NORTHERN CORN ROOTWORM AND EXTENDED DIAPAUSE

WHAT YOU’LL LEARN

- Northern corn rootworm is one of the two prominent corn rootworm (CRW) pests in the Midwestern states.
- Extended diapause allows eggs to overwinter, remain dormant during summer, overwinter again, and hatch the second summer.
- The most notable CRW injury is damage to the root system. Adult CRW feeding is primarily focused on silk clipping, which can interfere with pollination.
- Successful CRW management is possible with multiple best management practices (BMPs).

IDENTIFICATION AND COMPARISON

The Northern corn rootworm (Diabrotica barberi Smith & Lawrence) (NCRW) and the Western corn rootworm (Diabrotica virgifera virgifera LeConte) (WCRW) are the prominent corn rootworm (CRW) pests in the Midwestern states. The NCRW adult is cream to tan in color upon emergence, but turns to pale green and is about 1/4 inch long (Figure 1). The WCRW adult is yellow to green in color, has black stripes on the wing covers, and is about 5/16 inch long (Figure 2). The male’s stripes usually appear wider and may coalesce. The females of the two species are generally larger than the males.

LIFE CYCLE

Both NCRW and WCRW have a similar lifecycle: egg, larva, pupa, and adult. The eggs of the two species overwinter and begin hatching in late May or early June. Carbon dioxide (CO₂), emitted from corn roots, provides an irresistible attractant for the larvae. While feeding for three to four weeks, the larvae pass through three growth stages or instars. After the last instar, pupation occurs and the adults begin to emerge in late July and August and start feeding on leaves, pollen, and silks.

NORTHERN CORN ROOTWORM EXTENDED DIAPAUSE

In a number of areas within the upper Midwest, NCRW has developed an adaptation known as extended diapause. This common adaptation, which is an ability to produce eggs that remain dormant for one or more growing seasons, is a significant feature that sets NCRW apart from WCRW. This positions the hatching eggs into many first-year corn fields following soybean. Without root protection, damage from larval feeding can become economically important. Areas in Iowa have been affected by this genetic variant more than other Midwestern states (Figure 3).

A Minnesota study conducted in 2002 to determine the potential yield loss resulting from NCRW extended diapause resulted in a 32 bu/acre loss. Farmers may not see this response in a typical field as the study was conducted in a field with heavy NCRW pressure.

Figure 1. Pale green to tan colorations of Northern corn rootworm adult.

Figure 2. Male (left) and female (right) of Western corn rootworm adults.

Figure 3. Locations on the map represent NCRW pressure where first year corn, following soybean, had economic damage from root feeding and silk clipping.*

*Affected fields were identified by farmer reports of down or lodged corn. Monsanto brand representatives or licensed retail agronomists scouted fields and confirmed NCRW as the predominant species. Root samples were extracted from affected fields and nodal injury scored. Often, Pherecon® yellow sticky insect trap cards were posted to document adult CRW numbers and species. Corn products were verified with farmers, traits checked, and validated as above-ground only or no rootworm B.t. traits. Often, fields had multiple seed brands and dots represent a myriad of seed corn brands.

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Oviposition, or egg laying, in the current corn crop can help determine management decisions two years away when a non-host crop is planted in the field.

**BEST MANAGEMENT PRACTICES**

Regardless of CRW species, effective management begins with scouting. Scouting information is invaluable in making decisions regarding the integrated approach for control tactics including crop rotation, planting of pyramided traits such as Genuity® SmartStax® technology corn products for CRW protection, and when warranted, use of foliar insecticides to control adult beetles.

- **Scout and Protect Roots** - The most notable injury from CRW larval feeding is the injury to the root system (Figure 4). Root injury subjects the plant to increased drought, compaction, inadequate fertility, and other stresses, and can increase the potential for significant yield reduction. Root lodging is also a possibility, which can make harvest difficult. In continuous corn operations where CRW populations are known to exist and where NCRW extended diapause variants were known to be present in a corn crop two years prior and root lodging occurred, Genuity® SmartStax® technology corn products should be considered. If non-B.t. protected corn products are planted into continuous corn situations or when extended diapause variants were known to be present in a corn crop two years prior and root lodging occurred, a soil applied insecticide (SAI) should be considered; however, SAI may be difficult to handle, require expensive application equipment that most growers who rotate are lacking, add costs, and have been known to be inconsistent in their performance. Additionally, root digs, which normally occur in late-July are imperative to help evaluate CRW larval damage and assess CRW management strategies. The Iowa State Node-Injury Scale can be used to evaluate feeding damage (www.ent.iastate.edu). Weeds and volunteer corn should be managed in soybean fields as pollinating weeds and corn can attract CRW beetles.

- **Scout and Protect Silks** - Adult CRW populations should be monitored around tasseling to determine if adult measures are warranted to protect silks from clipping (Figure 5). Silk clipping can prevent ovule fertilization, which results in aborted kernels (Figure 6). In some regions, the economic threshold of five beetles/plant may justify a foliar insecticide application to protect silks. University guidelines should be followed for the thresholds. Adult scouting can also help determine the potential for infestation in future corn crops.

**Sources:**


Developed in partnership with Technology Development & Agronomy by Monsanto. For additional resources on this topic, contact your local seed representative or visit your seed brand website.

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*Important IRM INFORMATION:** Genuity® RIB Complete® corn products do not require the planting of a structured refuge except in the Cotton-Growing Area where corn earworm is a significant pest. See the IRM/Grower Guide for additional information. Always read and follow IRM requirements. Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible. ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. Roundup Ready® crops contain genes that confer tolerance to glyphosate, the active ingredient in Roundup® brand agricultural herbicides. Roundup® brand agricultural herbicides will kill crops that are not tolerant to glyphosate. Genuity Design®, Genuity®, RIB Complete®, Roundup Ready® Technology and Design®, Roundup Ready®, Roundup® and SmartStax® are trademarks of Monsanto Technology LLC. LibertyLink® and the Water Droplet Design® is a registered trademark of Bayer. Herculex® is a registered trademark of Dow AgroSciences LLC. Respect the Refuge and Corn Design® and Respect the Refuge® are registered trademarks of National Corn Growers Association. All other trademarks are the property of their respective owners. ©2016 Monsanto Company. 1408215160453 041218LGM

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