Friendly Bacteria Help Fight Potato Rot Fungi

PEORIA, Ill. — Soil-dwelling bacteria are scientists' latest weapon against an unsightly post-harvest disease called dry rot that costs U.S. potato growers as much as $250 million annually in tuber losses.

Agricultural Research Service scientists Patricia Slininger, David Schisler and colleagues are testing the bacteria as a biological alternative to thiabendazole (TBZ), a chemical fungicide that's losing its effectiveness against Fusarium sambucinum, the main culprit behind dry rot.

Through ARS, its in-house research agency, the U.S. Department of Agriculture holds two patents on the bacteria as biological dry rot control agents. A third patent covers their use to inhibit sprouting, another costly potato storage problem.

The two scientists began exploring the bacteria's biocontrol potential in 1994, when a third ARS researcher, Ann Desjardens, reported TBZ resistance in 90 percent of dry rot strains she isolated from potato fields.

At ARS' National Center for Agricultural Utilization Research in Peoria, Ill., Slininger and Schisler researched different physical and nutritional conditions for mass-producing the bacteria in liquid culture and keeping them viable during cold storage.

Lab tests and trial runs in potato storage houses indicate that spraying tubers with the bacteria can diminish dry rot disease by 59 percent or more. The six Pseudomonas and Enterobacter strains being tested are harmless to humans, but form a living bandage around potato wound sites that stymies dry rot infections.

The bacteria secrete natural antibiotics that suppress the dry rot fungus. One such antibiotic, indoleacetic acid, may also help retard sprouting on stored potatoes. Cultures of some of the biocontrol bacteria seem to retard stored potato sprouting nearly as well as 1-methylethyl-3-chlorophenylcarbamate (CIPC). Although used on more than half the U.S. potato crop, CIPC faces tighter regulation due to concerns over its persistence in the environment and on the spuds.

Now that the patents are available for licensing, the Peoria scientists are seeking a commercial partner to adapt the technology for market use.

High-Maysin Corn Available For Breeding

TIFTON, Ga. — Agricultural Research Service scientists are accepting seed requests for new corn populations whose silks deter caterpillar feeding with a natural repellant called maysin.

By crossing the maysin-rich corn with elite commercial lines, plant breeders can eventually provide farmers with hybrids that will fare better against lepidopteran pests like the corn earworm. Its caterpillar stage causes $100 million annually in yield losses and control costs.

"The high-maysin material available now includes two corn populations," says Neil W. Widstrom, a geneticist in ARS' Crop Genetics and Breeding Research Unit at Tifton, Georgia.

"It will be most useful to sweet-corn breeders, since there's more concern about ear damage for that crop than for dent corn."

Registration of EPM6 (a purple-kerneled population) and SIM6 (a yellow-kerneled population) concludes 23 years of maysin research by scientists at ARS laboratories.

Through breeding and backcrossing, scientists took a two-pronged approach to curbing earworm damage. First, they selected plants whose silks produce enough maysin to stop the caterpillar from feeding after just a few bites.

Second, they chose plants with tight husks that force the pest to chew the silks before the kernels, which don't contain maysin.

Maysin works by binding up certain proteins in the earworm's gut so that it cannot grow. But humans, other animals, and beneficial insects face no danger from maysin.

Currently, farmers battle earworms with chemical insecticides. In Florida, where half the nation's fresh-market sweet corn is grown, this can often mean spraying 30-40 times a season to ensure the blemish-free ears consumers desire.

But with high-maysin hybrids, scientists predict, insecticide use could be cut in half. Their optimism is rooted in laboratory and field trials showing higher earworm mortality rates and less ear damage in high-maysin corn than in nonmaysin corn.

The ARS effort in Tifton, Ga., has demonstrated that transferring maysin to silks of elite inbred lines is feasible, says Widstrom, adding "we'll honor requests for breeder seed of the released high-maysin populations for at least five years." Samples are limited to 100 grams, or about 300 to 500 seeds per request.

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Swenson Speaks On Important Water And Ag Issues

STATE COLLEGE (Centre Co.) — Leland Swenson, past president of the National Farmers Union, spoke at the Great Lakes Forum on Agriculture here last week to a delegation of agriculture commissioners from the Northeast United States and Canada about the importance of water issues and agriculture.

"Water is quickly becoming a critical issue in agriculture, even more significant than biotechnology or trade," said Swenson.

In his presentation, Swenson explained how water issues are growing more important, especially regarding the future of the country's water supply. A growing population with changing priorities is beginning to affect the quantity, quality, distribution and management of water, he said.

Swenson raised questions about the abundance and scarcity of water in different areas of the country, the costs of recycling water for different uses and priorities for water use.

"Our country's changing priorities impact water availability and quality for food production, which, in turn, impact the structure of farming," said Swenson. He asked the audience to weigh how the country should prioritize the uses of water between human consumption, food production, navigation, industry, energy production, wildlife and recreation.

Swenson also discussed the impacts that market forces, personal water rights and government regulations have on water resources.

"Our country's priorities for water are changing as population centers change, as the structure of farming changes and as we are forced to recognize climate change impacts. We must be prepared to address those changes," Swenson added.