GMPRC
GRAIN MARKETING AND PRODUCTION RESEARCH CENTER

RESEARCH Kernels

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- **Number.** Our customers can use our new 800 number **(1-800-627-0388)** to contact us.

- **Measurement of Vitreousness in Durum Wheat Using NIR.** Vitreousness is a visual measure of the clear appearance of the starch inside the kernel and it is used by the wheat industry as an indicator of milling and cooking quality. A NIR spectrometer attached to a single kernel wheat characterization instrument was used to classify kernels of durum wheat as vitreous or non-vitreous. Results showed that kernels that were obviously vitreous or non-vitreous were almost perfectly differentiated by NIR. Kernels with wide variations in the level of vitreousness were correctly classified 75% of the time. The NIR classifications appear to be due in part to starch and protein NIR absorption. This technology may provide the industry with an objective means for measuring the vitreousness of durum wheat kernels. (Floyd Dowell, phone: 785-776- 8523, email: fdowell@usgmrl.ksu.edu)

- **Demonstrated Transfer of Herbicide Resistance from One Species of Amaranthus (Pig Weed) to Another.** Amaranth plant species are commonly called Pig weed. A study was conducted to determine if the resistance to a specific herbicide could be transferred from one species of pig weed to another. The herbicide that was chosen kills plants by inhibiting the activity of a particular enzyme called acetolactate synthetase. The two plant species used were the Palmer amaranth and the common waterhemp. Plants of each species were grown in the growth chamber and crosses were made between herbicide resistant and sensitive plants. A total of 15 hybrids were produced from an estimated 10,000 flower cross pollinations. When hybrid plants were crossed with parents that were sensitive to the herbicide, the plants that were produced were resistant. This demonstrates that herbicide resistance that develops in one species may potentially spread to other species in the field. (Daniel Skinner, phone: 785-532-7247, email: dzolek@ksu.edu)

- **Impact of Diatomaceous Earth Treatment on Natural Insect Predators.** The Anisopteromalus calandrae is a very small wasp found in nature that attacks and kills rice weevil larva in wheat and other small grains. After stinging the larva, the female wasp lays one or two

eggs on the larva which develop into new wasp progeny and consume the larva as a food source during the process. With the potential loss of fumigants such as methyl bromide in the near future, the use of control alternatives such as diatomaceous earth is increasing. When tested in the laboratory at levels of 200 ppm and 400 ppm dusted onto Hard Red Winter wheat, the longevity of the parasitic female wasps and their ability to control the rice weevil was significantly decreased. On treated samples, only 13 wasp progeny developed compared with 93 progeny on untreated wheat. Therefore, while these alternative insect control products may be less detrimental to the environment, they may still have a significant impact on beneficial insects. (James Baker, phone: 785-776-2785, email: baker@usgmrl.ksu.edu)

- **Insect Resistance to Bacillus thuringiensis (Bt) Toxins Involves Gene Modification.** The development of insect resistance to Bacillus thuringiensis (Bt) toxins is a threat to the longevity of this environmentally-safe insecticide and to the toxin genes engineered into many crops such as corn and cotton. Bt resistant and sensitive strains of the Indianmeal moth were examined. Results showed that changes in the genetic material caused changes in two amino acids in the protein, aminopeptidase. Aminopeptidases are known to bind toxins in several insects. Thus, changes in the toxin- binding protein, aminopeptidase, explain how certain strains of the Indianmeal moth have been able to develop resistance to Bt toxins. This discovery is an important step in our understanding of how resistance to Bt toxins develops in insects. It also opens the door to the possible development of ways for overcoming this resistance. (Alan Dowdy, phone: 785-776-2719, email: dowdy@usgmrl.ksu.edu)

- **Importance of Food Odor in Insect Resistant Packaging.** In a cooperative research effort with a food manufacturing company, it was determined that certain types of cereals were becoming infested in the grocery stores while other cereals from the same plant were not. Results showed that the problem cereals contained significant quantities of dried apricots and apples which are components attractive to a number of insects. Also influencing infestation was the type of package liner. The company had been testing a liner with minute holes which allow pressure on the inside and outside of the packages to prevent a "pillowing" effect with pressure changes. These minute holes allowed insect pests to "smell" the contents of the package and provided them with a starting place to invade. The same cereals in packages without holes were much more resistant to insect invasion and remained insect free for approximately 8 weeks while the packages with holes became heavily infested after 2 weeks. Other cereal types containing little or no fruit and remained almost free from insect infestation for 12 weeks. This study indicates the importance of odor in developing an effective insect resistant package. (Michael Mullen, phone: 785-776-2782, email: mullen@usgmrl.ksu.edu)

- **New Scientist Joins the Plant Science and Entomology Research Unit.** The main objective of the Plant Science and Entomology Research Unit is to develop wheat and alfalfa germplasms that are resistant to a wide variety of insects and diseases. Dr. John Fellers is a new addition to this Unit. He is a native of Oklahoma and received his B.S. and M.S. degrees in Crop Science from Oklahoma State University where his research focused on wheat tissue culture. Dr. Fellers

received his Ph.D. in Crop Science from the University of Kentucky where he studied the development of disease resistance in tobacco plants. He continued this work in a postdoctorate position at North Carolina State University where he worked on mapping and cloning disease resistance genes in tobacco. Dr. Fellers will work on various aspects of pest resistance in wheat. Initial studies will include the development of molecular markers for resistance to karnal bunt and other diseases. (John Fellers, phone: 785-532-2367, email: jpf@alfalfa.ksu.edu)

- **New Postdoctorate in the Plant Science and Entomology Research Unit.** Dr. Dirk Hays received his Ph.D. from the University of Calgary, Alberta, Canada. He will be investigating the mechanisms of virulence of rust in both alfalfa and wheat. (Dirk Hays, phone: 785-532-7798, email: dhays@alfalfa.ksu.edu)

- **Additional Vacancies: Engineering.** GMPRC is currently looking for engineers to fill two vacancies in the Engineering Research Unit that have occurred due to retirements. Interested candidates should contact Dr. Jim Steele, Research Leader (phone: 785-776-2727, email: jsteele@usgmrl.ksu.edu)

- **Entomology.** GMPRC is currently looking for an entomologist to continue with the Hessian fly control program. Interested candidates should contact Dr. Merle Eversmeyer, Research Leader (phone: 785-532-6168, email: mge@alfalfa.ksu.edu)

- The announcements for the vacancies can be located at the ARS Human Resources Web site.