

# Continuing Evolution Of Field Resistance In Western Corn Rootworm Confirmed In Illinois



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## URBANA, ILL.

Last year, University of Illinois professor of entomology and crop sciences Extension coordinator Mike Gray reported some severe cases of rootworm damage to Bt hybrids expressing the Cry3Bb1 protein. This year, bioassays conducted at Iowa State University on the offspring of rootworms from these fields confirmed resistance to Cry3Bb1 protein in Illinois.

The fields in which severe root pruning and lodging were observed had been in continuous corn production systems for many years. The producers had consistently relied upon the use of a single trait (Cry3Bb1).

"Problems observed in these fields were similar to those that Aaron Gassmann at Iowa State University observed in some Iowa fields in which resistance to the Cry3Bb1 protein had been confirmed in 2011," said Gray (see <http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0022629>).

To determine if there was resistance in the Illinois fields, Gray collected adults from the fields, which were located in Henry and Whiteside counties in northwestern and north central Illinois. He sent them to Gassmann, who conducted bioassays on the larvae of mated adults and on control (never exposed to Bt proteins) western corn rootworm larvae.

"I shared the results from Dr. Gassmann's laboratory with audiences at the 2012 Agronomy Day on campus," Gray said. "The findings from Illinois mirror those that he published last year concerning some problem fields in Iowa."

Survivor rates for the Illinois larvae were the same on Cry3Bb1 root tissue as they were on the isoline tissue (no Cry3Bb1 expression). They remained susceptible to the Cry34/35Ab1 protein. The control larvae (never exposed to Bt proteins) remained susceptible to both Cry3Bb1 and Cry34/35Ab1 proteins.

In light of these results, growers who have experienced less than satisfactory performance with a Bt hybrid, and growers who want to avoid a future problem with a Bt hybrid, should consider the following recommendations.

- Rotate to soybeans or another non-host crop.

- Use a corn rootworm soil insecticide at planting, along with a non-Bt hybrid.

- Use a Bt hybrid that expresses a corn rootworm Cry protein that is different than the one expressed by the Bt hybrid that performed poorly in 2012 or that has been in use for several consecutive years.

- Use a pyramided Bt hybrid that expresses multiple Cry proteins targeted against corn rootworms.

- Most important, use a long-term, integrated approach to corn rootworm management that includes multiple tactics.

"I am particularly concerned about the escalation of soil insecticide usage with Bt hybrids for corn rootworm protection," Gray said. "This seems to be becoming a very common practice in many Corn Belt states."

One of the primary benefits touted when rootworm Bt hybrids entered the market place in 2003 was that soil insecticides could be reduced and maybe eliminated. Even though commodity prices have increased, so have seed costs, and now many producers are adding another input cost – that of a soil insecticide.

"One other very strong concern that I have, along with many of my entomology colleagues, is the increased selection pressure that is being placed on the Cry34/35Ab1 protein in areas of the Corn Belt where resistance has been confirmed to the Cry3Bb1 protein," Gray added.

"Pyramided hybrids that are being used in these areas continue to work reasonably well; however, one protein, Cry34/35Ab1, is providing the primary control," he continued. "Moreover, the required refuge for these pyramided Bt hybrids has been reduced from 20 percent to a 5 percent seed blend." Even though a seed blend (refuge-in-a-bag) is a preferred resistance management strategy for corn rootworms, Gray said that he remains concerned about the reduction in refuge.

"The western corn rootworm remains a versatile insect foe," Gray concluded. "It has adapted to many classes of insecticides, crop rotation, and to this relatively new transgenic technology. Producers will need to employ a well-conceived, integrated-pest-management approach to stay one step ahead of this insect." Δ