

Grain Quality Newsletter

News and Highlights from NC-213: Management of Grain Quality and Security in World Markets.

Volume 26:3

Visit the NC-213 web site at: <http://www.oardc.ohio-state.edu/nc213>



Calendar items of interest ...

Upcoming deadlines and events

- **NC-213 Annual Meeting 2007:** Our next Annual Meeting will take place on February 21-22, 2007, in Kansas City, Missouri, at the Embassy Suites KCI. We will be meeting with the Wheat Quality Council (their meeting dates are February 20, 21, and 22) and enjoy a joint banquet on the evening of Wednesday, February 21, 2007. Please read the article in this issue.
- **Anderson Research Grant Program—Team Competition 2005:** If your first year of research ends soon, remember to file an Annual Report with the Administrative Advisor's office to ensure that your second year funding will be released on time.
- **Anderson Research Grant Program—Regular Competition 2007:** Projected announcement date is June 2007 for a projected due date for RFP on September 1, 2007.
- **Anderson Research Grant Program—Team Competition 2008:** Projected announcement date is June 2008 for a projected due date for RFP on September 1, 2008.

The Grain Quality Newsletter is published and distributed at no charge to NC-213 (formerly NC-151) participants and supporters of research on "Management of Grain Quality and Security in World Markets."

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NC-213 Annual Meeting Set for February 2007

The NC-213 Annual Meeting/Technical Session is scheduled for February 21 and 22, 2007, at the Embassy Suites K.C.I. in Kansas City, Missouri. We will be enjoying a joint banquet with the Wheat Quality Conference.

NC-213's current Executive Committee is excited to offer a program that will include many informative presentations.

Here is the tentative program:

Wednesday, February 21, 2007

11:00 a.m.–1:00 p.m.
NC-213 Executive Committee Meeting.

1:00 p.m.–5:00 p.m.
NC-213 Meeting Registration.

1:00 p.m.–5:00 p.m.
NC-213 Technical Sessions.

Banquet

Sit-down plated-dinner with Wheat Quality Council and NC-213. Presentation of The Andersons Research Award. Keynote Address provided by Wheat Quality Council (speaker to be announced). Location: Ballroom, Embassy Suites K.C.I.

Thursday, February 22, 2007

8:00 a.m.–12:00 p.m.
NC-213 Technical Sessions, Continuation.

12:00 p.m.–1:30 p.m.
NC-213 Business Meeting
Location: Salon E, Embassy Suites K.C.I.

For all NC-213 Participants, Executive Board, and Industry Advisory Committee.

The Technical Sessions will include presentations from all three objectives and awarded proposals from the Andersons Research Grant Program.

Objective 1: This session will explore the practices and technologies to support quality management systems for production, distribution, processing, and utilization of quality grains and oil seeds. Papers will address, in part, the practices and technologies to support quality management systems for production, distribution, processing, and utilization of grains and oil seeds. Pre-harvest production will also be covered.

Objective 2: This session will explore basic knowledge, science-based standards, and technologies that promote crop quality, food security, and food safety in grain markets. Papers will address

NC-213 Annual Meeting/Technical Session Program
Embassy Suites K.C.I.
7640 N.W. Tiffany Springs Parkway
Kansas City, Missouri 64153
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grain quality and food safety during production, storage, and processing for feed, food, or industrial use.

In addition, this session will include the evaluation and development of standards and technologies based on sound science. Research areas include identity preservation; pest control; microbiological indicators of safety and quality; physical, chemical, and biological means of ensuring grain safety and quality; and trace-back technologies.

Objective 3: This session will explore the creation of and dissemination of scientific knowledge that will enhance public confidence in market-driven quality management systems for grain. Papers will address methods of measuring ingredients, methods of evaluating biochemical components, and the identification of quality traits of ingredients.

Speakers

Richard Stroshine, Purdue University

Storability measurement of shelled corn as a means of improving stored grain management practices and preventing losses. (Anderson Research Grant Program Regular-Awarded Proposal)

Richard Stroshine, Purdue University

Physical and chemical properties of shelled corn related to conditioning and processing. (Anderson Research Grant Program Regular-Awarded Proposal)

Lloyd Bullerman, University of Nebraska-Lincoln

Biological evaluation of reduction of Fumonisin B1 Toxicity in corn grits by extrusion processing. (Anderson Research Grant Program Regular-Awarded Proposal)

Klein Ileleji, Purdue University

Investigation of methods to improve the flowability of distillers' dried grains with solubles (DDGS) during processing, handling, storage, and transport. (Anderson Research Grant Program Regular-Awarded Proposal)

Dirk Maier, Purdue University

Ozonation of corn, wheat, and barley for the control of pests and spoilage agents, and the removal of off-odors in commercial grain storage structures. (Anderson Research Grant Program Team-Awarded Proposal)

Tim Herrman, Texas A&M University

Review on a Distance Learning Program with the Feed Industry.

IWCSP Conference Explores Grain Quality Preservation

More than 650 scientists, engineers, government officials, students, media, and industry representatives from 46 countries gathered at the 9th International Working Conference on Stored Product Protection (IWCSP) in Campinas, Brazil, from October 15 to 18, 2006, to present, review, and discuss the latest research, technologies, and practices related to grain quality preservation and stored product protection.

NC-213 members who attended were Linda Mason and Dirk Maier from Purdue University; Tom Phillips and Brian Adams from Oklahoma State University; Bh. 'Subi' Subramanyam from Kansas State University; Jim Throne, Frank Arthur, Paul Flinn, and Jim Campbell from the USDA-ARS GMPRC; and Don Wicklow from the USDA-ARS NCAUR.

More than 180 keynote addresses, oral presentations, and posters were presented during the conference. Topics included stored grain losses; microorganisms, mycotoxins, and other biological contaminants; new chemicals and food residues; pest resistance to pesticides and control measures; biology, behavior, and pest detection on stored grain; fumigation and control atmosphere; alternative methods to chemical control; quality in grain drying; psocids, mites, and other contaminants; and stored grain protection.

NC-213 members were actively involved in all aspects of the conference by serving as session moderators (Paul Flinn, Jim Throne, Bh. Subramanyam, Dirk Maier), keynote speakers (Don Wicklow, Frank Arthur, Dirk Maier) as well as oral paper and poster presenters. All told, NC-213 members contributed a substantial portion of the 180 proceedings contributions.

Proceedings in hard copy or on a CD are available by contacting Dr. Jim Campbell at james.campbell@gmprc.ksu.edu.

Additionally, Jim Throne, who has served many years as secretary-treasurer of the IWCSP Permanent Committee (PC) was elected chair of the PC and Jim Campbell was elected secretary-treasurer. Dirk Maier was elected to serve on the PC as the first engineering representative.

The primary purpose of the PC is to coordinate the planning of each conference.

The IWCSP takes place every four years and is the premier scientific conference on grain quality preservation and stored product protection in the world. Its primary purpose is to bring together research scientists, consultants, extension specialists, government officials, and industry representatives involved in the safe storage of the world's durable food commodities, such as grains, legumes, pulses, nuts, as well as derived processed products, such as animal feeds. (See <http://www.abrapos.org.br/9thIWCSP/en/index.php>).

The 10th IWCSP will be held in Lisbon, Portugal, in 2010. All NC-213 members are encouraged to attend the next conference.

NC-213 Engineers, Scientists, and Economists Share Their Research

Integrating the Stored Grain Advisor Pro Expert System With an Automated Electronic Grain Probe Trapping System

Automation of grain sampling should help to increase the adoption of stored-grain integrated pest management. A new commercial electronic grain probe trap (OPI Insector™) has recently been marketed. To make accurate insect management decisions, managers need to know both the insect species and numbers found in their grain. To make good management decisions, trap catch needs to be interpreted for the user.

Insect species and grain temperature are two important factors that influence trap catch. Thus, an electronic trap needs to be able to estimate the species caught and grain temperature.

OPI Insector™ electronic grain probes were field tested in two bins, each containing 32.6 tons of wheat, for a 10-month period. Estimates of insect density (insects/kg wheat) were compared to the Insector counts. A statistical model was used to convert Insector™ catch into insects per kg. The average Insector™ manual tip counts and electronic counts were similar for most trapping dates.

Stored Grain Advisor Pro (SGA Pro) was modified to automatically read the Insector database and to use a statistical model to estimate rusty grain beetle density from trap catch counts and grain temperature. Management decisions using Insector™ trap catch estimates for the rusty grain beetle density were similar to those made using actual insect density for 10 out of 12 sampling dates for the first grain bin, and 11 out of 12 sampling dates for the second grain bin.

The statistical model used to predict insect density from Insector™ trap catch tended to underestimate rusty grain beetle density when the grain was warmer than 23°C.

(Paul Flinn, 785-776-2707, e-mail: paul.flinn@gmprc.ksu.edu)

Detection of Corn Kernels Infected by Fungi

Near-infrared spectra, X-ray images, color images, near-infrared images, and physical properties of single corn kernels were studied to determine if combinations of these measurements could distinguish fungal-infected kernels from uninfected kernels.

Kernels used in this study were inoculated in the field with eight different fungi—*Acremonium zeae*, *Aspergillus flavus*, *Aspergillus niger*, *Diplodia maydis*, *Fusarium graminearum*, *Fusarium verticillioides*, *Penicillium* spp., and *Trichoderma viride*. Results indicate that kernels infected with *Acremonium zeae* and *Penicillium* were difficult to distinguish from uninfected kernels, while all of the other severely infected kernels could be distinguished with greater than 91% accuracy.

A neural network was also trained to identify infecting mold species with good accuracy, based on the near-infrared spectra. These results indicate that this technology can potentially be used to separate fungal-infected corn using a high-speed sorter and automatically and rapidly identify the fungal species of infested corn kernels. This will be of assistance to breeders developing fungal-resistant hybrids as well as mycologists studying fungal-infected corn.

(Thomas Pearson, 785-776-2729; e-mail: thomas.pearson@gmprc.ksu.edu)

Detection of Underdeveloped Hazelnuts From Fully Developed Nuts by Impact Acoustics

The acoustic emissions from inshell hazelnuts as they impact with a steel plate were analyzed for their ability to distinguish nuts with fully developed kernels from those with underdeveloped kernels. The analysis included examination of the acoustic signals in the time domain as well as the frequency domain.

Classification accuracies as high as 97% were achieved by this simple and low-cost method. The system has a potential to sort nuts at rates up to 40 per second.

Nuts with underdeveloped kernels are of lower value and can be more likely to contain aflatoxin. Thus, this method should give hazelnut producers and exporters a means to produce a higher quality and safer product.

(Thomas Pearson, 785-776-2729; e-mail: thomas.pearson@gmprc.ksu.edu)

Separation of Pearl Millet Proteins by HPCE

Pearl millet is widely grown around the world for a diverse number of uses. Millets are common in developing countries and often grown in areas with poor soil and low moisture levels. The characterization of pearl millet proteins is far behind that of cereals such as wheat.

The purpose of this project was to investigate the use of high-performance capillary electrophoresis (HPCE) for characterizing pearl millet proteins and for use in varietal identification and potential for analysis of protein expression during kernel development. HPCE was found to successfully separate millet proteins and was a rapid technique for differentiating pearl millet hybrids and lines. This provides a new tool for studying pearl millet proteins.

Factors Impacting Ethanol Production From Grain Sorghum in the Dry-Grind Process

Sorghum is a drought- and heat-tolerant grain with starch content similar to that of maize. Currently, about 5 to 15% of the U.S. sorghum crop goes towards the production of fuel ethanol.

In order to improve the production of fuel ethanol from sorghum, the goal of this research was to understand the key factors impacting ethanol production from grain sorghum. Major factors related to higher ethanol production from sorghum included high starch content, rapid liquefaction, and low viscosity during liquefaction.

Understanding the factors that can lead to improved ethanol production from sorghum may lead to ways the ethanol process can be altered to improve ethanol yields from sorghum and help sorghum breeders identify sorghum germ plasm specifically for ethanol production.

(Scott Bean, 785-776-2725; e-mail: scott.bean@gmprc.ksu.edu)

Durability and Breakage of Feed Pellets During Repeated Elevator Handling

Pelleting of animal feed improves the efficiency of feeding and the convenience of feed handling. An estimated 80% of nonruminant feed in the United States is pelleted. These feed pellets need to be durable and of high quality to withstand the handling and transportation process from feed mill to feed trough.

To determine breakage and durability of corn-meal-type feed pellets, the pellets were repeatedly transferred between two storage bins in the USDA-ARS Grain Marketing and Production Research Center research elevator at Manhattan, Kansas. The feed pellets withstood eight repeated elevator handlings without a significant change in durability as measured by the standard tumbling box test.

In general, the handling characteristics were similar to shelled corn, but these feed pellets generated less dust emissions compared with shelled corn. These results will help feed handlers evaluate and improve their handling and transportation procedures.

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Feed Industry HACCP Training to Be Available Online

Feed Industry Hazard Analysis and Critical Control Points (HACCP) Training is being offered online by the Department of Soil and Crop Sciences at Texas A&M University. The course—Feed Industry HACCP, Agro 689—will be offered from January to March 2007. The course may be taken for two graduate credits or as a continuing education course.

HACCP in the feed industry utilizes a process approach directed toward ensuring food safety. While not a regulatory standard for the North American feed industry, an increasing emphasis on HACCP by food processors and export customers necessitates the voluntary adoption of this technique by all sectors of the feed industry to retain their competitiveness.

This course emphasizes a science-based risk-management approach to identifying and managing hazards in feed ingredients and finished feed combined with the application of management science including quality assurance, regulatory standards, ISO 9001 and ISO 22000 quality-management systems, and hazard analysis and critical control point principles needed to maintain a system to manufacture safe foods and feeds.

Course contents:

- Prerequisite programs including quality assurance, standard operating procedures (SOPs), sanitary SOPs, regulatory standards, and ISO 9001 and 22000.
- Physical and chemical safety hazards in a feed mill.
- Pathogen reduction and biological food safety hazards.
- HACCP Principles.
- Developing a HACCP plan.
- Implementing and maintaining HACCP.
- Managing recalls: Class 1 and Class 2.

Registration information including cost will be posted on the class web site at: <http://agonline.tamu.edu/haccp/>.

The lead instructor is Dr. Tim Herrman, professor of grain science. He may be reached at 979-845-1121; fax: 979-845-1389; e-mail: tjh@otsc.tamu.edu.

The textbook for this course is: *HACCP: A Systematic Approach to Food Safety*, by Kenneth E. Stevenson and Dane T. Bernard, Third Edition, 1999. The text is available for online purchase from www.bn.com or www.amazon.com.