GMPRC
GRAIN MARKETING AND PRODUCTION RESEARCH CENTER

RESEARCH Kernels

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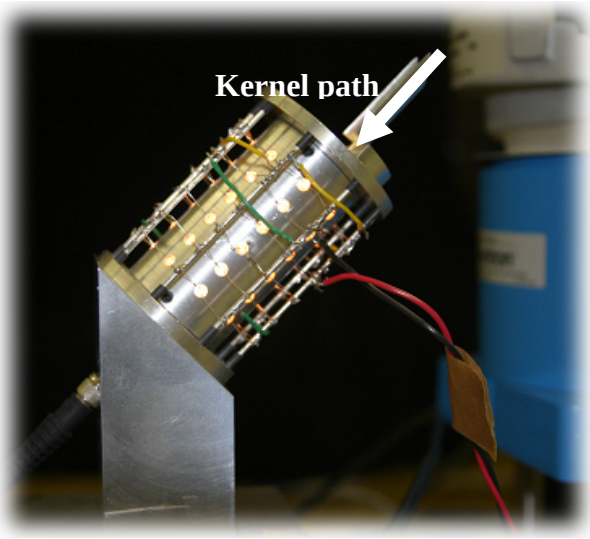
We Can Analyze That Kernel In 1/10th Of A Second. When producing new varieties, seed development requires the evaluation of hundreds of seed lines over multiple years to produce only a handful of commercial varieties or hybrids each year. Single-kernel near infrared (SKNIR) measurement has been used to improve and accelerate this process by being able to measure and sort seeds for desirable characteristics. We have designed and tested a new SKNIR system that can measure seed characteristics for corn and soybeans at 10 kernels per second. In this instrument, spectra are collected as kernels move along the length of a glass tube. Results show that



Light tube detector.

this instrument was capable of accurate predictions of kernel protein and moisture contents at these speeds. Thus, this instrument has excellent potential for reducing the number of years and costs associated with the development of new corn hybrids and soybean lines that carry specific quality traits. (Paul Armstrong, telephone: 785-776-2728; email: paul.armstrong@gmprc.ksu.edu)

Is There A Fungus Among Us? We measured near infrared spectra, x-ray images, visual color images, and physical properties of single corn kernels to determine if combinations of these measurements could distinguish kernels infected with one of several different fungi (*Acremonium zeae, Aspergillus flavus, Aspergillus niger, Diplodia maydis, Fusarium graminearum, Fusarium verticillioides, Penicillium spp.,* and *Trichoderma viride*) from sound kernels. Results indicated that kernels infected with *Acremonium zeae* and *Penicillium* were difficult to distinguish from non-infected kernels while all of the other severely infected kernels could be distinguished from sound kernels with greater than 91% accuracy. This technology will be able to assist breeders in the development of disease resistant hybrids. In addition, it may be commercialized to help clean grain shipments and improve the quality. (Thomas Pearson, telephone: 785-776-2729; email: thomas.pearson@gmprc.ksu.edu)

Watch Out For High Relative Humidity When Aerating Grain! Grain aeration has been used as an inexpensive method to improve storage conditions and lower the risk of insect infestations. However, our studies have shown that this may be difficult to do immediately after harvest as part of an integrated pest management strategy in much of the hard winter wheat growing region due to the significant impact of high nighttime relative humidity. We evaluated 50 years worth of historical weather data from mid-July through early August in Kansas, Oklahoma, Texas, eastern New Mexico, and eastern Colorado.

Our calculations showed that, when the complicating effect of high humidity was combined with the high temperatures, the average number of hours available for effective grain cooling decreased by an average of 68% for 12% moisture wheat and by 88% for 10% moisture wheat when compared with calculations based on ambient temperatures alone. (Mark Casada, telephone: 785-776-2758; email: mark.casada@gmprc.ksu.edu)

Give Those Hessian Fly Pests A Tummy Ache. The Hessian fly is one of the most destructive insect pests of wheat plants. One important method for controlling such pests is to inhibit the activity of their digestive enzymes so that they can not digest their food.

Adult Hessian fly.

Previous work in our laboratories has focused on one type of digestive enzyme called an endopeptidase because it breaks down proteins by cutting them apart in the middle. We are currently studying the digestive activities of digestive enzymes called exopeptidases because they break down proteins by cutting pieces off the end rather than in the middle. We have found five genes in the larval stage of the Hessian fly that code for three different exopeptidase enzymes. We are in the process of finding methods to inhibit these enzymes as a means of controlling this significant insect pest. (Ming-Shun Chen, telephone: 785-532-4719; email: ming-shun.chen@gmprc.ksu.edu)

New Method Developed For Measuring and Extracting Healthful Compound From Soybeans. Many different forms of soy meal and other preparations are found in a wide variety of foods and the compound, genistein, from soy beans is present in almost all of them. Genistein has been shown to mimick the effects of the female hormone, estrogen, and could have benificial uses in the treatment of heart disease and cancer. We developed a new method for extracting the genistein from food substances using solvents under pressure and heat. Levels extracted from a wide variety of foods were comparable to those obtained using older slower methods. This extraction process is rapid, can be automated, can be used to measure the levels of genistein in foods, and could be scaled up for commercial extractions of this important substance. (Scott Bean, telephone: 785-776-2725; email: scott.bean@gmprc.ksu.edu)

Too Hot? Try Some EF-Tu Protein. When plants are stressed by heat in their environment, one proposed response is that they produce proteins that make them more tolerant to such heat stress. In maize (corn), a protein called EF-Tu that is localized in the chloroplast structures, has been implicated as such a heat tolerance protein. We investigated the levels of EF-Tu produced by heat tolerant and heat sensitive lines at different stages of plant growth. Heat tolerant maize lines produced EF-Tu in plants of all ages (except for 5-day-old shoots) and showed additional accumulation of EF-Tu under conditions of heat stress. In contrast, levels of EF-Tu in heat sensitive plants were lower and the protein only accumulated in plants up to 14 days old. Breeders may be able to use this information to select for hybrid lines that can withstand higher heat stress conditions in the environment. (Zoran Ristic, telephone: 785-532-7746, email: zoran.ristic@gmprc.ksu.edu)

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