GMPRC
GRAIN MARKETING AND PRODUCTION RESEARCH CENTER

RESEARCH Kernels

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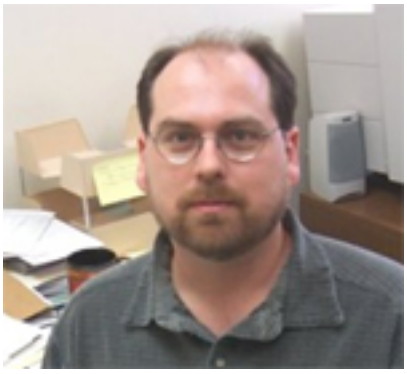

GMPRC Scientist Selected as Northern Plains Area Early Career Research Scientist of the Year. The Northern Plains Area of the Agricultural Research Service includes a total of nineteen research locations in the states of Montana, North Dakota, South Dakota, Wyoming, Colorado, Nebraska, and Kansas. Each year, area personnel select a scientist who is early in her/his career as a recipient of the Early Career Research Scientist of the Year Award and Dr. Jim Campbell from Manhattan has been selected as this year's recipient. Dr. Campbell grew up in New Jersey. He received his B.S. degree in Environmental Sciences and an M.S. degree in Entomology from Rutgers University. He received his Ph.D. in Entomology from the University of California-Davis. He began his career with USDA in 1999 in Manhattan where he initiated a research program focused on the behavior of stored-product insect pests and how to use this information to keep the levels of these insect pests under control. Results from his studies provide answers to questions concerning how these pests locate their food supply and what causes them to move from one location to another in food processing and storage facilities. This information is vital in the development of effective management practices for these pests. (Jim Campbell, telephone: 785-776-2717, email: campbell@gmprc.ksu.edu)

- **New DNA Markers Found for Fusarium Head Blight Resistance Genes.** Fusarium head blight is a destructive disease of wheat worldwide. Resistance genes from a Chinese wheat cultivar, Sumai 3 and its derivatives have been well characterized through the use of DNA molecular markers. These are small unique segments of DNA that are highly correlated with the presence of traits such as resistance genes. In examining another Chinese cultivar, Wangshuibai, we have tentatively identified 15 molecular markers associated with three genes for fusarium head blight resistance. One was mapped on chromosome 1B and two were mapped on chromosome 3B. These markers can be used by breeders to improve wheat resistance to this devastating disease. (Guihua Bai, telephone: 785-532-7116; email: gbai@agron.ksu.edu)

- **Combination Treatment of Avidin Corn Powder and Parasitoid Wasps Controls Insect**

Pests in Stored Corn. The protein avidin (found in chicken eggs) is toxic to many of the insect pests that attack our grain supply. In previous experiments, researchers have moved the gene that codes for this protein into corn. This transgenic corn was ground into a powder and tested to see if this formulation alone or in combination with parasitoid wasps was effective at controlling insect pests that feed on the outside or the inside of grain kernels. Small-scale tests were conducted in plastic jars containing 3 kg of non-transgenic corn. One pair each of maize weevils (internal feeder), red flour beetles (external feeder), and rusty grain beetles (external feeder) were added to each test container. Treatments included 0.3% powdered avidin corn alone, parasitoid wasps alone, or a combination of avidin corn powder and parasitoid wasps. The avidin corn powder had no effect on the internal feeding maize weevils; however, the parasitoids were very effective against the weevils. In contrast, the external feeders were not suppressed by the parasitoid wasps, but were suppressed by the avidin corn powder. The combination treatment of parasitoid wasps and avidin corn powder was effective at suppressing populations of all three insect pests. This combination treatment provides managers with an important tool for controlling both internal and external feeding insect pests. (Paul Flinn, telephone: 785-776-2707; email: flinn@gmprc.ksu.edu)

- **Link Developed Between Heat Stress in Wheat and End-Use Quality.** The formation of the large protein polymer, glutenin, has long been recognized as being vital to the end-use quality of Hard Winter wheat. We studied the formation of glutenin in two sets of wheat lines that were grown under different conditions of heat stress. Wheat lines grown in day-time temperatures of 100o F and night-time temperatures of 77o F beginning 16 days after anthesis had much lower levels of glutenin. However, the glutenin that was present existed in the larger polymer form. When the heat stress was applied 25 days after anthesis, larger amounts of glutenin were formed producing flour with near normal end-use quality. (George Lookhart, telephone: 785-776-2736; email: george@gmprc.ksu.edu)

- **Potential New Gene for Hessian Fly Resistance Discovered.** Hessian fly is one of the most destructive pests of wheat grown in the Great Plains. We transferred a Hessian fly resistance gene from a wild relative of wheat to common wheat. Genetic analysis indicated that this gene is either a novel gene or a new allele and provides wheat breeders with a new choice to generate new wheat varieties that are resistant to Hessian fly. (Ming Shun Chen, telephone: 785-532-4719; email: mchen@oznet.ksu.edu)

- **Extruded Sorghum Starch Better for Ethanol Production.** Sorghum or milo is a drought-resistant, low input grain that can be grown in areas that are too dry for other cereal crops. Like corn, sorghum is rich in starch and represents an important potential resource for bio-fuels. Extrusion uses high temperatures and pressure to force a product through small holes. This process generates high shear forces that are capable of disrupting molecules and altering their chemical properties. We investigated the effects of both conventional extrusion and extrusion in the presence of a supercritical fluid like carbon dioxide. Analysis of the sorghum flour after extrusion showed increases in the starch content, free sugar content, and high levels of gelatinized starch. Extruded flours and non-extruded controls were fermented to ethanol using yeast. Both

conventional and supercritical fluid extruded flours showed increased ethanol yields and fermentation efficiencies with supercritical fluid extruded flour giving the highest values. (Scott Bean, telephone: 785-776-2725; email: scott@gmprc.ksu.edu)

- **Starch Granule Size Composition Impacts Bread Quality.** Wheat generally has two types of starch granules - large (Type A) and small (Type B). We separated these different sized starch particles from the gluten protein and the water soluble components of a commercially available bread wheat flour. The flour was then reconstituted with the original levels of water soluble components, gluten, and starch and baked. However, the starch contained varying ratios of Type A to Type B starch particles. Crumb appearance and texture were significantly different depending on the ratios of the starch particles. Flour containing a ratio of 30% small to 70% large particles produced bread with the best crumb appearance. Flours with 100% small or 100% large starch granules produced loaves of bread with inferior crumb grain scores. Both the fineness and the gas cell elongation ratios were very low. However, as the relative amount of small starch granules increased, loaves of bread with softer textures that were better maintained during storage were produced. (Okkyung Kim Chung, telephone: 785-776-2703; email: okchung@gmprc.ksu.edu)

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