GMPRC
GRAIN MARKETING AND PRODUCTION RESEARCH CENTER

RESEARCH Kernels

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- **GMPRC Scientist Leads the Way in Discovering How Beetles Are Made.** For the past several years, Richard Beeman has been studying the genetics of Tribolium castaneum, commonly known as the red flour beetle, which is an important insect pest for harvested grain and cereal products worldwide. In June, Dr. Beeman submitted a request to the National Human Genome Research Institute, which is part of the National Institute of Health (NIH), asking that sequencing the complete genome of the red flour beetle be placed on the list of high national priorities. This request was granted and the Human Genome Sequencing Center of Baylor College of Medicine in Houston, TX was selected as the location where the sequencing will take place. The Agricultural Research Service is providing $200,000 in support of this effort and the remainder of the approximate $2.5 million cost will be funded by NIH. Dr. Beeman will supply the DNA for the sequencing project from his laboratory in Manhattan, KS.

  Beetles include some of the most destructive insect pests that attack our food supply. Knowing the structure of the entire genome of the red flour beetle will not only provide scientists with many new potential control points for this important pest, but it may provide information that can be used to control other important pest beetles such as the lesser grain borer, rice weevil, corn rootworm, and cotton boll weevil, to mention just a few. (Richard Beeman, telephone: 785-776-2710, email: beeman@gmprc.ksu.edu).

- **Beneficial Fungus Helps Control Important Insect Pest in Oats.** Stored oats are susceptible to infestation by insects such as the sawtoothed grain beetle. We have found that adding a specific fungus, Beauveria bassiana, that attacks only insects at a rate of 150 milligrams of spores per kilogram of grain resulted in a 70% reduction of beetles produced on cracked oats and a 98% reduction of beetles produced on whole oats. Future studies will test the effect of this fungus on other insect pests. (Jim Throne, telephone: 785-776-2796, email: throne@gmprc.ksu.edu).

- **Will the Real GLASSY Wheat Please Stand Up.** Vitreousness is an important quality attribute in hard wheats and especially in Durum wheat which is used to make pasta products. When vitreous kernels are cut open, the inside of the kernel has a glassy or vitreous appearance. High vitreousness indicates high protein content, harder and coarser granulation, higher yield of semolina, superior pasta color, and improved cooking quality. As a result, highly vitreous Durum usually sells for a premium. Current techniques for determining the level of vitreousness in wheat involve tedious visual inspections. We have tested a Foss Cervitec 1625 Grain Inspector and, after development of classification models, have found that it distinguished between highly vitreous and non-vitreous kernels with an accuracy greater than 92%. In addition, analysis times with this instrument were much faster. (Tom Pearson, telephone: 785-776-2729, email: tpearson@gmprc.ksu.edu).

- **How Badly Damaged is That Soybean?** Damage is an important quality factor for grading, marketing, and end-use of soybeans. Seed damage can be caused by weather, fungi, insects, artificial drying, and mechanical damage during harvesting, storage, and handling. The current method for assessing soybean damage is a visual assessment of the seed discoloration. An NIR instrument was used to collect single seed spectra in the wavelength region from 490 to 1,690 nm. Classification accuracies were 100% for sound seeds, 98% for weather damaged seeds, 97% for frost damaged seeds, 64% for sprout damaged seeds, 97% for heat damaged seeds, and 83% for mold damaged seeds. This work was done in cooperation with Dr. Donghai Wang from the Biological and Agricultural Engineering Department at Kansas State University. (Floyd Dowell, telephone 785-776-2753, email: fdowell@gmprc.ksu.edu).

- **Can First-Break Rollers in a Flour Mill be Gap Adjusted Automatically?** Some 140 samples of tempered wheat representing the six major classes were ground in an experimental roller mill using five roll gap settings (0.38, 0.51, 0.63, 0.75, and 0.88 mm). Grinding energy was measured in terms of energy units per mass and the flour produced was sieved into different sized fractions. Additional Hard Red Winter and Soft Red Winter samples were also milled in order to develop NIR prediction models specifically for these two wheat classes. NIR spectra were taken of all ground samples. Prediction models were developed from NIR data and could accurately predict the amounts of material obtained in each of the different particle size fractions with r2 value in the .9 range for the best models. As a result, it may be possible to use NIR analysis of the flour to automatically adjust the roll gap settings so that the desired particle sizes are produced. (Floyd Dowell, telephone 785-776-2753, email: fdowell@gmprc.ksu.edu).

- **Hessian Fly Larva Saliva Proteins Contain Secretion Signal.** In our last issue of Research Kernels (July 2003), we reported that Hessian fly larva inject saliva into wheat plants during feeding which severely stunts or kills the young seedlings. In our continued study, we have learned that a group of proteins in this saliva are made with a special amino acid sequence that serves as a secretion signal that can move the proteins from inside the salivary glands where they are made into the saliva of this insect pest. These proteins may play key roles in allowing this insect to attack wheat plants and finding ways to inhibit their activity may lead to better Hessian fly control or to more resistant wheat varieties. (Ming Shun Chen, telephone 785-532-532-4712, email: mchen@oznet.ksu.edu).

- **How Can You Design the Best Windbreak System?** In a recent study, we coupled a Geographical Information System that allows you to examine specific areas of a field or a series of fields with the windbreak subroutine from the Wind Erosion Prediction System. This combination allows scientists to simulate the effects of different types of windbreaks and their location and to test their effectiveness at controlling soil erosion. Application of this technique to an existing windbreak network showed that the windbreak distribution did not provide optimal protection. This tool may be applied to develop more effective windbreak systems in the future. (Larry Hagen, telephone 785-537-5545, email: hagen@weru.ksu.edu).

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