HERBICIDE RESISTANCE

PLANT GENETIC SYSTEMS GETS BASTA RESISTANCE

LONDON—A new twist in the tale of introducing herbicide resistance into crop plants has been achieved by scientists at Plant Genetic Systems (Gent, Belgium). By engineering into plants a bacterial gene for an enzyme that inactivates the herbicide's active ingredient, company scientists claim to have produced tobacco, tomato, and potato plants that are sufficiently resistant to Hoechst's (Frankfurt, F.R.G.) Basta herbicide to be unharmed by the concentrations that would kill weeds growing alongside them.

Phosphinotricin, the herbicide's active ingredient, is an analog of glutamine and acts by blocking the plant enzyme, glutamine synthetase. But if phosphinotricin is acetylated, it no longer blocks glutamine synthetase. It is the gene for an acetylating enzyme, found in a strain of streptomyces by scientists at Biogen SA (Geneva, Switzerland), that has been engineered into the crop plants under an agreement that gives Plant Genetic Systems exclusive rights to use the gene in plant biotechnology.

The gene is introduced into leaf disks by more-or-less standard agrobacterial vectors, containing any one of a number of plant-specific gene promoters, such as that from cauliflower mosaic virus. Shoots growing from the disks develop into plantlets and then into mature plants which, in greenhouse trials, are claimed to withstand spraying with Basta even when doses are 10 times those normally used for weed killing.

Assay of the acetylating enzyme in plant tissues shows that it is constitutively expressed in the cytoplasm, says company scientist Marc Vaeck. The plants grow as usual and seem to have normal flowers and seeds. Although second-generation plants are not yet available to test, Vaeck believes that the plants have stably inherited the bacterial gene. He bases his confidence on the company's experience with tobacco plants carrying the gene for the insecticidal toxin of *Bacillus thuringiensis*. Introduced into tobacco plants by similar means to those employed in the current project, the gene has by now been stably inherited through four generations.

Vaeck emphasizes the superiority of the approach used to endow plants with phosphinotricin resistance. It is better to provide the plant with an additional enzyme that is designed specifically to inactivate the herbicide, he says, than to aim to change the herbicide's target to an insensitive form. The price that may have to be paid for making a target enzyme insensitive is that it will no longer retain full normal function, probably to the detriment of the plant.

Plant Genetic Systems has taken out patents covering not only the production of phosphinotricin-resistant plants but also their growth in the face of spraying with the herbicide. At present Basta is approved in West Germany, The Netherlands, and Belgium, but is only suitable for use as a non-selective herbicide and desiccant.

Because the use of the resistant plants would go hand-in-hand with that of the herbicide, Hoechst is tied into the project's future. But so far Plant Genetic Systems, which has about 100 employees under the scientific direction of Marc van Montagu, has developed the project with in-house financing. **—Peter Newmark**