Defatted Corn Protein Produces Palatable Gluten-Free Bread

A good, crusty roll with dinner is a pleasure most people take for granted. But for millions of Americans, this simple, basic pleasure is off limits because they cannot tolerate proteins found naturally in grains like wheat, barley, and rye that are used in flours.

Agricultural Research Service chemists Scott Bean and Tilman Schober, in the Grain Quality and Structure Research Unit in Manhattan, Kansas, had some success developing gluten-free pan bread from other grains, but they couldn't make free-standing rolls because they spread out too much. "The bread was considered lower in quality than comparable wheat bread," says Bean. Gluten-free grains include corn, sorghum, and rice.

Now Bean and Schober have found a way to make rolls from corn that are more than just gluten-free: they also rise more and resemble wheat rolls.

In previous studies, Bean and Schober found that a corn protein called "zein"—a readily available byproduct from corn wet milling and fuel-ethanol production—could be used to make a more wheatlike dough. The dough still didn't meet their standards, though, because it lacked strength, and the rolls produced from it were too flat. They used a commercially available zein in that study.

But more recently, Bean and Schober found that by removing additional fat from zein, they were able to produce a dough more similar to wheat dough and free-standing hearth-type rolls that resemble wheat rolls. "We found that removing more of the fat from the protein's surface allows the proteins to stick to each other much like wheat proteins do—leading to the elastic nature of wheat dough," says Bean.

Even better than corn for baked products, according to Bean, is sorghum—a gluten-free grain of choice as a wheat substitute. But since corn and sorghum are similar, they used the former as a research model.

"Corn protein, in our view, is an intermediate step to achieving the Holy Grail of gluten-free breads—forming a wheatlike dough using nonwheat proteins, resulting in products with a fluffy, light texture," says Bean.

This research may prove useful for the 2-3 million Americans affected by celiac disease, a condition in which the human immune system erroneously attacks the intestine when gluten is ingested, causing severe diarrhea and inability to absorb nutrients. Gluten-free palatable rolls from corn, rice, and sorghum would be a welcome addition to their diet.

A paper on this work was accepted by the *Journal of Cereal Sciences*.—By **Sharon Durham,** ARS.

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New Soybeans With Seed Rot Resistance Identified

The fungus *Phomopsis longicolla* is largely to blame for a disease called *Phomopsis* seed decay (PSD) that has claimed more than 5 million bushels of U.S. soybeans each of the past 5 years. The seed disease is most problematic in midwestern and southern states.

Control strategies used by farmers have been inconsistent. These include rotating soybeans with corn or wheat (nonlegume crops on which the fungus can't grow), treating seed with fungicides, and tilling the soil to disrupt spore dissemination. The ideal defense is to plant resistant varieties.

To that end, Agricultural Research Service plant pathologist Shuxian Li is coordinating a 3-year project out of Stoneville, Mississippi, to screen for PSD resistance in hundreds of soybean germplasm accessions, breeding lines, and commercial cultivars collected from around the world. "Resistant varieties can provide protection for soybean producers at no additional cost beyond the price of planting the seed," notes Li, in ARS's Crop Genetics Research Unit.

Her efforts to identify resistant sources kicked into high gear in April 2009 following a grant from the United Soybean Board (USB). Li's collaborators on the project are Pengyin Chen and John Rupe, professors at the University of Arkansas in Fayetteville, and Allen Wrather, a professor at the University of Missouri in Portageville.

The USB grant expands on prior field trials the team had conducted since May 2007 in Mississippi and Arkansas that identified several promising PSD-resistant soybean lines from commercial varieties provided by Mississippi State University collaborators and plant introductions from the USDA Germplasm Collection. Typically, the resistant lines identified from this research showed little or no incidence of PSD and had a high germination rate with strong vigor. Additional screening using local strains of *P. longicolla* will also be conducted on soybeans from other sources (including 28 countries).

To expedite their research, Li is developing new and fast screening methods to identify sources of PSD resistance and map resistance genes. The team is also identifying DNA markers associated with the expression of these resistance genes in mapping populations of offspring plants derived from cross-breeding.

Once the markers have been validated, the team will make them publicly available for use in marker-assisted selection, an approach that will save soybean breeders considerable time and expense in developing elite commercial cultivars for growers.—By **Jan Suszkiw,** ARS.

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