

USING CROP ROTATION AS AN INSECT MANAGEMENT TOOL IN CORN

If I have corn traits for insect protection planned for my field, will that break corn rootworm's lifecycle and lower their population?

It depends. Crop protection relying on a single trait (such as a single gene for a *B.t.* toxin) also relies on corn rootworm populations being susceptible to the toxin conferred by the trait. Populations of corn rootworm identified as being tolerant to a specific toxin can still be managed by corn products with multiple insect protection traits (in other words, multiple genes for multiple toxins). However, if corn rootworm populations have been increasing, resistance or tolerance to the toxins may only be part of the story.

In some regions, northern corn rootworm experiences an extended diapause, allowing them to circumvent the corn-soybean rotation strategy and emerge as larva when corn is planted again. The western corn rootworm has a behavioral variant and can feed on soybean plants and lay eggs in soybean fields. The larvae then hatch and feed on corn planted after soybean. These insects should be managed with (1) in-row insecticide, (2) crop rotation, and (3) insect protection traits, especially in areas with, or years following high insect activity.

Is a three-year crop rotation enough to diminish populations of insects that overwinter in the larval stages?

It is possible to diminish northern corn rootworm biotypes with extended diapause with longer crop rotations. Crop rotation is a cultural practice intended to interrupt insect life cycles and prevent building insect populations. Insects with an extended period of dormancy during some stage of development are difficult to control with a three-year rotation. Wireworms take three to six years to develop from eggs to adult beetles. Therefore, wireworms of all ages from multiple generations may be present in the top 24 inches of soil.¹

Why isn't crop rotation effective against more corn insects?

Crop rotation breaks the life cycle of insects with limited mobility and limited host plants between the harvest of the first crop and the beginning of the next crop. However, most insects have a period when they emerge from overwintering as adults and can fly across at least

a single farm. Corn earworm moths travel hundreds of miles from the south each year to re-infest fields in the Corn Belt.² These types of migratory insects are not as well controlled with crop rotation.

Crop rotation is used to manage corn rootworms because adult beetles feed on corn silks mid- to late-growing season and lay eggs in the soil at the base of the corn plants. At the beginning of the next growing season, newly hatched larvae feed on corn roots. So, there is limited mobility between harvest and the next crop. Corn rootworms rely on short rotations and continuous corn to build higher populations.

Pencil out the market prices, my most profitable crop to plant is corn. Is there still a way to manage insects with just a few profitable crop options?

Yes, corn traits and insecticides can be used to manage insects in the short term. This would be the case if corn is following corn or in short rotation with soybean. Over time, farmers can create more distance between the ideal habitats of an insect. Distance can be spatial or temporal.

A stacked crop rotation would create unpredictable diversity to inhibit insect population outbreaks. For example, an extra year during a typical corn and soybean rotation: corn-corn-soybean-soybean, creates confusion for insects and is the purpose of stacked rotations.³ In areas with high corn rootworm populations, a more complex rotation of wheat-wheat-corn-corn-soybean-soybean could be used because adaptation would be very difficult for an insect. Alfalfa would be the most intense rotation addition since it adds a three-year perennial.

Sources

¹ Glogoza, P. 2005. Corn insects of North Dakota affecting planting decisions. North Dakota State University. E-631 (revised).

² Stoner, K.A. 2012. Management of insect pests with crop rotation and field layout. Sustainable Agriculture Research & Education.

³ Nickel, R. 2014. Stacking crop rotation controls pests. Successful Farming. https://www.agriculture.com/crops/corn/production/stacking-crop-rotation-controls-pests_137-ar45188.

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ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. Performance may vary, from location to location and from year to year, as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible and should consider the impacts of these conditions on the grower's fields. ©2019 Bayer Group. All rights reserved. 2002_Q4