GMPRC
GRAIN MARKETING AND PRODUCTION RESEARCH CENTER

RESEARCH Kernels

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- **Aflatoxin Detected in Single Corn Kernels by NIR Spectroscopy.** Aspergillus flavus is a fungus that produces aflatoxin and can invade corn kernels, especially if the plant has undergone some type of stress. The occurrence of aflatoxin in corn has caused severe economic consequences during periods of drought stress. NIR transmittance spectra from 500 to 950 nm and NIR reflectance spectra from 550 to 1700 nm were obtained on whole corn kernels exhibiting various levels of bright greenish-yellow fluorescence. Afterwards, each kernel was analyzed for aflatoxin. When analyzing transmittance spectra, >95% of kernels were correctly classified as containing >100 ppb aflatoxin or as having no detectable aflatoxin. When analyzing reflectance spectra, classification accuracies were generally greater than 90%. This research shows that NIR spectroscopy can be used to rapidly screen corn kernels for the presence of aflatoxin. This was a cooperative effort between the GMPRC, the USDA ARS Western Regional Research Center, Albany, CA, and the USDA-ARS National Center for Agricultural Utilization Research in Peoria, IL.

(Tom Pearson, telephone: 785-776-2729, email: tpearson@gmprc.ksu.edu.)

- **Identity preservation during commercial grain handling.** The Engineering Research Unit 50,000 bu grain elevator is being used to determine identity preservation procedures for commercial grain storage facilities, and levels of contamination that may be expected. In initial testing, grain residues and cross-contaminations were measured in all of the elevator equipment after grain handling was completed. The preliminary contamination tests indicated that only the first 15 to 20 bu of grain (approximately 1% of the leg rate per hour) were contaminated at greater than a 1% level; only the first 40 to 50 bu of grain (approximately 2% of the leg rate per hour) were contaminated at greater than a 0.5 % level.

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- **Safe Storage of Cleaned Oats.** Oats are susceptible to attack by insect pests during storage. We investigated the susceptibility of eight commercial varieties of oats grown in the U.S. to attack by flat grain beetles and sawtoothed grain beetles, common insect pests of stored oats in the U.S. Whole oats could be stored at high temperatures for at least a year without reaching the insect damage threshold (established for classifying a sample as infested in the official inspection system). However, the insect damage threshold was reached in about three months when the oats were cracked. These results indicate that little or no insect control would be required if oats were cleaned to remove cracked grain and other insect food sources before storage.

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- **Chewing Insects Require Metals for Hard Teeth.** Insect mandibles are used to damage and penetrate intact grain kernels. We have examined whether the ability of insect pests to attack kernels may be influenced by the presence of metals in the mandibular teeth. In a collaborative study with scientists in the UK, we have shown for the first time that not only adult, but also larval mandibles of several stored product insect pests have high levels of zinc and/or manganese in these teeth. Larvae that do not have such high levels of metals in their mandibles are less capable of penetrating whole kernels.

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- **Two New Scientists Join GMPRC. Dr. Tom Pearson** joined the Engineering Research Unit in July to fill the position vacated by Dr. Inna Zayas. Dr. Pearson received his B.S. in Mechanical Engineering from California State University in Fresno, and his M.S. and Ph.D. in Agricultural Engineering from UC Davis. Dr. Pearson has experience as a Project Engineer/Senior Research and Development Engineer with Wiebe Conveyance, Hollister, California, and as a Lead Scientist at the Western Regional Research Center, Albany, CA. He has expertise in developing high-speed detection and sorting systems, machine vision, NIR, acoustics, and electronic circuitry. Dr. Pearson's responsibilities at the GMPRC will include developing sensing methods, techniques, equipment, and instrumentation for automating quality assessments of grain and grain products.

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- **Dr. Ming-Shun Chen** will be joining the Plant Science and Entomology Research Unit in

August. Dr. Chen received his B.S. in Plant Protection from the Hunan Agricultural University and his M.S. degree in Entomology from the Fujian Agricultural University in China. After working as a research assistant in the Chinese National Rice Research Institute, he attended graduate school at Kansas State University where he received his Ph.D. in biochemistry. During his stay in Manhattan, he worked with Gerald Reeck in Biochemistry on the identification of wheat and rice proteins that are toxic to pest insects. For the past 9 years, he has been conducting genetics research in the control of cancer at the Washington University School of Medicine in St. Louis, Missouri. Dr. Chen brings a wealth of experience from several different areas and his main responsibility will be the continuation of the Hessian fly project. This includes studying the plant-insect interactions that are needed in order for the Hessian fly to damage the wheat plant and the response of the wheat plant to insect attack on the molecular level.

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