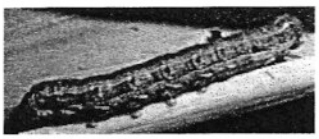
Corn earworm and fall armyworm (headworms)

Helicoverpa zea and *Spodoptera frugiperda*

Corn earworm



Fall armyworm

Corn earworm and fall armyworm moths lay eggs on leaves or grain heads of sorghum. Newly hatched corn earworm larvae are pale in color and only 1/16 inch long. They grow rapidly and become variously colored, ranging from pink, green or yellow to almost black. Many are conspicuously striped. Down the side is a pale stripe edged above with a dark stripe. Down the middle of the back is a dark stripe divided by a narrow white line that makes the dark stripe appear doubled. Fully grown larvae are robust and 1 ½ to 2 inches long.

Young fall armyworm larvae are greenish and have black heads. Mature larvae vary from greenish to grayish brown and have a light-colored, inverted, Y-shaped suture on the front of the head and dorsal lines lengthwise on the body.

Corn earworm and fall armyworm larvae feed on developing grain. Small larvae feed on flowering parts of the grain head at first, then hollow out kernels. Larger larvae consume more kernels and cause the most damage. The last two larval stages cause about 80 percent of the damage. Frass is common in infested grain heads, on tops of upper leaves and on the ground under plants.

Natural mortality of small corn earworm and fall armyworm larvae is normally very high. Both corn earworm and fall armyworm moths can lay several hundred eggs on sorghum grain heads before or during flowering, but only a few larvae survive. Natural factors suppressing these insects include predators, parasites, pathogens and cannibalism among larvae.

Infestations occur less often in early- than late-planted sorghum. An important management tactic is to use sorghum hybrids with loose (open) grain heads. Early-planted sorghum and hybrids with open grain heads usually are less infested.

Begin sampling for headworms soon after the field finishes flowering and continue at 5-day intervals until the hard dough stage. To sample headworms, grasp the stalk just below the sorghum head, bend the head into a clean, white, 5-gallon bucket, and vigorously beat the head against the side of the bucket. Headworms will fall into the bucket where they can be seen and counted. Sample at least 30 grain heads, selected at random from across the field. In fields larger than 40 acres, sample at least one grain head per acre. Record the number of small (less than ¼ inch long), medium (¼ to ½ inch long) and large (longer than ½ inch) headworms found in the samples. Divide the total number of medium or large headworms by the number of heads sampled to get the average number of headworms per head. Then multiply the average number of headworms per head by the number of heads per acre to calculate the number of headworms per acre. (To estimate the number of plants or heads per acre for various row spacings, see page 20.)

Studies have shown that a corn earworm larva will consume about 0.010252 pounds (4.65 grams) of grain during its development in the sorghum head. However, estimating the economic injury level for headworms is complicated because the potential yield loss varies with the size of the larvae. That is why it is necessary to record the number of small, medium-size and large headworms.

Small larvae (up to ¼ inch) consume very little grain (about 10 percent of the total) and about 80 percent of them die in this stage. Therefore, small larvae should not be considered in determining the economic injury level. If most headworms are this size, sample the field again in 3 to 4 days. If most of the larvae are larger than ¼ inch at that later time, determine which size (medium-size or large) is most common and use the corresponding equation below to calculate the economic injury level.

If the infestation consists of about equal numbers of medium-size and large headworms, use this equation:

Potential loss (as lbs/acre) = (no. of large larvae/acre x 0.010252) + (no. of medium-size larvae/acre x 0.19 x 0.010252)

Treatment would be economically justified if the value of the potential loss (loss in pounds per acre x dollars per pound of grain) exceeded the treatment cost per acre.

Most corn earworm larvae larger than ½ inch will survive to complete development, and these large larvae are most damaging; they consume 83 percent of the total grain consumed during larval development. About 19 percent of medium-size larvae (¼ to ½ inch long) survive beyond this stage. Thus, the potential grain loss from medium-size larvae is only 19 percent of the potential loss from large larvae.

Two ways to determine the economic injury level are presented. Both use the same factors and yield the same results. The first method uses the equations below to present the threshold as the number of larvae per head, while the second method shows the results in table format as the number of larvae per acre. The number of larvae per acre can be divided by the number of heads per acre to yield the mean number of larvae per head as an economic injury level.

Economic injury level for large larvae:

$$\text{Number of large larvae per head} = \frac{\text{Cost of control as \$ per acre} \times 9754}{\text{Grain value as \$ per cwt} \times \text{heads per acre}}$$

Economic injury level for medium-size larvae:

$$\text{Number of medium-size larvae per head} = \frac{\text{Cost of control as \$ per acre} \times 9754}{\text{Grain value as \$ per cwt} \times \text{heads per acre} \times 0.19}$$

Table 16. Economic injury level for large (longer than ½ inch) corn earworm larvae shown as the number of larvae per acre. When the number of larvae per acre exceeds the number in the table at a given cost of control and value of grain per cwt, the value of the protected grain exceeds the cost of control.[1]

Control cost	Grain value $/100 lbs			
$/acre	6.00	7.00	8.00	10.00
6	9,750	8,500	7,250	5,750
8	13,000	11,000	9,750	7,750
10	16,250	14,000	12,250	9,750
12	19,500	16,750	14,750	11,750

[1] This threshold table assumes all larvae will survive and complete development.

Table 17. Economic injury level for medium-size (¼ to ½ inch) corn earworm larvae shown as the number of larvae per acre. When the number of larvae per acre exceeds the number in the table at a given cost of control and value of grain per cwt, the value of the protected grain exceeds the cost of control.[1]

Control cost	Grain value $/100 lbs			
$/acre	6.00	7.00	8.00	10.00
6	51,500	44,750	38,250	31,250
8	68,500	58,000	51,500	41,750
10	87,750	73,750	64,500	51,500
12	102,750	88,250	77,750	62,000

[1] This table assumes 81 % of the medium-size larvae will die in that stage and not contribute to additional yield loss.

Table 18. Suggested insecticides for controlling corn earworm and fall armyworm in sorghum.

Insecticide	Concentrate/ unit area	Days from last application to: Harvest	Graze
Carbaryl			
(Sevin®)			
(4F)	32-64 oz	21	14
(80S or 80WSP)	1.25-1.8 lb	21	14
(4XLR+)	32-64 oz	21	14
Cyfluthrin		See remarks	
(Baythroid® 2E)	1.3-2.8 oz		14
Cyhalothrin		See remarks	
(Karate® 1E)	2.56-3.84 oz		
(Warrior® 1E)	2.56-3.84 oz		
Esfenvalerate			
(Asana® XL)	5.8-9.6 fl oz	21	—
Methomyl			
(Lannate®)			
(2.4LV)	12-24 oz.	14	14
(90WSP)	4-8 oz.	14	14
Zeta-cypermethrin			
(Mustang Max®)	1.75 to 4.0 fl oz	14	45

Remarks

Cyfluthrin. If one or two applications are made, green forage may be fed or grazed on the day of treatment. If three applications are made, allow at least 14 days between last application and grazing.

Cyhalothrin. Do not graze livestock in treated area or harvest for fodder, silage or hay.