



# Fusarium Focus

Volume 4 • Issue 3

Fall 2002

## 2002 FHB Forum Dec 7-9, Cincinnati

**T**he U.S. Wheat & Barley Scab Initiative will hold its annual National Fusarium Head Blight Forum Dec. 7-9, 2002 at the Holiday Inn Cincinnati-Airport Conference Center, Erlanger, Ky.

An integral component of the U.S. Wheat & Barley Scab Initiative, the forum includes scientists involved with FHB research, as well as others in the grain industry, including growers

and grower group representatives, millers and food processors.



The Forum will be organized into six sessions: Biotechnology; Chemical and Biological Control; Epidemiology and Disease Management; Food Safety, Toxicology and Utilization; Germplasm Introduction and Enhancement; and Variety Development and Uniform Nurseries. Each of the six sessions will be comprised of a

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## Dry Weather Limits FHB, DON in '02 Growing Season

Dry conditions generally limited the development of FHB and DON in U.S. and Canadian wheat and barley fields during the 2002 growing season.

In North Dakota, field surveys by North Dakota State University indicated that the field severity of scab in wheat ranged from 0 to 24.4%, but the average was only 1.2%, indicating a much lower level of scab in wheat in 2002 than in 2001. Field severities of scab in barley also were quite low, overall, according to Marcia McMullen, NDSU extension plant pathologist. Maps of the occurrence of some of the major crop diseases in North Dakota in 2002 are available on the web at [www.ag.ndsu.nodak.edu/aginfo/ndipm/](http://www.ag.ndsu.nodak.edu/aginfo/ndipm/).

Leaf rust, heat at critical growth development stages, and drown-out were more of a problem in wheat and barley fields in Minnesota this year than FHB, according to University of Minnesota small grains specialist Jochum Wiersma. "You could find some, but it was minor."

It was extremely dry in South Dakota this year (as it was in many Plains states), but that didn't eliminate disease risks entirely. "My concern was mycotoxin colonization in ripening grain where there was high humidity, especially in the eastern part of the state," says South Dakota State University extension plant pathologist Marty Draper. Lab tests of grain samples underway now will tell a better

story of the presence of mycotoxin development such as DON in grain this year, he says.

Hot, dry weather made screening for FHB in field trials this past summer difficult, says Draper. For example, wheat ripened so fast that plant development outpaced the growth of FHB in some inoculated screening nursery plant trials. "It makes it harder to draw conclusions, so it will be better to have all the data in, including DON results. That will be an important piece to analyzing plant performance this year," says Draper.

Manitoba Agriculture plant pathologist David Kaminski said in an Agweek article that this year, most of the wheat and

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## FHB Forum • from page 1

poster session, speakers, and open or panel discussions.

Featured Forum speakers and topics include:

- Richard Magnusson, Roseau, Minn., with a grower's perspective on FHB.
- Fungicide product updates from leading manufacturers.
- Using Near Infrared Transmission as a screening tool for DON in barley.
- Practical Aspects of Ground Application of Foliar Fungicides—Phillip Needham, Miles Farm Supply, Owensburg, Ky.
- Predictive model for FHB of wheat based on seasonal/climatic

trends— Mauricio Fernandes, Embrapa Trigo, Brazil.

The full agenda can be found on the USWBSI's web site, [www.scabusa.org](http://www.scabusa.org), under the link, "2002 National Fusarium Head Blight Forum."

### Participants Urged to Register Online

Advanced registration for the Forum is required, and participants are encouraged to register online at [www.scabusa.org](http://www.scabusa.org). The registration fee is \$90 before Nov. 18; \$120 after. Credit cards can be used for online registration. The conference registration fee includes Saturday reception/dinner; Sunday break-

fast, lunch and dinner; Monday breakfast; refreshment breaks and conference materials, including one copy of the Forum proceedings.

The deadline for submission of posters and reports for the Forum proceedings is Nov. 11; see the USWBSI's website for more details.

Forum participants are responsible for their own lodging arrangements. A block of rooms has been reserved at the Holiday Inn Cincinnati Airport in Erlanger. To reserve a room at the special rate of \$70 +tax/night for a single or a double, call the Holiday Inn directly at (859) 371-2233, and indicate that you are with the National Fusarium Head Blight Forum. Reservations must be made by Nov 25, after which rooms that have been held for the Forum will be released.

Direct any questions regarding the 2002 Forum to the USWBSI Networking and Facilitation Office at (517) 355-2236 or [scabusa@msu.edu](mailto:scabusa@msu.edu). ■

## Scenes from last year's FHB Forum

*The National FHB Forum is a primary means for crop scientists from around the world to discuss ongoing FHB research and research results.*



### IMPORTANT DATES

#### 2002 National FHB Forum:

**Nov. 11th:** Deadline for the submission of posters and reports for the Forum proceedings.

**Nov. 18th:** Registration Form Due to register at the lower rate.

**Nov. 25th:** Last day to reserve hotel at guaranteed availability.

If you have any questions regarding the 2002 National Fusarium Head Blight Forum, contact the Networking and Facilitation Office at (517) 355-2236 or [scabusa@msu.edu](mailto:scabusa@msu.edu).

# Gene Jockeys Fight Fusarium

**T**omorrow's wheat and barley plants might be equipped with genes that protect against a formidable fungal foe, *Fusarium graminearum*. This destructive fungus is responsible for a disease commonly known as wheat scab, or Fusarium head blight, which causes plump kernels to shrivel and take on an unhealthy, bleached, scabby appearance. Right now, there's no effective control for this plant disease, which caused estimated losses of \$2.7 billion in 1998 to 2000 in the north central and Great Plains states.

In a "dirty trick" strategy, scientists with the Agricultural Research Service, together with industry and university researchers, hope to use genes from *Fusarium* itself to undermine the



*Geneticist Ann Blechl and colleagues are the first to insert modified *Fusarium* chitinase and glucanase genes into wheat plants, which may lead to wheats that are more resistant to *Fusarium* head blight.*

fungus.

Their approach revolves around a natural process that *Fusarium* uses to invade plants. The fungus, in order to keep adding onto its rootlike growing tip, or hypha, has to periodically tear down its old hyphal cell walls and make new ones.

To do that, *Fusarium* manufactures cell wall-degrading enzymes called chitinase and glucanase. The scientists are inserting genes into experimental wheat plants that enable the plants to manufacture these same enzymes. Their goal? Disrupt the *Fusarium* growing tip's orderly invasion by overwhelming the fungus with chitinase and glucanase that it didn't make and can't control.

Research geneticists Patricia A. Okubara with the ARS Root Disease and Biological Control Research Unit in Pullman, Wash., and Ann E. Blechl at the ARS Crop Improvement and Utilization Research Unit, Albany, Calif., are collaborating in the research. Okubara, Blechl and co-inventors Thomas M. Hohn of Syngenta at Research Triangle Park, N.C., and Randy M. Berka of Novo Nordisk, Davis, Calif., are seeking a patent for the work.

Scientists have known about the role of chitinase and glucanase for years. But Okubara and Blechl are the first to use pieces of the *Fusarium* microbe's own chitinase and glucanase genes as anti-*Fusarium* genes in wheat. Further details are published in *Agricultural Research* magazine online at: [www.ars.usda.gov/is/AR/archive/aug02/gene0802.htm](http://www.ars.usda.gov/is/AR/archive/aug02/gene0802.htm). ■

*By Marcia Wood, USDA-ARS, which administers the USWBSI.*

## Dry Weather • from page 1

barley crop has less than 1% *Fusarium* damaged kernels. "Most areas are reporting a reduction in the number of *Fusarium*-damaged kernels in all cereals," he said. "There is the odd place where there is a significant infection in winter wheat, which we expected. But (scab in) the spring seeded cereals is down overall."

There was some stand loss of wheat in Arkansas this year due to early excess moisture, but little FHB. "You might find it in isolated fields, but we did not have any noticeable levels," says Rick Cartwright, University of Arkansas plant

pathologist. "Spring weather was not conducive to FHB development. It was cooler than normal and dry at flowering."

After enduring several poor years, and frustrations over losing white wheat market opportunities due to DON, wheat growers in Michigan generally had a successful growing season, yielding high quality wheat. Typically, in any wheat field in Michigan where FHB could be found, only about 5% of wheat heads were affected, and of those heads affected, severity was very low, according to Pat Hart, Michigan State University plant pathologist. ■

# NDSU Study Analyzes Crop Insurance for FHB Quality Losses in Barley

**F**armers want crop insurance that adequately covers quality losses, such as grain affected by Fusarium head blight. However, crop insurance products aimed at bolstering coverage for quality losses must be priced properly: A high premium may discourage program participation, while a low premium may encourage program abuse.

That's according to a new study at North Dakota State University, with E. William Nganje, assistant professor at NDSU's Department of Agribusiness and Applied Economics, as lead author. The study was derived from related research funded by the USDA/ARS, as part of an ongoing collaborative effort with the USWBSI.

Crop insurance payments for barley damaged by FHB have covered less than 2% of the average annual loss (\$40 million) to North Dakota farmers since 1993, according to the study, citing loss estimates from the U.S. General Accounting Office. Quality risks are particularly apparent with malting barley, and in some instances, quality related losses have exceeded yield and price losses covered by current insurance instruments.

The study points out that DON (Deoxynivalenol), the contaminant produced by FHB that can make barley unsuitable for malting and wheat unsuitable for milling, results in risks to participants throughout the marketing system including producers, end-users, and marketers, altering procurement and



*Lighter, discolored barley heads are infected with Fusarium head scab fungi.*

production patterns. There has been a sharp reduction in six-row malting production within traditional U.S. production areas, and U.S. maltsters and brewers, the traditional buyers of Northern Plains barley, have reacted by expanding their imports of malting barley from Canada by about 380% in the last decade.

Multiple Peril Crop Insurance (MPCI), Revenue Assurance (RA), and Income Protection (IP) are crop insurance tools available to U.S. barley producers: MPCI provides coverage for production shortfalls, while RA and IP provide coverage for revenue shortfalls. RA only provides revenue protection for feed barley. MPCI and IP do not explicitly cover losses due to quality risks. Moral hazard concerns (that may increase costs to insurance agents) or farmers' behavior after they purchase crop

quality insurance and the lack of publicly available data on quality losses have been suggested as some major reasons why quality losses are not explicitly covered by current insurance programs.

Nganje's study analyzed how quality losses from FHB might be incorporated into crop insurance contracts. The results suggest that contrary to the federal government policy of incurring all the overhead cost of crop insurance, this cost should range from 5 to 25% of estimated quality losses as a control variable to set premium rates and coverage levels. This cost would enable private insurance agents to monitor farmers' behavior on the effective use of fungicide and other recommended barley production practices prescribed in the USDA loss adjustment manual.

If costs incurred by farmers are zero, coverage levels may be higher than the 85% recommended limit, resulting in potential moral hazard problems. On the other hand, costs greater than 25% may cause farmers and private insurance agents to be averse to crop quality insurance, resulting in a very small level of coverage as is currently the case with FHB and barley. Nganje points out that methodologies used in the study could be applicable in other cases of quality losses as well, such as durum wheat or the marketing of biotech/non-biotech crops.

The full study may be found online at [www.scabusa.org](http://www.scabusa.org) under the link "research updates." ■

# Forecasting Models Aiding Ohio Growers in Determining FHB Risk

**T**wo forecasting models are being evaluated at Ohio State University to help wheat growers determine the risk of FHB.

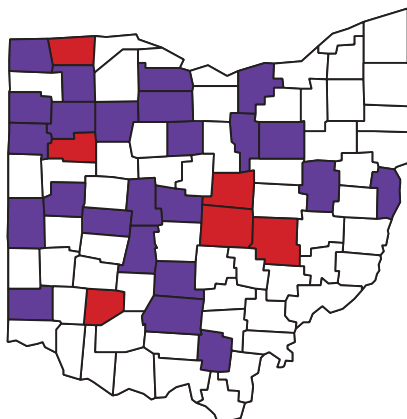
The first model attempts to predict the probability of head scab based on the weather that occurs prior to flowering of the crop. This model looks at the duration of precipitation in hours and the number of hours the air temperature is between 60 and 86 degrees F for seven days prior to flowering, when the fungus is developing spores. This model has been 78% accurate in determining when the disease will not be severe.

The second model attempts to predict the probability of scab based on the weather that occurs 10 days after flowering, addressing the time when the fungus is developing spores, when infection occurs and when disease develops. It has been 84% accurate in determining when disease will be severe.

Using the two models, a risk prediction is made by OSU plant pathology staff for early, mid and late flowering fields at various locations in Ohio, as well as two in Indiana and one in Michigan. The scab risk models predict the probability of disease occurrence, not the level of disease severity. Each model calculates a probability of FHB occurring at a severity level greater than 10%, considered to be an economic level of disease. The higher above this threshold probability level, the greater the risk of head scab occurring. This is similar to a weather forecast for rain, in that the weather service predicts the

## Summary of Wheat Head Scab Incidence in Ohio, 2002

2002 Actual Head Scab Incidence



Fields with 0-10% scab  
Fields with 0-20% scab

- Low (fields with 0-10% heads with scab)
- Moderate (fields with 0-20% heads with scab)
- Counties with no color were not surveyed.

occurrence of rain, not the amount of rain.

Head scab risk predictions are posted as soon as weather data is available from weather stations and the wheat crop in the area of the weather station reaches the critical flowering period.

This year, the OSU FHB forecasting system predicted low to moderately low levels of disease for the majority of locations where weather information was obtained. To validate the forecasting system, and to determine the accuracy of the predictions, OSU Extension agents surveyed wheat fields in 30 counties to determine the actual incidence of scab. Results of the survey indicated that the average incidence of scab per field was 4.1 % (Over 75% of the fields surveyed had incidence

levels below 5%) with a range of 0 % to 48.6%.

Given that range, one might ask why some fields have higher levels of FHB than others. The answer is that the level of FHB any particular field is dependent on many factors, including varietal susceptibility, proximity of wheat plants to a fungal inoculum source like corn residue, and how quickly plants dry after a rain event (duration of head wetness). Additionally, relative maturity of the variety and planting date can alter the flowering date of a field, causing considerable variability in disease levels. Thus, each field can have a different level of disease.

This year in the Ohio wheat growing area, cool temperatures during the week prior to flowering and during the week after flowering apparently limited *Fusarium* spore production and infection of the wheat heads in spite of adequate precipitation. Thus, during both 2001 and 2002, the two years that the OSU forecasting system has been operating, only low to very low levels of scab developed, as predicted by the forecasting system.

The system may prove to be helpful in forecasting FHB for wheat producers in Ohio, who lost an estimated \$180 million in farm income in 1995 and 1996 due to reduced yield and poor quality grain from FHB.

More information about the forecasting system can be found online: [www.oardc.ohio-state.edu/ohiofieldcropdisease/](http://www.oardc.ohio-state.edu/ohiofieldcropdisease/). ■



# Glover New Spring Wheat Breeder for South Dakota State University

**D**r. Karl Glover was hired in July 2002 as the spring wheat breeder at South Dakota State University. He is responsible for developing new spring wheat varieties for South Dakota and surrounding areas.

Glover plans to build upon what he says is an already strong program with regional varietal successes, such as Russ and Oxen, two hard red spring wheat varieties that enjoyed large acreages and adaptation in the Northern Plains over the past few years.

He believes FHB and leaf rust to be key yield limiting challenges he faces as a wheat breeder. He considers leaf rust susceptibility to be more common in South Dakota varieties than those from neigh-



**Dr. Karl Glover**

boring states, and plans to use molecular marker techniques in his breeding program to develop

more resistant spring wheats.

“Marker-assisted selection can save quite a bit of time where we don’t have to grow the plants for weeks or months to screen (for rust).” Instead, with the use of molecular markers, determining the likely presence of rust-resistant genes can be accomplished using tissue from plants that are only several days old. Additionally, data from test results can be used for making selections only hours after the tests are initiated.

He envisions the role of a university plant breeding program to include germplasm enhancement, traditional plant breeding, and perhaps more cooperation on transgenic programs with private industry. Glover is currently helping to develop regulatory guidelines that will be used to answer questions about what SDSU is doing to ensure that Roundup-Ready technology will not compromise the conventional breeding program and production agriculture, prior to their approval for release.

Glover earned his Ph.D. in plant breeding from Kansas State University and his M.S. and B.S. degrees in agronomy from SDSU. Prior to his appointment as HRSW breeder, he was a post-doctoral researcher at the University of Illinois Department of Crop Science, at Urbana - Champaign. ■

— *By David Boehm, recently named Northern Plains regional business manager for AgriPro Wheat.*

## U.S. Wheat and Barley Scab Initiative Fusarium Focus



This newsletter is made possible by the U.S. Wheat and Barley Scab Initiative administered by the USDA-ARS. 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 &

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This newsletter contains an update on only a sampling of research funded by the USWBSI. For more information on scab research in the U.S., and projects funded by the USWBSI, see the Initiative’s website, [www.scabusa.org](http://www.scabusa.org).

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

# Cargill AgHorizons Constructing Specialized Elevator to Clean Scabby Grain

**C**argill AgHorizons is constructing a new grain elevator facility in Morris, Man., that will include a specialized processing system capable of cleaning fusarium-damaged wheat to export standards. Scheduled for completion next summer, the 12,000 metric ton (about 440,000 bushels) concrete elevator will have the capacity to load 50 rail cars at a time.

Rob Rannie, facility manager, said in an Agweek magazine

article that the elevator will be equipped with Camas grain cleaners, which Rannie said will work better than gravity table grain cleaners. He said that the gravity tables remove 15 to 20% of the grain to get diseased grain to milling standards. The Camas cleaners can get to milling standards while removing just 5% of the grain. He added that the new cleaners will work at high humidity levels that hurt the gravity table's efficiency.

"We have these cleaners at two of our other facilities in Western Canada," Rannie said in Agweek. "We have found them to be somewhat more successful than the gravity tables." Rannie said other elevators in the Red River Valley have been bringing in wheat from Saskatchewan to blend with local wheat to raise it to milling quality. He thinks that with the new elevator's equipment, the Morris facility will be able to produce milling quality grain just using Manitoba-grown wheat. Scab has been a problem in Manitoba every year since 1993, Rannie said, and has spread west to Saskatchewan. ■

## USWBSI to Review FY03 FHB Research Pre-Proposals

The goal of the U.S. Wheat and Barley Scab Initiative is to develop—as quickly as possible—effective control measures that minimize the threat of Fusarium head blight (scab) to the producers, processors, and consumers of wheat and barley. The Initiative is guided by a Steering Committee that includes growers, farm organizations, food processors (i.e. millers, pasta manufacturers, and brewers), scientists (from Land Grant universities, USDA, and private companies), and consumer groups.

Each year, the USWBSI Steering Committee submits a comprehensive research plan to the USDA-ARS, designed to

achieve the Initiative's goals. That plan is the Initiative's recommendation for how the USDA-ARS can most effectively employ the funds appropriated by the U.S. Congress for collaborative FHB research. Pre-proposals for fiscal year 2003 (approx. May 2003-April 2004) research projects were submitted to the USWBSI in September by crop scientists from across the nation, and will be reviewed by one of six USWBSI research area committees. To see a list of currently funded projects, and a description of the different research areas, visit the Initiative's web site at [www.scabusa.org/research.htm](http://www.scabusa.org/research.htm). ■

### Barley Improvement Conference Jan 7-9, 2003

The 34th Barley Improvement Conference will be held at the Sir Francis Drake Hotel, 450 Powell Street (on Union Square), San Francisco, Calif., Jan. 7-9. The Conference provides barley researchers, barley producers, and malting, brewing, and grain trade personnel the opportunity to hear reports on the status of barley research programs, and to meet and exchange information and ideas. For more information, see the website of the American Malting Barley Association, [www.ambainc.org](http://www.ambainc.org). Click on the news and information link. ■



# FHB News Briefs

## European Barley Database Online

The European Barley Database (EBDB) includes documentation of European barley collections and germplasm exchange. A link can be found on the USWBSI website, [www.scabusa.org](http://www.scabusa.org), under the "Research Updates" link.

## Ali New Manager of NDSU's FHB Forecasting System

Dr. Shaukat Ali is the new manager of the FHB forecasting system ([www.ag.ndsu.nodak.edu/cropdisease/cropdisease.htm](http://www.ag.ndsu.nodak.edu/cropdisease/cropdisease.htm)) at North Dakota State University. He replaces Len Francl, who recently joined the Department of Plant Pathology at Penn State University. Francl says he plans to continue FHB research at Penn State, working with Erick De Wolf, also of Penn State, on advanced forecasting models and new, regionally based systems.

## 2003 Wheat Industry Conference Jan 26-31, 2003

The Wheat Industry Conference, held next year at the Hyatt Hotel in Albuquerque, New Mexico, is a joint annual meeting of the wheat industry, including the National Association of Wheat Growers, U.S. Wheat Associates, and the Wheat Export Trade Education Committee (WETEC). It includes a Wheat Research Forum. For more information, see the NAWG's web site, [www.wheatworld.org](http://www.wheatworld.org).

## Database of FHB Researchers Online

A database of crop scientists involved with FHB research, as well as other wheat and barley industry contacts with an interest in FHB research, can be found online at [www.scabusa.org](http://www.scabusa.org).

Developed by Control Room Technologies, the USWBSI database is a web-enabled

database which simplifies the process of obtaining information related to the USWBSI. Database users may search the following main categories of available information: Projects, Institutions, Grants, Documents, Committees, and Contacts, who may be searched by name, institution, or organizational unit.

The [scabusa.org](http://scabusa.org) site is integrated with this database. The different sections of [scabusa.org](http://scabusa.org) provide links to information in the database. The table can be sorted by clicking on the heading of a column. Clicking on the same column heading again sorts the information in reverse order. On each database page, text entry boxes and drop-down menus are provided for searching and filtering of records.

Follow [www.scabusa.org/database.html](http://www.scabusa.org/database.html) to access the database, or click on the "database" link at the top of the home page of the USWBSI website. ■



## U.S. Wheat & Barley Scab Initiative

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