

Corn Rootworm Management

Corn rootworm (CRW) larvae and adults cause economic loss every year. The impact of CRW larvae on yield varies greatly depending on the timing of rootworm feeding, available moisture and the hybrid's ability to regenerate damaged roots. Plants with damaged root systems are more susceptible to drought stress and lodging. Adult CRW beetles feeding on corn silks during pollination can result in poor seed set and subsequent yield loss.

Corn rootworm management has become complex as the pest's ability to evolve has made crop rotation ineffective in many areas. The soybean variant western corn rootworm has evolved to lay eggs in non-corn fields. The northern corn rootworm has shown "extended diapause," in which eggs remain viable in the soil for several years before hatching. The recent documented resistance to the Cry3Bb1 protein further emphasizes the importance of an integrated pest management system. This article will discuss scouting for corn rootworm and management options for reducing damage from this pest.



Figure 1. Corn rootworm larvae.

Scouting for corn rootworm larvae

- Begin in early to mid-June, or when the corn is in the V6 to V12 growth stage.
- Dig up 2 plants at each of 5 locations with the soil from 6" to 8" around the plant. Sift soil over a sheet of black plastic looking for 1/32" to 1/2" long larvae.
- There is no economic threshold for larvae per plant; however, some consultants determine the need for emergency controls with an average of 2 to 3 larvae per plant using a visual search, or when 8 or more larvae are found using soil washing.
- If average length of larvae is > 1/2 inches or pupae are found, a rescue treatment may be too late.



Figure 2. Severe corn rootworm feeding damage.

Scouting for adult corn rootworm activity

- The western corn rootworm (WCRW) and northern corn rootworm (NCRW) are the most destructive species found throughout the mid-western U.S. and Canada.
- Adult emergence begins in early to mid-July with male beetles emerging before females.
- Evaluate fields for silk clipping. If pollination is in progress and the beetles have chewed back the silks so that less than 1/2 inch of silks is exposed beyond the husks, beetles should be controlled.
- To control adults before egg laying, examine 2 plants in 25 locations in the field. Treat if the number of beetles averages 0.75 or more per plant and 10% of females are gravid with eggs.



Western (L) and northern (R) corn rootworm beetles.

Management

Management of corn rootworm involves a scouting program that monitors larvae and adult beetle numbers, which predicts potential egg laying and future problems. Corn rootworms are able to rebuild their populations rapidly, so yearly scouting is a good practice. Depending on the level of rootworm feeding and beetle activity, there are several management options. It is important to incorporate several of these options to achieve effective control.

- **Crop rotation**
 - Management tool that can reduce corn rootworm pressure.
 - Ineffective in areas with soybean variant WCRW that lay eggs in non-corn fields or variant NCRW in which eggs may remain in the soil for several years before hatching (extended diapause).
- **Control rootworm larvae**
 - Use of a granular or seed applied insecticide at planting.
 - Poncho® 1250 (clothianidin, 1.25 mg ai/kernel) provides good control in fields with light to moderate pressure.
- **Suppression of larval development**
 - Use hybrids that contain a Bt trait for corn rootworm control.
 - Continuous corn fields or fields with moderate to heavy corn rootworm pressure should incorporate the use of corn hybrids that contain corn rootworm traits such as Herculex® Xtra.

- **Control corn rootworm beetles with insecticides**
 - Application of an insecticide is effective at reducing gravid egg-laying beetles.

When developing a corn rootworm management program, it is important to use a multi-level approach. Be sure to alternate modes of action when using insecticides. When using corn hybrids that contain Bt traits for corn rootworm control, it is essential that refuge acre requirements are followed. Failure to comply with refuge requirements and lack of control of adult beetles within the refuge acres will only accelerate the pest's ability to develop resistance. Resistance to the Cry3Bb1 toxin has been reported in fields that were planted to corn containing the Cry3Bb1 for as little as three consecutive years (Gassmann et al 2011).

Areas with high numbers of adult corn rootworm beetles should incorporate a beetle suppression program that utilizes foliar-applied insecticides. A beetle suppression program should help reduce the amount of egg laying and potential problems in the future.

Table 1. Insecticide treatments for adult corn rootworms (adapted from the University of Nebraska Entomology Department).

Mode of Action	Product Name	Common Name	Rate (Formulation per acre)	Restrictions / Comments
3 R	Asana® XL 0.66	esfenvalerate	5.8-9.6 fl oz	Field corn. May be chemigated.
3 R	Baythroid® XL	beta-cyfluthrin	1.6-2.8 fl oz	PHI 21 days for grain or fodder. REI 12 hrs.
1B R	Lorsban® 4E	chlorpyrifos	1-2 pts	Field corn, seed corn. May be chemigated.
3 R	Mustang® Max EC, Respect®	zeta-cypermethrin	2.72-4.0 oz	Apply in a minimum of 2 gallons/acre by air and 10 gallons/acre by ground.
1A	Sevin XLR	carbaryl	1-2 qts	Field corn and popcorn. See bee caution on label. May be chemigated.
1B, 3 R	Stallion®	chlorpyrifos + zeta-cypermethrin	3.5-4.7 fl oz	PHI 30 days for grain and 60 days for forage
3 R	Warrior II w/Zeon Technology®	lambda-cyhalothrin	1.28-1.92 fl oz	

IRAC Mode of Action Classification:

- Group 1 = Acetylcholine esterase inhibitors: 1A = Carbamates, 1B = Organophosphates
- Group 3 = Sodium channel modulators R = Restricted-Use Product

References

Gassmann, A.J., J.L. Petzold-Maxwell, R.S. Keweshan, and M.W. Dunbar. 2011. Field-evolved resistance to Bt maize by western corn rootworm. *PLoS ONE* 6(7): e22629. doi:10.1371/journal.pone.0022629.

Anonymous. 2011. Insecticide treatments for corn rootworm adults in field corn. University of Nebraska-Lincoln, Department of Entomology. Online at: <http://entomology.unl.edu/instabls/crwadult.shtml>

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