

Science, Vol 289, Issue 5481, 843-845 , 11 August 2000

AGRICULTURAL BIOTECHNOLOGY:

Monsanto Donates Its Share of Golden Rice

Dennis Normile*

Monsanto Co. has agreed to provide royalty-free licenses to speed up work on a genetically modified rice that could alleviate vitamin A deficiency around the world. Researchers welcomed last week's announcement, but warn that a thicket of intellectual property claims surrounds the technology and that significant legal hurdles remain before the rice can become widely available to farmers in developing countries.

"Monsanto is the first company with the good will to offer this technology free for humanitarian purposes," says Ingo Potrykus, a plant molecular biologist at the Institute for Plant Sciences of the Swiss Federal Institute of Technology in Zurich. "I hope I can use this to convince other companies to give up their intellectual property rights," adds Potrykus, who developed the variant in collaboration with Peter Beyer of the Center for Applied Biosciences at the University of Freiburg in Germany (*Science*, 13 August 1999, p. [994](#); and 14 January, p. [303](#)). Monsanto CEO Hendrik Verfaillie says his company, a subsidiary of Pharmacia Corp., is taking this step "to minimize the time and expenditure associated with obtaining licenses needed to bring 'golden rice' to farmers and the people in dire need of this vitamin."

Potrykus's team transferred into rice the multiple genes needed to create a synthesis pathway for b-carotene, which the body converts into vitamin A. It marked the first time a trait requiring multiple genes had been transferred into a plant. The enriched rice, which has a golden hue, promises to help alleviate a widespread public health problem: vitamin A deficiency, which afflicts 400 million people and can lead to vision impairment and increased susceptibility to disease.

Before the promise can be realized, however, the b-carotene pathway must be transferred to the different varieties of rice grown in each region. Potrykus's group has tried to hasten the process by offering to make its germ plasm and related technology freely available. The offer drew interest from several national rice research labs, as well as the International Rice Research Institute (IRRI) in the Philippines.

But claims of intellectual property rights have kept the technology bottled up in Potrykus's lab. Two outside studies have found that between 25 and 70 proprietary techniques and materials are involved in the gene transfer. Potrykus says Monsanto's most important claim is on the 35S promoter, which boosts the

expression of the genes introduced into the rice. That change makes possible a high level of b-carotene synthesis.

But other important pieces of the puzzle lie outside Monsanto's control. Incorporated into the golden rice, for example, are two "bits of DNA" acquired, says Potrykus, under separate agreements that require the donors' consent to be passed on to third parties. The agreements have prevented him from distributing the germ plasm to any of the rice breeders interested in working with it.

Potrykus has spent a year negotiating with the two companies that hold rights to the DNA to enable the technology to be used by public-sector research groups. He declined to identify the companies to avoid jeopardizing what he calls a "delicate stage" of the negotiations, which he hopes will be concluded "within 2 months." Potrykus and others hope that Monsanto's announcement--made at an agricultural biotechnology symposium in Chennai, India--will set a precedent for companies with a stake in the necessary technologies. "It may encourage others to work to cut through some of the red tape," says Ronald Cantrell, IRRI's director general.

Last week Monsanto also announced progress on its earlier promise to make public a draft of the sequence of the rice genome unveiled this spring in a collaboration with Leroy Hood, then at the University of Washington, Seattle, and now president of the Institute for Systems Biology in Seattle (*Science*, 14 April, p. [239](#)).^{*} The data have already been transferred to Japan's Rice Genome Research Program (RGP), which is the lead agency for the International Rice Genome Sequencing Project (IRGSP). The Japanese group will pass the Monsanto data to other IRGSP members once legal issues are resolved. Takuji Sasaki, RGP director, says that the Monsanto data, although "rough," should hasten completion of the sequencing project, whose status will be discussed next month at a meeting in South Carolina.

With reporting by Elizabeth Pennisi.