Agronomic Spotlight

Seminis grow forward

Corn Earworm on Sweet Corn

- Corn earworm is one of the most damaging insect pests of sweet corn in North America.
- Corn earworm larvae feeding on sweet corn kernels reduces the marketability of the ear.
- Cultural practices, resistant hybrids, and insecticides are used to manage corn earworm on sweet corn.

Corn earworm (CEW), *Helicoverpa zea*, is a major pest on sweet corn in many areas of North America. CEW is also known as the tomato fruitworm, the sorghum headworm, vetchworm, and the cotton bollworm. Besides feeding on corn, cotton, sorghum, and tomato, the insect has a wide host range that includes many agronomic, fruit, vegetable, ornamental, and weed species. CEW is particularly damaging on sweet corn because the larvae damage kernels and deposit frass, which can render affected ears unmarketable.[1,2,3]

Identification

CEW larvae vary in color from light green to dark brown, usually having an orange to light-brown head capsule, and have three to four stripes along their body (Figure 1). Larvae have small, black micro-spines on their bodies that make them feel rough to the touch. When fully developed, CEW larvae are about 1.5 inches long.[2, 4]

Figure 1. Corn earworm larva. Ted MacRae.

Adult moths are about 0.75 inches long with wingspans of 1 to 1.5 inches. The forewings are usually yellow-brown with small, dark central spots. The hind wings are creamy white near the body and darker near the tips but with lighter colored margins (Figure 2).[2] Females lay eggs that are spherical, initially pale green, turning yellowish and then gray with age (Figure 3).

Figure 2. Corn earworm adult. Ted MacRae

Figure 3. Corn earworm egg. Ted MacRae

Life Cycle

CEW usually only overwinters in areas south of 40°N latitude. However, the adults are highly mobile and readily disperse from southern states to northern states and Canada during the growing season.[2] There are multiple generations of CEW per year in the south, usually two or three generations in much of the midwestern U.S., and only one generation in northern areas such as Minnesota and Canada.[2] Female moths lay eggs on leaf hairs and fresh silks (preferred). A female can lay 35 eggs per day and 300 to 500 eggs during her lifetime, which is usually 5 to 15 days. The moths are most active at dusk. The eggs hatch in two to ten days (depending on temperature), and the emerged larvae start to search for feeding sites. Larvae will travel down the silk channel and start feeding on kernels. The larvae will go through five or six instars (molting stages). They will then stop feeding, drop to the soil, burrow down into the soil and form the pupal stage. In the summer, the pupal stage typically lasts for 13 days. The pupal stage is also the overwintering stage in southern areas of the U.S. At the end of the pupal stage, the insect will metamorphose, and the adult moth stage will emerge. The adults are most active at night when they will mate, and the females will lay eggs. The whole life cycle takes about 30 days to complete during the summer.[2,4]

Insect Damage

Sweet corn that matures mid-season is generally less likely to be injured by CEW. CEW females are most attracted to silking sweet corn early in the season, before the dent corn in the area begins to silk, and late in the season, after dent corn silks dry down.[1] In regions where CEW does not overwinter, the adults arrive later in the season, so early planting can help prevent damage. Larvae will feed on leaves, tassels, whorls, silks, and within ears. Chewing on the silks can interfere with pollination leading to poor ear-fill; however, feeding on the ear is usually the most damaging. Feeding in the ear starts at the tip but can progress halfway down the length of the ear. Initially, there can be two or more larvae feeding on an ear, but they become cannibalistic as they mature, so eventually, there will be only one larva per ear. Feeding injury also can provide a site of infection for fungal pathogens.[2,4]

Monitoring

Scouting for CEW should begin prior to first silk and continue through harvest. Traps baited with a commercially available CEW pheromone lure are used to monitor and count adult male moths to estimate CEW populations and activity levels. The cone-shaped traps can be made of netting (Heliothis style traps) or metal hardware cloth (Hartsack style traps).[5] Traps should be put up and bated just before the sweet corn begins

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to tassel, even with early planted sweet corn. One trap per farm is sufficient. The pheromone lure should be changed every two to three weeks. Moths should be counted, removed, and destroyed twice a week to estimate the average nightly moth count.[1,2] Counts are used to help schedule application of insecticides.

Management

The primary means for controlling CEW on sweet corn is through the application of insecticides based on moth counts and action thresholds. Management of CEW is not possible after the larvae have reached the ear and are protected by the husk. So, there is a short window of time when insecticide-based control can kill the larvae before they enter the ear.[3] Sprays should be directed at the middle third of the plant, in the ear zone. The goal is to treat the silks and to drive the product into the silk channel. This usually requires spray pressures of 30 psi or higher, and ground applications almost always result in better control than aerial applications. A setup of three nozzles per row, with two drop nozzles aimed at the ear zone (one on each side) and one overhead nozzle, usually provides the best coverage.

Applications should begin when ten percent of the ears are silking if the action threshold of nightly moth counts has been reached. Depending on the products used and the moth count numbers, repeat applications may be needed every three to five days, or more often under heavy moth pressure. Applications should continue until 90% of the silks have turned brown and dried.[2,3]

Specific threshold levels and treatment frequency recommendations vary somewhat by region. Growers should consult regional pest management guides for locally appropriate recommendations. The Midwest Production Guide for Commercial Vegetable Growers recommends that if no silking dent (field) corn is present in the area, an action threshold of one to three moths per night should be used to trigger insecticide applications if green silks are present on the sweet corn.[6] With less than five moths per night, a treatment frequency of every five days is recommended. When moth counts reach 50 to 100 per night, the treatment frequency should be increased to once every two to three days. When silking dent corn is present during the mid-season, the action threshold can be raised to ten moths per night.[1] High moth counts and higher temperatures will necessitate the shortening of spray intervals, as silks grow faster at warmer temperatures, and the part of the silk that has emerged since the last application will not be protected.

Several insecticide products are registered for controlling CEW on sweet corn.[6] Pyrethroids have been the primary class of insecticides used for CEW on sweet corn, and many products in this class are available. However, insecticide-resistant CEW populations have developed over time.[7,8] While the pyrethroid insecticides remain mostly effective in areas such as the Midwest, there have been sporadic failures of control and decreased efficacy of applications in some locations.[7] Insecticide products containing other classes of active ingredients are also available.[6]

Natural enemies, including egg parasites and predators, can also help lower populations of CEW. Species of *Trichogramma* are egg parasites of CEW. Predators that eat CEW eggs and small larvae include lady beetles, green lacewings, minute pirate bugs, big-eyed bugs, and damsel bugs.[2,4]

Some cultural practices can be used to lower damage caused by CEW. Early planting, especially in northern areas, can allow the sweet corn crop to develop before populations of CEW reach threshold levels. Tillage can help reduce overwintering of the pupal stage in southern areas.[2,3,4]

Sweet corn hybrids that have long, tight-fitting shucks (husks) often suffer less damage from CEW because the narrow silk channel restricts the larvae's ability to reach the ear. However, this characteristic is usually not sufficient to provide adequate control on its own.[3]

Sweet corn hybrids that contain one or more genes for the Bt protein became commercially available in the 1990s to help manage insect pests such as CEW. Initially, these hybrids were very effective for managing CEW and reduced the need for insecticide applications. The development of Bt-resistant populations of CEW have lowered the efficacy of host resistance in some areas; however, these hybrids remain useful as a part of an integrated pest management program.[9]

Sources:
[1] Foster, R. 2017. Corn earworm. Purdue University Extension Entomology, Vegetable Insects, E-31-W. [2] Capinera, J. 2000. Corn earworm. Featured Creatures. UF IFAS. EENY-145. http://entnemdept.ufl.edu/creatures/veg/corn_earworm.htm. [3] Bessin, R. 2019. Corn earworm management in sweet corn. Entfact-318. University of Kentucky Cooperative Extension. [4] Godfrey, L., Wright, S., Summers, C., and Frate, C. 2019. Corn earworm. UC IPM Pest Management Guidelines. UC ANR Publication 3443. [5] Welty, C. 2009. How to use pheromone traps to help manage corn earworm & European corn borer on sweet corn in Ohio. Ohio State University. [6] Phillips, B., Maynard, E., Egel, D., Ingwell, L., and Meyers, S. 2019. Midwest vegetable production guide for commercial growers 2021. [7] Flood, B. and Rabaey, T. 2007. Potential impact of pyrethroid resistance in Helicoverpa zea to the Midwest processing industry: sweet corn and snap beans. Plant Health Progress doi:10.1094/PHP-2007-0719-06-RV. [8] Jacobson, A., Foster, R., Krupke, C., Hutchison, W., Pittendrigh, B., and Weinzierl, R. 2009. Resistance to pyrethroid insecticides in Helicoverpa zea (Lepidoptera: Noctuidae) in Indiana and Illinois. J. Econ. Entomol. 102:2289-2295. [9] Dively G., Venugopal P., and Finkenbinder C. 2016. Field-evolved resistance in corn earworm to Cry proteins expressed by transgenic sweet corn. PLoS ONE 11(12): e0169115.
Websites verified 2/18/2021

For additional agronomic information, please contact your local seed representative.

Performance may vary from location to location and from year to year, as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible and should consider the impacts of these conditions on the grower's fields. The recommendations in this article are based upon information obtained from the cited sources and should be used as a quick reference for information about sweet corn production. The content of this article should not be substituted for the professional opinion of a producer, grower, agronomist, pathologist and similar professional dealing with this specific crop.