



Fusarium Focus

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Spring 2004

U.S. to Host International FHB Symposium Dec 11-15

Orlando Meeting Incorporates USWBSI Forum, European Fusarium Seminar

The U.S. Wheat & Barley Scab Initiative (USWBSI) is hosting the 2nd International Symposium on Fusarium Head Blight, which will run Saturday, Dec. 11 to Wednesday, Dec. 15, 2004, at the Wyndham Orlando Resort in Orlando, Florida.

This international symposium will incorporate the 8th European Fusarium Seminar, and will take the place of the U.S. National FHB Forum in past years. The fundamental objective of this symposium is to facilitate world-wide efforts aimed at eliminating FHB as a threat to global food security.

“Fusarium Head Blight (“Scab”) is an international problem, affecting wheat and barley from Europe to the Pacific Rim, as well as North America. An international symposium allows for the sharing of research information and networking with the crop scientists from around the world who are focusing on this issue,” says Rick Ward, a winter wheat breeder at Michigan State University and co-chair of the USWBSI.

Ward, who is chair of the International Organizing Committee (IOC) for the upcoming symposium, was among a delegation of U.S. wheat and barley researchers who took part in the first international symposium, held in China in May, 2000.

“We expect representation from 20 or more countries, so this symposium is likely to be the largest



Incorporating the 8th European Fusarium Seminar

gathering of FHB research scientists ever held,” says Ward. “There have been extensive advances in knowledge and technology employed in FHB research since the first symposium four years ago, so the opportunities for mutual learning and collaboration at the symposium in Orlando are significant.” Contacts serving on the Symposium’s International Organizing Committee are listed on page two.

The Symposium will be organized into one plenary session and six research sessions:

- Host Plant Resistance and Variety Development
- Genetic Engineering
- Chemical, Cultural and Biological Control
- Food Safety, Toxicology, and Utilization of Mycotoxin-contaminated Grain
- Pathogenesis, Epidemiology, and Disease Forecasting
- Taxonomy, Population Genetics, and Genomics of *Fusarium spp.*

Each of the six research sessions will include a poster session, speakers, and open or panel discussions. The USWBSI will soon be accepting the online submission of titles/summaries for papers and papers/abstracts associated with a poster, to be included in the Symposium Proceedings. The Proceedings will be prepared prior

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Second Intl FHB Symposium Calendar

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| May 1: | Online submission of titles-summary begins. |
| June 1: | Online registration for symposium begins. |
| July 2: | Deadline for submission of titles-summary. |
| Oct. 25: | Deadline for early registration - \$200.
Last day to receive a full refund. |
| Oct. 26: | Late registration begins - \$230. |
| Oct. 29: | Deadline for the submission of poster abstract and/or manuscript content for the symposium proceedings. |
| Nov. 5: | Last day to receive partial refund. |
| Nov. 16: | Last day to reserve hotel with guaranteed availability. |

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to the Symposium so participants can use them during the sessions.

More details on the Orlando Symposium, including instructions for submitting titles for papers, can be found on the USWBSI's Web site, www.scabusa.org. Online registration for the International Symposium will begin June 1. The early registration fee is \$200; late registration is \$230 (begins after Oct. 25). The registration fee covers symposium materials (including one copy of the Symposium proceedings) and many of the meals.

Participants are responsible for booking their own hotel arrangements. The Wyndham Orlando Resort can be accessed online, www.wyndham.com/hotels/MCOWD/main.wnt. Participants are guaranteed a special room rate of \$70.00+tax/night. A block of rooms have been secured from December 9-15. ■

International Organizing Committee of the 2nd International Symposium on FHB

Peter Ruckenbauer
Institute for Agrobiotechnology
Tulln, Austria
pruck@ifa-tulln.ac.at

Dr. Peidu Chen
Nanjing Agricultural
University, China
pdchen@public1.ptt.js.cn

Dr. Bikram Gill
Kansas State University
Manhattan, KS USA
bsg@ksu.edu

Prof. Dajun Liu
Nanjing Agricultural
University, China
djliu@public1.ptt.js.cn

Dr. Akos Mesterhazy
Cereal Research non profit Co.
SZEGEd. Hungary
akos.mesterhazy@gk-szeged.hu

Dr. Thomas Miedaner
University of Hohenheim

Stuttgart, Germany
miedaner@uni-hohenheim.de

Dr. Paul Nicholson
John Innes Centre
United Kingdom
paul.nicholson@bbsrc.ac.uk

Dr. Sanjaya Rajaram
CIMMYT Wheat
Program, Mexico
s.rajaram@india.com

Dr. Cees Waalwijk
Plant Research International
Wageningen, The Netherlands
c.waalwijk@plant.wag-ur.nl

Dr. Rick Ward
Michigan State University
East Lansing, MI USA
wardri@msu.edu

Dr. Lu Weizhong
Nanjing Agricultural
University, China
wzlu@public1.ptt.js.cn

'Next Generation' Scab Forecasting Models Deployed

Over the past two years researchers at Penn State, Ohio State, Purdue, North Dakota State and South Dakota State have developed a new generation of prediction models for Fusarium head blight. These new models are scheduled to replace models that were released in 2001, and improve prediction accuracy of pre-flowering predictions of scab from 70% to 80%.

The next generation of models will be deployed as part an FHB Prediction Center that provides disease predictions for 23 states east of the Rocky Mountains (Figure 1). The user interface provides a map-based estimate of risk, and allows a user to customize a forecast for winter and spring wheat. The Prediction Center can be accessed online at www.wheatscab.psu.edu.

The web site includes details about the FHB prediction model, an FHB fact sheet, and a customized forecast

by region (see link "risk map tool").
– Erick DeWolf, Penn State University ■

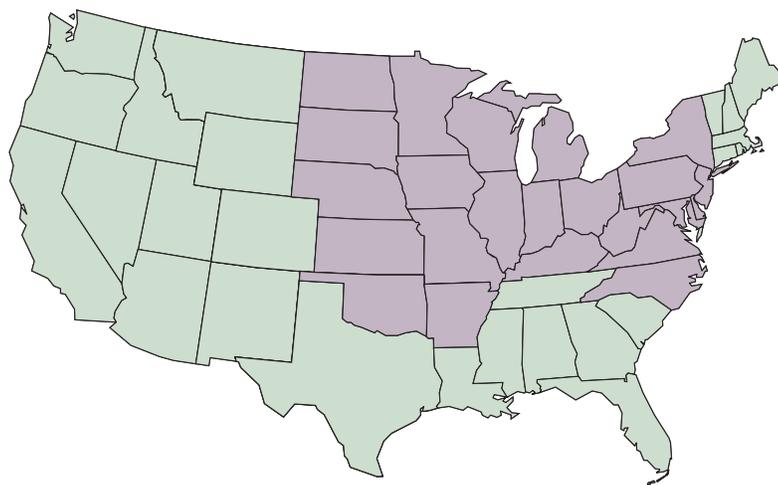


Figure 1. Next generation of prediction models for Fusarium head blight are scheduled for deployment in 23 states (in green above) during 2004. Forecasts can be reached via the Fusarium Head Blight Prediction Center available at www.wheatscab.psu.edu

Soft Red Wheat Region Hopes to Rebound After FHB, DON in '03

Millers and other end users of wheat are hoping the soft red winter wheat crop will rebound this year, following what some in the industry say was unprecedented FHB damage to farmers and millers in the mid-Atlantic SRWW production region (North Carolina, Georgia, Virginia, extending to Kentucky and Tennessee) in 2003, crippling grain flow patterns and sales.

Michael Pate's overview on last year's mid-Atlantic FHB problem was an eye opener for many at the National Fusarium Head Blight Forum, held last year in Bloomington, Minn. Pate is director of technical services at Midstate Mills, Inc. A North Carolina-based company, Midstate's business includes wheat flour and dry corn milling, baking mix blending, and animal feed production. Products are sold into a number of regional and national markets.

Pate, who also is chair of the North American Millers' Association's technical committee, said that because of high DON in the 2003 soft red winter wheat crop in mid-Atlantic states, all major mills stopped sourcing wheat from that region last year, beginning in early November.

He explained that Midstate and other mills operate on fixed contracts with cake, pastry, cookie and doughnut makers, who pay for a specific amount for the flour they contract with their mill suppliers. If the local supply of quality wheat is insufficient, mills must source wheat elsewhere to produce enough flour to hold up their end of the contract.

"This might not seem like a significant issue to you...but let's say

I'm selling half a million pounds of flour to a baking facility in North Carolina, and all my contracts are based on pulling wheat by truck within a 200-mile radius. Suddenly, your supply source is gone, and you have the tremendous added cost of shipping wheat as far away as 1,000 miles from Ontario by rail. And the main reason is DON."

DON is the abbreviation of deoxynivalenol, commonly called vomitoxin, a toxic byproduct of FHB that can make wheat unfit for milling, and barley unsuitable for malting.

Growers and mills in the region are also affected by the lost confidence of buyers. "You're dealing with the perception of our customers that our products are unsafe," Pate said, "and these customers are major players in the food industry."

In the past, it was thought that DON in wheat could be reduced to acceptable levels by the milling process, a concept called "milling loss," typically on the order of 50%. Thus, if raw kernels of wheat contained DON of two parts per million, the derivative flour of this wheat would typically test at 1 ppm or less in flour intended for human consumption.

In 2003, however, DON levels of wheat from FHB-infected wheat in mid-Atlantic states didn't decline as much as expected during milling. For example, raw wheat that may have tested for 2 ppm DON would mill flour testing at 1.8 ppm DON. This would be too high to meet the federal advisory level of 1 ppm or less in flour intended for human consumption.

Pate says an investigation by various milling entities revealed that there probably never was a significant "milling loss" from separating



Michael Pate, director of technical services at North Carolina-based

Midstate Mills, and chair of the North American Millers' Association's technical committee, presented an overview of how FHB and DON affected mid-Atlantic wheat trade, at the National Fusarium Head Blight Forum, held last year in the Twin Cities.

At the research forum, scientists reported research results and advancements in variety development and uniform screening nurseries; epidemiology (how scab develops, spreads) and disease management; food safety, toxicology, and utilization; biotechnology; chemical and biological control; and germplasm introduction and evaluation.

A full report of research conducted under the U.S. Wheat and Barley Scab Initiative and discussed at the Forum is posted online at www.scabusa.org, under the 2003 National Fusarium Head Blight Forum Proceedings.

the pericarp or hard outer covering from the rest of the kernel. "The apparent loss can be attributed to the removal by milling precleaning equipment of small shrunken kernels that had high DON levels," said Pate.

Particularly troublesome with last year's harvest is that plump kernels infected with DON weren't getting removed by the cleaning process, and thus posed a risk in entering

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the milling stream. And millers aren't going to take chances with flour that may exceed the federal DON advisory level. Even the livestock industry is careful about using feed tainted with DON. Pate points out that North Carolina is one of the nation's leading producers of pork and poultry.

"It's a matter of food safety," Pate said. "If you cannot provide a safe food commodity to the end user, two things happen to you: you're not going to have any business, and lawyers are going to step in. Litigation is the watch word for what we do."

Pate notes that the federal guideline for DON in wheat is now just that; an advisory level. But with further problems, a DON limit could

become law. "The government doesn't allow blending to lower aflatoxin levels in corn. The same would become true for wheat as well. Also, once an advisory level is changed to a statutory limit, if I have (flour) over 1 ppm DON, the government could have it destroyed," Pate said.

He reminded crop scientists at the National FHB Forum of the urgency of their research. "My charge to you would be to get us a solution, and get it soon, because the future of our industry in the mid-Atlantic states is depending on it."

The U.S. Wheat and Barley Scab Initiative, which got underway in 1997 and coordinates the National FHB Forum, is a national research effort to find multiple solutions for controlling FHB and DON in wheat and barley. ■

Cornell's Schmale, Bergstrom Compile "Scab 101" for APSnet

Cornell University's David Schmale III and Gary Bergstrom have put together an online primer on FHB for the American Phytopathological Society's Plant Health Instructor Education Center, which can be found at www.apsnet.org/education/LessonsPlantPath/fusarium/default.htm.

The easy-to-understand information covers symptoms and signs of the disease, pathogen biology, how FHB spreads, managing the disease, and the significance of the disease.

Schmale is a Ph.D. student whose research is being supported by a USWSI grant in the Epidemiology and Disease Management Section. Bergstrom

is a professor in Cornell's Department of Plant Pathology.

More background information on FHB can be found at www.scabusa.org. At the bottom of the home page, click on "Scab and DON Links." ■



NDSU Study: Phytosanitary Regulations Leading Non-Tariff Barrier

A recent study at North Dakota State University points out that unreasonable phytosanitary regulations are a leading non-tariff barrier to international trade. Only freight disadvantages are more of a trade barrier for N.D. ag commodities than phytosanitary regulations, according to study authors Jeremy Mattson, Won Koo, and Richard Taylor.

"Some trade restrictions may be necessary for countries to ensure the safety of the food supply and the health of plants, animals, and the environment. However, it is sometimes the case that governments go beyond what is necessary to protect domestic industries," the authors write.

DON, the toxic byproduct of scab, is not referred to in the study. However, many in the wheat industry are fearful that DON could become an international trade issue, as some countries in Europe are debating whether to tighten DON limits in flour products to levels which milling experts say is unachievable.

The NDSU study on non-tariff trade barriers can be found online at <http://agecon.lib.umn.edu/cgi-bin/detailview.pl?paperid=13044>. ■

Folicur Approved to Help Manage FHB in Kentucky

Fusarium head blight (FHB) of wheat, and deoxynivalenol (DON) accumulation in harvested grain, are periodically very serious problems in Kentucky. On April 15, 2004, the EPA approved Kentucky's Section 18 application which sought emergency labeling for Folicur 3.6F to help with FHB/DON management during 2004. Folicur is manufactured by Bayer CropScience. This new fungicide tool, when used with other FHB/DON management tactics (see www.ca.uky.edu/ukrec/newsletters/news03-2.pdf) will reduce the risk of FHB and DON, as long as weather conditions are not highly favorable to FHB and DON during crop flowering and grain fill.

Let me say up front that Folicur is not a "silver bullet" for managing FHB/DON. A great deal of research suggests that about 30% reduction in FHB symptoms and DON accumulation is a reasonable expectation for winter wheat. Sixty percent control or more has been achieved in rare field studies in the U.S., but these are atypical results. In other words, do not expect Folicur to provide the same level of FHB/DON control as you have come to expect when fungicides are used to control other wheat diseases. The key is to think in terms of disease suppression, not control. Nevertheless, a 30% reduction in FHB and DON could have a significant economic impact locally, and statewide, if FHB is moderate in 2004. But I am advising growers that significant losses due to FHB and/or DON are likely even where Folicur has been applied if weather conditions favor severe FHB this spring.

The Section 18 in Kentucky allows for a single ground or aerial application of 4 fl oz/A of Folicur 3.6 F to wheat at full head emergence (Feeke's stage 10.5) to very

early flowering (Feeke's stage 10.51). Applications cannot be made before full heading nor within 30 days of harvest. The Folicur Section 18 applies only to wheat and is good for the period April 20, 2004 to May 20, 2004.

Excellent fungicide coverage on wheat heads is crucial to achieve the greatest possible FHB/DON suppression. This is no small challenge, since most spray systems used in wheat were developed to deliver pesticides to foliage (horizontal structures). In order to maximize coverage on heads (vertical targets), significant changes may need to be made to the sprayer boom system. Also, discipline must be exercised to ensure that proper sprayer pressure and volumes are used.

For ground application, research has shown that best head coverage is achieved with a double-swivel nozzle configuration of XR8001 flat-fan nozzles oriented forward and backward at a 45 degree angle. Acceptable coverage can also be achieved with a single nozzle configuration using TwinJet TJ8002 nozzles. When using either the double-swivel nozzle or the single TwinJet configuration, best head coverage is achieved when the boom is set 8 to 10 inches above the heads, spray pressure is 30 to 40 psi OR 80 to 90 psi, fungicides are delivered in 15 or more gallons of water/A, and ground speed does not exceed 8 mph during application.

For aerial application, nozzles should be angled to direct spray 90 degrees to the direction of travel. Spray droplet size should range from 300 to 400 microns and Folicur should be delivered in no less than 5 gallons of water/A. It is best to spray early in the morning or at other times when heavy dew is present. This will facilitate fungicide coverage on heads.

As indicated above, Folicur must be applied at a specific time, early flowering, in order to be effective. The optimal time for application is 25% of primary heads, scouted at several random sites in a field, showing anthers (pale, yellow-green structures about 1/8-in-long). Much beyond 25%, and it may be too late. The flip side - applying Folicur before full head emergence/early flowering (which is illegal!) - can also seriously compromise FHB/DON suppression. This brings up a point of contention that many wheat producers may face this spring. Delaying application of Folicur to achieve FHB/DON suppression could allow for excessive build-up of other fungal diseases. Conversely, application of other labeled fungicides before full head emergence will control other diseases, but will have no impact on either FHB or DON. Making both applications, while legal, will be economically difficult to justify. In this case, I would advise growers that foliar disease development should take precedence since little is to be gained by suppressing FHB/DON if serious losses are incurred by allowing fungal diseases to develop.

One desire we all have is for fungicides to be used only when needed. Regular field scouting for foliar fungal diseases has been successfully used by growers for many years to determine if and when to spray fungicides. However, this is not possible with FHB since once symptoms are present it is TOO LATE to spray with Folicur. Below are some general guidelines to help you determine if you should spray Folicur for FHB/DON suppression:

- Soil moisture has been good and rain is expected in the near

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MSU Professor's FHB Research Featured on "MicrobeWorld Radio"

Everything you ever wanted to know about microbes (and more) can be found online at www.microbeworld.org. The web site, coordinated by the American Society for Microbiology, is more interesting and easy to understand than one would expect, with informative facts on microbes good and bad, illustrated by colorful graphics. There's also in-depth features on key issues (like the West Nile Virus and antibiotic resistance) and even a syndicated daily 90-second radio feature.

FHB research by Frances Trail, associate professor at Michigan State University's Departments of Plant Biology and Plant Pathology, has been featured on the radio program. The interview appeared on 57 mostly NPR-affiliated radio



stations across the country. You can listen to the short radio interview by clicking on the MicrobeWorld Radio icon. Under the radio show archives, go to "Nov. 1st-15th 2003" link, then the Nov 11 feature, "Fungi, Guns and Spores."

The interview was about Trail's research on how fungal spores of *Gibberella zeae* are shot into the air. Of course, one can only give so much information in 90 seconds. So away from the radio mike, she

describes the research more specifically: "We have studied the colonization and perithecium development in the check variety Norm. We have found that perithecia only form in association with light-transmitting cells, such as stomates and silica cells. Can this indicate a physiological or light requirement for the fungus to develop? We are attempting to answer that question."

Trail continues: "We have found that 25% of Norm plants inoculated produce vascular gels which prevent the fungus from traveling down the vascular system and colonizing the stem. Can this type of resistance be used to reduce inoculum development in the crop debris?" That's another question to be answered, she notes. ■

New Spring Wheat Steele-ND Has Good Scab Resistance

Steele-ND, a new hard red spring wheat variety, has been developed and released by the NDSU Agricultural Experiment Station. The semi-dwarf variety is a cross between Parshall and ND 706, with a heading date and height similar to the high-yielding Reeder variety. Straw strength is similar to Russ but not as strong as Reeder or Alsen, the leading variety in North Dakota.

The test weight of Steele-ND is about equal to Alsen but the kernels are larger, according to Mohamed Mergoum, hard red spring wheat breeder at North Dakota State University. Steele-ND has good milling and baking properties, with protein slightly less than Alsen.

Steele-ND has good resistance to leaf and tan spot and is about equal to Alsen in wheat scab resistance. In central and eastern North

Dakota, where disease pressure is greater than western N.D., Steele-

ND has outyielded both Reeder and Alsen, Mergoum says. ■



A test plot of Steele-ND, which will be increased as certified seed this year and will be generally available to the public for production in 2005. Photo courtesy Mohamed Mergoum, NDSU HRS wheat breeder.

New Discussion Boards on www.scabusa.org

New online discussion boards and “chat rooms” are now available at the USWBSI web site. Click on the link “USWBSI Discussion Forum.” If you are a member of the FHB Listserv, you have been given a temporary user ID. To log in, enter the first part of your email address (before the @ symbol), replacing periods (“.”) with an underscore “_” and in all lowercase. The default password is “scab” but users are encouraged to change their password for security reasons. The discussion boards can be accessed through the USWBSI home page, www.scabusa.org.

Messages may be posted regarding the six areas of the USWBSI, or any topic related to FHB. Once you have logged in, update your user profile under the link “sign up”. Look for helpful ways to keep track of information topics under the “options” link. Select different subject areas via the “go to confer-

ence” link at the bottom of the WebBoard main page.

Researchers with projects funded by the USWBSI, or who wish to have projects funded through the USWBSI, are encouraged to post suggestions and input on program descriptions and research priorities for FY05. “We cannot overstate the importance of these program descriptions,” note Initiative co-chairs Rick Ward and Tom Anderson. “Whether you are a scientist or a stakeholder in the wheat and barley industries, we urge you to carefully review each of the program statements and ensure that the objectives, priorities, and overall direction embodied in the statements reflect what you regard to be a sensible stance at this point in time. We are doing this in order to give all parties direct input and oversight on the core essence of the Initiative’s research strategies and direction.” ■

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future (relates to spore production, dispersal of *Fusarium graminearum* spores, and crop infection).

- Crop has good yield potential (relates to economics and crop density, which increases canopy humidity and may increase spore production, facilitate spore dispersal, and encourage crop infection).

- Temperatures 68-86 F (relates to spore production and crop infection).

- Humidity is high (80% day or night) and/or free water (such as dew) is present on the heads during this period (relates to spore production, dispersal, and crop infection).

- Rain showers and/or free water were available 5-7 days before flowering (relates to spore release, dispersal, and crop infection).

If most or all of the above conditions exist when the crop is at 10-15% flower, you should consider spraying Folicur within one or two days.

University of Kentucky extension plant pathologist Don Hershman authored this information specific to wheat growers in Kentucky, so some recommendations may not be applicable in other states. The following link tracks EPA Section 18 actions in other states: <http://cfpub1.epa.gov/oppref/section18/search.cfm>. ■

USDA All Wheat Seedings Projection Lowest Since 1973

All U.S. wheat seeded for harvest in 2004 is projected at 59.4 million acres, which would be down 4% from 61.7 million acres in 2003, and the lowest since 1973, when 59.2 million acres were planted, according to the USDA’s March 31 prospective plantings report. Spring wheat seedings (other than durum) are projected to be the lowest since 1984. Durum seeding intentions at 2.75 million acres, down 158,000 from 2003, would be the third consecutive year durum seedings have declined, and the lowest since 2.24 million acres were seeded in 1993, noted for what is recognized as the worst FHB epidemic ever in the Northern Plains.

Most of the decline in wheat acreage was attributed to increased area for soybeans, with USDA projecting soybean area up 3%, or more than 2 million acres from last year. The decline in wheat acreage in recent years – the Red River Valley of Minnesota and North Dakota, for example – has been spurred in part to FHB in wheat, and advancements in northern-grown soybean hybrids. ■





U.S. Wheat and Barley Scab Initiative Fusarium Focus

This newsletter is made possible by the U.S. Wheat and Barley Scab Initiative. For more information about the Initiative, or to submit news items for consideration in this quarterly publication, contact Sue Canty, U.S. Wheat & Barley Scab Initiative, Networking & Facilitation Office, 380 Plant & Soil Sciences Building, East Lansing, MI 48824-1325 Phone: (517) 355-2236 FAX: (517) 353-3955 E-mail: scabusa@scabusa.org.

This newsletter contains an update on only a sampling of research funded by the USDA-ARS and facilitated by the U.S. Wheat and Barley Scab Initiative. For more information on scab research in the U.S., and projects funded by the USWBSI, see the Initiative's website, www.scabusa.org.

Fusarium Focus is compiled by Prairie Ag Communications, 2607 Wheat Drive, Red Lake Falls, MN 56750.

U.S. Wheat & Barley
Scab Initiative
Networking & Facilitation Office
380 Plant & Soil Sciences Building
East Lansing, MI 48824-1325

