



Extension FactSheet

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Corn Rootworm Management

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Pest Biology and Host Injury

The Western corn rootworm (WCR), *Diabrotica virgifera virgifera*, and the Northern corn rootworm (NCR), *Diabrotica barberi*, are leaf beetles that feed predominantly on corn. Rootworms overwinter as eggs that were deposited by adult females in the soil during the late summer months of the previous growing season. Egg hatch generally occurs from late May to mid-June, about the time that corn is in the four-leaf stage of development. The phenology of rootworm egg hatch often coincides with sightings of the adult firefly beetle.

The eggs hatch into larvae, which feed on corn root systems for a period of three to four weeks during which time they pass through three growth stages commonly referred to as the first, second, and third instars. A mature third-instar larva is about 1/2 inch in length and has a dark brown head and anal plate. At maturity, the third instar transforms into a pupa, which is inactive for a week or two. The pupae then turn into adult beetles, which emerge from the soil and start feeding on corn foliage, pollen, and silks around mid-July. The adults are active for about 10 to 12 weeks, during which time they feed, mate, and deposit their eggs, which become the overwintering stage of the life cycle.

The rootworm larvae cause the most significant damage through feeding injury to the corn root. Where rootworms are active, the injury may range from a few feeding scars and tip injury on a root system to elimination of entire nodes of a root system. As root injury becomes severe, lodging occurs and yields are reduced.

Rootworm adults may also cause significant foliar injury and interfere with pollination by excessive feeding on the silks, which is generally called silk clipping. WCR adults tend to feed primarily on foliage. Adult WCR are gold in color with a black head and three black stripes on wing covers. In the case of male WCR, the black strips merge to the point that the entire wing cover appears black. NCR adults tend to feed more on corn silks. Adult NCR are pale to dark green in color.



Western Corn Rootworm



Northern Corn Rootworm

Until recently, rootworm injury was limited primarily to continuous corn, since rootworm beetle adults only deposited their eggs in corn fields. But a new biotype of WCR, which deposits its eggs in soybeans and possibly other crop habitats, is now capable of causing significant injury to first-year corn. This new biotype, commonly called the first-year corn rootworm, is currently migrating eastward across Ohio.

First-year corn may also be susceptible to rootworm injury when eggs remain in the soil for more than a year. In this situation, the eggs deposited in corn remain dormant throughout the following year and then hatch the next year, when corn may again be planted in a two-year rotation cycle. Such rootworm activity is called extended diapause and is commonly associated with NCR, especially in the northwestern region of the Corn Belt. Cases of NCR infestation in Ohio first-year corn have been observed.

Assessment of Rootworm Injury in Field Corn

When rootworm injury in corn is detected, an assessment of the injury should be conducted to determine the severity of the problem. Rootworm injury on corn root systems is commonly rated on the Iowa 1 to 6 scale, where level 1 represents a total absence of injury and level 6 represents an almost total loss of the root system.

A root rating of 2 is assigned to a root system that exhibits feeding injury, but no single root has been reduced to within 1.5 inches in length.

A root rating of 3 is assigned to a root system where one or more roots have been reduced to stubble of 1.5 inches or less. An average rating of 3 is generally regarded as an economic level of injury.

A root rating of 4 is assigned to a root system where the equivalent of a complete root node has been eliminated by rootworm feeding. This level of injury is economic and often results in extensive lodging, especially if wet soil conditions exist at the time of peak injury.

A root rating of 5 is assigned when the equivalent of two or more root nodes have been eliminated by rootworm feeding. At this level of injury, the entire stand will exhibit lodging and many plants will likely be lost.

Prevention of Rootworm Injury in Corn

Where first-year corn rootworm is not a problem, annual rotation of corn with an alternative crop will eliminate rootworm problems. If the first-year corn rootworm problem is present, corn following soybeans may be susceptible to rootworm injury.

Where a significant potential for rootworm injury is anticipated in continuous corn or first-year corn following soybeans, planting time or post-emergence application of a soil insecticide



Root system with severe injury rated 5 (left) next to root system with minimal injury rated 2.

as a preventive treatment will reduce rootworm injury. Use of an effective soil insecticide treatment is expected to reduce rootworm injury to an average level of less than a root rating of 3. Preventive soil insecticide treatments reduce the potential for injury but do not totally eliminate a rootworm infestation. As a result, rootworm injury in treated fields will increase proportionately to the level of initial infestation, and insecticide treatment failures may be anticipated where very heavy infestation occurs.

If field-specific site history on adult rootworm abundance is available, the rate of a soil insecticide treatment may be adjusted according to perceived risks. However, use of a soil insecticide at a rate lower than that recommended on the label may fail to achieve satisfactory control of rootworm. For specific information on soil insecticides labeled for control of corn rootworm, refer to OSU Extension Fact Sheet No. FC-ENT-0011-01, *Field Corn Insect Pest Management*.

Prediction of the Potential for Rootworm Injury in Field Corn

Potential rootworm injury may be estimated by monitoring the relative abundance of adult rootworm beetles from late July to early September in fields to be planted to corn the following year. Where corn is to be planted after corn, adult abundance may be evaluated by visual counts of beetles on corn or by using yellow sticky traps. Pherocon AM yellow sticky traps are preferred. Where corn is to be planted after soybeans, adult activity may be evaluated by sweep net sampling or by using yellow sticky traps.

In the case of corn following corn, the visual observation of one or more adult rootworm beetles per corn plant in a random sampling of 20 or more corn plants indicates a need to use a soil insecticide if corn is to be planted again at that site. In the case of corn following soybeans, the collection of two or more adult rootworm beetles per day per yellow sticky trap, where a minimum of four traps are used to monitor a field biweekly over a six-week period, indicates a potential for rootworm injury. For additional information on monitoring adult corn rootworm activ-

ity in field corn, refer to OSU Extension Fact Sheet No. FC-ENT-0017, *Monitoring Western Corn Rootworm Activity in Soybeans to Predict Rootworm Injury in First-Year Corn*.

Potential for Prevention of Losses from Rootworm and Additional Pests

The use of a soil insecticide for control of rootworm may provide stand protection against other soil-based pests or stalk protection against stem-boring pests, depending on the treatment selected. In Ohio, the protection provided by a soil insecticide may often be justified as cost effective where such use prevents more than one pest problem (e.g., rootworm plus cutworm or

wireworm). The control of only one pest problem may not justify the cost of the treatment.

For Additional Information

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