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Crops That Shut Down Pests' Genes

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Monsanto is developing genetically modified plants that use RNA interference to kill the insects that eat them.

By Katherine Bourzac

Monday, November 05, 2007

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Researchers have created plants that kill insects by disrupting their gene expression. The crops, which initiate a gene-silencing response called RNA interference, are a step beyond existing genetically modified crops that produce toxic proteins. Because the new crops target particular genes in particular insects, some researchers suggest that they will be safer and less likely to have unintended effects than other genetically modified plants. Others warn that it is too early to make such predictions and that the plants should be carefully tested to ensure that they do not pose environmental problems. But most researchers agree that it's unlikely that eating these plants would have adverse effects on humans.

Corn that bites back:
Genetically modified corn made by Monsanto silences genes in the insects that eat its roots, slowing and eventually killing them. The normal corn root system on the left has been nibbled by corn rootworm; the hardy root system on the right is from a genetically modified corn plant.
Credit: Monsanto

RNA interference occurs naturally in animals ranging from worms to humans. It's a process whereby double-stranded RNA copies of specific genes prevent cells from translating those genes into proteins. The new genetically modified plants carry genes for double-stranded RNA targeted to particular insect genes. Two papers published concurrently in *Nature Biotechnology* this week show that in some insects, eating double-stranded RNA is enough to cause gene silencing. This is surprising: in previous research, RNA interfered with organisms' gene expression only when it was injected.

"People have been trying this, but there have been no reports of success before," says Karl Gordon, a research scientist in entomology at the Commonwealth Scientific and Industrial Research Organisation, in Canberra, Australia. The recent work, he says, is the first to demonstrate the promise of RNA interference as a means of pest control.

Researchers at the Chinese Academy of Sciences, in Shanghai, made cotton plants that silence a gene that allows cotton bollworms to process the toxin gossypol, which occurs naturally in cotton. Bollworms that eat the genetically engineered cotton can't make their toxin-processing proteins, and they die. Researchers at Monsanto and Devgen, a Belgian company, made corn plants that silence a gene essential for energy production in corn rootworms; ingestion wipes out the worms within 12 days.

The most effective genetic approach to pest control has been to make plants that produce a protein called Bt toxin, which causes insects to slow down, then stop eating crops, then die. More than 120,000 square miles of crops genetically engineered to produce Bt were grown last year. But Bt isn't effective against many pests, including corn rootworm, which can cause such extensive damage to corn plants' root systems that the plants blow over in the wind. And researchers are concerned that insect pests are becoming resistant to Bt.

"We need a way to come around resistance to Bt," says Abhaya Dandekar, professor of pomology at the University of California, Davis. RNA interference is attractive, he says, because insects are unlikely to become resistant to it. "The only way to go around RNA interference is to shut down the whole system." What he means is that the new plants take advantage of a gene-silencing mechanism that the insects' bodies already use: RNA interference is thought to be a critical part of insects' and

other animals' immune systems. Insects that shut down RNA interference in order to safely eat genetically engineered plants would probably get sick, says Dandekar.

Another drawback to Bt is its nonspecificity. The toxin may have what are called off-target effects: it can kill insects that pose no threat to crops.
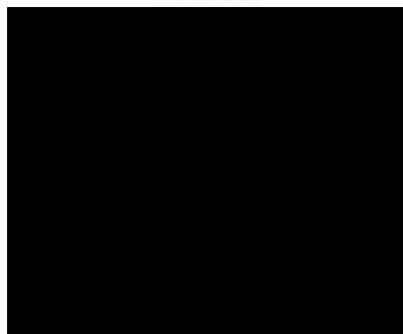
RNA interference, says Ty Vaughn, a researcher at Monsanto, "can be species specific," allowing for "a higher level of control." Other researchers agree and say that Monsanto has, so far, demonstrated a high level of specificity. "They should be able to avoid nonspecific, off-target effects," says Gordon.

But other researchers warn against jumping to that conclusion too soon. "RNA interference to control pests is an interesting idea, but it's important to understand the ecology," says Bernard Mathey-Prevot, director of the Drosophila (fruit fly) RNA Interference Screening Center at Harvard Medical School. "It's very hard to know in advance whether other insects might be targeted."

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o

..drawback to Bt is its nonspecificity.

No quotation nor citation regarding this pantload. Bacillus thuringiensis sp. are target organism specific; they affect larval guts. Non-target effects are "scientifically qualified" as nil. Principle drawbacks: Bt must be applied; application must coincide with pest activity; and, Bt must be ingested.

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bee-t
Thanks RevTech for beeing so specific.

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Re: bee-t
LOL
Try mites and a virus combo.
Now if they'd only really work on it!!
In the mean time we need someone spreading other species of bee to fill the void thats bee-ing left!!
Its doubtfull that moving species to other areas will cause more problems than cures.

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McMillan96...
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Posts:38
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possibilities
    What if the ingesting of these plants, later, causes problems for the ones who ingested them? Just as it does for the insects it is intended to stop?!
    Saying it has been tested, only proves that it hasn't caused a problem YET!

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wisewolf
11/12/2007
Posts:1

Trust
Science aside trusting Monsanto to actually do the right thing by the consumer is a joke. They are developing for patent rights and then of course profit. Read more about how they are locking up what farmers can and cannot grow. By removing the diversity of crops Monsanto is taking us down a road that could very well destroy that which feeds us all. I cannot speak for this process and I am a great fan of science but Monsanto does not have a good track record as far as I'm concerned. If you believe otherwise you are an idiot.

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