



# Southwestern Corn Borer

The southwestern corn borer was originally described from a specimen collected in Mexico in 1911. It was first noted in Kansas in 1931 in Morton and Stevens counties. By the mid-1940s, it had been identified as far north as southern Nebraska and east nearly to the Kansas-Missouri border. Heaviest infestations are generally associated with sandy soils south of the Arkansas and Cimarron rivers in southwest and south central Kansas.

## Description

Southwestern corn borer moths are white with light-tan scales along the veins in the wings and about  $\frac{3}{4}$  inch (19 mm) long (Figure 1.). Other than slightly darker scales along the veins, they have no distinct markings on the wings. The wings are folded about the body when not in use, giving the moths a tented or cylindrical appearance. Moths are primarily active at night but can be found during the day under leaves or behind leaf sheaths.



Figure 1.

Fresh eggs are creamy white and oval shaped, with a slightly raised or convex upper surface. Each egg is a little less than  $\frac{1}{8}$  inch (3 mm) in diameter. Although single



Figure 2. Red-bar stage.

eggs can sometimes be found, eggs generally are laid in groups of two to five, overlapping slightly. Eggs may be laid anywhere on the plant, but most are laid in the upper surfaces of leaves. The eggs change color as they mature, developing three parallel rows of reddish-orange lines before hatching, which is commonly referred to as the red-bar stage (Figure 2).



Figure 3.

Then, approximately 24 to 36 hours before hatching, the dark heads of the larvae can be seen through the egg shell. This is often called the “blackhead” stage.

There are two distinct larval color phases of southwestern corn borer. During the summer, larvae are white with distinctive dark brown to black spots. During the fall and winter, the larvae lose their spots and become nearly all white. One distinguishing characteristic of southwestern corn borer larvae that can be seen even in small instars using a hand lens or microscope is that the hooks on the bottom of the prolegs form a complete circle (other larvae commonly found on corn have a straight line or incomplete circle of hooks on soles of the prolegs).

The pupae are about 1-inch long, medium- to dark-brown in color, with a blunt tail-end ringed with a row of blunt projections (Figure 3.).

## Life Cycle

The southwestern corn borer has two, and sometimes three, generations per year. It overwinters as a full-grown larva in the crown or base of the corn plant below ground level. These larvae pupate in late May through June. The pupal stage lasts about 10 days, after which the moths emerge, mate, and lay eggs that produce the first generation of borers.

Eggs of the first generation are laid from mid-June through early July. Larvae infesting young corn move to the inner whorl where feeding damage appears as shot holes in the leaves. Once the larvae are about half grown,



Figure 4. *Nondiapausing larva*

they begin to tunnel into the stalks. By mid-July some larvae pupate, and moths emerge to begin a second generation by late July or early August.

The majority of the eggs of the second generation are laid in the ear zone. Small larvae feeding on tassel-stage corn usually can be found between the husk layers of the primary ears and ear shoots and later may feed on the cob and ear shank. When the larvae are several days old, they bore into the stalk and begin tunneling. Sometimes, larvae bore in and out of the stalk several times, making visible exit and entry holes.

The mature borers of the second generation tunnel down the stalks to the base of the plant, below the soil line. In the lower portion of this tunnel, a long cell is hollowed out and lined with a thin layer of silk. As this cell is being constructed, the larvae move back up the stalk above the soil surface and ream the inside of the stalk until only a thin outer shell remains. During this period, the larvae molt and lose their dark-colored spots and become an almost uniform white color. The hibernation cell is then completed by closing the upper part of the tunnel with a silken plug.

## Damage to Corn

Losses from southwestern corn borer can occur from “dead heart” (death of the growing tip) resulting from first generation larvae feeding in the whorls of young corn plants; from larvae tunneling in the stalk and ear; and from larval girdling, which frequently results in lodged plants. Girdling is a behavior pattern in which larvae, in preparation for overwintering in the plant stub, chew a groove around the inside of the stalk a few inches above the soil surface. Girdled plants are weakened and susceptible to lodging. This girdling behavior is more closely associated with day length than plant maturity.

## Control Strategies

Cultural practices play an important role in managing the southwestern corn borer. Farmers can take advantage of the fact that the crown of the corn plant serves as the overwintering site for this pest. With fall or winter stalk destruction by disking, chiseling, or “middlebusting,” the borers are exposed to lethal freezing and drying conditions. To be

most effective in reducing overwintering borer population, this should be done in all corn fields throughout an area of several counties or more. Even one or two fields left undisturbed through the winter may produce enough moths to cause borer problems throughout the neighboring areas. At best, the population will have been reduced to more nearly manageable levels.

On an individual farm basis, planting date is one of the main factors that can be manipulated to reduce losses from this species. Early-planted corn is usually less susceptible to lodging than late-planted corn. This is because early planting allows harvesting at an earlier date before girdling occurs or at least before the corn is exposed to prolonged periods of wind, rain, and snow after maturing.

Other helpful cultural practices include using a moderate plant population along with proper fertilization and timely and adequate irrigation. This ensures strong, healthy stalks that will withstand lodging conditions better than those that have been weakened by various stresses. The use of early-maturing varieties, harvest of high-moisture corn, and harvest with equipment designed to pick up lodged stalks all aid in reducing yield loss.

Some beneficial insects, including predators and parasites, attack southwestern corn borer. These include lady beetles, lacewings, spiders, and at least one species of extremely tiny wasps which parasitizes borer eggs. Flickers and other birds destroy many overwintering southwestern corn borers in Louisiana and Mississippi, but such predation is a rarity in the High Plains.

The extension services in some states recommend chemical control of the southwestern corn borer when certain infestation levels are present. Generally, it is the second generation of the season at which control efforts are aimed, because it is these larvae that will girdle the corn stalks. Where there is a partial third generation, the larvae often are overtaken by winter or corn harvest before they reach the stage of maturity in which girdling behavior is common.

Proper timing of insecticide application is important since, for greatest effectiveness, the larvae must be treated after hatching from the eggs, but before they enter the stalk. Light-trap catches of moths and the use of computerized prediction of borer development are helpful in determining when insecticide applications should be made. Although an individual moth lives only a few days, more than one treatment will probably be required because of the several-week-long period over which this generation of moths is laying eggs. If a decision is made to apply an insecticide, avoid automatic spray schedules and base additional treatments on individual field infestations of borer egg masses and newly hatched larvae. Be aware that some insecticides may increase spider mite populations later in the season.

## Scouting Methods

Scout corn fields for first generation southwestern corn borers from mid-May through June depending on the latitude and the year. Carefully check the leaves for egg masses and small larvae. Also look for plants with early signs of shot-hole feeding injury on leaves and search the whorls and leaf axils of these plants for small larvae. Note that relatively small plants have no immunity or lack of attractiveness to the southwestern corn borer as they do to the European corn borer. In fact, plants under 15 inches (38 cm) tall are especially susceptible to serious injury or death from “dead heart” induced by southwestern corn borer.

Scout for the second generation southwestern corn borer from about mid-July through August or until effective control measures have been employed. Most eggs of this generation are found on the upper surface of leaves in the middle portion (ear zone) of plants that have reached the tasseling stage. Levels of infestation should be determined for each corn field. Inspecting corn plants for these small egg masses requires meticulous attention and is quite time consuming.

## Economic Thresholds

Thresholds for first generation control are not well established. While yield reduction can occur from damage caused by first generation larvae, it is not generally assumed to be serious unless the majority of the plants are infested. In absence of better knowledge, the European corn borer threshold of 50 percent of the plants infested

with live larvae could probably be used. Fortunately, first generation infestations have generally been light in most fields in Kansas.

Most insecticide treatments are directed against second generation larvae. Insecticides should be applied when 20 to 25 percent of the plants are infested with eggs or newly hatched larvae.

If using the Kansas State University southwestern corn borer computer model predictions, scouting should begin when 25 percent emergence is predicted. If you find 20 percent or more of the plants infested with eggs at that time, then treatment is recommended when 50 percent emergence is expected and again seven to 10 days later. If you find some eggs but not enough to justify treatment re-scout the field in three to five days. Then consider treatment if the sum of the two counts is greater than 25 percent. In this case, you may still need two applications. If populations were low on the first two samplings, a third sampling should be made seven to 10 days after the first sampling date. This time, sum the results of all three sampling dates and recommend treatment if the total exceeds the 25 percent threshold. With this light pressure one application a week or so after the predicted date of 50 percent emergence should provide adequate control.

Corn borer resistant corn lines including Bt-corn require adjustments to the treatment threshold for corn borer.

For current control recommendations see the most recent version of the recommendation guide *Corn Insect Pest Management*, MF810.

## Authors

**R. Jeff Whitworth**, Entomologist, Kansas State University

**Phil E. Sloderbeck**, Retired Entomologist, Kansas State University

**Randall A. Higgins**, (Deceased) Entomologist, Kansas State University

**Lawrent L. Buschman**, Retired Corn Entomologist, Southwest Research-Extension Center, Kansas State University

**Amie Norton**, Nanoentomologist, Kansas State University

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