Transgenic Revolution

Potential For Resistance Spurs Utilization Of 20 Percent Refuge

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A transgenic revolution has occurred in agriculture, dating back to 1996 when the first Bt hybrids came to the marketplace. Dr. Mike Gray, professor of entomology with the Department of Crop Sciences University of Illinois, detailed the revolution at the recent Dixon Springs Field Day.

Those early Bt hybrids were bred to control European corn borer. There was a very rapid increase in the use of that technology from 1996 to today.

"If you look, for instance, in Illinois in 2006, about 19 percent of the corn that was planted was a stacked hybrid containing maybe a herbicide tolerant trait as well as a Bt event," he pointed out. "Then just one year later, in 2007, the use of stacked hybrids in Illinois went up to 40 percent, so we saw doubling in the use of that technology. We've all seen again a tremendous adoption of the herbicide tolerant soybeans that are dominant now throughout the midwest.

Gray continued to compare this revolution, in terms of how pests, insects and weeds are managed with what happened following World War II when there was a very successful use of the corn aided hydrocarbon insecticides that were used against a number of insect pests.

"We saw the use of the herbicides really being highly effective as well against a number of important weeds, especially with the movement away from cultivation," he said. "I compare the two revolutions and point out that despite some very spectacular successes early on with DDT and some of the other corn aided hydrocarbons, that eventually some problems began to surface – unwanted residues on fruits and vegetables, biomagnification of some of the corn aided hydrocarbons in the food chain and, ultimately because of overuse, resistance."

One thing Gray discussed was his concern of the potential for development of resistance.

"Obviously there have been a lot of benefits with the use of transgenic plants where we're not seeing the unwanted residues on food and that's a real plus, or we're seeing certainly in corn reductions in insecticide use and I think that's a plus from an environmental, human health and safety vantage point," he said. "So the primary concern with transgenic crops is an overuse of a technology in some cases and that increases selection pressure and potential for resistance development."

He reminded the audience of the importance of the 20 percent refuge to make sure there are survivors which can mate with any rare individual that does survive in a Bt field. He made a point of reenforcing those points.

Gray ran through a checklist of the different products that are in the marketplace to control resistance, such as the Herculex hybrids, the Yield Bred hybrids, and the AgriSure hybrids.

"I wanted to make sure farmers knew what proteins were being expressed in those hybrids and what insects those proteins would target," he said. "I reminded them the western corn
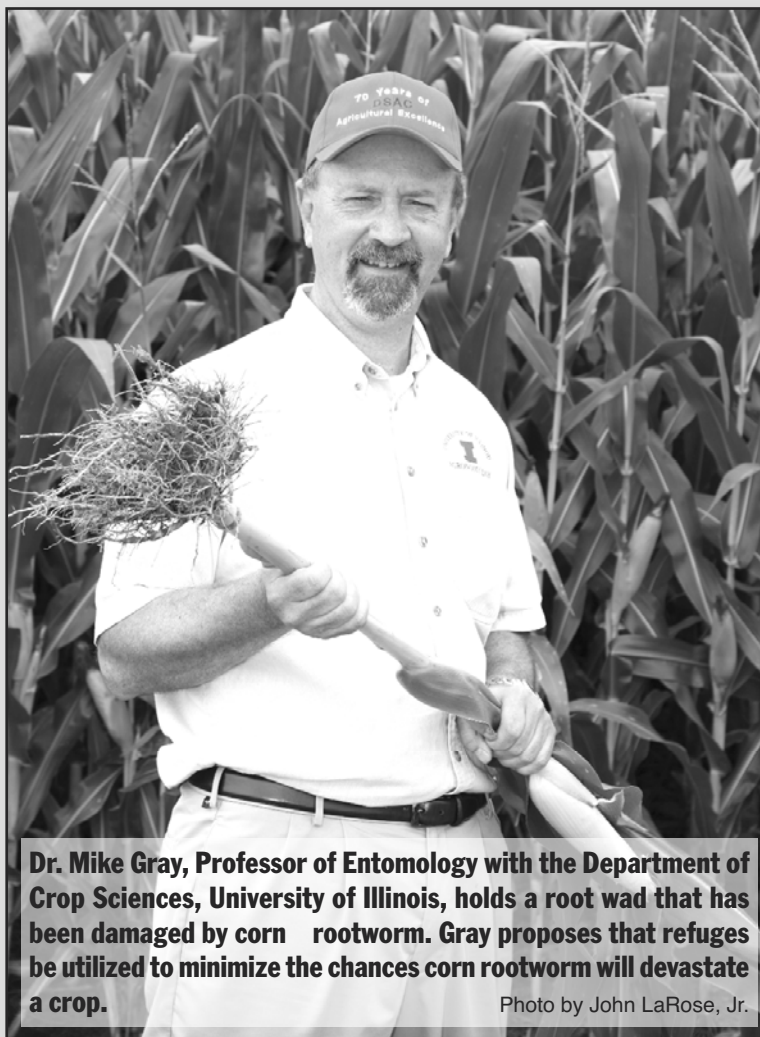
Dr. Mike Gray, Professor of Entomology with the Department of Crop Sciences, University of Illinois, holds a root wad that has been damaged by corn rootworm. Gray proposes that refuges be utilized to minimize the chances corn rootworm will devastate a crop.   Photo by John LaRose, Jr.

rootworm evolved in a way to circumvent the benefits of crop rotation and this was an insect we used to control just by rotating corn and soybeans. As we now know, back in the mid 1990s a variant of the corn rootworm took advantage of the regular rotation of corn and soybeans and instead of laying their eggs exclusively in corn began to lay their eggs in the soil of soybean fields. The eggs overwintered and the following year in that first year corn field farmers began to see some very significant root damage.

"So if this is an insect that can adapt to a control like crop rotation I think we need to be at least leary and respectful that similarly the prospect is out there for resistance at some point if we don't utilize refuges like the EPA mandates," Gray concluded.   Δ