 days
carbaryl (Sevin XLR 4F)	1–1.5 qt	4–2.6	14 days	14 days
malathion (Malathion 57EC)	1 qt	4	until spray dries	0 days

*This information is for preliminary planning purposes only. Carefully read the label of any product you plan to use, and follow all label directions and restrictions.

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