

## Bt-Corn Pollen Can Kill Monarchs

Eating pollen from corn plants genetically engineered to make their own pesticide can kill larvae of monarch butterflies, according to a Cornell University study.

The results raise doubts about a supposed smart bomb in the pesticide arsenal, the Bt toxin. Biotech companies sell corn carrying the toxin gene, designed to protect the crop from moth caterpillars with minimal collateral damage to bees and other beneficial insects.

In a laboratory test, about half of the monarch caterpillars died after 4 days of munching on leaves dusted with Bt-corn pollen, report Cornell's John E. Losey and his colleagues. All the caterpillars that ate regular corn pollen survived, the researchers note in the May 20 *NATURE*.

"We don't know how big the risk is," Losey cautions. More tests need to answer such questions as how much pollen coats leaves in the real world and whether wild caterpillars avoid coated leaves, he says.

The Bt toxin, discovered in the bacterium *Bacillus thuringiensis*, kills its victims by perforating their guts. In 1996, Novartis Seeds of Golden Valley, Minn., introduced corn souped up with the Bt gene to fight corn borers. By 1998, up to 16 million of the 80 million acres of corn harvested in the United States carried some form of the gene, according to Monsanto Co., a St. Louis firm that licenses the technology behind Bt corn.

Earlier tests did not explore Bt effects on monarchs, says Cornell's Linda S. Rayor, a coauthor of the new study. The caterpillars eat leaves only from milkweed, which thrives along roadsides and field edges. Rayor lives near a cornfield and can testify that corn, which is wind-pollinated, sheds pollen beyond field borders.

Other butterfly caterpillars feed near fields, too. "I think there's a really good chance the pollen affects less charismatic species," she says.

Losey points out that previous work had already raised questions about Bt's safety. Lacewings are not fazed by direct exposure to Bt, but they languish from indirect effects, say Angelica Hilbeck of the Swiss Federal Research Station in Zurich and her colleagues. In the April 1998 *ENVIRONMENTAL ENTOMOLOGY*, they reported that 1.5 times as many lacewings died when fed Bt-eating corn borers than when they dined on Bt-free caterpillars.

That study did not kick up the fuss now arising from the Cornell research. Monsanto spokesman Randy Krotz acknowledges that he's tied to the phone answering questions. "Remember where we're coming from," he urges. Earlier pesticides used to control corn borers killed a wider spectrum of creatures, he points out. Also, he emphasizes that the Losey team just estimated real-world pollen exposure by eye. "It's not very likely you're going to have mortality in the field," Krotz predicts.

Monarch specialist Karen S. Oberhauser of the University of Minnesota in St. Paul remains concerned. "[The study] certainly demonstrates there's a clear potential for harm," she says.

Biological control specialist John J. Obrycki of Iowa State University in Ames agrees. "John's work is real drama-tic," he says of Losey's research. The results fit with preliminary data from Obrycki's student Laura C. Hansen. About a quarter of monarch larvae died after 1 day of munching on pollen-dusted leaves collected near Bt-corn fields.



Kent Loeffler

A monarch caterpillar dines on a milkweed leaf dusted with corn pollen.

Obrycki also questions the argument that Bt corn is a lesser evil than old pesticides. That may be true where farmers irrigate corn fields and create green paradises for pests. Iowans generally don't do that, he says, and only about 2 percent of the state's cornfields get sprayed for borers. If farmers plant Bt corn on more acres, he worries, "you've added a significant new risk to monarchs."

—*S. Milius*