



# *Fusarium Focus*

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## Remembering Tom Anderson

**USWBSI Co-Chair & Minnesota Wheat Grower  
Died July 23 Following Lengthy Battle With Cancer**

The U.S. Wheat & Barley Scab Initiative (USWBSI) lost a strong advocate and true friend with the passing on July 23 of Tom Anderson following a long battle with cancer. Anderson, a western Minnesota wheat grower, had served as co-chair of the USWBSI since its inception in 1997.

Dave Van Sanford, University of Kentucky wheat breeder and USWBSI co-chair, says Anderson's special personality and absolute dedication to the USWBSI were apparent to the end. "At the [USWBSI] Steering Committee meeting in late May in Lexington, Ky., we finished the meeting with a trip to the UK scab nursery," Van Sanford recounts. "As we broke up, I observed Tom — who was feeling very poorly at the time — go over and make the effort to talk with a couple of scientists who were relatively new to the committee. He wanted to know about their science; and, more importantly, he wanted to connect with them.

"So even in the last stages of his life, he remained fully engaged in the Scab Initiative, and his humanity was boundless. Tom's sense of humor remained intact as well, as he teased me about all the weeds we had in our scab nursery."

Kay Simmons, the USDA-ARS National Program Staff's designated agency official to the USWBSI, is another of many individuals in the scab community with fond memories of Anderson.



*Tom Anderson*

"Tom believed in the value of agriculture research led by both farmers and scientists," Simmons remarks. "He set an example of leadership, responsibility and integrity that must motivate all of us. He always sought to identify and encourage new leaders for the Scab Initiative and other farmer-industry research partnerships.

"Tom never stopped fighting to help

### **2007 FHB Forum Details**

*See Page 3 for details on the 2007 National Fusarium Head Blight Forum, scheduled for Dec. 2-4 in Kansas City.*

growers and the agricultural community. All of his efforts made a remarkable contribution to U.S. agriculture and science."

In an interview just two weeks before his death, the 59-year-old Anderson discussed his longstanding interest in agricultural research and his deep commitment to the work of the U.S. Wheat & Barley Scab Initiative. A full-time farmer since his graduation from North Dakota State University in 1970, Anderson's initial foray into the research community occurred about 10 years later with sugarbeets. By 1985 he was a member of the Sugarbeet Research and Education Board of Minnesota and North Dakota. "I was desperately interested in research," he recalled. "And diseases were such an issue [in beets] at the time — root rot, Fusarium, Cercospora.

"Then along comes 1993, and we get hammered with Fusarium Head Blight [in wheat and barley]. I had traded combines that year — bought a brand new 1480 IH. I took it out to the field, got it set, started combining — and [ended up with] nothing in the hopper! The wheat was so light and crappy that it just went out the back." Anderson had forward contracted a significant portion of his anticipated crop, but harvested barely enough to cover his September contract obligations. After discounts for light test weight and other quality factors, he netted about \$2.00 a bushel on what he was able to deliver.

A member of the Minnesota Wheat Research & Promotion Council's advisory committee on research and communications, Anderson joined other producers during the winter of 1993/94 to lobby the Minnesota Legislative for emergency funding for scab research. "We did get

Photo: Tracy Gayler





*This photo of the Anderson family — Tom, Kirsten, Paul and Melissa — was taken at the family farm near Barnesville, Minn., on July 10, less than two weeks before the Minnesota farmer and USWBSI co-chair passed away. Paul now operates the farm.*



*Tom Anderson received numerous awards for his service to U.S. agriculture. Among them were the Outstanding Agriculturist Award from his alma mater, North Dakota State University, and the Torch and Shield Award from the University of Minnesota.*

some money (nearly \$500,000) for what we then called the ‘Minnesota Scab Initiative,’ ” he noted. “I like to think the national [scab initiative] was built somewhat on that ‘basic template’ — but on a much larger scale.”

The American Phytopathological Society monograph *Fusarium Head Blight of Wheat & Barley*, edited by Kurt Leonard and William Bushnell, provides details about the period following the 1993 scab epidemic. “The enormity of the 1993 epidemic in the spring grain area of the USA and central Canada fueled extensive private, public, and collaborative educational responses, and also was the impetus for renewed or more concerted research efforts to find solutions for managing this devastating disease,” the book states. Among the meetings held was a forum in Fargo, N.D., in November 1994 where “a US North Central regional research committee, NCR 184, was established to address research needs of this disease.” That group initially represented 12 state universities.

In March of 1997, “a group of scientists, growers, and industry representatives met in Chicago to discuss the organization of a regional Fusarium Head Blight Initiative to address major

research needs and approaches to get federal funding,” the APS monograph states. “This effort to get federal funding was led by Rick Ward, wheat breeder at Michigan State University, in conjunction with Tom Anderson, Minnesota wheat and barley farmer . . . . This effort soon expanded to a national effort, with wheat and barley researchers from across the country with varying areas of expertise participating.”

That “national effort” culminated, of course, in the formation of the U.S. Wheat & Barley Scab Initiative, with Ward and Anderson as its co-chairs.

Though the incidence and severity of scab in his west central Minnesota grain fields varied widely with the year and environment, Anderson never wavered in his dedication to the goals and activities of the USWBSI. Even as he fought cancer the last few years of his life, he tried to get to as many meetings as possible — and likewise stayed in touch on a regular basis, via telephone and e-mails, with other Initiative leaders. Just two weeks before he died, he stated, “I’m going to have to retire [from the Initiative]; but I’m going to stick it out as long as I can. I’ve truly enjoyed my time on the Initiative,” he continued. “It’s been a joy of my life, along with the sug-

arbeet board. It’s hard to give those up.”

Regarding the many personal relationships he developed through his work with the USWBSI, Anderson paused and simply stated, “That’s huge. That’s huge.”

Then his voice choked up as he professed, “Short of Kirsten (his wife) and my children (Melissa and Paul), this has been the love of my life — the love of service.”

While farming was, in and of itself, an obvious centerpiece of Tom Anderson’s life, it was not, he affirmed upon looking back across three decades, quite enough to satisfy him. “There was a hole there that just wasn’t getting filled. Not that I’m a scientist by any stretch; but [the interest in research] really challenged me to be involved — and I ate it up like candy.”

That marvelous appetite for service remained powerful to the very end, with the U.S. Wheat & Barley Initiative — and U.S. agriculture in general — ranking prominently among the fortunate beneficiaries.

Tom Anderson will be eulogized during the 2007 National Fusarium Head Blight Forum, to be held December 2-4 in Kansas City. — Don Lilleboe ◆



# 10th FHB Forum Set for Dec. 2-4

This Year's Venue Is The Westin Crown Center in Kansas City, Mo.

Interested members of the scab community are encouraged to attend the 2007 National Fusarium Head Blight Forum, scheduled for December 2-4 at The Westin Crown Center in downtown Kansas City, Mo.

This will be the 10th FHB Forum, which attracts wheat and barley growers, grower group representatives, public and private scientists, millers, maltsters and brewers, other food processors, consumers and additional individuals with an interest in Fusarium Head Blight (scab) and its impact.

The 2006 FHB Forum followed a different format from previous meetings. It was devoted largely to the development of a comprehensive action plan for the U.S. Wheat & Barley Scab Initiative for the next three to five years. Participants spent much time meeting on discipline-group and commodity-based levels to discuss and formulate that plan.

The 2007 Forum will return to the traditional format, emphasizing stakeholder and scientific speaker presentations along with poster sessions. Part of the program, however, will feature



focused discussion groups.

The keynote speaker on the Forum's first day will be Brazilian José Maurício Fernandes, who will discuss "A Model-Based Assessment of Fusarium Head Blight Outbreak Frequency Under a Changing Climate Environment."

General sessions are scheduled for Sunday, the 2nd, in the areas of Food Safety, Toxicology and Utilization of Mycotoxin-Contaminated Grain; Pathogen Biology and Genetics; and

Gene Discovery and Engineering Resistance. FHB Management will be featured on Monday morning, with that afternoon dedicated to focused group discussions. Variety Development and Host Resistance is the featured subject area on Tuesday morning. That session will be preceded by commodity-based coordinated project meetings for barley, durum and hard winter wheat. The 2007 Forum will adjourn at noon on Tuesday, the 4th.

The Monday evening dinner and program will include a special tribute to Tom Anderson, the late co-chair of the U.S. Wheat & Barley Scab Initiative.

Advanced registration is required for the 2007 National Fusarium Head Blight Forum. (The registration fee increases after November 2.) Participants also are responsible for making their hotel reservations with The Westin Crown Center.

For details on this year's program, registration and hotel reservations, visit [www.scabusa.org/forum07](http://www.scabusa.org/forum07). Or, contact the USWBSI Networking & Facilitation Office at (517) 355-0271, Ext. 183; e-mail: [scabusa@scabusa.org](mailto:scabusa@scabusa.org). ♦

— For 2007 Forum Program & Registration Details: [www.scabusa.org/forum07](http://www.scabusa.org/forum07) —

## Wheat Genomics Conference in K.C. Dec. 1 & 2

The first U.S. National Wheat Genomics Conference will be held on December 1 and 2 in the same hotel as this year's National Fusarium Head Blight Forum.

Hosted by the National Wheat Improvement Committee's subcommittee on wheat genomics, the meeting is intended to provide (1) a venue for wheat workers to learn of current endeavors in U.S. wheat genomics and related research, and (2) a forum to foster interaction, discussion and

collaboration among scientists. The meeting also is intended to provide the opportunity to formulate and communicate the future research needs of the nation's wheat genomics community.

Organizers note that while the main theme is wheat genomics, the session topics and presentations will be broad and will encompass aspects of other research disciplines that may be directly or indirectly related to genomics.

An open poster session also will be held in conjunction with the conference.

For a complete list of speakers and the full meeting agenda, visit this web site: <http://wheat.pw.usda.gov/NWIC/NWG07meet.html>.

Registration is set for Friday evening, November 30, at The Westin Crown Center in Kansas City. The conference will conclude by noon on Sunday, prior to the start of the FHB Forum.

For conference registration, go to [www.regonline.com/142179](http://www.regonline.com/142179). Hotel registrations at the Westin must be made through the FHB Forum web site: [www.scabusa.org/forum07](http://www.scabusa.org/forum07). ♦



# MSU Research Focuses on DON Human Health Risk Assessment

## Jim Pestka & Colleagues Seek Better Understanding Of How Deoxynivalenol & Other Trichothecenes Work

“Protecting crop yield and test weight is only part of the battle against scab,” emphasized U.S. Wheat & Barley Scab Initiative co-chair Dave Van Sanford during remarks to the '06 National Fusarium Head Blight Forum. “Dramatically lowering DON levels is equally as important.”

Addressing the marketing hurdles and human health risks posed by the presence of deoxynivalenol (DON) in FHB-infected grain has become a “front-burner issue” for the USWBSI. In updating its action plan for the next few years, the Initiative’s Food Safety, Toxicology & Utilization/Diagnostic Services division has set two comprehensive goals: (1) provide analytical support for DON/trichothecene quantitation for Initiative stakeholders; and (2) provide requisite information on DON/trichothecene safety issues to producers, millers, researchers, risk assessors and regulators.

Dr. James Pestka and his colleagues at Michigan State University in East Lansing have been extensively involved in the effort to learn more about DON and its implications for human health. Pestka, professor of food science and human nutrition at MSU, has led several major research projects during the past decade relating to (1) the rapid, reliable analysis of DON and other mycotoxins, and (2) how these toxins potentially affect human health.

The MSU group’s primary emphasis at present is on human health risk assessment. “We’ve been focusing on the immune system,” Pestka explains, “because DON and other trichothecenes seem to target immune cells in terms of toxicity. We want to understand the mechanisms of how the trichothecenes work; then we can use that information to make predictions about the potential

human health risks.”

There currently is no global consensus on what threshold level of DON constitutes a health risk to humans. The U.S. Food & Drug Administration has established an advisory level of 1.0 part per million (ppm) for bran, flour and germ intended for human consumption. (There’s no FDA advisory level for wheat intended for milling, since manufacturing processes and technologies can substantially reduce DON levels in the final product.) Health Canada has a guideline of 2.0 ppm for uncleaned soft wheat utilized for nonstaple foods (except for infant foods, where it is 1.0 ppm).

Europe is generally much stricter (less tolerant), with several European nations having set the maximum tolerated level of DON at 0.5 ppm. That low level has big implications for exporters of U.S. or Canadian grain to Europe. “If the U.S. is selling grain to Europe, we obviously must comply with those standards,” Pestka points out.

He adds that there is some pressure — both within FDA and from other countries — for the United States to lower its tolerance levels closer to that established in Europe. For his part, the MSU scientist believes the current U.S. guidelines are more realistic — and safe.

Most of the scientific studies to date on the safety threshold and health effects of DON consumption have been carried out with animals — mainly mice, due to

their sensitivity. The approach used by the FDA to determine a safety threshold for DON in humans has been similar to that used when establishing guidelines for other substances, such as food additives or drugs. “They look at ‘What is the maximum dose that does not affect the animal in a negative way?’ ” Pestka explains. “For non-cancer-causing chemicals such as DON, they then include a 100-fold safety factor to make a prediction of what maximum dose would not affect a human. So it’s a very conservative approach and extremely reliant upon good-quality animal studies.”

The Europeans also use the 100-fold safety factor, Pestka relates — but then take it a step further. “They look at the animal study data to establish a maximum tolerated exposure dose. Then they look at consumption — how much people are eating — and assess whether those individuals in the upper percentile of grain consumers are exceeding the maximum tolerated dose.” The risk factor is thus based on the consumer who eats the most grain, not the average consumer. “So that increases the safety factor even higher.”

Pestka questions whether going beyond the 100-fold factor is really necessary in order to do a good job of protecting human health. “What we see with DON and other trichothecenes is that you go from absolutely ‘no effect’ to, quite rapidly, a ‘large effect.’ ”

There’s also the matter of DON being a naturally developing substance as opposed to a synthetic. “You can choose to put a red dye in an M&M or you can choose whether or not to sell a drug. So you can use that very conservative approach,” Pestka illustrates. “But when Mother Nature decides whether a toxic compound is going to be in a crop in a particular year, we don’t have a lot of choice about that. So that 100-fold conservatism or beyond may actually prevent a consumer from having access to a nutritious food that perhaps poses little or no health risk. This problem is of most concern in developing countries, where populations have limited choice and availability of foods.”

Research currently being conducted at MSU should be useful in answering

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*‘Our data suggest it’s not realistic to lower the (DON) guideline any more than it is; that it’s sufficiently conservative to make sure people in the United States are safe.’*



Photo: Don Lilleboe



Jim Pestka and Chidozie Amuzie

regulators' questions, should pressure intensify on the United States to lower its guidelines. "Our data will help answer the question, 'Is it realistic to do that?'" Pestka says. "Right now, our data suggest it's not realistic to lower the guideline any more than it is; that it's sufficiently conservative to make sure people in the United States are safe."

The above discussion revolves around the intake of DON through food ingestion. But there's another important method through which this and other mycotoxins can impact human health — respiratory exposure, *i.e.*, inhalation.

Chidozie Amuzie, a doctor of veterinary medicine who is presently working on his Ph.D under Pestka, has been

researching the inhalation effect. He has conducted studies with animals exposed to the same amount of mycotoxin through two routes — the nose (inhalation) and the mouth (ingestion). His findings show that two to three times more DON ends up in the animals' blood and body tissues when the toxin is inhaled versus being ingested. "So the efficiency of absorption is a lot higher through the nose," Amuzie confirms.

Such findings carry obvious implications for those who work around grain dust, such as farmers and elevator employees. "We do know for a fact that the inhalation route is a more-efficient route to absorb DON; and it gets to all the tissues when it's inhaled," Amuzie reiterates. "If I were to be exposed to the same quantity through my mouth and through my nose, I would get more effects through the nose."

Amuzie is also working on ways to improve the predictability of human safety assessments that are based on studies conducted on animals such as mice — studies whose results are then commonly extrapolated to humans.

Specifically, Amuzie is studying how the activation of certain signaling pathways in immune cells can serve as "biomarkers" that accurately predict DON's adverse effects. The signaling indicates some type of stress is present. That's not necessarily a bad thing, and the cell often is able to adjust to the stress. It's when the cell's ability to adjust becomes overloaded that bad things start occurring — such as a negative reaction to a toxin or chemical.

So Amuzie and Pestka are attempting to identify, through the use of biomarkers, what the thresholds are — *i.e.*, determining the lowest dose that could potentially cause a negative effect. Such findings can then be used to make better, more-accurate predictions on human safety. — Don Lilleboe ♦

## Barley Grower Survey Highlights

A survey conducted in late 2006 by the Institute of Barley and Malt Sciences (IBMS) generated interesting details about barley production and economics from the grower vantage point. The survey was sent to 5,000 Idaho, Montana and North Dakota barley producers, with just over 1,400 responses received. Here are a few highlights:

- While the number of farmers growing barley declined in all three states during the past decade, the decline was most pronounced in North Dakota.
- Not surprisingly, "price" was the most important factor in growers' decision whether to plant barley. "Production issues" — *e.g.*, rotation, ease to raise, variety, growing season length, yield and disease considerations — ranked second. The "production issue" category ranked higher in North Dakota than in the other two states, as did "quality."
- Acceptance rates of barley for malting were highest for Idaho growers and considerably lower for growers in North Dakota and Montana. DON and high protein were the main reasons for rejection in North Dakota, while protein and

plumpness were cited most often in Montana. For growers in eastern North Dakota, DON alone accounted for about 22% of malting barley rejections; in north central North Dakota, it accounted for about 17%. The DON percentages were substantially lower in western North Dakota and virtually nonexistent in Montana and Idaho.

- When it came to rating the importance of new programs that could assist them with barley production, growers rated information on variety performance, fertilization/irrigation techniques as most important. Insurance and risk management ranked higher in North Dakota than in the other two states. Seminars on quality evaluation or agronomic practices, as well as field demonstrations, were lower.
- As to where they obtain information on barley, the print media, industry personnel and meetings were frequently cited in all states. State university Extension was singled out by nearly one-third of North Dakota growers, placing it on par with print media. The Extension ranking was slightly lower in Montana and Idaho. Web sites were listed by about 6% of the survey respondents.

The web site address for the IBMS, which is housed at North Dakota State University, is: [www.ag.ndsu.edu/ibms](http://www.ag.ndsu.edu/ibms). ♦



# Incidence & Severity of Scab Quite Low in 2007

## Nebraska & Kansas Were the Exceptions, According to Reports from University Specialists

With a couple exceptions, the scab ogre was in a relatively benign mood during 2007, as levels of Fusarium Head Blight were low across the majority of U.S. wheat and barley production areas. That's the consensus from reports provided by university specialists in several states. The most notable exceptions occurred in the High Plains states of Nebraska and Kansas.

"Incidence and severity levels of scab were low across the state," reports **University of Minnesota** extension plant pathologist Charla Hollingsworth. "The disease was not an economic issue for producers. Grain quality was good, with very few scab-by kernels present."

Hollingsworth says 2007 weather varied widely between the northern and southern districts of the Red River Valley. "In the north, soils remained saturated to wet during much of the early to mid growing season," she indicates. A number of northern areas received heavy rainfall on June 2, exceeding five inches in some locales. "Frequent rain showers kept soils from drying before small grain crops headed (approximately June 24 to July 7)," Hollingsworth adds. The southern end of the Red River Valley (west central Minnesota) received rain early in the growing season, but June was generally dry.

During the critical two-week period when many Minnesota grain fields were susceptible to FHB infection, air temperature highs ranged from 69° to 96° F in the southern Valley and 59° to 91° in the north. These temps were accompanied by unusually windy conditions across the region. "Conditions were much more humid in the northern Valley than the south," Hollingsworth reports. "Depending on the location, humidity highs ranged from 80% or more during the critical period."

The abundance of soil moisture, coupled with dense plant canopies, pointed toward high wheat yields in the northern Red River Valley; thus motivating many producers to invest in fungicide applications. But heavy demand on aerial applicators, along with sustained winds, resulted in some fields not being treated on a timely basis or at all. Meanwhile, to the south, the dry conditions prompted many producers to forgo fungicides.

Moist under-canopies in many Minnesota wheat and barley fields portended scab development this past summer. Hollingsworth believes the actual low disease levels were due to "the constant breeze/wind that was present during crop heading. Wind-dried plant tissues did not support infection by airborne spores that were being produced."

To the west, **North Dakota** also enjoyed a relatively mild

scab year. North Dakota State University extension plant pathologist Marcia McMullen reports that an NDSU survey of 1,147 wheat fields — 380 of which were post-flowering — indicated the presence of scab in just 5.8% of those 380 post-flowering fields. "Symptomatic wheat fields averaged a low field severity rating of 0.9% (same as in 2006)," McMullen adds. "The majority of occurrence was in the northeastern part of the state, where average scab field severity was slightly higher, at 1.3%"

NDSU field scouts also surveyed 261 barley fields across the state this season, of which 65 were post-heading. Of those 65 fields, 7.7% had symptoms of Fusarium Head Blight, with an average field severity of 1.6%. The major area of scab presence was in the northeastern part of the state, similar to wheat.

For both wheat and barley, dry weather and hot temperatures (90°F-plus) across most of North Dakota during late June and early July prevented greater development of the disease, McMullen says. Also contributing to the low incidence were "the planting of varieties with improved resistance, and [the] use of fungicides at flowering."

McMullen adds that NDSU studies continue to document differences in variety disease response and variety-by-fungicide interactions. "In 2007, substantial differences in variety susceptibility to Fusarium Head Blight were observed at some eastern [N.D.] test sites," she reports. "Also, some NDSU studies in eastern N.D., looking at variety response to fungicides, showed highly significant reductions in FHB and significant economic gains in yield with fungicide application at flowering."

NDSU 2007 data on winter wheat variety disease response and performance, as well as fungicide results from across the state, are posted on the university's small grains web site: [www.ag.ndsu.edu/smgrains/](http://www.ag.ndsu.edu/smgrains/). Spring grain information will be posted as it becomes available.

**South Dakota State University** plant pathologist Jeff Stein says his state's grain producers likewise enjoyed a season largely free from scab. "We did not have significant levels of scab anywhere in the state this year," he indicates. "I have heard reports of some fields with noticeable levels of infection; but I've not heard of a single grower getting docked for excessive deoxynivalenol (DON) levels."

"Due to frequent rain events this spring, I felt the season had the potential for epidemic levels of scab to occur," Stein remarks. "However, we received very little precipitation after May 1. Since both wheat and barley flower after that point, conditions were not particularly favorable for infection."

Stein points out that South Dakota is a "transition state" for wheat production in the Great Plains, residing at the northern and southern boundaries of the hard winter and spring wheat regions, respectively. About 1.9 million acres of winter wheat were planted in the state in 2007, along with approximately 1.4 million acres of spring wheat. Planted barley acreage was about 50,000. "We had decent fall moisture [in 2006] to get the winter wheat crop established and a very wet spring in the eastern half of the state, where most of the wheat is grown," Stein notes. "Due to the amount of precipitation received, producers were expecting above-average yields this season. That, in combination with very high grain prices, resulted in an above-average



age number of acres being sprayed with fungicides.”

The situation in **Nebraska** was not as pleasant. University of Nebraska small grains breeder Stephen Baenziger says visible infections of scab were found in wheat fields “from eastern Nebraska [west] to North Platte and south to Kansas.” It was, he states, “the most widespread epidemic [of scab in Nebraska] in the past 22 years.” DON levels were high enough to incur elevator dockages of up to \$1.00 per bushel, he adds, with some loads being rejected. Baenziger estimates that about one-third (600,000 acres) of Nebraska’s wheat was affected.

The focal point for scab infections was around Hastings (south central part of the state). “Western Nebraska had limited moisture, so I expect some scab-infected grain was blended off with the uninfected grain of the west,” Baenziger observes.

Rain during and following flowering was a key factor in Nebraska’s higher scab levels this year. Also, a late freeze reduced self-pollination and injured heads in some fields. “Many of the worst-infected fields were also low yielding due to the freeze damage,” Baenziger reports. “I’m not sure if this was just coincidence, or [if] the scab and freeze were related.”

The UN breeder says most of the scab-affected growers were caught off guard. “They may have sprayed for foliar diseases, mainly leaf rust,” he says. “But [they] were not expecting scab due to its episodic nature in Nebraska.”

Further south, Erick De Wolf, extension plant pathologist for **Kansas State University**, says scab was present at low to moderate levels in many Kansas locales during 2007. “Historically, head scab is most likely to occur in eastern Kansas — and rarely occurs further west in central Kansas,” he notes. During the ’07 growing season, however, above-average rainfall and persistent high relative humidity triggered above-normal levels of the disease in both eastern and central Kansas. Based on variety evaluations, De Wolf estimates an average incidence level of 10% in those areas’ fields.

“The low to moderate levels of head scab this year further compounded the frustration of many Kansas wheat producers who had already seen their crop damaged by multiple freeze events and epidemics of leaf rust,” De Wolf adds. “The impacts of the freeze and head scab are also [affecting] the preparation of seed to be planted this fall. Many seed producers are dealing with low-test-weight seed, high clean-out rates and reduced germination of potential seed lots.”

The story was less serious elsewhere. Gene Milus, plant pathologist with the **University of Arkansas**, says his state’s wheat crop was scab-free in 2007. In **Ohio**, “unfavorable environmental conditions during flowering and early grain fill led to low Fusarium Head Blight levels at most locations,” reports Pierce Paul, plant pathologist with the Ohio State University at Wooster, where the wheat crop flowered between May 22 and 29 — a period of warm, dry weather.

“FHB intensity and grain DON content were very low in all research plots, with mean incidence less than 1.0% and mean DON contamination less than 0.2 ppm,” Paul notes. “Very similar trends were observed at other locations across the state in a survey conducted by county extension educators. Based on the

results from 12 major wheat-growing counties, average incidence was 1.0%.”

**University of Kentucky** extension plant pathologist Don Hershman says his state lost more than half its wheat to spring freezes this year. “In fields that were not destroyed and replanted to corn or soybean, I expected the secondary tillers to significantly delay harvest and result in grain fill during conditions that would probably be more favorable for FHB.”

That did not prove to be the case, however. “It was dry and the temperature moderate in late April through May,” Hershman notes. “As a result, the secondary tillers filled like gangbusters, and there was almost no disease of any kind, including FHB. I have not heard any reports about DON being an issue in the Kentucky wheat that was harvested.”

Cornell University plant pathologist Gary Bergstrom reports that FHB incidence and DON contamination in winter wheat and other cereal grains “were at their lowest levels in **New York** state in at least a decade.” As in other states, Bergstrom says the low levels can be attributed to very dry conditions “from heading through grain-filling stages.” Virtually no fungicides were applied for FHB management. The situation was similar for foliar diseases in New York during 2007, he adds.

The 2007 **Maryland** winter wheat crop was virtually scab-free, reports University of Maryland extension plant pathologist Arvydas Grybauskas. Droughty conditions ensued in the state about the time the winter wheat began flowering, he says. That, coupled with higher temperatures, shortened the grain-fill period. Scattered showers opened a window of opportunity for scab development in certain locales; but in the end “a very low incidence of scab occurred,” Grybauskas relates, “and I am not aware of any case that produced detectable DON levels.”

In general, Maryland produced “wheat of the best seed quality” in 2007, according to the UM plant pathologist. “We have not pursued a Section 18 for Folicur,” he adds, “so there is no fungicide management option at this time in our state. Growers did not need and did not make any in-season management changes for scab, nor was there any forecasted threat.”

Incidence of scab was also very low further to the south. Jerry Johnson of the **University of Georgia** reports very little damage due to scab in 2007. An extremely dry growing environment during the grain-filling period was a major reason why.

The situation was similar in **North Carolina**, notes J. Paul Murphy, professor of crop science at North Carolina State University. “Overall, the level of scab was low due to a very dry period from anthesis to maturity; and we heard no reports of problematic DON levels from growers or county agents,” Murphy reports.

Still, in one isolated area in the eastern part of the state, “we observed the heaviest FHB epidemic in four years — almost 40% incidence in susceptible varieties,” he adds. That location was planted late (December) due to wet weather during the fall of 2006, and it also received one or two rains at anthesis, “which seemed to promote the FHB.” Murphy notes that in the two seasons in which heavy incidence of Fusarium Head Blight has been observed in North Carolina, “both were characterized by late fall planting and later-than-usual anthesis.” ◆



# USWBSI-Funded Research for FY 2007

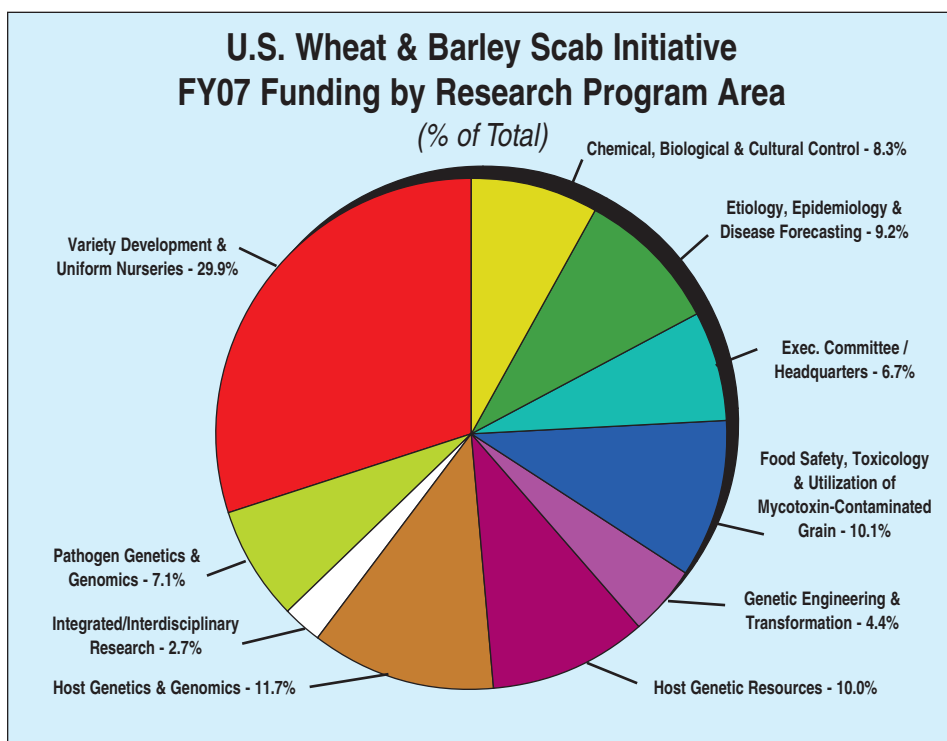
The U.S. Wheat & Barley Scab Initiative (USWBSI) recommended just over \$5.1 million in research project spending during fiscal year 2007. That figure encompassed 124 projects located in 25 states plus Mexico. Funded entities include 26 land grant universities, the USDA Agricultural Research Service (ARS) and the International Maize and Wheat Improvement Center (CIMMYT) in Mexico. A total of 86 principal investigators (PI) are heading up the projects.

The pie chart at right shows the percentage of total funding being invested in the various research areas. In terms of the dollars actually allocated by ARS — \$4,991,639 — it breaks down as follows:

- *Chemical, Biological & Cultural Control* — \$414,983 / 24 projects
- *Executive Committee & USWBSI Headquarters* — \$334,650
- *Etiology, Epidemiology & Disease Forecasting* — \$456,821 / 13 projects
- *Food Safety, Toxicology & Utilization of Mycotoxin-Contaminated Grain* — \$502,530 / 6 projects
- *Genetic Engineering & Transformation* — \$221,077 / 6 projects
- *Host Genetic Resources* — \$497,840 / 16 projects
- *Host Genetics & Genomics* — \$584,955 / 17 projects
- *Integrated/Interdisciplinary Research* — \$133,351 / 4 projects
- *Pathogen Genetics & Genomics* — \$353,880 / 9 projects
- *Variety Development & Uniform Nurseries* — \$1,491,552 / 26 projects

## To View Individual Project Information

For a complete list of research project titles, names of principal investigators and the amount of the USWBSI FY 2007 funding for each project, visit [www.scabusa.org](http://www.scabusa.org). Go to "Browse Funding Data" and click on "Projects." Under "Fiscal Year Filter," go to "2007."



A total of 139 "pre-proposals" from 92 principal investigators were received for consideration for fiscal year 2007. Each pre-proposal was reviewed by the appropriate USWBSI Research Area Committee (RAC), of which there are eight. The RAC then delivered to the Initiative's Executive Committee a review sheet that placed each pre-proposal into one of three categories: (1) recommended for funding within the "working cap;" (2) recommended for funding, but not in the working cap; or (3) not recommended for funding.

Following its own review process and consultation with the chair and vice chair of each RAC, the Executive Committee presented its plan and budget to the USWBSI Steering Committee (SC) on December 12, 2006. (The SC's membership is comprised of both stakeholders and researchers from the four commodities involved in the Initiative — barley, spring wheat, winter wheat and durum wheat.)

The EC's draft plan subsequently was

unanimously endorsed by the Steering Committee, and consequently became the official USWBSI comprehensive research plan and budget recommendation for fiscal year 2007. The plan was then translated into individual USDA-ARS grant applications, which were submitted, en masse, as the USWBSI's recommendation for how USDA-ARS could allocate the resources awarded it by the U.S. Congress.

The deadline for FY 2008 research proposals to the U.S. Wheat & Barley Scab Initiative has passed, and the review process has begun. However, anyone wishing to learn more about the process can visit the Initiative's web site: [www.scabusa.org](http://www.scabusa.org). Go to "Annual Research Plan" and then click on "FY08 Request for Pre-Proposals."

Since the inception of the USWBSI a decade ago, approximately \$40 million in federal dollars have been allocated for research on Fusarium Head Blight and its impact on food and feed (e.g., vomitoxin, or DON). ◆





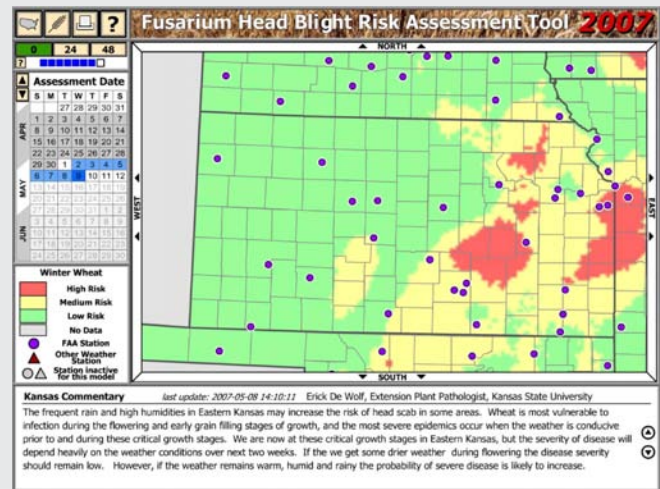
# Disease Prediction Models for FHB Gain Resolution in 2007

By Erick De Wolf

Extension Plant Pathologist / Kansas State University

The national efforts to predict Fusarium Head Blight took a quantum leap forward during the 2007 growing season. The disease prediction models developed by a cooperative effort among researchers at Kansas State University, Ohio State University, Penn State University, North Dakota State University, South Dakota State University and the University of Nebraska are deployed via a web-based interface that provides daily estimates of disease risk in 24 states east of the Rocky Mountains.

This past winter, the research team completed testing on model improvements that would increase the resolution of the disease predictions from 20 km to 5 km (see figure at right). The 2007 season also brought the addition of weather stations belonging to independent agricultural weather networks in North Dakota (NDAWN) and Michigan (MAWN), as well as expanded capacity to display the commentary of disease specialists in each state. These commentaries help



growers integrate the model predictions with local conditions and recommendations for disease management. The disease prediction models can be found on-line at the URL: [www.wheatscab.psu.edu](http://www.wheatscab.psu.edu).

## Recent Scab-Related Peer-Reviewed Publications

- Cai, X., P.D. Chen, S.S. Xu, R.E. Oliver, and X. Chen. 2005. Utilization of alien genes to enhance Fusarium head blight resistance in wheat: A review. *Euphytica* 142: 309-318.
- Chen, X., J.D., Faris, J. Hu, R.W. Stack, T. Adhikari, M.E. Elias, S.F. Kianian, and X. Cai. 2007. Saturation and comparative mapping of a major Fusarium head blight resistance QTL in tetraploid wheat. *Molecular Breeding* 19: 113-124.
- Nduulu L. M., A. Mesfn, G. J. Muehlbauer, and K. P. Smith. 2007. Analysis of the chromosome 2(2H) region of barley associated with the correlated traits Fusarium head blight resistance and heading date. *Theor. Appl. Genet.* 115:561-570.
- Oliver, R.E., R.W. Stack, J.D. Miller, and X. Cai. 2007. Reaction of wild emmer wheat accessions to Fusarium head blight. *Crop Sci* 47: 891-897.
- Oliver, R.E., X. Cai, R.W. Stack, T. Friesen, S. Halley, and S.S. Xu. 2007. Fusarium head blight resistance in

tetraploid wheat (*Triticum turgidum*/ L.). *Crop Sci* (accepted 6/27/07).

- Oliver, R.E., S.S. Xu, R.W. Stack, T.L. Friesen, Y. Jin, and X. Cai. 2006. Molecular cytogenetic characterization of four partial wheat-/Thinopyrum ponticum/ amphiploids and their reactions to Fusarium head blight, tan spot, and Stagonospora nodorum blotch. *Theor Appl Genet* 112: 1473-1479.
- Oliver, R.E., X. Cai, S.S. Xu, X. Chen, and R.W. Stack. 2005. Wheat-alien species derivatives: A novel source of resistance to Fusarium head blight in wheat. *Crop Sci.* 45: 1353-1360.
- Stepanik, T., Kost, D., Nowicki, T., & Gaba, D., Effects of electron beam irradiation on deoxynivalenol levels in distillers dried grain and solubles and in production intermediates, *Food Additives and Contaminants*, Sept. 2007, 24 (9): 1001-1006.

*Fusarium Focus* welcomes your submissions for listing in future issues of this newsletter. Please send to:

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## 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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