BIOTECH

The Terminator's Back

CONTROVERSIAL SCHEME MIGHT PREVENT TRANSGENIC SPREAD **BY CHARLES CHOI**

The "terminator" genes appeared to meet their end in 1999 amid a storm of controversy. Incorporated into bioengineered crops, the genes would make the plants infertile and thereby force farmers to buy seeds every year, rather than cultivate them from past harvests. Hence, biotech firms would have a guaranteed income stream and patent protection. The outcry over the genes led multinational Monsanto, which was at the time trying to buy the company that developed the technology, to declare that it would abandon commercial uses of the terminator. Advocates of genetically modified (GM) crops, however, think that such genes should come back—as a means to protect the environment.

Invented in 1993, the terminator genes make a cytotoxin ironically named RIP, for ribosome inhibitor protein, which renders the seed nonviable. Biotechnology watchdogs saw such genetic-use restriction technology as a tool to force farmers in developing nations into "bioserfdom." "The majority of the world uses their own seed, and the notion of the terminator gene giving a few people control of the world food supply incited an immense controversy," recounts Margaret Mellon, director of the agriculture and biotechnology program at the Union of Concerned Scientists in Washington, D.C.

In calling for the return of terminator genes, supporters of GM crops note that genetically enhanced plants have as much or more potential as exotic species to invade surrounding ecosystems and drive wild populations into extinction. "Terminator technology is a near perfect way of controlling unwanted GM spread," insists geneticist William M. Muir of Purdue University.

Terminator critics remain unconvinced. "What if these triggers aren't perfect?" Mellon asks of the means necessary to activate the terminator gene. For instance, the original design required GM seeds to be soaked in an antibiotic to activate the gene. "If the chemical doesn't penetrate completely, then you would let loose plants that weren't sterile," she says.

Considering that there are now 130 million acres of GM crops covering the world, Muir acknowledges that even if terminator system's failure rate were one in a million, you would still have 130 acres of fertile plants out there. But having some containment "is a heck of a lot better" than none, a situation that the world currently faces, Muir observes. Besides, he adds, when exotic organisms escape into foreign environments, there is often a critical limit below which small releases do not result in long-term establishment. Of course, exceptions exist—the spread of Africanized "killer" bees from Brazil resulted from only three queens. Muir suggests that newer and more reliable terminator technology could "get failure rates of one in 10 billion, which is very acceptable." Based on recent patent filings, biotech giants, including Syngenta and DuPont, are continuing to tinker with and improve terminator systems.

Still, a terminator plant could spread its DNA around. Mellon points out that the genes could move through pollen to neighboring fields and inadvertently kill off nearby crops or wild cousins. Most research shows that the pollen doesn't get very far—99 percent of corn pollen travels just 30 feet, Muir says, unless a tornado or hurricane blows through. (Some research has found, however, that transgenic DNA has appeared miles away from its source.)

Scientists are also busy looking into other, arguably better ways to prevent DNA spread, states plant molecular biologist Henry Daniell of the University of Central Florida. One example is maternal inheritance technology, in which modified genes pass down to only the seeds (the maternal line), not to the pollen (the paternal side). The technology has actually been tested in tobacco, potato and tomato plants. "There is no one gene-containment strategy for all crops," Daniell remarks. It might take several to satisfy environmentalists and farmers alike.

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READY ACCEPTANCE of transgenic crops is apparent in China's Hebei province.

GREG BAKER *AP Photo*

CONSPIRACY IN THE MAIZE?

In April, *Nature* stated that it should not have published the work of David Quist and Ignacio Chapela, which the journal now considers flawed. The researchers, both at the University of California at Berkeley, had reported that DNA from transgenic maize planted in Mexico found its way into native species as far off as 60 miles. The news was a public-relations disaster for biotech companies trying to persuade many nations to lift their embargoes on genetically modified crops.

Soon messages on the server AgBioWorld started attacking the scientists. A story in the May 14 *Guardian,* a U.K. newspaper, suggested that these accusations were part of an smear campaign to align other scientists against Quist and Chapela. It indicated that "Mary Murphy" and "Andura Smetacek"—two of the first and most persistent message posters—are not real people and claims to have traced their e-mails to the Bivings Group, a Washington, D.C., firm that handles public relations for Monsanto. Bivings denies any connevtion to the postings.