U.S. WHEAT & BARLEY SCAB INITIATIVE

Fusarium Focus

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Highlights from 2010 National FHB Forum

Approximately 175 crop scientists, growers and wheat and barley industry representatives gathered on December 7-9 for the 2010 National Fusarium Head Blight Forum. The 13th annual FHB Forum took place at the Hyatt Regency in Milwaukee, Wisc.

The event featured stakeholder and scientific speaker presentations, along with focused group discussions and evening breakout sessions. Numerous scientific research posters were on display as well, with their authors present to discuss their projects and findings.

Organized and hosted by the U.S. Wheat & Barley Scab Initiative, the Forum is a key venue for reports on the latest research findings on Fusarium Head Blight (scab) and deoxynivalenol (DON), the mycotoxin produced by scab infection in grains.

The USWBSI Steering Committee held its biennial meeting after the 2010 FHB Forum's adjournment.

The following pages contain photos and narrative describing highlights from the 2010 FHB Forum. The event's entire proceedings can be found on the USWBSI website: www.scabusa.org. ❖

Above: Attendees at the 2010 FHB Forum represented a variety of scientific disciplines and commercial entities — from USDA and university research and extension personnel, to grain growers and agribusiness.

Right: Co-chairs of the U.S. Wheat & Barley Scab Initiative are Minnesota producer Art Brandli (left) and University of Kentucky wheat breeder Dave Van Sanford.

Mark Your Calendar!

2011 National Fusarium Head Blight Forum

December 4-6

Hyatt Regency St. Louis, Mo.

— 2010 FHB Forum —

Deirdre Ortiz, principal scientist with the Kellogg Company's Global Snacks Group, was the 2010 FHB Forum's keynote speaker. Her topic was *"Industry Needs for Early Warning and Integrated Management Systems for Harmful Mycotoxins."*

Kellogg, a $13 billion food company headquartered in Battle Creek, Mich., manufactures its products in 18 countries and markets them in more than 180 around the globe. It buys about 2.0 billion pounds of wheat each year — mainly soft white wheat from North America. Among its many well-known brands, in addition to Kellogg's®, are Keebler®, Pop-Tarts®, Rice Krispies®, Special K®, Cheez-It® Morningstar Farms® and Famous Amos®.

Food safety is paramount to the company, as are, of course, the economics of commodity purchasing and product manufacturing and sales.

Ortiz used several case studies to illustrate the impact that mycotoxins can have on Kellogg's business, and to drive home the importance of sound FHB management and early warning of significant problems.

The first case occurred in 1996 when a widespread outbreak of FHB occurred in the soft white wheat areas of Michigan, New York and southern Ontario. No early warning systems were in place at that time, and DON testing was not nearly as refined as it is today. The upshot was that Kellogg had to purchase large volumes of soft white wheat from Pacific Northwest sources that year — which meant millions of dollars in added transportation costs. Plus, quality differences of Northwest wheat (compared to that from the Great Lakes region) resulted in reduced throughput at Kellogg food manufacturing plants.

Fortunately, a lot of progress has occurred since 1996, Ortiz noted. The U.S. Wheat & Barley Scab Initiative was established and continues to contribute in a major way; wheat growers' improved agronomic practices have helped hold down FHB damage; more fungicides have become available; improved FHB resistance has been bred into many wheat varieties; better DON forecasting and testing tools exist; and millers themselves have been able to employ a variety of handling and cleaning methods to minimize DON concentrations.

'Consumers expect safe food. Our systems require time to manage change; therefore, early warning is critical.'

"We had to become knowledgeable on FHB as a technical community within Kellogg," Ortiz pointed out. "This allowed us to make investments in the right areas to manage the FHB outbreaks and to reduce [their] impact."

Another case that Ortiz outlined in her presentation was the significant level of scab in Ohio during the 2010 growing season due to highly conducive weather conditions.

A large amount of soft red wheat is grown in Ohio, she noted, and many large mills in the eastern United States blend this wheat with their local sources. Kellogg has numerous bakeries in the eastern half of the country, "and nearly all of these bakeries have Ohio-based wheat as some portion of their flour," Ortiz related. With many bakery products (*e.g.*, crackers, cookies) being relatively inelastic in their pricing, a shortage of suitable Ohio soft red wheat can translate into a significant impact on profitability.

Ortiz summed up the ongoing need for progressive management of FHB — and of DON and other mycotoxins — by emphasizing the importance of food safety to the food industry in general and to Kellogg specifically.

"We rely on safe food ingredients for our business and for our consumers," she noted. The increasing use of whole grains and brans (where many mycotoxins are concentrated) makes management especially vital, she added. "Consumers expect safe food," Ortiz concluded. "Our systems require time to manage change; therefore, early warning is critical." ❖

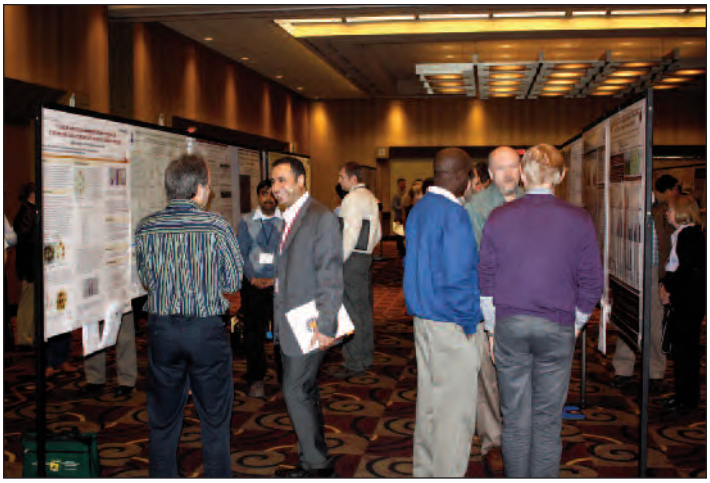
— 2010 FHB Forum —

Right: Kathleen D'Ovidio and Henry Kim, of the U.S. Food and Drug Administration's Center for Food Safety and Applied Nutrition, provided an overview of FDA regulatory policy and the agency's mycotoxin compliance program.

D'Ovidio stated that while mycotoxins will never be totally eliminated, FDA's strategy for controlling them — including deoxynivalenol (DON) — encompasses three primary areas: (1) the monitoring of susceptible commodities, both domestic and imported; (2) taking enforcement action when it is warranted; and (3) providing guidance to the food industry.

Kim noted that the initial FDA guidance (advisory) levels for DON in both human and animal food were established in 1982. They were updated in 1993, with the animal feed portions updated again in 2010.

The likely next steps, according to Kim, will be to update the current mycotoxin compliance program, and to consider monitoring for mycotoxins — including DON — under FDA's 'Total Diet Study' program.



Above: The traditional poster sessions again were a popular venue at the FHB Forum in Milwaukee. More than 80 posters were available for attendees to review, with their authors also present for discussion. There were 19 posters under the Gene Discovery and Engineering Resistance research area; nine under Pathogen Biology and Genetics; 21 under FHB Management; 30 under Variety Development and Host Resistance; one under Food Safety, Toxicology and Utilization; and two under "Other" research areas.

Above: Focused group discussions during the 2010 Forum provided opportunities for those directly involved in the various USWBSI research areas and coordinated projects to come together, discuss progress and challenges, and chart action plans for future work. Those pictured here were taking part in the FHB Management discussion session led by facilitator Christina Cowger, plant pathologist with USDA-ARS, based at North Carolina State University.

— 2010 FHB Forum —

Talks on USWBSI Website

Below are the invited speaker presentations from the 2010 Fusarium Head Blight Forum.

The majority of these presentations can be accessed on the U.S. Wheat & Barley Scab Initiative's website — http://scabusa.org/forum.html#forum10. The entire proceedings of the 2010 FHB Forum also can be downloaded from this site.

Plenary Session —

- *Industry Needs for Early Warning and Integrated Management Systems for Harmful Mycotoxins*
  Deirdre Ortiz, Kellogg Company

Gene Discovery and Engineering Resistance —

- *Paving the Way for Biotech Wheat*
  Jane DeMarchi, National Assn. of Wheat Growers
- *Genetic Basis for the 3-ADON and 15-ADON Trichothecene Chemotypes in Fusarium*
  Nancy Alexander, USDA-ARS, Peoria, Ill.
- *Tracking Released Clones of Gibberella zeae within Wheat and Barley Fields*
  Melissa Keller, Virginia Tech, Blacksburg

FHB Management —

- *Data Mining of Weather and Climatic Data to Improve Risk Prediction of Fusarium Head Blight*
  Larry Madden, Ohio State University, Wooster
- *Determinants of Adoption of Scab Mgmt. Techniques*
  Greg McKee, North Dakota State University
- *Advances in the Development and Application of Prediction Models for FHB and DON*
  Erick DeWolf, Kansas State University

Food Safety, Toxicology and Utilization of Mycotoxin-Contaminated Grain —

- *Vomitoxin: FDA's Regulatory Program*
  Kathleen D'Ovidio and Henry Kim, FDA Center for Food Safety and Applied Nutrition, College Park, Md.
- *Stability of the Trichothecene, Deoxynivalenol in Processed Foods and Wheat Flake Cereal*
  Ken Voss, USDA-ARS, Athens, Ga.

Variety Development and Host Plant Resistance —

- *Current Knowledge on the Genetics of Fusarium Head Blight Resistance in Wheat: Implications for Resistance Breeding*
  Hermann Burstmayr, University of Natural Resources and Life Sciences, Tulln, Austria
- *Novel FHB-Resistance QTL with Uncertain Origin & Its Introgression into Durum & Hard Red Spring Wheat*
  Steven Xu, USDA-ARS, Fargo, N.D.
- *Genomic Selection for Fusarium Head Blight Resistance in Wheat*
  Mark Sorrells, Cornell University, Ithaca, N.Y.

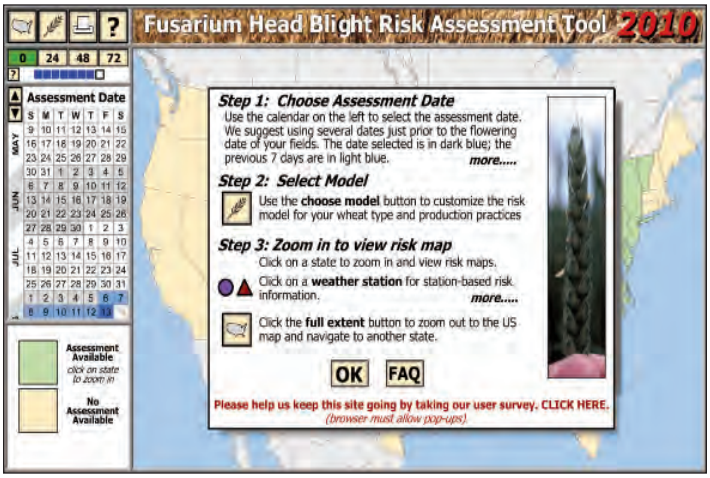
Above: Larry Madden, Ohio State University, Wooster, updated the Forum audience on the use of weather and climatic data to improve risk prediction of FHB. Though the relationships are complex, the research results "can be used to guide the next generation of risk prediction models," he stated.

Right: Jane DeMarchi, National Association of Wheat Growers, reported on efforts to advance the introduction of biotech wheat. NAWG's goal is to have wheat yields increase 20% by 2018, she noted, adding that with the world's rapidly growing need for increased food production, "it is time for wheat to be able to take advantage of biotechnology."

Below: John McLaughlin of Rutgers University delivers his Forum presentation on "Activation Tag Screening to Identify Novel Genes for Trichothecene Resistance."

FHB Alert System Ready for 2011 Season

Startup This Year Projected for Early March
State Commentaries a Key Supplement



The U.S. Wheat & Barley Scab Initiative's FHB Alert System, which proved its value in 2010, promises to be even more useful this year. Two more states — Louisiana and Mississippi — are joining two dozen other winter- and spring-wheat producing states that were active in the program in 2010. Due to the inclusion of these Gulf Coast states, the projected "go live" date this year also is earlier — early March, as compared to April 15 last year.

Another important change for 2011 is the refinement of regions grouped for purposes of the FHB alerts so that growers and other users have information that is more customized to their geographic area.

The purpose of the FHB Alert System is to give growers and grain industry personnel better advanced notice of potential outbreaks and the risk of scab in their area, thus facilitating timely treatment of at-risk fields with fungicides. The system is tied in with the Fusarium Head Blight Risk Assessment Tool hosted by Pennsylvania State University, Kansas State University, Ohio State University and the U.S. Wheat & Barley Scab Initiative (USWBSI).

That FHB risk assessment tool — located at http://www.wheatscab.psu.edu/riskTool.html and available in early March — is where the alerts originate. The prediction model data are supplemented by "feet on the ground" commentary from university extension plant pathologists and other crop specialists in participating states. The commentaries are very important, says Kansas State University plant pathologist Erick DeWolf, because they provide timely, localized interpretation of crop-impacting factors that may not be considered by the scab prediction model.

DeWolf, a principal developer of the scab prediction model/FHB Risk Assessment Tool and one of the coordinators of the FHB Alert System, delivered a report on its use during the 2010 National Fusarium Head Blight Forum in December. A survey of users during 2010 found the following, based on answers from nearly 360 respondents:

• *System Users* — About 22% of FHB Alert System users last year were farmers; 37% were farm advisors; 25% were university personnel.

• *Influence on Awareness of Scab Risk* — About 49% said the system "moderately" improved their awareness of scab risk in their area; 41% said it "greatly" improved their awareness. Just 10% said it made no difference.

• *Influence on Actions* — About 37% of respondents said the system influenced their perception of risk and need for action. About 23% said it motivated them to seek advice. Another 19% said the system essentially confirmed their prior evaluation of risk, and 17% said they used the system only for informational purposes.

• *How Information Was Used* — Nearly half (47%) of respondents said they used the alert system to advise others. About 24% used it strictly for "education," and another 19% said the information had a direct application on their farm (*i.e.*, deciding whether to apply a fungicide).

• *Value Level* — Of the survey respondents, 47% said the system was of moderate value, combined with other sources of information. A nearly identical number — 46% — said the alert system had a high value for them.

Producers, crop consultants, grain processors and marketers and other interested persons can sign up for 2011 alerts by going to the following web address: http://scabusa.org/fhb_alert.php. Alerts are sent out to one's cell phone or email, depending upon the user's preference. Frequency and timing of alerts depends upon a given area's risk for serious scab problems — which obviously varies, depending upon environmental conditions and crop stage. ❖

Below: Erick DeWolf reports on the FHB Alert System during the 2010 National Fusarium Head Blight Forum in Milwaukee.

AMBA Approves UM Scab-Resistant Malting Barley Variety 'Quest'

Now on List of Recommended Varieties for 2011

Improved Fusarium Head Blight resistance is one of the features of Quest, a new malting barley variety released by the Minnesota Agricultural Experiment Station.

The spring, six-rowed barley is the first University of Minnesota malting barley variety with improved resistance to Fusarium Head Blight (FHB), commonly known as scab. Quest accumulates half the level of deoxynivalenol (DON), compared to the popular six-rowed varieties Tradition and Lacey. Quest is similar in yield to Tradition and Lacey, which account for 70% of Midwest barley acreage.

"Quest's resistance derives from barley varieties that trace back to China and Switzerland," said Kevin Smith, who leads the barley breeding program at the University of Minnesota. The time-consuming work of developing scab-resistant barley varieties is supported by the U.S. Wheat and Barley Scab Initiative, the Minnesota Small Grains Initiative, and the American Malting Barley Association (AMBA).

Tested as experimental line M122, the variety is aptly named Quest to underscore the arduous and long road the breeding program had to plow to capture a distinct improvement in resistance to a disease that has decimated the Midwest malting industry.

New barley varieties undergo a four-year, two-step quality evaluation by AMBA (www.ambainc.org). This testing has been completed, the final results of evaluation were satisfactory, and the AMBA Board of Directors at their December 22, 2010, meeting approved the addition of Quest to the AMBA list of recommended varieties for 2011.

"The addition of Quest to the AMBA list of recommended varieties is historic. It is the first variety developed from scab-resistant germplasm in the U.S. to be added to the list and will be of benefit to both growers and industry in reviving Midwest barley production," said Mike Davis, AMBA president.

Barley acres in Minnesota declined after the arrival in 1993 of Fusarium Head Blight in the state. Quest has the potential to provide growers an option to increase barley acres.

"The University of Minnesota is committed to helping small grain growers succeed by developing varieties that generate economic activity and provide new options for growers," said Beverly Durgan, director of the Minnesota Agricultural Experiment Station and dean of extension. "Quest and our new wheat varieties, including RB07, are the latest example of our drive to develop better small grain varieties." ❖

Fusarium Focus

Fusarium Focus is an online newsletter published periodically by the U.S. Wheat & Barley Scab Initiative. The USWBSI is a national, multi-disciplinary and multi-institutional research system whose goal is to develop as quickly as possible effective control measures that minimize the threat of Fusarium Head Blight (scab), including the production of mycotoxins, for the producers, processors and consumers of wheat and barley. Contact information is as follows:

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Recent Scab-Related Peer-Reviewed Publications

• Keller, M.D, Waxman, K.D., Bergstrom, G.C., and Schmale, D.G. 2010. Local distance of wheat spike infection by released clones of Gibberella zeae disseminated from infested corn residue. *Plant Disease* 94: 1151-1155.

• Horevaj, P., Gale, L.R., Milus, E.A. 2011. Resistance in winter wheat lines to initial infection and spread within spikes by deoxynivalenol and nivalenol chemotypes of Fusarium graminearum. *Plant Disease* 95: 31-37.

• Khatibi, P. A., Newmister, S., Rayment, I., McCormick, S. P., Alexander, N. J., and Schmale, D.G. 2011. Bioprospecting for trichothecene 3-O-acetyltransferases in the fungal genus Fusarium yields functional enzymes that vary in their ability to modify the mycotoxin deoxynivalenol. *Applied and Environmental Microbiology*. Published ahead of print. DOI:10.1128/AEM.01738-10.

• Puri, K. D., and Zhong, S. 2010. The 3ADON population of Fusarium graminearum found in North Dakota is more aggressive and produces a higher level of DON than the prevalent 15ADON population in spring wheat. *Phytopathology* 100:1007-1014.

• Wegulo, S. N., Bockus, W. W., Hernandez Nopsa, J., De Wolf, E. D., Eskridge, K. M., Peiris, K. H. S., and Dowell, F. E. 2011. Effects of integrating cultivar resistance and fungicide application on Fusarium head blight and deoxynivalenol in winter wheat. *Plant Dis.* http://apsjournals.apsnet.org/doi/pdfplus/10.1094/PDIS-07-10-0495

Listings of recent FHB-related publications by USWBSI-associated principal investigators are invited. All PIs are encouraged to submit listings. If publications are currently accessible through the Web, please include the URL address. Listings for the next edition of Fusarium Focus should be sent to Don Lilleboe at dlilleboe@forumprinting.com