



CROPS

Western Corn Rootworm

no. 5.570

by F.B. Peairs and S.D. Pilcher ¹(8/2010)

Quick Facts...

Western corn rootworm larvae feed on root hairs and small roots; larger rootworms feed on primary roots.

Crop rotation is the most consistent and economical means of controlling western corn rootworm populations.

Cultural practices that promote strong root systems and a vigorous crop will make corn more tolerant to rootworm feeding and damage.

The number of adult beetles present during the previous growing season is the best guide for selecting the fields that need to be treated with insecticide.

The western corn rootworm (WCR) and the northern corn rootworm (NCR) attack corn in Colorado. Although both species can be found in corn-growing areas across the state, only WCR is considered an economic problem.

The adult NCR has uniform light green wing covers, while WCR has black or black and yellow wing covers (Figure 1). The following information pertains to management of WCR. Most of it also is appropriate for NCR.

Life History and Damage

The WCR overwinters in the egg stage. Eggs start to hatch in late spring. The date depends on soil temperature. Hatch in southern Colorado usually starts in mid-May, while eggs in cooler areas do not hatch until early June.

After hatching, the small rootworm larvae move to nearby corn roots and begin feeding on root hairs and small roots. Larger rootworms feed on and tunnel in primary roots.

Under heavy rootworm pressure, root systems can be completely destroyed (Figure 2), but damage usually is less than this. Yield losses due to rootworm feeding are difficult to determine, as many corn varieties can compensate for some root damage. In general, economic losses occur after one or more primary roots are chewed to within 1.5 inches of the plant. Grain yield losses in our studies have averaged about 10 percent over the last decade. Rootworm damage also can result in extensive “gooseneck” lodging and harvest difficulties.

By mid-July, most larvae have finished feeding and transformed into adult beetles. They emerge from the soil to feed, mate and lay eggs. These eggs produce the larvae that will attack the following year’s crop.

The adults prefer to feed on corn leaves. Once pollen shed is completed, they usually migrate in search of other pollen sources, such as later-planted fields or other pollen producing crops.

Females start laying eggs when they are about two weeks old. They prefer moist areas, so eggs usually are concentrated in the soil between the rows in irrigated corn.

Heavier soils with organic matter content above 1.5 percent also are preferred.

Adult rootworm feeding on silks has been thought to interfere with pollination and grain

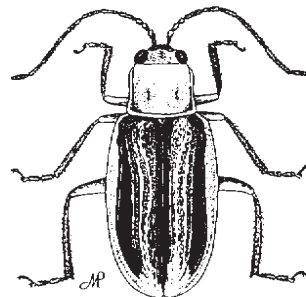


Figure 1: Western corn rootworm adult (left); and larva (right).

**Colorado
State**
University

Extension

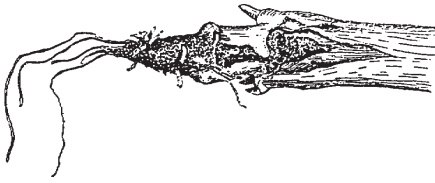


Figure 2: Western corn rootworm root damage.

production. Studies under Colorado conditions have failed to show significant yield loss from as many as 20 beetles feeding on a single ear, so insecticide treatments to prevent such damage are not generally recommended.

Management Practices

Crop Rotation

This is the most consistent and economical means of controlling rootworms. Corn rootworms must feed on corn roots in order to develop and mature properly. If they hatch in a field rotated out of corn, they will starve to death because they cannot move more than 10 to 20 inches in search of food. Also, rootworm beetles rarely lay eggs anywhere but in corn. First-year corn will not require an insecticide to control the rootworms that hatch from the few eggs that might be present. Rootworm variants that are “resistant” to 2-year rotations occur in the midwest but have not been reported from Colorado.

Varieties

There are no commercial non-transgenic rootworm-resistant corn varieties. Varieties do differ in root development, so select a material well adapted to the area that can be expected to produce a vigorous root system. Such varieties can be expected to tolerate a moderate amount of root feeding. Transgenic corn hybrids resistant to rootworms are highly effective. Be sure to select a variety that has also yielded well in local tests. Also, be sure to follow all resistance management recommendations and restrictions. For more information on transgenic corn, see Colorado State University Extension fact sheets 0.707, *Bt Corn: Health and the Environment* and 0.708, *Managing Corn Pests with Bt Corn*.

Early Planting

Fields that have completed pollen shed are not very attractive to rootworm beetles. Early planted fields can be through pollination before the majority of the adults have emerged, and therefore have less egg laying activity. Early fields also will have relatively larger root systems when rootworm feeding starts. This makes them somewhat more tolerant to rootworm damage.

Other Cultural Practices

Practices that promote strong root systems and a generally vigorous crop will make corn more tolerant to rootworm feeding and damage.

Insecticides

Some, but not all, continuous corn fields will have rootworm populations large enough to justify the expense of protecting the crop with an insecticide. The number of adults present during the previous growing season is the best guide for selecting the fields to be treated. If records from the previous year show that beetle counts for a field averaged more than 18,000 beetles per acre on any scouting day during August or early September, then an insecticide treatment should be considered.

Continuous corn fields that were not scouted during the previous growing season also should be protected with an insecticide or transgenic hybrid.

If a field is to be treated, then one of several recommended application methods must be selected. One of these methods may be more convenient than the others for a particular farming operation.

- Seed may be treated with an insecticide. Seed treatments may not be effective under heavy rootworm pressure.
- Granular rootworm insecticides can be applied in-furrow or banded over the row either at planting or cultivation.

- Liquid rootworm insecticides can be applied at planting or at cultivation in a spray directed at the base of the plant. However, do not apply planting time liquid or granular insecticides before May 5.
- Finally, treatments may be directed against the adults, preventing egg laying and protecting next year's crop.

Rootworm insecticide failures are not uncommon. Proper rates, proper calibration and good incorporation will minimize the risk of such an occurrence. Registered corn rootworm insecticides and the correct rate per 1,000 feet of row for each are given in the *High Plains Integrated Pest Management Guide* at www.highplainsipm.org. Proper incorporation increases insecticide life, helps the insecticide reach the root zone and lowers the risk to birds, which are very susceptible to most rootworm insecticides.

If these precautions are taken, then the most likely causes for failure are enhanced microbial breakdown, planting-time applications made too early in the season, and insecticide-resistant rootworms. Applications at cultivation time will avoid problems with the first two causes. However, poor weather may prevent a properly timed cultivation treatment.

Treatments to prevent egg laying are recommended when beetle counts exceed 18,000 per acre (three beetles on four plants at 24,000 plants per acre). Lower this threshold to 12,000 per acre in first-year corn because a higher proportion of beetles will be egg-laying females.

Treatments made before 10 percent of females are carrying fertile eggs will not significantly reduce egg laying. This usually occurs two to three weeks after the first adult has emerged from the soil. Treat again if beetle counts rebound to more than 12,000 per acre.

Adult treatments during pollen shed are a significant threat to honey bees. Follow all pollinator protection instructions on the label. If bee safety is a significant concern, consider controlling rootworms by crop rotation transgenic hybrid or the application of soil insecticides at planting time or cultivation.

Adult treatments during pollen shed are a significant threat to honey bees.

It is a good idea to monitor rootworm insecticide performance by leaving an untreated strip in the field. In mid-July, compare roots from this strip and roots from treated areas for damage. If both areas have two or more primary roots chewed down to within 1.5 inches of the plant, then the insecticide has performed poorly. Rotate the field to another insecticide the following year. If just the untreated area shows this damage, then the insecticide performed well and could be used the following season.

¹ F.B. Peairs, Colorado State University Extension entomologist and professor, bioagricultural sciences and pest management; and S.D. Pilcher, Golden Plains Area entomologist, retired.