

California Field Test Goes Forward

Court rejects activists' efforts to stop AGS genetic experiment; University of California test expected to proceed, too

RESEARCHERS at Advanced Genetic Sciences, Inc. (AGS), of Oakland, California, have sprayed a 0.2-acre plot in Contra Costa County, California, with a genetically altered bacteria meant to retard the formation of frost on strawberries and other crops. The testing of the organism, dubbed "Frostban," went forward at 6:30 a.m. on Friday, 24 April, after a California Superior Court judge rejected activists' legal efforts to stop the test.

Field trials are needed to confirm the effectiveness of modified forms of *Pseudomonas syringae* and *P. fluorescens*. If field trials support laboratory studies, the product not only could reduce costly crop losses but would allow countries to extend the growing ranges for certain fruits and vegetables. The AGS field trial is the first deliberate release of genetically altered bacteria to be sanctioned by the Environmental Protection Agency (EPA). The National Institutes of Health (NIH) first declared the experiment safe 4 years ago, a position that numerous other scientific organizations have supported since then.

Unlike the strains that usually colonize plant leaves, the genetically altered bacteria do not secrete proteins that contribute to damaging ice nucleation—frost formation on plants. AGS and other investigators have found that frost formation can be forestalled until temperatures drop to around -5°C (23°F), if plants can be colonized with bacterial strains that lack the gene responsible for this protein secretion. Although greenhouse experiments have been successful, it is not clear that a sufficient population of the modified organisms can survive in the field. Non-ice-nucleating strains of the bacteria occur in nature, but usually in small numbers relative to the more populous frost-forming varieties.

Californians for Responsible Toxics Management, Jeremy Rifkin's Foundation on Economic Trends, and others challenged the field trial on the grounds that state had arbitrarily changed the classifications of *P. syringae* and *P. fluorescens* from pests to pesticides. They further argued that AGS had not conducted an "environmental impact report" as required by California law.

But Judge Darrel W. Lewis dismissed the plaintiffs' request, stating that they failed to show that irreparable harm would result or to demonstrate that they could prevail on the merits when the case was tried. The case is now dead because AGS has started the field experiment.

EPA approved the experiment this spring, after suspending the company's permit because it conducted an authorized outdoor test with the bacteria at its headquarters in Oakland (*Science*, 4 April 1986, p. 15). The company's action produced an uproar in Monterey County where the experiment was first slated to take place. As a result the company was forced to find a new location. The Contra Costa County government ap-



Michael Maloney, San Francisco Chronicle

Frostbuster. Julie Lindemann, a research scientist at Advanced Genetic Sciences, sprays strawberry plants with genetically altered bacteria to test their ability to survive in large numbers outside of the greenhouse and to retard frost formation. The bacteria is considered safe to work with, but federal law requires that protective clothing be worn until the bacteria is registered as a pesticide.

proved the test after receiving assurances from the company that the site would be closely monitored. EPA also has a team at the site to track the experiment.

Less than 24 hours after the court's decision last week, AGS's test plot of 2500 strawberry plants was vandalized. Numerous plants were ripped from the ground, but John Bedbrook, AGS's director of research, said most of the damaged plants were salvaged. Andrew Caffrey, one of the plaintiffs in the law suit who is affiliated with the environmental group, Earth First, endorsed the vandalism as a form of "self-defense."

Lee Rogers, counsel for the Foundation on Economic Trends, said the action was "unconscionable." As for the court's decision, Rifkin says, he will not attempt to take further legal action on the matter against AGS or Steven Lindow, a researcher at the University of California at Berkeley. "We have had a good 4 years to consider this issue," noted Rifkin.

In fact, it was Lindow who in 1983 first won permission from NIH's Recombinant DNA Advisory Board to field test a genetically altered *P. syringae* bacterium in a plot of potatoes. But the experiment was delayed after Rifkin challenged the test in September of 1983. Like AGS' organisms, Lindow's "Ice Minus" (*P. syringae*) bacterium has a gene deleted to inhibit frost formation on plants.

At press time, Lindow had planned to begin his field test of the organism on 29 April on a tiny plot of potatoes at the university's experiment station near Tulelake, California. The first stage of the experiment involves planting seed potatoes that have been treated with altered *P. syringae* bacteria. When the plants are 3 or 4 weeks old they will be sprayed with the bacteria, too.

Lindow was on the verge of proceeding with the experiment last August (*Science*, 5 September 1986, p. 1034) when Californians for Responsible Toxic Management and Rifkin sought to block the experiment. They charged that the state Department of Food and Agriculture failed to comply with the California Environmental Quality Act. The university and Lindow subsequently agreed to delay the test while an environmental assessment on the experiment was updated.

The AGS experiment is the first of many field trials that the Oakland, California, company plans to conduct with the gene-deleted *P. syringae* and *P. fluorescens* bacteria. Bedbrook says it could be 3 or more years before the company actually can bring Frostban to market. AGS officials expect that the product also will be used for almonds, peaches, cherries, grapes, and other crops. ■ MARK CRAWFORD