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Evolutionary Biology and Genetically Engineered Crops

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Consideration of evolutionary theory can aid in crop design

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Most of the controversy surrounding the use of genetically engineered organisms has so far focused on unintended establishment of these organisms, or their genes, in enviroments where they could disrupt ecological systems or adversely affect human health (Gillett et al. 1985, Kolata 1985, Sharples 1982). In contrast, almost no attention has been devoted to potential, evolutionary responses of indigenous organisms to the genetically engineered organisms. These evolutionary changes could rapidly nullify the utility of the genetically engineered organisms and could significantly alter ecosystem function. In this article, I discuss how empirical and theoretical research in evolutionary biology could be used in the development of release strategies that may limit such problems without stifling the potential benefits of genetic engineering.

I focus on the effects of planting genetically engineered crops contain-

Evolutionary responses of indigenous organisms to genetically engineered crops could rapidly nullify the crops' advantages

plants, similar approaches could be taken whenever a genetically engineered organism affects the fitness of other organisms.

What is special about genetic engineering?

In some ways there is nothing new about incorporating genes for pest resistance into crop plants. Intentionally or unintentionally, humans have been doing this for hundreds of years by selectively collecting seed from the plants in their fields that yielded best

plant breeding, sexual incompatibility between most species places narrow taxonomic restrictions on the sources of genes that can be transferred to a given crop. If recent successes in genetic engineering are an indication of future prospects, it will be possible to transfer genes for pest resistance, not only among plants in different genera and plant families, but also among organisms in different phyla (Goodman et al. 1987). The recent transfer of a toxin-producing gene from a bacterium (*Bacillus thuringiensis*) to tobacco and other plants in the nightshade family underscores the ability of genetic engineers to cross taxonomic barriers and tap previously unavailable gene pools (Goodman et al. 1987).

A second difference between classical and genetic-engineering techniques lies in the potential number of resistance factors a crop may contain. Classical plant breeding efforts are considered successful when a single foreign resistance factor is incorpo-

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