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Western Bean Cutworm in Corn and Dry Beans

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This NebGuide addresses the life cycle, scouting and treatment of the western bean cutworm in corn and dry beans.

Western bean cutworm (WBC) can be a severe pest in corn and dry beans. Larval feeding damages both crops through reduced yield and quality. In corn, direct feeding losses may be compounded by fungal and mold infections associated with larval waste products. In beans, damaged or 'worm-chewed' beans are a significant quality factor for both processed and dry bagged beans. Western bean cutworm infestations occur every year in western Nebraska. In some years, this pest is found in high numbers throughout the state.

Life History

Western bean cutworm has one generation per year with moth emergence usually beginning in early July. The emergence date can be predicted by calculating growing degree days. Starting heat unit accumulations on May 1, using a base air temperature of 50°F, growing degree days for 25 percent, 50 percent and 75 percent moth emergence are 1319, 1422, and 1536, respectively. Populations vary from year to year, but there is a tendency for higher numbers every six to eight years. Moth emergence tends to be greater in fields with sandy soils and may be increased by rainfall or irrigation.

Western bean cutworm moths are about 3/4 inch long with a wing span of about 1 1/2 inches *(Figure 1)*. The body is light brown and the wings are generally dark brown with a distinctive pattern. The front wings have a broad white or cream stripe that runs two-thirds the length of the leading edge. Behind this stripe is a central white spot and, further away from the body, a half moon shaped spot. The hind wings are cream colored without markings. When at rest the wings are swept back over the body. The moths are strong fliers and are known to travel several miles. Female moths emit a pheromone (scent) that attracts males for mating. After mating, eggs are usually laid on either field corn, popcorn, sweet corn, or dry beans. Tomatoes and fruits of nightshade and ground cherry

Figure 1. Adult western bean cutworm.

Figure 2. Newly laid eggs.

are acceptable but non-preferred hosts. Eggs are laid in masses of 5-200 with an average of about 50 eggs per mass *(Figure 2)*. The eggs are 0.03 inches in diameter, dome shaped with ridges and reticulations. When first laid, the eggs are pearly white, but within two days they turn tan. By the fifth day of development, they turn a dark purple color *(Figure 3)*. Egg development usually takes five to seven days.

After egg hatch, the larvae remain near the egg mass for about 10 hours, feeding on the chorion (shells) of the eggs. The larvae then move to protected feeding sites, the location depending on the growth stage of the host. Larvae feed for about 31 days and develop through five stages (instars) on the host plant. First instar larvae are quite mobile and may

Figure 3. Eggs immediately prior to hatch.

Figure 4. Newly hatched larvae.

Figure 5. Larger larvae on corn ear tip.

Figure 6. Larva with stripes on prothorax.

Figure 7. Pupa.

infest several adjacent plants. They are dark brown with faint cross hatched markings on their backs *(Figure 4)*. As the larvae develop, they become light tan to pink in color and the cross hatch markings on their backs become more distinct *(Figure 5)*. Third instar and older western bean cutworms larvae also can be differentiated from other cutworms and caterpillars feeding on the host plant by three characteristic dark brown stripes immediately behind the head *(Figure 6)*. Larvae continue to feed through the fifth instar after which they drop to the ground, burrow 5-10 inches under the surface, and construct an earthen overwintering cell *(Figure 7)*. They spend the winter inside this cell in a pre-pupal stage. Larvae pupate in late May followed by adult emergence in early July.

Infestations on Corn

Western bean cutworm moths lay eggs on the upper surface of corn leaves, in the upper portion of the canopy. Fields nearing tassel emergence or those planted to hybrids with an upright leaf characteristic are preferred for oviposition (egg-laying). Most eggs hatch, but only a small percentage of the larvae actually survive to maturity. In pretassel corn, newly hatched larvae move to the whorl where they feed on the flag leaf, the flowers of the tassel and other yellow tissue *(Figure 8)*. Once tasseling begins, larvae move to the green silks of the developing ear. In posttassel corn, the larvae move directly to the fresh silk. Through this dispersal behavior, larvae from one egg mass may infest several plants down the row and in immediately adjacent rows in an area 6 to 10 feet in diameter. Second and third instar larvae continue to feed on the silks and begin feeding on the tips of the developing ears. Fourth instar larvae feed primarily on the ear tip *(Figure 5)*. If the ear tips are crowded, some larvae may move to the outside of the ear, chew through the husks and initiate feeding *(Figure 9)*. While one larva per ear rarely causes an economic loss, recent research has shown that a field average of one larva per plant at dent stage can reduce yield by 3.7 bu/acre. Western bean cutworm larvae are not cannibalistic which may result in an infestation of multiple larvae per ear. In years with severe infestations, two or more larvae per ear may be common and, although unusual, corn ears infested with more than 20 larvae have been recorded. In these crowded situations, as much as 50-60 percent of an ear's kernels may sustain feeding damage.

Figure 8. Larva in corn tassel.

Figure 9. Cutworm damaged corn ears.

Figure 10. Cutworm damage to bean pod.

Infestations on Dry Beans

Western bean cutworm eggs are laid on the lower surface of bean leaves, in areas with the greatest concentration of foliage. First instar larvae may disperse up to 12 feet along a row and 10 feet across rows. Larvae remain on the leaves until they are about 1/2 inch long, where they feed at night on young leaf material and blossoms. As the larvae grow they begin to feed in the pods and on the developing seeds *(Figure 10)*. Larger larvae leave the pods during the day seeking protection in the soil. If the larvae have not completed development when the beans are cut, they may congregate under the windrow and feed on the pods and seeds until harvest *(Figure 11)*. Economic injury levels for yield loss and dockage are being investigated.

Figure 11. Cutworm-damaged dry beans.

Sampling Corn

Western bean cutworm moths can be detected with black light or pheromone traps. Most of the eggs are laid during the peak moth flight in mid to late July. Light traps should be monitored regularly until after the adult population peaks. Field scouting should be initiated when western bean cutworm moths are first noticed. The upper surface of the upper leaves of corn plants should be examined for egg masses and/or small larvae. Before pollen shed, the tassels also should be inspected for small larvae. When scouting for western bean cutworms, check 10 consecutive plants in several randomly selected locations of each field. These locations should be representative of all areas of a field. Egg laying also will vary with plant growth stage; therefore, portions of a field planted to hybrids with different maturities should be sampled separately. Checking as few as five locations in the field may be adequate to establish the infestation level, particularly if either a low (0 in 10) or a high (more than 2 in 10) number of plants in each location have egg masses or larvae. If the number of infested plants falls between these extremes, observations in 10-15 locations may be required to accurately establish the western bean cutworm damage potential for the field.

If eight percent of field corn plants have egg masses and/or small larvae, consider an insecticide application. This threshold or infestation level may need to be adjusted based on the crop's value and control costs. If an insecticide application is required, timing is critical. If the eggs have hatched, insecticide applications should be made after 95 percent of the plant tassels have emerged, but before the larvae have a chance to enter the silks. Once larvae move to the silks, insecticide control is more difficult. If the eggs have not hatched and plants have tasseled, the application should be timed when most of the eggs are expected to hatch. Purple eggs should hatch within about 24 hours.

Sampling Dry Beans

It is difficult to scout dry beans for eggs and small larvae, but insecticide treatments are recommended when two or more larvae are found per row foot. Pheromone trap catches may be used to provide an estimate of possible infestation, proper timing of field scouting activities, and optimum timing for initiation of control methods. Pheromone traps may be constructed from a one gallon plastic milk jug *(Figure 12)* and pheromone may be purchased from a commercial supplier *(Table I)*. The milk jug traps are inexpensive and effective. They are constructed by cutting out the side panels of the jug, leaving a 2-inch bottom reservoir to be filled with a 4:1 mixture of water and antifreeze, and a couple of drops of dish soap. Moths become trapped in this liquid and can be counted. Pheromone lures may be secured with a pin to the under surface of the milk jug cap. Scentry™ pheromone lures are recommended because of the variability seen with other brands. The traps should be mounted at a 4-foot height on posts in two locations at the edge of each bean field. Install traps near lush vegetation, such as a growing corn or sugarbeet field. It also may help to place the traps in the northwest and southeast corners of the field. These steps will insure that moths will not avoid the traps due to lack of vegetation and the prevailing winds will spread the pheromone over the field, increasing the chance of drawing moths from the field being monitored.

Figure 12. Milk jug trap.

Pheromone traps should be set out in early July. Moths captured in each trap should be counted regularly and the total accumulated over time until the moth flight peaks. During the moth flight, the traps should be emptied and moths counted at

Table I. Suppliers of western bean cutworm sampling equipment and supplies.

Light traps
Gempler's, Inc., 211 Blue Mounds Rd.,Mt. Horeb, WI 53572, phone (800) 382-8473
Scentry® pheromone
Gempler's, Inc., 211 Blue Mounds Rd., Mt. Horeb, WI 53572, phone (800)382-8473
Great Lakes IPM, 10220 Church Rd NE, Vestaburg, MI 48891, phone (989) 268-5693

the traps can quickly exceed their capacity and may need to be counted daily. To insure optimum moth capture, a fresh antifreeze mixture should be added each time the traps are counted. The date of the peak moth flight should be recorded and the cumulative number of moths, caught from the initiation of the flight until the peak, should be calculated. If the cumulative catch at the peak of the moth flight is less than 700 per trap, the risk of significant damage is low. If the number is between 700 and 1,000 moths per trap, the risk of damage is moderate. A large infestation in nearby corn fields could also signal a potentially damaging population in dry beans. In this situation, bean pods should be checked for larval infestation and feeding damage two to three weeks after the peak moth flight. If pod feeding is significant, consider an insecticide application. If the total moth count exceeds 1,000, the risk for damage is high. Not all high risk fields will develop economically threatening damage, so sample pods to gain further information on damage potential. If noticeable pod damage is observed, an insecticide application should be considered. If an insecticide treatment is required, the application should be made 10-20 days after the peak moth flight.

Pest Management

Few cultural methods effectively control western bean cutworms. Disturbing the soil by plowing or disking is thought to reduce overwintering larval survival; however, the effectiveness of this practice on a broad scale has not been tested. A few dry bean varieties have some resistance to feeding damage but the agronomic characteristics of these varieties are not favorable for commercial production. There are also several predators that help reduce western bean cutworm infestations. Ladybird beetle adults feed on both eggs and larvae up to the third instar. After the third instar of larval development, predation by birds can be beneficial. Blackbirds are frequently noticed feeding on western bean cutworm larvae found in the ear tips of corn plants. In addition to these natural enemies, western bean cutworm larvae are susceptible to a naturally occurring disease caused by the microsporidian, *Nosema* sp. Although these naturally occurring control methods are important in reducing western bean cutworm infestations, outbreaks that can cause economic loss in corn and dry beans are still common and may require insecticide applications for adequate control.

Insecticide controls target the larvae stage of western bean cutworms. Liquid insecticides applied by airplane or through a center pivot irrigation system typically provide acceptable control. Treatment should target early instar larvae that are still active on the plant because effectiveness decreases as larvae mature or if they reach the silks. There is some evidence that synthetic pyrethroid insecticides will force larvae out of protective areas due to the irritation properties of the active ingredient. These insecticides may be more effective should the larvae reach the silks prior to treatment. Products that contain *Bacillus thuringiensis* as the active ingredient do not control western bean cutworms. Larval survival is also relatively high on currently available transgenic corn plants that express the toxin produced by *B. thuringiensis* (*Bt* corn). *Bt* corn hybrids containing the Cry1F toxin (Herculex I) are labeled for control of western bean cutworm larvae. Current insecticide recommendations are available from your local Extension office or at the University of Nebraska Department of Entomology internet site (*http://entomology.unl.edu/fldcrops/pestipm.htm*).

The incidence of spider mites in a field should be considered when choosing an insecticide. Some synthetic pyrethroid insecticides may result in an increase (flare) of spider mite infestations. These products do not control the mites but will increase their dispersal within the canopy. Synthetic pyrethroids are also highly toxic to the natural enemies of spider mites, eliminating the population-regulating effect of these beneficial organisms. If spider mites are present and a synthetic pyrethroid is to be applied, a miticide should be included in the spray mixture.

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