Helping Cereals Resist Head Scab

Head scab annually causes millions of dollars' worth of losses in wheat, rye, barley, and other cereal crops in the Great Plains and Midwest.

All this damage is caused by the fungus *Fusarium graminearum,* which got nicknamed "head scab" because of the blisters or scabs it forms on the grain-bearing structure, or head, of grain plants.

The disease is cyclical, severely infecting crops one year and then disappearing for several years before reappearing again. A recurrence of severe infestations of head scab across the Great Plains and Midwest in recent years has sent plant breeders and researchers scrambling for new ways to combat the disease.

Plant breeders typically attempt to reinforce cereal crop defenses by breeding for greater resistance to the fungus. Thomas M. Hohn, a microbiologist in the ARS Mycotoxin Research Unit at Peoria, Illinois, says he and colleagues decided to look for the genetic equivalent of an Achilles's heel in the fungus and found it.

SUSAN MCCORMICK

Premature bleaching of wheat infected with *Fusarium graminearum* is a typical symptom of head scab.

They have successfully disarmed the fungus' ability to produce its toxin, trichothecene, by identifying the gene that is responsible for the production of an enzyme, *trichodiene synthase*.

This enzyme enables the fungus to produce trichothecene. Scientists at the lab disabled the toxin-producing gene and were able to successfully demonstrate that the genetically altered fungus was less damaging to crops.

ARS scientists say this new knowledge of the importance of toxin production by the fungus will give wheat breeders more ammunition for fighting costly head scab.

"We know disease resistance in wheat and barley is based on several factors and that current wheat breeding strategies provide only partial resistance," says Hohn. "We believe our findings linking toxin production with the amount of disease caused by the fungus may be another tool for wheat breeders to use in combating this disease."—By **Dawn Lyons-Johnson,** ARS.

Thomas M. Hohn is in the USDA-ARS Mycotoxin Research Unit, National Center for Agricultural Utilization Research, 1815 N. University St., Peoria, IL 610604; phone (309) 681-6380, fax (309) 681-6665, e-mail thohn@mail.ncaur.usda.gov ◆

Steadfast Trefoil's a Survivor

The first commercial variety of birdsfoot trefoil in the world with both the ability to spread and to resist root diseases is now available.

Birdsfoot trefoil is a fine-stemmed, yellow-flowered forage crop that resembles alfalfa; but it tolerates poor soil conditions and abuse from grazing animals much better than alfalfa. It is palatable to animals, nutritious, and doesn't cause bloating that animals can get from other legumes.

"Steadfast is a fitting name for the new variety, because its ability to spread by rhizomes helps plants keep from being killed by root diseases that normally plague trefoil varieties," says Paul R. Beuselinck, an ARS plant geneticist.

In Morocco, in the late 1980s, Beuselinck discovered wild birdsfoot trefoil that produces rhizomes—underground runners that allow the plant to spread to new sites. The Moroccan wild types he collected contributed to the parentage of Steadfast, which was released jointly by ARS and the University of Missouri in 1995.

Rhizomes occur below the soil and can root and make new plants. Even if the original parts of the mother plant die from disease, new plantlets that develop from rhizomes allow the plant to survive and spread.

Root diseases have retarded the popularity of birdsfoot trefoil in the United States. "Over time, stands of American varieties without rhizomes will likely thin out. But stands of Steadfast, which has rhizomes, can be expected to thicken, making more forage available for animals," says Beuselinck.

The variety should do well in areas of intensively managed animal grazing systems for producers wanting a nonbloating, cool-season legume as a component of their grass-based pastures.

"Producers can use it on acres now planted only in grass or that are considered unimproved," says Beuselinck.

Peterson Seed Company, Inc., in Savage, Minnesota, has obtained an exclusive license to sell and distribute Steadfast.—By **Linda Cooke,** ARS.

Paul R. Beuselinck is in the USDA-ARS Plant Genetics Research Unit, University of Missouri, 207 Waters Hall, Columbia, MO 65211; phone (573) 882-6406, fax (573) 882-1467, e-mail pbeuselinck@psu.missouri.edu ◆