

Sexual *Trichoderma* Discovered

The sex life of a tropical fungus may provide some insight into how genes control such biological processes as the production of enzymes that degrade fibers and the biological control of plant diseases caused by other fungi.

In 1992, a U.S. Department of Agriculture scientist, while doing a biological survey of the rainforest in Puerto Rico for USDA's Forest Service, found a live specimen of *Hypocrea poronioidea*—a rare fungal species.

"*H. poronioidea* is the seldom seen and never grown sexual state of a group of important beneficial fungi in the genus *Trichoderma*," says Amy Rossman. She is director of the ARS Systematic Botany and Mycology Laboratory at the Beltsville (Maryland) Agricultural Research Center.

Originally found in southern Brazil at the turn of the century, *H. poronioidea* has been rediscovered seven times since then—once by Rossman—but never living. She has made at least 10 collection trips to rainforests in Costa Rica, Venezuela, Puerto Rico, and Dominica, searching for new and rare fungi.

"*Trichoderma* is one of the most often used biological fungicides," she says. "It controls damaging fungi like *Phytophthora infestans*, the organism that causes late blight, the most destructive disease of potatoes worldwide. It also curbs various species of pythium, the soilborne fungi that cause damping-off diseases in seedlings of agricultural and nursery crops."

Mycologist Gary Samuels is a world expert on *Trichoderma*. His job at the Systematic Botany and Mycology Laboratory is to discover and characterize fungi that can be used to solve agricultural problems.

"Unfortunately," he says, "*Trichoderma* reproduces primarily asexual-

ly, so it cannot be readily improved by selective breeding to fight crop diseases. But *H. poronioidea* overcomes this problem."

Samuels was the first to grow *H. poronioidea* in a laboratory. When he placed two collections recently found in Puerto Rico and a third from Uganda in an artificial culture, he discovered the fungus has a life cycle that includes distinct spore forms that are both sexual and asexual.

ARS plant pathologist Bob Lumsden is looking for biological alternatives to the environmentally problematic fumigant, methyl bromide, for controlling fungal diseases at the Biocontrol of Plant Diseases Laboratory in Beltsville.

He says, "It is very significant to have a species of *Trichoderma* with a sexual stage. Now the fungus can be sexually bred."

Moreover, the genetic system of *H. poronioidea* can be characterized, and the genes controlling sexual reproduction can be isolated using molecular biology techniques.

Samuels says these genes can be cloned and possibly inserted into the chromosomes of previously asexual *Trichoderma* species, thus inducing them to reproduce sexually. This would enable scientists to easily manipulate their biological control potential or their ability to produce degrading enzymes.

Besides controlling plant diseases, one *Trichoderma* strain, *T. reesei*, is also commercially exploited to produce enzymes that degrade cellulose. Quantities of the fungus are sold commercially to manufacturers of stone-washed blue jeans, laundry detergents, paper, and chicken feed. "This important strain was picked up during World War II, degrading a cotton tent on Bougainville Island in the South Pacific," says Rossman.

As biological control agents in sustainable agricultural systems, "fungi have untapped potential," Samuels points out. "But their use is hindered by a lack of knowledge of their relationships."

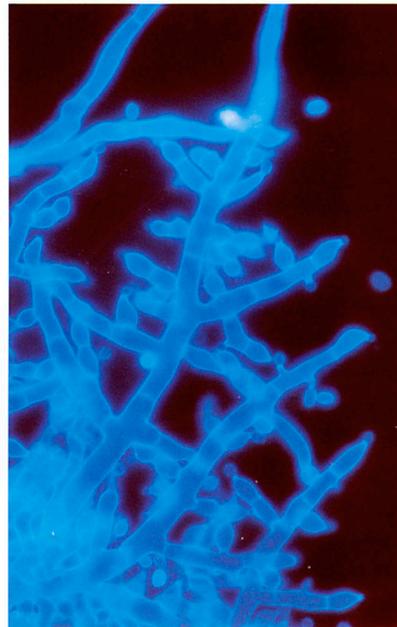
Rossman concurs. "We still don't know what kinds of fungi exist and what they can do for us," she says.

"Most mycologists agree that the estimated number of fungal species is around 1.5 million. Only about

150,000—or 10 percent—are known. It is not surprising that we are having problems identifying those fungi that affect agricultural commodities."—By **Hank Becker, ARS.**

Amy Y. Rossman and Gary J. Samuels are at the USDA-ARS Systematic Botany and Mycology Laboratory, Bldg. 011A, 10300 Baltimore Ave., Beltsville, MD 20705-2350; phone (301) 504-5364 (Rossman) or (301) 504-8279 (Samuels), fax (301) 504-5810. ♦

GARY SAMUELS



Asexual phase of *Hypocrea jecorina*, magnified about 2,500 times.