



RESEARCH Kernels

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- **USDA Small Grain Genotyping Lab in Manhattan, KS Offers Services.** The new USDA Small Grain Genotyping Laboratory located in Manhattan, KS, is one of four regional laboratories that have been established to provide analytical services to the wheat breeding community. Our Manhattan laboratory is now ready to offer genotyping services free of charge to hard winter wheat breeding programs. DNA markers can be screened using seeds (need a minimum of 5 seeds) or plant tissue (requires approximately 80 mg tissue). Customers wishing to use this service should contact Dr. Guihua Bai; telephone: 785-532-1124; FAX: 785-532-6168; email: gbai@agron.ksu.edu. Additional information about this service along with the sample submission protocol can be obtained from our web page defining this service at: www.oznet.ksu.edu/wheatgenotyping/service.html
- **Screening of Wheat Varieties for Hessian Fly Resistance Continues at GMPRC.** For many years, scientists at our Center have been screening wheat samples for the presence of genes that make them resistant to infestations by the Hessian fly. Each year breeders submit over 5000 breeding lines to our laboratories for evaluation and, in the past 10 years, over 20 Hessian fly resistant cultivars and 10 germplasms have been released as a result of this effort. Resistance screening is offered to breeding programs free of charge and customers who wish to take advantage of this service should contact Dr. Ming Chen; telephone: 785-532-4179; email: mchen@oznet.ksu.edu. At present, only phenotypic screening is available. However, we are developing molecular markers linked to specific resistance genes and marker-assisted selection will be available in the near future. Additional information about this service is available on our web page defining this service at: www.oznet.ksu.edu/hessianfly.
- **Waffles Made From Sorghum Flour Taste Great.** The demand for baked products that do not contain wheat is increasing and fueled by significant numbers of people who can not tolerate wheat proteins. We have optimized the production of non-wheat waffles using food-grade sorghum flour as the primary ingredient. Egg-protein foam was used to provide the necessary structure to the waffles and the base formula consisted of sorghum flour, non-fat powdered dry milk, powdered egg whites, sugar, salt, and baking soda. Waffle quality was measured using texture analysis, weight, height, and by visual assessment of color and internal structure.

Sorghum waffles produced with this procedure were similar to wheat waffles in appearance, structure, and taste. (Scott Bean, telephone: 785-776-2725; email: scott@gmprc.ksu.edu)

- **Are There Any Bugs in That Wheat?** Manual inspection of wheat kernels for insect damage is laborious, requiring approximately 20 minutes per 100g sample. In addition, visual inspection may miss significant levels of infestation hidden inside the kernels. We have developed a technique that measures the sound made by single kernels as they fall onto a steel plate as a means of measuring insect damage. Undamaged kernels produce noise that is mostly above what humans can hear and this noise dies out very quickly. Insect-damaged kernels produce sound at a lower frequency that tends to linger on. We have used this system to correctly identify insect damaged kernels with 90% accuracy and undamaged kernels with 99% accuracy. This technique is non-destructive, relatively inexpensive, and fast with a throughput rate of over 40 kernels per second (100g in 80 seconds). (Thomas Pearson, telephone: 785-776-2729; email: tpearson@gmprc.ksu.edu)
- **A Unique Method to Attack Indianmeal Moths.** Insects, like people and other mammals, depend on proteins to protect them from attack by fungi and bacteria. In mammals, these proteins are called antibodies. We have discovered and characterized a large protein that circulates in the blood of Indianmeal moths and activates the insect's immune system when under attack by microorganisms. We have demonstrated that specific regions of this molecule have unique biochemical characteristics that are responsible for this immune system activation. Understanding how such proteins work to protect the insect offer an opportunity for us to design small compounds that can interfere with the normal functions of this insect immune system making them much more vulnerable to attack by microorganisms. (James Baker, telephone: 785-776-2785; email: baker@gmprc.ksu.edu)
- **How Can That Fusarium Fungus Cause Head Blight in Wheat?** *Fusarium graminearum* (also called *Gibberella zeae*) is the fungus that is mainly responsible for Fusarium head blight - an important disease affecting the yield and quality of wheat and barley. We have identified one major gene that controls the ability of this fungus to infect wheat and this gene is located in a region of the chromosome that controls the amount of toxin produced by the fungus. We have also identified one or two genes that control the aggressiveness of this fungus by controlling which toxin is produced. Those organisms that produced deoxynivalenol were about twice as aggressive as those that produced nivalenol. (Robert Bowden, telephone: 785-532-2368; email: rbowden@plantpath.ksu.edu)
- **Engineering Research Unit Expands High-Speed Sorting Capabilities.** The Engineering Research Unit has expanded their cooperative research with Satake, Inc., Houston, TX, to include a second single-kernel high-speed sorter. We will now have the capability to sort bulk samples at more than 1000 kernels per second using a high resolution visible wavelength sorter, and a sorter that utilizes near-infrared wavelengths. This technology is currently being used by several breeding programs in surrounding states to purify white wheat varieties that are being developed and was partially funded by the Kansas Wheat Commission. We also received funding from the Texas Corn Producers to utilize this technology to remove aflatoxin and fumonisin contaminated

kernels from corn. Tests will be conducted to determine if this technology can remove unwanted kernels from edible sorghum and soybeans, discolored kernels from white millet and white sorghum, aflatoxin contaminated kernels from peanuts, and scabby kernels and insect damaged kernels from wheat. (Floyd Dowell, telephone: 785-776-2753; email: fdowell@gmprc.ksu.edu)

- **Update on Center Renovation.** We are preparing to start the renovation process for our main research facility here in Manhattan. Contractors have submitted their bids and we expect the actual renovation process to begin early this summer. During this process, portions of our employees will be moved to temporary quarters in our newly built “swing space” while the old HVAC and electrical systems in their normal locations are replaced. Once a section has been renovated, employees will be returned to their normal locations and the next section for renovation will be vacated. Since the main entrance will be one of the first sections renovated, visitors to the Center will have to enter the facility through a new door located on the west side of the building. We anticipate that the renovation process will take nearly 2 years to complete. (Donald Koeltzow, telephone: 785-776-2702; email: dek@gmprc.ksu.edu)

U.S. Department of Agriculture, Agriculture Research Service, Grain Marketing and Production Research Center, 1515 College Avenue, Manhattan, KS 66502. Phone:800-627-0388.