

ANALYSIS

Critics slam new Monarch *Bt*-corn data

The world's media are, it seems, becoming immune to scare stories about the effects of GM crops on monarch butterfly populations. The latest research published in the German journal, *Oecologia*, following a two year study on small scale plots at Iowa State University, predicts that pollen from transgenic corn expressing toxin derived from *Bacillus thuringiensis* affects survival of monarch larval "at least 10 metres" from the field border. Although the work still falls well short of being a true field study, it is greatly more substantial than the preliminary laboratory experiment published in *Nature* last year by researchers at Cornell University (*Nature* 399, 214). Despite this, and despite the dearth of real news in the media's traditional "silly season" of August, the Iowa work has attracted considerably less media attention than the earlier paper. Industry commentators and a number of entomologists involved with a broad international field survey to examine the effects of *Bt* corn on the monarch butterfly have leveled detailed criticism at the Iowa work.

In the *Oecologia* study, the Iowa researchers, John Obrycki and Laura Hansen, placed potted milkweeds—the monarch larva's preferred food—in small plots of corn and, through multiple sampling, assessed the level of pollen deposition on leaves of the milkweeds at various distances from the crop. In the laboratory, they fed newly hatched monarch larvae on small discs cut from the leaves exposed in the field. Using those "field" results, they deposited field-collected pollen in controlled amounts onto discs cut from other milkweed leaves. In these separate experiments, monarch larvae less than 12 hours old and 12–36 hours old were placed on the discs and their survival was followed over a period of 120 hours.

The study is, in principle, a great improvement over the earlier work at Cornell. Firstly, it has proper controls: the researchers compared the effects of two types of *Bt* transgenic corn—Novartis' event 176 "KnockOut" and event Bt11 "YieldGard"—with those of two virtually isogenic, but non-*Bt* varieties. Secondly, the researchers made careful measurements of the level of pollen in "the field" and applied those measurements carefully in the laboratory. Thirdly, they attempted a 100-fold dose-escalation study to examine the effects of the pollen deposited at 14, 135, and 1300 grains per square centimeter. Fourthly, they measured the levels of *Bt* toxin in the pollen.

Unfortunately, the work appears to fall down both in its execution and its interpretation. As the authors themselves point out, for instance, there are huge discrepancies between the toxin levels in pollen that they

measured and those from replicated measurements accepted by the US Environmental Protection Agency (EPA; Washington, DC). For Bt11 corn, the level is over four times higher (0.39 versus 0.09 $\mu\text{g/g}$). For event 176 corn, on the other hand, their measured toxin levels are over four times lower than the EPA-accepted figures. Moreover, Obrycki and Hansen detected *Bt*-toxin concentrations of 0.052 $\mu\text{g/g}$ of pollen—half the accepted figure for Bt11—in pollen collected from the "non-*Bt*" variety, 4494. Unsurprisingly, perhaps, the data shows that high doses of this non-*Bt* variety have the same lethality to larvae as high doses of event Bt11 transgenic corn.

The dose-escalation studies also produced some odd results. A critique of the paper prepared by entomologists Mark Sears at the University of Guelph (Ontario, Canada) and Anthony Shelton at Cornell University (Geneva, NY) points out that there was 40% survival of monarch larvae exposed to event Bt11 pollen at doses of both 135 and 1300 grains per cm^2 . "It is very unusual," say Sears, "that a dose 10 times lower would produce the same effect."

The broader criticism of the Iowa work is that that it comes nowhere near to replicating field conditions. Val Giddings, the agricultural biotechnology specialist at the industry lobby group, the Biotechnology Industry Organization (BIO; Washington, DC), claims that "The *Oecologia* paper is not truly 'field research'...much of what it reports is based on analyses taking place in laboratory manipulations rather than field conditions."

Expanding on this, Sears and Shelton maintain that the results of true field trials will be affected by factors such as "moisture on the leaf surfaces, variable temperature and humidity, degradation of the pollen by sunlight, microorganisms, rainfall, wind, natural dispersal and behavior of monarch larvae, predation, and a host of other ecological factors." They argue that some or all of these factors will affect larval mortality, possibly to the extent that they will overshadow any effects of *Bt* toxin from the pollen.

BIO's Giddings said that the implication by Obrycki and Hansen that *Bt* corn has a negative effect on monarch butterflies was difficult to reconcile with what is, in effect, the largest field trial possible: "Last year, more than 28 million acres [of North America] were planted with *Bt* corn, an increase of approximately 40% over the previous year," he said. "In the same time period, the monarch butterfly population flourished and increased by about 30%, according to [the environmental monitoring group] Monarch Watch."

Sears and Shelton point to a series of field trials that are taking place within an international program that involves scientists from Maryland, Minnesota, Iowa, Nebraska, Pennsylvania, Ontario, Canada and elsewhere, the first year results of which have been discussed at several scientific meetings. The preliminary data from those wider studies indicate, they say, that *Bt* corn does not pose a significant threat to monarch populations.

John Hodgson

Internet chat damages biotechnology stocks

State officials in Massachusetts and a New Jersey biotechnology firm are seeking unspecified financial penalties against three men accused of posting defamatory Internet postings about Biomatrix (Ridgefield, NJ), a developer and manufacturer of hyaluronan polymer-based products, and two divisions of Genzyme (Cambridge, MA)—Genzyme Tissue Repair and Genzyme Surgical Products. The move follows a ruling in July by a superior court judge in New Jersey that found the men had defamed Biomatrix and two top officials—the first time a court has ruled online material capable of libel. Analysts and industry officials say biotechnology companies are particularly susceptible to attacks by cyber-hoaxers because the

value of companies—the majority of which don't have products—are difficult to assess by non-professional investors. However, some are unconvinced that the depreciation in stock was due to the hoaxers.

On August 22, Massachusetts Secretary of State William Galvin announced he was seeking a "cease-and-desist" order against the men, and that he would be turning over the results of an investigation by his Internet fraud unit to the US Attorney General, the Federal Bureau of Investigation, and the Securities and Exchange Commission, according to Brian McNiff, a Galvin spokesman in Boston.

Between April 1999 and July 2000, the men, who used more than 15 online identi-