



RESEARCH Kernels

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- **Fumonisin Detected in Single Corn Kernels by NIR Spectroscopy.** Fumonisin is a toxin that is produced by certain species of fungi that can grow on corn and other grains. Horses are particularly sensitive to the presence of this toxin in feeds. Single corn kernels that had been infected with *Fusarium verticillioides* were analyzed for fumonisin content using near infrared (NIR) spectroscopy. Kernels with greater than 100 ppm fumonisin were correctly classed as fumonisin positive and those containing less than 10 ppm were accurately classed as fumonisin negative. Generally, analysis of spectra data from 4 specific wavelengths correctly classified more kernels than analysis of data from only 2 wavelengths. This research shows that NIR technology can be used to rapidly screen single corn kernels for the presence of fumonisin. This project was a cooperative effort between the GMPRC, the USDA-ARS Western Regional Research Center in Albany, CA, and the USDA-ARS National Center for Agricultural Utilization Research in Peoria, IL. (Floyd Dowell, telephone: 785-776-2753, email: fdowell@usgmrl.ksu.edu)
- **Aeration Management for Stored Corn.** Historical weather data were used to classify the northern United States into different regions and predict how quickly stored corn could be cooled through aeration to limit insect population growth. Model predictions showed that aeration would quickly lower temperatures to 60 F throughout the northern United States, while it took 2-3 months for temperatures in unaerated corn to drop to this level, depending on regional climatic patterns. Lowering grain temperature to 60 F stops insect development. Aeration also reduced the predicted number of maize weevil larvae and adults produced in aerated corn, as compared to unaerated corn. Proper use of aeration could reduce or even eliminate the need for insecticides in corn and other grains stored in the northern United States. (Frank Arthur, telephone: 785-776-2783, email: arthur@usgmrl.ksu.edu)
- **Sampling Plan Developed for Area-Wide Integrated Pest Management of Stored Wheat.** In collaboration with Kansas State University and Oklahoma State University, 10 one-gallon grain samples taken using a vacuum probe from the top 40 feet of stored wheat in large grain elevator storage bins have been shown to provide a reliable estimate of current insect infestation levels in these bins. The total insect density tended to be highest near the grain surface and often decreased with depth in the grain. Elevator managers are using information on insect densities from our

sampling program to make pest management decisions. Using information on insect density to decide which grain to sell or fumigate can reduce the cost of insect pest management. For example, fumigation of all of the grain at an elevator storing 700,000 bushels of wheat would cost \$14,000. However, if the elevator manager knows that only 3 of these bins have high insect numbers, fumigating these bins would cost only \$1,400 and the cost of pest management would be reduced by \$12,600. (David Hagstrum, telephone: 785-776-2718, e-mail: hagstrum@usgmrl.ksu.edu)

- **Development of Techniques to Genetically Modify Beetles.** Foreign genes have been successfully inserted into beetles for the first time. Two "jumping genes", one derived from a moth and the other from a fly, have been inserted into the chromosomes of the red flour beetle, a common pest of stored products, using new transgene technology. These jumping genes can be used to modify, tag, or delete target genes in pest insects; to identify insect control genes for insertion into transgenic crops; or to insert novel genes into beneficial insects to confer additional desirable traits. Information obtained from such studies reveals normal developmental processes in insect pests that can be attacked to produce better, more cost effective, and more environmentally friendly insect pest control in the future. (Dick Beeman, 785-776-2710, email: beeman@usgmrl.ksu.edu)

- **New Insect Model Accurately Predicts Insect Problems in Grain Elevators for more Economical Pest Management.** Insect pests of stored grain cause millions of dollars in losses annually in the U.S. Most of the wheat in the U.S. is stored in large country and terminal elevators, and the lesser grain borer is one of the most common and damaging insects to this grain. When more than two insects are found per kg, the wheat is designated infested and the value is discounted to cover the cost of fumigation. We have developed a computer model that predicts insect numbers in elevator storage bins. The model was tested using field data collected from elevators in Kansas and Oklahoma in the Area-wide Integrated Pest Management Program (IPM) for Suppression of Insects in Stored Wheat. In general, the model accurately predicted lesser grain borer populations and their distribution within the silos. This model can be used to predict when insects in grain will reach unacceptable levels, the cost benefit of different treatments, and the probability of insects being detected when the grain is shipped out. This model will be used in a decision support system that we are developing for grain elevators, as part of the area-wide IPM program for insect pests in stored wheat. (Paul Flinn, telephone: 785-776-2707; email: flinn@usgmrl.ksu.edu)

- **Modified Trap to Detect Stored Product Insects.** The FLITe-TRAK trap is used to monitor insect activity around stored products, such as in processing facilities, warehouses, mills, and retail facilities. The trap has been modified by adding a dust resistant cover for use in dusty environments to eliminate fouling with dust that reduces the effectiveness of the original trap. The trap is being marketed by Tre'ce' Inc. in Salinas, CA. An additional trap, the "Descreet Trap" designed to be placed under shelves out of view, will also be available from Tre'ce'. (Mike

Mullen, telephone: 785-776-2785; email: mullen@usgmrl.ksu.edu

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- **Potato Protein is Biopesticide Against Corn Rootworm.** The southern corn rootworm causes extensive damage to many agricultural crops. Cultivars resistant to rootworms can be produced using biotechnology. We have identified and characterized a protein from potato that selectively inhibits the major digestive protein in rootworms and we have shown that this protein retards the growth of this insect when it is eaten. The results indicate that the gene that codes for this protein could be used to develop rootworm-resistant plants. (Karl Kramer, telephone: 785-776-2711; email: kramer@usgmrl.ksu.edu)

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- **GMPRC Has a New Telephone System.** We apologize to any of our customers who have had difficulty reaching us on the telephone recently. On Monday, December 18, two of the main computer boards of our telephone system failed. Replacement of these boards was not cost effective and a completely new telephone system had to be installed. Thus, we ask for your patience while we learn how to transfer calls and apply voice mail and other features of this new systems. All of our telephone numbers have remained the same including the 1-800-627-0388. Again, we regret the inconvenience that this has caused. (Don Koeltzow, telephone: 785-776-2702; email: dek@usgmrl.ksu.edu)

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Kernels

Grain