NORTHERN CORN ROOTWORM AND EXTENDED DIAPAUSE

WHAT YOU’LL LEARN

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

IDENTIFICATION AND COMPARISON

The Northern corn rootworm (Diabrotica barberi Smith & Lawrence) (NCR) and the Western corn rootworm (Diabrotica virgifera virgifera LeConte) (WCR) are the prominent corn rootworm (CRW) pests in the Midwestern states. The two species are very similar; however, the NCR has developed a genetic variation known as the “extended diapause” variant.

The NCR adult is cream to tan in color upon emergence, but turns to pale green and is about 1/4 inch long (Figure 1). The WCR adult is yellow to green in color, has black stripes on the wing covers, 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 NCR and WCR 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.

EXTENDED DIAPAUSE OF NCR

A significant feature that sets NCR apart from WCR is its ability to produce eggs that hatch after a dormant period of two winters and one growing season. 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

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 NCR 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 NCR as the predominant species. Root samples were extracted from affected fields and nodal injury scored. Often Pherecon™ yellow sticky insect trap cards were also posted to document adult CRW numbers and species. Corn products were verified with farmers, trait 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.
have been affected by this genetic variant more than other Midwestern states. A Minnesota study conducted in 2002 to determine the potential yield loss resulting from NCRW extended diapause resulted in a 32 bu/a loss.3 Farmers may not see this response in a typical field as the study was conducted in a field with heavy NCRW pressure. 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 (BMPS)**

Successful CRW management is possible with multiple BMPS, including scouting, foliar insecticide applications when warranted, and by planting products with the Genuity® SmartStax® technology with dual modes of action for CRW in a comprehensive management plan. When extended diapause variants are present, additional management may be required.

**Scout and Protect Silks**

Five NCR beetles per plant is considered the economic threshold in some regions and may justify an insecticide application to protect silks.4 Silk clipping can cause catastrophic yield losses that can be easily prevented. NCRW can damage grain and set up a pathway for pathogens leading to several ear rot issues. Monitor adult populations around tasselning to determine if adult control measures are needed to protect silks and ears and to help predict infestation levels for the next corn crop. Manage weeds and volunteer corn in soybean fields (pollinating weeds and corn can attract beetles).

**Scout and Protect Roots**

Soil applied insecticides are hazardous, require expensive application equipment most growers who rotate are lacking, and add costs. Genuity® SmartStax® technology was more consistent than SAI per university data, provided CRW control for an average of $15/acre, and outyielded and had stands better than fields treated with SAI alone. Scout regularly for early-season larval feeding by conducting root digs to assess root damage.

**ROOTWORM LARVAL DAMAGE**

The most notable injury from CRW larval feeding is the injury to the root system (Figure 4). Root injury subjects the plant to increased effects from drought, compaction, fertility, and other stresses, and can increase the potential for significant yield reduction (Figure 5). Root lodging a possibility, which can make harvest problematic. Lodged roots cannot be seen above ground and can be caused by many factors; therefore, root digs are imperative to help assess CRW management strategies. Normally, root digs to evaluate CRW larval damage should take place in late-July. The Iowa State Node Injury Scale can be used to evaluate feeding damage (www.ent.iastate.edu).3 Adult CRW damage is primarily focused on silk clipping (Figure 6). As the beetles emerge from the soil and feeding begins, As silks begin to emerge, the beetles migrate to the silks and eat the silks, which can interfere with pollination. Ovules that are not fertilized cannot develop into kernels. Insecticides may be warranted if beetle populations have met threshold levels and pollination is still occurring. University guidelines should be followed for the thresholds.


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.