

Managing Armyworms in Pastures and Hayfields

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Introduction

Two species of armyworms can be significant pests of Arkansas forage and pasture production. Both species belong in the family Noctuidae along with other garden and agronomic pests such as cutworms, bollworms and budworms.

In Arkansas, the “true” armyworm (*Pseudaletia unipuncta*) is more of a spring pest of cool-season grasses and tall fescue. The fall armyworm (FAW) (*Spodoptera frugiperda*) is a summer/fall pest primarily of bermudagrass, but it can also damage fall-seeded, newly established winter annuals, fescue and orchardgrass.

In southern Arkansas, we can expect to see fall armyworm damage in bermudagrass as early as July. True armyworms are more of an issue in northern and central Arkansas, primarily on fescue (and fescue grown for seed) but will also damage other grasses and small grains. True armyworms may not reach pest status every year, partially as a result of mortality from natural predators and pathogens. In contrast, we can expect to have fall armyworm damage in south Arkansas forage about every year. In recent years, we have also witnessed significant fall armyworm damage in central and north Arkansas. Other armyworms such as the yellow striped armyworm

(*Spodoptera ornithogalli*) and beet armyworm (*Spodoptera exigua*) may attack forages but seldom reach pest status on Arkansas forage.

Damage from true armyworm and fall armyworm can seem to appear overnight. Although the damage might appear overnight, larvae have likely been feeding for a week or more before they or their damage appear. This is because when the worms are small (early instars) they do not eat much. It is not until the fifth and sixth instar that the caterpillars begin consuming large amounts of forage (Figure 1). In addition, large armyworms may move into an uninfested field (or area of a field) adjacent to a field that was just defoliated. Because armyworms are so destructive and compete with livestock for forage, producers should diligently scout susceptible fields for the true armyworm beginning in April and for the fall armyworm beginning in July.

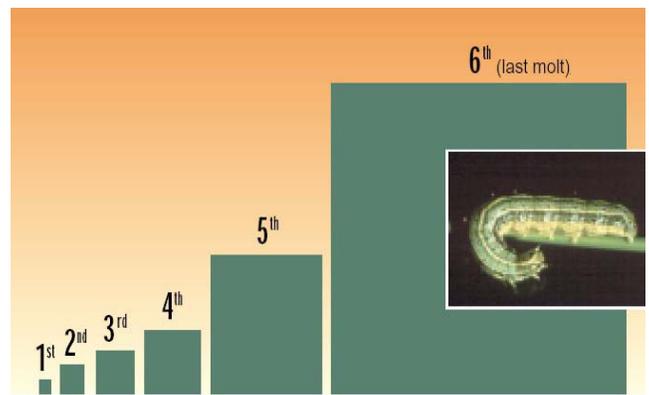


Figure 1. Relative amounts of food eaten by a fall armyworm caterpillar during each growth stage. Kathy Flanders, Auburn University

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Description

Egg: Fall Armyworm and True Armyworm.

The FAW egg is creamy white and dome-shaped with a flattened base. The egg curves upward to form a broadly rounded apex. Eggs are laid in masses of 50 or more on lower leaf blades, primarily in areas of lush growth. The egg mass (usually laid in a single layer) is covered with gray scales, which gives the mass a furry appearance (Figure 2). True armyworm eggs look similar and are laid in masses in dense, grassy vegetation.



Figure 2. Armyworm egg mass. Scott Akin, University of Arkansas

Larva (caterpillar): Fall Armyworm. When newly hatched, the fall armyworm larva is light green to cream-colored with a dark head capsule and measures approximately $\frac{1}{16}$ inch long. As the larva feeds and molts, it becomes darker with light-colored lines down the sides of its body. The head capsule is dark with a light-colored Y mark on the front. In addition, the top portion of the next to last abdominal segment has four small dark dots. The inverted Y on the head capsule (Figure 3) and four dots on the abdomen are good characteristics to distinguish the fall armyworm from the true armyworm (Figure 4). A fully grown fall armyworm larva is about $1\frac{1}{2}$ inches long.



Figure 3. Inverted "Y" on the head of fall armyworm.

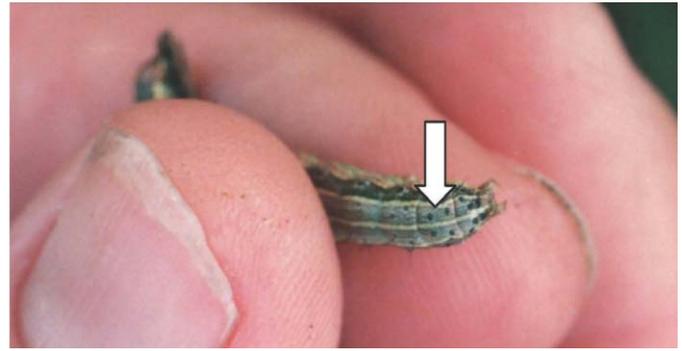


Figure 4. Fully grown fall armyworm larva. Note set of four dots on the end of the abdomen. Kathy Flanders, Auburn University

Larva (caterpillar): True Armyworm. Newly-hatched true armyworm larvae are similar in appearance to the fall armyworm. As the true armyworm grows and molts, key characteristics become more visible. Its head is greenish brown with dark streaks (mottled appearance). The body is greenish brown to black with paired dark markings. True armyworm larvae exhibit paired, black triangular spots along the back of each abdominal segment and a thin yellow line running lengthwise through each row of spots (Figure 5) that distinguish them from other armyworm larvae. A fully grown true armyworm larva is about $1\frac{1}{2}$ inches long.

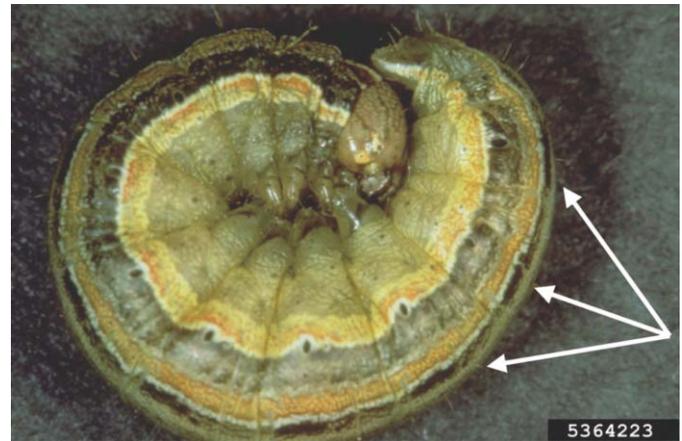


Figure 5. True armyworm showing the dark spots along the back. Frank Peairs, Colorado State University

Pupa: Fall Armyworm and True Armyworm.

Pupae of the two species are very similar in appearance. They are reddish brown and about $\frac{1}{8}$ inch long (Figure 6). Pupation normally takes place in the upper portion of the soil when fully developed larvae burrow into the soil and construct an oval, loose cocoon. If soil conditions are too hard, the cocoon may be formed on the soil surface.



Figure 6. Armyworm pupa.

Adult: Fall Armyworm. The adult fall armyworm is an ash-gray moth with a 1½-inch wingspan. It has mottled front wings with whitish spots near the tip. Its hind wings are whitish with narrow brownish wing edges.

Adult: True Armyworm. The adult true armyworm is light brown or tan with a salmon-colored apostrophe or exclamation mark on the center of the front wing. It is similar to the fall armyworm adult in size.

Biology

Fall armyworms and true armyworms have a similar life cycle, except that the fall armyworms do not overwinter in Arkansas. Even the mildest of Arkansas' winters is too cold for the fall armyworm to survive. Fall armyworms can overwinter in southern Florida, southern Texas and in Central and South America. They make their way to Arkansas on wind currents from the south. Initial moth flights, which vary in size and timing, will influence severity and timing of fall armyworm outbreaks. Unlike the nocturnal true armyworms, fall armyworm caterpillars feed any time of the day or night but are most active early in the morning or late in the evening.

Life cycle: Fall Armyworm. Female armyworm moths lay egg masses of fifty to several hundred eggs at night, usually on foliage or sometimes on light-colored objects (Figure 2). Often eggs are laid in areas of the pasture with the most lush growth. Total egg production per female ranges from about 1,500 to 2,000.

Eggs hatch into small (⅛ inch) light green caterpillars usually within 2 to 4 days (Figure 7). Beginning in the second and continuing into the third instar, the fall armyworm larva turns brownish. The first instar through the fifth instar each lasts from about 1.5 to 3 days; the sixth instar will last nearly 4 days. During the summer months,



Figure 7. First instar armyworms. Eric Howard, University of Arkansas

larvae require about 12 to 16 days to reach the full 1½ inch size. During cooler weather larval development may be extended to about 30 days. Fully grown larvae transform into pupae on or in the soil. The pupal period lasts about 9 days. Adult moths emerge from pupae, mate and begin laying eggs in about 3 days. Although the female FAW can live about 2 weeks, most of her eggs are laid within the first week of her life. Adult FAW moths are nocturnal. In Arkansas, the FAW occurs in waves of about 30 days apart. It is not uncommon to have three generations in southern Arkansas. Finding mixed sizes (small and large) of caterpillars indicates that overlapping generations are present.

Life cycle: True Armyworm. The life cycle of the true armyworm is similar to that of the FAW. However, because true armyworms are present during cooler periods (spring), their development period (which is temperature dependent) is a little longer than that of the FAW. When temperatures are warmer, a generation will take about 40 days, but about 60 days when temperatures are cooler.

Habits and Damage

Fall Armyworm. Fall armyworm damage often appears as a browned or burned-out patch resembling drought damage (Figure 8). The damaged patch will usually increase in size as the fall armyworm consumes more foliage. The brown color results from drying of the plant due to dehydration after armyworms chew tender growth. Often, after a severe fall armyworm infestation, the only vegetation left in the field will be tough stems. Fall armyworms seldom kill healthy, established bermudagrass. However, newly established stands of bermudagrass, winter annuals (rye, ryegrass, wheat), fescue or orchardgrass are at risk of stunting or dying.



Figure 8. Fall armyworm damage on closely mowed grass. The brown patches resemble drought damage. Kathy Flanders, Auburn University

Fall armyworm outbreaks are more likely during periods of drought because some of their natural enemies are less active during droughts. Fall armyworm outbreaks in Arkansas often occur as the grass

greens from rain that has broken a prolonged dry period. Fall armyworm outbreaks (Figure 9) may occur as early as July and continue into the fall. Well-fertilized bermudagrass seems to be the preferred fall armyworm habitat. Although fall armyworms feed more actively in early morning and late afternoon, they may eat throughout most of the day in tall forage. Fall armyworms often conceal themselves during the brightest part of the day.



Figure 9. Fall armyworms in a sweep net during an armyworm outbreak.

True Armyworm. Similar to fall armyworm damage, true armyworm damage seems to appear overnight and for the same reasons. The large caterpillars (fifth and sixth instars) consume large amounts of forage very quickly, whereas small caterpillars consume very little. In addition, true armyworms feed at night. In contrast to fall armyworms, true armyworms do not normally feed on bermudagrass. Instead, they primarily feed on fescue and other cool-season grasses. In severe infestations on fescue grown for seeds, seed heads may be cut from the stem and significantly decrease seed yield. Although true armyworms can have two to three generations per year, typically only the first generation causes significant damage to forage. True armyworms tend to avoid forage containing legumes, such as alfalfa and clover.

Natural Enemies

Natural enemies – parasites, predators and pathogens – occur and can possibly eliminate or reduce fall armyworm abundance in a short period of time. It is not uncommon to note a decrease in the fall armyworm population after a larger population of small larvae had previously been observed. For

example, in recent years the parasitoid wasp, *Cotesia marginiventris*, occurred in large numbers and helped control fall armyworms in many fields (Figure 10). Fall armyworm predators are usually generalists and include ground beetles, earwigs, predaceous bugs, birds and rodents. Viruses, fungi, nematodes and bacteria are among the pathogens that may attack armyworms. Among these, the most important are the nuclear polyhedrosis virus (NPV) and some of the fungal diseases (Figure 11). True armyworms have a similar complement of natural enemies.



Figure 10. *Cotesia marginiventris* (Cresson), an internal parasite of armyworms. Debbie Waters, University of Georgia



Figure 11. Armyworm larvae killed by pathogens. Matt Montgomery, Sangamon/Menard Extension Unit Educator, University of Illinois

Scouting

The first and best approach to limiting armyworm damage in forage production is scouting for these pests before economic damage occurs. Producers should also watch for bird (cattle egrets and other

birds) flocks feeding in fields because birds will exploit armyworms as a ready food source. Early signs of armyworm damage by small caterpillars include leaves that are chewed on the underside only and fields with a slight “frosted” appearance. Other latter signs of armyworm outbreaks are dead areas of fields and caterpillars stuck on vehicle tires driven through the field.

When scouting, first check for armyworm larvae in and around areas with dead grass or where birds are feeding. Remember, true armyworms feed at night and fall armyworms primarily feed in the early morning and late afternoon, so if you are scouting when armyworms are not usually active, you must dig around in the thatch and at the base of the plant to see the armyworms. Also look for other evidence of armyworms such as frass (larval excrement that resembles dark grass seeds).

Control decisions should be based on treatment thresholds derived from sampling the field. In general, insecticide treatment is warranted if three or more half-grown armyworms per square foot are present. The best way to conduct sampling is to make at least 10 random samples across the field. Also remember that moths often lay eggs in the lushest part of the field, so include a few samples from these areas. A sampling device constructed of $\frac{1}{2}$ or $\frac{3}{4}$ PVC pipe that covers one square foot makes the sampling much easier (Figure 12). After the sampling device is randomly dropped, carefully examine grass blades, stems, plant bases and thatch for caterpillars. Record the number and approximate size of the caterpillars found within the perimeter of the sampling device. To make the process easier and reduce digging into thatch with your fingers, use soap flushes (2 table-spoons lemon-scented detergent and 1 gallon of water) to drive caterpillars out of the thatch.



Figure 12. Homemade PVC sampling device for counting armyworms in one square foot of area.

Once fall armyworms are found infesting a field, it is advisable to take note of that date. Remember that infestations usually occur in waves about one month apart, so scout accordingly. At minimum, scout no more than two weeks after the initial infestation occurred, and if an overlapping population was noted, do not wait two weeks to begin scouting for the second infestation.

Control

Proper timing of insecticide application results in better control. In most cases, insecticide control is warranted when an average of three or more worms per square foot occurs. However, other factors, such as the size of the caterpillars and maturity of the hay crop, should be considered before making an insecticide application. For example, if a hay field is heavily infested and the grass is ready to harvest, consider cutting and baling as soon as possible rather than making an insecticide application. If the field is not ready to cut and you have more than three very small ($\frac{1}{8}$ to $\frac{1}{4}$ inch) caterpillars per square foot, do not treat before necessary. Instead, get the equipment ready to spray and monitor the field closely, because natural enemies could possibly reduce the population below treatment threshold within a short period of time. If the population is not reduced, then treat when the caterpillars reach $\frac{1}{2}$ inch. Caterpillars larger than $\frac{3}{4}$ inch are difficult to kill, resulting in poor control. Fully grown caterpillars ($1\frac{1}{2}$ inches) are close to pupation and may have already caused most of the damage, thus an insecticide application may not provide an economic benefit.

The best type of equipment to apply insecticides for armyworm control is a properly calibrated boom sprayer. If a boom sprayer is not available, a properly calibrated cluster nozzle sprayer can be used but only if it has a consistent spray distribution along the entire swath width. In general, the absolute minimum spray solution volume per acre is 10 gallons. Higher volumes of spray solution usually result in better and more even coverage.

Insecticide choices for armyworm control are more numerous today than in past years. When choosing insecticides, producers should consider grazing or harvest restrictions, local availability, cost and residual activity. Several of the newer products have little to no grazing or harvest restrictions. Per-acre insecticide cost will vary from as low as about \$3.00 up to over \$10.00. When calculating cost, always consider the cost per acre and not the cost per gallon of product. For example, a gallon of some products may treat over 100 acres, while others may only treat less than 10 acres. Generally, products

with longer residual activity will cost more per acre. When armyworm pressure is high, longer residual activity may be worth the extra expense and save one application. Also remember, grass that has been cut, grazed or is growing very fast following an insecticide application may not have much insecticide residue left.

Pyrethroid insecticides are faster acting than insect growth regulators and work well on small and medium-sized caterpillars. In general, insect growth

regulators will have longer residual activity than pyrethroids. However, because insect growth regulators are slower, they should be used when the caterpillars are small. Most insecticide labels will provide a rate range (low to high). Consider using the higher rate if the armyworms are large because they are harder to kill. Products available to control both armyworm species in forage are updated annually and listed in MP144, *Insecticide Recommendations for Arkansas*, available at http://www.uaex.uada.edu/Other_Areas/publications/PDF/MP144/C_Pasture.pdf.