Adopt resistance management to save potato insecticides

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The Colorado potato beetle is a survival expert, developing resistance to just about every pesticide growers adopt.

Clemson University; bugwood.org

The Colorado potato beetle has an ability to overcome most insecticides.

Even the neonicotinoids that provided an astonishingly long 16-year respite are now showing signs of weakness.

But while neonicotinoid resistance is an industrywide concern, the situation isn't dire—yet. Careful pesticide rotations and a return to more management-intensive practices should help keep the pest in check.

Among pests worldwide, only the diamondback moth tops Colorado potato beetle in its ability to generate pesticide resistance, says Russ Groves, Extension vegetable specialist at the University of Wisconsin in Madison. "So [neonicotinoid resistance] is no surprise."

Act now to slow resistance

Resistance can appear with unsettling speed.

Long Island's beetle populations, for instance, are notorious, sometimes showing signs of resistance in the same year a chemical is introduced, he says. Imidacloprid managed to retain effectiveness for about four years there.

But full-blown neonicotinoid resistance is still intermittent, with well over half the country's potato growers continuing successful use, Groves says.

Season-long control is diminishing, however. A single application at planting once provided 100 days of control, Groves says.

"Now we're doing well to get 50."

"It's still manageable," says Mark Otto, president of Agri-Business Consultants Inc., a Lansing, Mich., company specializing in potato management. A third of his clients have fought serious neonicotinoid resistance since 2004.

This past season he sprayed 50 percent more acres, which he suspects is due less to jumps in resistance than to the season's weather delays.

But the incidents popped up in new areas, sounding warnings for the future.

Zsofia Szendrei, assistant professor of entomology at Michigan State University in East Lansing, has taken over the 12-year national bioassay on Colorado potato beetles. Counts of resistance show up as an exponentially increasing curve, but in 2007 it climbed steeply.

"We're not back to the days of flaming fields or manually removing beetles," Szendrei says.

Other pesticides and practices can fill in the gap.

"Neonicotinoids have been around so long growers have gotten into the habit of applying it once," at planting, she says. "They've never had to apply foliar sprays."

Take an integrated approach

But more options, in different chemical classes, are now available, says Ed Grafius, professor emeritus and Szendrei's predecessor at Michigan State University. The downside is that they typically cost more and aren't as easy to use.

Growers don't have the luxury of complacency, however.

"You're not supposed to practice resistance management once it's biting at your heels," Groves says.

Newer foliar sprays, including spinosads, insect growth regulators such as novaluron, and abamectin and other mectins are effective options against the first beetle generation, he says. That frees up neonicotinoids for a foliar application against the second generation.

Rotating chemistry classes through the season is vital. If you apply a neonicotinoid at planting, use anything but a foliar neonicotinoid later, says Andrei Alyokhin, associate professor of applied entomology at the University of Maine in Orono.

Abandon the idea of killing every beetle in your fields, Alyokhin says. That only increases the survival chances of resistant genes.

Instead, aim for manageable population levels that minimize economic losses.

Potato plants can tolerate considerable defoliation by the beetle—as much as 30 percent, depending on variety and environmental conditions—without a drop in yields, he says.

Watch your fields closely. The earlier you spot problem numbers, the easier the solution will be, Alyokhin says.

"The biggest concern isn't what the beetle is doing today," but the threat from subsequent generations, Grafius says.

Timing is critical. "You make far fewer mistakes when you [apply imidacloprid or thiamethoxam] at planting and it works," Otto says.Make a mistake—as happened in a couple of his fields last year—and in as little as a week the larvae may be burrowing into the ground to pupate. "Then you fight problems the rest of the season," he says.

Summer generations fly more as adults than overwintering adults, he says.

That could take them into new fields, undermining a trait growers have relied on to slow the beetles' spread: They don't fly far, preferring the ground.

Location, location, location

Wherever possible, planting at least a quarter-mile from other potato fields and maintaining strong crop rotations can limit new infestations, researchers say.

Achieving adequate field separation can be a tricky exercise in choreography with neighboring farms, Groves says. But "it can go a tremendous way to minimizing" problems with Colorado potato beetle.

"Even across the road is better" than directly adjacent fields, Alyokhin says.

Trap-cropping is another useful control strategy. Before planting the crop, plant a ring of sacrificial potatoes around the field to attract overwintering beetles when they emerge, Szendrei says.

"The beetles come out as soon as they smell the potatoes," she says. "It's hard to find anything more attractive [to them] than the potato."

Tomato, eggplant and wild nightshade are the other primary hosts.

Spray the trap crop as soon as the pest concentrates there.

Strike early, save later

An early attack with high pest mortality means fewer sprays over the entire season, she says.

The practice has allowed Otto's clients to drop one foliar insecticide application on their crop. With costs for each spray between $15 to $30 per acre, the effort is "worthwhile," he says.

The beetle's devastating impact on potatoes stems from its strong preference for the plant, its ability to reproduce on a large scale and its few natural enemies, Szendrei says.

Researchers are looking into mulches and pheromones as additional aids, while an MSU breeder is trying to develop new varieties that are less attractive to the pest.

"We can't rely on some future silver [pesticide] bullet to replace what's being used currently," Alyokhin says. "We have the tools. We just

have to use them judiciously."

For an easy to use chart of crop protection materials and chemical classes, visit the ***National Potato Council****.*

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