More False Promises

Genetically Engineered Insecticidal Crops & Pesticide Use

Monsanto, Aventis and other biotech corporations have genetically engineered crops, such as corn, cotton and potatoes, to produce their own insecticide. The biotechnology industry maintains that these insecticide-producing crops will dramatically reduce the amount of pesticides that farmers spray. At first glance, this might seem to make sense— and in fact, there may be a drop in pesticide use in some cases in the short run. But to determine the true impact of insecticidal crops on pesticide use, we must examine both short- and long-term effects. We must not only determine whether farmers are spraying fewer pesticides on their fields today, but we must also look ahead to see what impacts these crops may have on future pesticide use.

Through advertisements and news stories, corporations portray insecticidal crops as an alternative to toxic pesticides, but in reality, these crops are just another case of "business as usual" for biotechnology/pesticide companies and do not represent a shift towards a more sustainable type of agriculture.

Biotech companies are pesticide companies and are trying to sell a new technology.

Real alternatives that will lead to ecologically sound methods of growing our food and fiber do exist. Farmers and researchers around the world are continuing to develop ways to grow crops that don't require genetic engineering or hazardous chemicals — sustainable farming methods, such as multi-year crop rotations, that reduce pests and the need for pesticides without threatening our environment or human health. The use of genetic engineering is but one more attempt to find a technological fix to prop up an ailing system of industrialized agriculture.

• What are insecticidal plants?

To date, all commercialized genetically engineered insecticidal plants produce a type of Bt toxin, one of a family of related molecules produced by a soil bacterium, *Bacillus thuringiensis* (Bt). To develop what are known as Bt crops, a company clones the insecticidal gene from Bt and inserts it into a crop plant. The plant then produces its own toxin in most, if not all, parts of the plant through all or most of a growing season.

While there is some experimentation on other types of insecticidal plants, companies have not had much success to date.

• What is Bt?

Bt is a natural pest control product that is relatively safe and effective against many serious agricultural pests. For more than 50 years, conventional and organic farmers have used Bt in spray form to control insect pests. Toxins in Bt sprays break down rapidly in the environment and do not persist in water or accumulate in the food chain. Now, because of widespread use of Bt crops in which the Bt does not break down and increased insect exposure to the toxin, insect resistance could develop and this valuable pest management tool could be lost. (See below.)

• What types of Bt crops are being grown in the United States?

Corn and cotton. Although Bt potatoes are also approved by the U.S. government, Monsanto, the company that developed the crop, has withdrawn the potatoes from the market. Other Bt-producing crops that have been field tested in the U.S. but are not yet commercialized include canola, rice, soy, tomatoes and walnuts.

• Are farmers spraying fewer pesticides on Bt crops than conventional crops?

We must first recognize that there are many factors that affect the use of pesticides, such as variations in weather or pest problems. Other conditions such as seed or fertilizer prices may also influence how a farmer uses pesticides, whether the farmer planted Bt crops or not.

While some farmers in various parts of the U.S. who planted Bt crops have used fewer pesticides, many experts agree that it is not possible to make sweeping generalizations that Bt crops reduce pesticide use, even in the short run.

Bt corn

For example, take the case of Bt corn. This Bt crop was developed to control the European corn borer (ECB), and was grown on over 19.8 million acres in 1999 in the United States. Yet, a recent study in the journal *Bioscience* found that Bt corn does not significantly reduce insecticide use in most of the corn growing areas of the Midwestern United States. The study revealed that although there was a significant increase in the amount of Bt corn that was planted in the past five years, the percentage of field corn treated with insecticides has remained about the same—30%. Researchers found that farmers were using Bt corn in addition to pesticides, rather than as a replacement.[1]

Bt cotton

Bt cotton is often given as a prime example of the benefits of Bt crops. Cotton is notorious for requiring large doses of insecticides, and Bt cotton has enabled some farmers to reduce the amount of chemicals sprayed on their crops. In states where many farmers have opted to plant Bt cotton, there appears to be an initial reduction in insecticide use.

However, we must put this reduction in context. It seems likely that short term reductions will not be sustainable.

Insect resistance has been a recurring problem for cotton farmers around the world. Historically, nearly all new insecticides and other cotton pest management technologies appear to work well in the early years following introduction, but as time goes on, farmers encounter increasing insect resistance. It seems highly likely that short term reductions in pesticide use brought about by Bt cotton will not be sustainable. (See below for more on insect resistance.)

• Why won't Bt crops reduce pesticide use in the long term?

The primary reason that Bt crops will not fulfill the corporations' promise of reduced pesticide use is the high likelihood that insects will become resistant to Bt toxin—resulting in a return to synthetic pesticide use and loss of Bt sprays as a valuable pest management tool for both conventional and organic farmers.

But, there are other reasons as well—such as an increase in non-target pests and reduction in beneficial insects. In addition, some farmers in some areas are noting an increase in secondary pests that used to be controlled by pesticides but are not controlled by Bt crops

• How will the insect pests become resistant to Bt crops?

Bt crops produce the toxin throughout much, if not all, of the plant's life. The pests' ongoing exposure to Bt encourages development of resistance to the toxin. This happens because the individual insects not killed by the Bt will survive and reproduce. Over many generations, the number of resistant pests increases. This change in the pest population can result in a loss of effectiveness for both Bt crops and sprays. Scientists generally agree that widespread use of Bt crops could lead to insect resistance in a few years.[2]

• If Bt has been in use for over 50 years, why haven't insects become resistant to the sprays?

The lack of widespread resistance has probably been due to a combination of factors, such as relatively low levels of use and the fact that Bt sprays do not persist in the environment resulting in a low level of exposure for insect pests. In addition, Bt sprays have been used primarily by organic farmers or conventional farmers who use a system of integrated pest management (IPM). These farmers use the spray selectively—only at times when pest pressures reach a certain threshold—rather than at regular intervals whether they need it or not.

Recent reports have shown that some resistance to Bt spray has developed. It appears, however, that resistance is a problem in areas where farmers use the sprays in the same way they use synthetic pesticides—spraying regularly with little time between treatments, and using the sprays continually over long periods of time.

• What are the government and corporations doing to stop development of insect resistance?

In an effort to stop insects from developing resistance, the U.S. Environmental Protection Agency (EPA) required corporations to develop what are known as "resistance management plans." These plans rely on two key factors: Bt crops delivering high doses of Bt toxin and farmers planting nearby non-Bt plants or refuges. The idea behind this strategy is that the high dose will kill most pests and those that are resistant will breed with insects in nearby refuges, "diluting" their resistance.

There are several problems with this strategy, however. For example, Bt cotton does not produce a high dose against the cotton bollworm, one of the target pests.[3]

Some data have shown that not all Bt crops deliver the high dose that the strategy depends on. In addition, the plan requires that farmers provide refuges that are an adequate size and placed in close proximity to Bt crops. A biotechnology industry survey published in January 2001 indicates that this may not always be the case. According to the survey, nearly 30% of farmers who grew Bt corn in 2000 did not follow the resistance management guidelines.[4]

Under pressure from the biotechnology industry, the EPA approved Bt crops without adequate data on resistance management. As a result, we have an experiment on insect resistance being conducted on millions of acres of farmland across the United States. And if the experiment fails, growers return to toxic synthetic sprays and organic and conventional farmers lose Bt sprays as a pest management tool. And the biotech industry has not developed any genetically engineered alternatives to Bt crops that will be on the market in the foreseeable future.

Most farmers and pesticide/biotechnology companies are accustomed to losing pesticides to resistance and then replacing them with other products, which may turn out to be a very difficult attitude to overcome.[5]

• Are there other ways that Bt crops may affect pesticide use?

Research is beginning to reveal the impacts Bt crops can have on other non-target insects. Some of these are known as beneficial insects because of the key roles they play in keeping pest populations in check or helping with pollination. The green lacewing, for example, is a beneficial insect that eats a number of agricultural pests. Studies have indicated that the lacewing may be affected by the toxin in the digestive systems of insects that have eaten Bt corn.[6] If there are fewer lacewings, there will be more pests— and farmers may use more insecticides to control them.

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Regardless of what the biotechnology/pesticide industry wants us to believe, agricultural genetic engineering will not reduce pesticide use. While there may be examples of some reduced use in the short term, it is clear that this technology will not provide a long term sustainable solution to pest control.

We are finding that this new, powerful technology has unexpected and sometimes unpredictable and harmful impacts on human health and the environment. Reduced pesticide use is one of the benefits that industry maintains out weighs these risks. But as we have shown, the promise of reduced pesticide use is not based in reality— it is merely another short term tactic that industry uses to increase public acceptance and to ensure sales of their products.

Notes

1 Losey, J., and J. Obrycki, "Transgenic Insecticidal Corn: Beyond Insecticidal Toxicity to Ecological Complexity," Bioscience, *May 2001.*

2 Mellon, M. and J. Rissler, eds., Now or Never: Serious New Plans to Save a Natural Pest Control, *Union of Concerned Scientists, 1998.*

3 Personal comm, Jane Rissler, June 22, 2001.

4 Brasher, P., "Farmers violating biotech corn rules," Associated Press, January 31, 2001.

5 Mellon, op. cit.

6 Hillbeck, A. et al, "Effects of Transgenic Bacillus Thuringiensis corn-fed prey on Mortality and Development Time of Immature Chysoperla Carnea (Neuroptera: Chrysopidae)." Environmental Entomology, *Vol. 27, No. 2, April 1998.*

For more information

Now or Never: Serious New Plans to Save a Natural Pest Control, Margaret Mellon and Jane Rissler, eds., Union of Concerned Scientists, 1998.

The Ecological Risks of Engineered Crops, Jane Rissler and Margaret Mellon, MIT Press, 1996.

Genetically Engineered Food: Changing the Nature of Nature, Martin Teitel and Kimberly A. Wilson, Park Street Press, 1999.

Ag Biotech Info Web site at http://www.biotech-info.net/bt-transgenics.html

Pesticide Action Network' Genetic Engineering Presentation at the PANNA Web site, http://www.panna.org.

Union of Concerned Scientists Web site at http://www.ucsusa.org.

This fact sheet was prepared by Pesticide Action Network North America, June 2001.

Pesticide Action Network NORTH AMERICA

Pesticide Action Network North America (PAN North America) advocates adoption of ecologically sound practices in place of hazardous pesticides and genetically engineered crops. PAN North America has over 130 affiliated groups in Canada, Mexico and the U.S., providing technical support and participating in joint projects with partner non-governmental organizations in Africa, Asia and the Americas. For more information visit http://www.panna.org.

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PAN North America is one of the founding members of the **Genetically Engineered Food Alert Campaign**. Genetically Engineered Food Alert is a coalition of organizations concerned with the protection of consumers rights, public health and the environment. In an effort to better educate the public, Genetically Engineered Food Alert has launched a nationwide campaign about the risks associated with genetically engineered foods. For more information visit http://www.gefoodalert.org.