GMPRC
GRAIN MARKETING AND PRODUCTION RESEARCH CENTER

RESEARCH Kernels

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- **New Biopesticide Developed From Egg White.** Avidin is a protein found in chicken egg white that is toxic to many internal and external feeding insect pests that attack grain. The gene that codes for avidin has been incorporated into corn. When the avidin concentration in seeds from transformed plants was greater than 100 parts per million, it prevented the development of or was toxic to maize weevils, Angoumois grain moths, lesser grain borers, sawtoothed grain beetles, red flour beetles, flat grain beetles, confused flour beetles, Indianmeal moths, and Mediterranean flour moths. The only pest tested that was not effectively controlled was the larger grain borer. Avidin acts by binding to the vitamin biotin and making it unavailable to the insects. Levels that were toxic to insects showed no apparent oral toxicity to mice. Avidin is an environmentally friendly biopesticide because it is a naturally-occurring food protein with potential for controlling both field and post-harvest insect pests of cereals and their processed commodities.
  (Karl Kramer, phone: 776-2711, email: kramer@usgmrl.ksu.edu)

- **GMPRC and KSU Scientists Receive USDA-National Research Initiative (NRI) Grant.** Dr. George Lookhart from GMPRC in cooperation with Dr. Finn MacRitchie from the Department of Grain Science and Industry at Kansas State University received a two-year NRI grant of $151,850 to support studies on the effects of genetics and the environment on wheat protein quality during grain development. In this project, the actual sizes of the glutenin protein polymers will be measured and correlated with baking characteristics. This will provide a means for predicting the mixing and baking qualities of whole wheat and flour. It will also identify the effects of stress on dough polymers and provide information that can be used to manipulate the genes that code for glutenins and, as a result, improve wheat end-use quality.
  (George Lookhart, phone: 776-2736, email: george@usgmrl.ksu.edu)

- **New Single-Kernel-Near Infrared (NIR) Instrument is Now Available.** Perten Instruments of North America recently unveiled their new single kernel characterization system (SKCS 4170) which was developed jointly by Perten and members of the GMPRC Engineering Research Unit. This new system integrates the collection of single kernel hardness and NIR spectral data. With proper calibrations, this new instrument can measure kernel hardness, moisture content,

weight, diameter, color (red or white), protein content, insect damage, scab damage, etc., on single kernels at a rate of one kernel per second. Planned studies will examine the potential of this instrument to predict the end-use quality of wheat and other small grains such as sorghum, oats, barley, etc.
(Charles Martin, phone: 776-2730 email: chaz@usgmrl.ksu.edu)

- **Free Lipid and Quality Analysis in Wheat Can Be Accomplished Using NIR.** Free lipids are fat compounds that are not chemically bound to other compounds in flour. Levels of free lipids, especially those that have small sugar chains attached called glycolipids, have been correlated to the loaf volume of bread and, as a result, serve as a good determinant of bread baking quality. Results show that NIR can be used to measure the levels of various free lipids in wheat flour. Analysis times were short and the amounts of material needed were very small making this an ideal tool for predicting the baking quality of hard wheats in breeding programs or in the baking industry.
(Okky Chung, phone: 776-2703, email: and Jae Bom Ohm, phone: 776-2708, email: jay@usgmrl.ksu.edu)

- **Analysis of U.S. Soybean Genetic Base.** Soybean breeders have produced hundreds of improved varieties adapted to growing regions in North America. However, analysis of the parentage of these varieties has determined that as few as 18 soybean varieties introduced from China and the Koreas are the source of 85% of all of the genes in North American material. This narrow genetic base may threaten the ability of breeders to sustain genetic improvement of the crop. The USDA soybean germplasm collection has more than 15,000 soybean accessions, most have not been used by plant breeders. In order to aid breeders in the selection of genetically diverse parents for the development of breeding populations, several groups of plant accessions that are distinct from these ancestors have been identified. These lines may be useful to breeders wanting to utilize this genetic diversity in soybean improvement.
(Gina Brown-Guedira, phone: 532-7260, email: gbg@ksu.edu)

- **New Trap Developed for Monitoring Indianmeal Moth Populations.** The development of new, more effective monitoring tools that can detect the presence of insect pests are important because they can provide an early warning system that can detect and locate these pests before they become a serious problem. A trap was developed for Indianmeal moths that can be used in retail stores and other public areas. This trap can be hidden from customer view and still provides accurate information on the level of Indianmeal moths present. Because of its design, this trap may increase monitoring in places where none had been done in the past and may lead to earlier detection and better control of this important pest throughout the food distribution system.
(Mike Mullen, phone: 776-2782, email: mullen@usgmrl.ksu.edu and Allan Dowdy, phone: 776-2719, email: dowdy@usgmrl.ksu.edu)

- **Parasitoids Can Be Detected Accurately Using NIR.** Parasitic wasps, or parasitoids as they are commonly called, are naturally occurring, beneficial insects that attack and kill common

grain insect pests. They are a potential tool for controlling these pests as grain is stored and marketed. Since, some of the grain insect pests feed inside the kernel, the parasitoids that attack them also exist inside the kernel as a normal part of their life cycle. It is often impossible to determine if kernels contain internal pests or internal parasitoids by simply looking at them. NIR was used to scan wheat kernels automatically and was found to distinguish kernels that contained internal insect pests from those that contained internal parasitoids that had attacked the internal insect pests and from those that didn't have internal infestation with 100% accuracy. This technique is fast and efficient and can be used by companies that mass produce these beneficial insects to sort and characterize large numbers of samples for shipping and subsequent release in biological control programs. (Jim Baker, phone:776-2785, email: baker@usgmrl.ksu.edu)

- **New Scientist Joins GMPRC.** In August, Dr. Catherine Katsar joined the Plant Science and Entomology Research Unit of GMPRC. She is a native of Brooklyn, New York, and holds a B. S. degree in Plant Science from Cornell University. She received a M.S. degree in Plant Pathology and Microbiology and a Ph.D. in Entomology both from Texas A&M University. Her dissertation focused on greenbug resistance in sorghum. She continued further genetic studies of the greenbug as a USDA postdoctoral research associate in the Plant Protection Unit in Ithaca, New York. Dr. Katsar will be working on the mechanisms of wheat resistance to Hessian fly. Her work will include the development of more resistant wheat germplasms.
(Cathy Sue Katsar, phone: 785-532-4719, email: ckatsar@oz.oznet.ksu.edu)

Kernels Grain