

## **Fusarium Head Blight in 2011: An Overview**

By Don Lilleboe\*

*Several states experienced low to virtually non-existent problems with Fusarium Head Blight (scab) during the 2011 U.S. small grains production season, while a few others incurred significant disease incidence and crop loss. As always, growing season weather played a large role in the disease's status; but so too, on an expanding basis, has the use of FHB management tools like varietal selection, fungicide applications and crop rotation.*

*A recent survey by the U.S. Wheat & Barley Scab Initiative (USWBSI) of university specialists in several states tells the story. Here's an overview, presented by region.*

### **Mid-Atlantic Soft Winter Wheat Region**

If you're looking for good news on the scab front, it's hard to top the brief — and very positive — report from Erik Stromberg, extension plant pathologist with **Virginia** Polytechnic Institute and State University. “To my knowledge, Fusarium Head Blight was a non-issue in Virginia [in 2011],” Stromberg reports. “This was the best wheat crop (no disease) in my 30 years in Virginia.”

The situation was just as benign in **North Carolina** this year. Christina Cowger, USDA-ARS plant pathologist at North Carolina State University, says scab was not a problem in her state's fields. “Most wheat and barley flowers in April or early May in this state,” she notes, “and conditions were dry — with the exception of a short rainy spell in late April.”

Cowger adds that of the 14 wheat varieties ranked as “above average” in yield statewide in NCSU 2010-11 replicated trials, three (DynaGro Dominion, Southern States 8700 and Coker Oakes) are moderately resistant to scab. Also, “of the several varieties popular in some counties but not in the statewide top tier for yield, three are moderately scab resistant: P26R15, USG 3555 and Progeny 185.” It's difficult to accurately peg the extent to which scab-resistant varieties were planted in 2011, Cowger says. But informal estimates by extension agents and certified seed producers suggest that DynaGro Dominion and Coker Oakes were among the highest-acreage wheat varieties.

However, it appears the other six varieties in the top eight are susceptible or moderately susceptible.

“Fungicides were not widely used in North Carolina to combat head scab in 2011,” Cowger adds, “because producers correctly interpreted the scab forecast to indicate that a scab fungicide was not warranted.” The state’s small grain producers and their advisors were encouraged to sign up for scab alerts (*i.e.*, the FHB Alert System, hosted by the U.S. Wheat & Barley Scab Initiative) early last spring, and many did so. “This system has been a success in establishing the capacity for rapid response, should scab pose a risk to North Carolina producers in 2012,” Cowger states.

Scab was not a problem for **South Carolina** producers this year, either, reports Jay Chapin, Clemson University peanut and small grain production specialist. The lack of scab was likewise reflected in Chapin’s annual variety evaluations, where the disease’s absence prevented any scab ratings, though “we rate all diseases present,” he notes.

Predictably, no applied fungicides were targeted at scab in South Carolina. “Leaf rust and leaf/glume blotch are primary targets,” Chapin relates. “Tebuconazole is widely used, primarily before head emergence. But some applications [were] delayed until head emergence with the idea of still getting adequate rust/glume blotch protection and perhaps reducing scab risk.”

The situation was not nearly as pleasant to the north, in **Pennsylvania**. Fusarium Head Blight “was real serious on wheat and barley — perhaps as bad as I have ever seen, especially in the southern counties of the state,” reports Greg Roth, extension agronomist with Pennsylvania State University. “It was also a significant problem in the central counties on wheat, even though they were relatively ‘low risk’ through the heading period.” Roth says about one-half of Pennsylvania’s 2011 wheat crop came in with vomitoxin (DON) levels above the 2.0 ppm threshold.

Producers in southern counties who used Prosaro and Caramba fungicides had generally good success, Roth says, “with increases in yield and reductions in DON under high-pressure situations.” He had more reports of mixed results in Pennsylvania’s central counties, with even treated fields showing high DON levels. “Fungicides were a real benefit to many producers in the southern counties, and they will likely become part of mainstream wheat management,” the PSU agronomist predicts.

Alyssa Collins, director of Penn State’s Southeast Agricultural Research & Extension Center at Manheim, believes university small grain specialists did a good job of alerting growers to this year’s scab risk as flowering approached — and most farmers who could spray did so.

However, she adds, there's more work to be done in helping growers understand the timing issues involved in getting efficacy from their sprays. Also, while fungicide treatments are a key facet of managing this disease, variety selection and other management steps play an equally important role. "I feel like more farmers will be open to trying scab-resistant varieties [in 2012] if they are available," Collins affirms.

In **Maryland**, spring weather was conducive for FHB development — particularly in the central and northern parts of the state, reports University of Maryland field crops plant pathologist Arv Grybauskas. The southern wheat district generally escaped conditions favorable to the disease and, in turn, produced a crop of excellent quality.

"Rejections of seed at mills and elevators was considerably less in 2011 than in 2009," Grybauskas says. "This was in part due to the availability of low-DON seed for blending and in part due to lower disease severity." Maryland wheat producers slightly increased their use of moderately resistant varieties, he adds, in concert with such varieties' increased availability. Growers also made better use of the scab forecasting website and hiked their use of fungicides for managing the disease. "Fungicides helped to keep DON to acceptable levels," Grybauskas concludes.

### **Southern Soft Winter Wheat Region**

As in the Carolinas, scab took a vacation in **Georgia** in 2011. That's not surprising, given that Fusarium Head Blight historically has been very low in the state, notes Alfredo Martinez, extension plant pathologist with the University of Georgia. "Additionally, crop rotation with non-host crops has greatly reduced the possibility of the fungus carryover," he explains.

Because scab is rare in Georgia, fungicide treatments are geared toward controlling diseases like rust, powdery mildew and stagonospora, among others. "While there are some FHB-tolerant varieties available, most producers based their variety selection on high-yielding varieties that are resistant to foliar diseases and insects," Martinez says. In concert with USWBSI, the university's small grains team is actively pursuing the development of high-yielding soft red winter wheat cultivars with improved FHB resistance, he adds.

In **Alabama**, scab issues in 2011 were confined to the Quad Cities (Florence) area, comprised of three counties in the northwestern part of the state. Dry weather patterns in other wheat production areas greatly limited disease development there.

Growers in the Quad Cities area who applied a timely fungicide experienced yields in the range of 90 to 100 bushels per acre (compared to less than 60 bushels in untreated fields), notes Austin Hagen, Auburn University extension plant pathologist. Prosaro, Caramba and generic tebuconazole were the fungicides of choice.

Next door, in **Mississippi**, “light” is the best word to describe the 2011 scab footprint, says Tom Allen, extension plant pathologist with Mississippi State University’s Delta Research & Extension Center. Fields that did incur some FHB were typically in the eastern part of the state. Fungicides are the preferred control measure, though Allen expects more grower interest in tolerant or resistant varieties next year. He says Mississippi growers who do apply a fungicide to their wheat tend to do so more as a “plant health” treatment (*i.e.*, yield enhancement) rather than for yield loss prevention due to a specific disease.

To the northwest, in **Arkansas**, “scab was generally absent south of I-40 where most of the wheat is grown and where conditions before, during and after flowering were dry,” reports Gene Milus, University of Arkansas plant pathologist. Northeastern Arkansas did experience some heavy rains, with some scab developing late in the growing season. “However, I did not hear about any loads being rejected at the elevator,” Milus relates.

Of the 20 commonly grown wheat varieties in the state as of 2011, three were rated as moderately resistant to scab, eight were moderately susceptible, six were susceptible and the final three were very susceptible to FHB. It’s very difficult to determine how much of the Arkansas wheat crop was seeded to a resistant variety, Milus adds. “Seed was in short supply, so farmers planted whatever they could get,” he indicates. Little fungicide was used this year because conditions conducive to scab did not appear until after flowering.

### **Midwest / Northern Soft Winter Wheat Region**

**Ohio** experienced a very tough year of Fusarium Head Blight in 2010, with disease incidence levels ranging from 3% all the way up to 60%, and with DON levels of from less than 1.0 ppm up to 18.0 ppm. Fortunately, while scab made its presence known again this year, the 2011 experience was much less damaging, reports Pierce Paul, Ohio State University plant pathologist.

“Vomitoxin levels are relatively low, being below 5.0 ppm in the majority of harvested fields, with the odd field having 7.0 to 9.0 ppm,” Paul reports. “These numbers are much lower

than last year's numbers, which [reflected] the most severe scab and vomitoxin problem Ohio has had in over 10 years."

The average scab incidence in 2011 Ohio fields not treated with a fungicide was 12.4%, with more than 41% of those fields having more than 10% incidence, according to Paul. "That makes 2011 the third highest year for wheat scab since 2002." Average incidence of all non-treated fields within each county surveyed ranged from 1.4% to 31.1%, while averages for individual fields ranged from 0 to 44.9% incidence. Higher incidence levels tended to occur in two main clusters of counties within the state: (1) the southwest and (2) the central to mid-northwest.

"Overall, fields planted to varieties with moderate levels of resistance to scab and/or treated with a fungicide had lower disease levels than those planted to a susceptible or moderately susceptible variety and/or not treated with a fungicide," Paul notes. In addition, moderately resistant varieties treated with a fungicide had the lowest overall average level of scab (4%). Similarly, fields of susceptible varieties treated with a fungicide had an overall average incidence of 7.4%, compared to those that were not treated (average incidence of 11.3%).

"Wheat scab and vomitoxin continue to be the biggest threats to profitable production of high-yielding, high-quality wheat in Ohio," Paul emphasizes. "However, today we have better and more-effective tools than we did 10 years ago — *i.e.*, the scab risk assessment system, better fungicides and more-resistant varieties. Results for 2010 and 2011 show that selecting varieties that are moderately resistant, planting wheat after soybean (which the majority of growers in Ohio are doing), along with a well-timed fungicide application, is the most effective integrated approach for minimizing yield and quality losses due to scab."

**Kentucky** harvested an excellent wheat crop overall in 2011 — a surprise to many, since the crop was planted during a very dry period, followed by continuous spring rains that increased disease risk. At times during the spring, it appeared many fields had significant levels of Fusarium Head Blight and/or leaf and glume blotch, reports Don Hershman, University of Kentucky extension plant pathologist. But above-average temperatures during the first part of June helped the crop dry down rapidly. "In essence, the crop outraced the diseases to the finish line," Hershman says, thus softening the potential impact from disease infections. He says about 20% of the state's wheat had at least moderate levels of FHB (some severe), "but it did not translate into any serious damage, fortunately."

Hershman says about 40% of Kentucky wheat acres were treated with a fungicide (mainly Caramba and Prosaro), with FHB as the prime target. "Overall, farmers seemed pleased with the visual results of treatments when fungicides were applied in a timely fashion," he states. Some

fields could not be treated promptly due to ongoing rains; but the ensuing dry weather helped rein in scab development.

To the north, in **Indiana**, less scab developed in 2011 than in preceding years. “The northeast corner of Indiana did experience some problems with FHB due to moderate temperatures, high rainfall and high humidity as wheat was beginning to flower,” reports Kiersten Wise, Purdue University extension plant pathologist. Those conditions complicated timely fungicide treatments, and some producers incurred high levels of FHB as a result, she says. “Fields that had a combination of varietal genetic resistance and a well-timed fungicide application experienced less disease,” Wise notes.

“There were a few reports of dockage due to DON levels over 2.0 ppm; but overall, reports were low.”

Most **Illinois** wheat acreage is located in the state’s southern portion. There, just prior to anthesis, the FHB risk ran moderate to high. “But we lucked out and caught some dry weather during the majority of anthesis — which dropped the FHB risk to low,” notes University of Illinois extension plant pathologist Carl Bradley. “Scab could be detected in fields, but incidence and severity were low. I did not hear of any issues of high DON levels in southern Illinois wheat this year.”

Bradley says a lot of southern Illinois wheat fields were treated with a fungicide this year to aid scab management. That doubtlessly was a contributing factor to the overall low impact from the disease in 2011, as was the use by some growers of moderately resistant varieties.

**Wisconsin** also enjoyed a benign scab year in 2011. University of Wisconsin extension plant pathologist Paul Esker says conditions for development of FHB were variable, depending upon a particular field’s flowering period. “Fields that flowered in early June were under conditions that were less favorable for the development of Fusarium Head Blight,” he reports.

Fields flowering later in the month were more prone to infection, and many were sprayed with a fungicide. “Post-harvest, we have received few reports of damaging levels of FHB,” Esker relates.

To the east, the incidence of scab in **Michigan** fields was very low this year, says Martin Nagelkirk, Michigan State University extension director for Sanilac County. DON levels were correspondingly low as well, though an occasional load tested in the 2.0 to 4.0 ppm range.

While there are as yet no scab-resistant soft white winter wheat (which comprises one-third of the state’s crop) varieties in Michigan, “growers are beginning to select high-yielding white varieties that might be considered moderately susceptible rather than highly susceptible,”

Nagelkirk advises. “Moderately resistant varieties of soft red winter wheat are not as accessible as others, but they can be obtained.”

The use of fungicides on wheat in Michigan increased dramatically in 2011 due to the crop’s elevated value along with encouragement from extension and agribusiness. “A reasonable guess is that 75% of the soft white and 50% of the soft red received at least one application of fungicide this year,” according to Nagelkirk. “As last year, the use of fungicides likely increased grain yields by several bushels.”

The MSU extension educator views the efforts of the U.S. Wheat & Barley Scab Initiative as proving of significant benefit to his state’s wheat producers. “Of particular value is the forecasting model, trials that measure the efficacy of fungicides — and educational materials regarding FHB and other diseases,” he affirms.

Up in **New York**, wheat planting in the fall of 2010 was delayed following a late soybean harvest. “This resulted in a delay in wheat flowering into early June 2011, after the prolonged rainy period had ended,” notes Gary Bergstrom, Cornell University plant pathologist. “In general, only low levels of Fusarium Head Blight were observed in New York winter wheat fields in June and July.”

Isolated winter wheat fields — particularly some early planted ones that flowered in late May — did experience moderate levels of FHB. However, says Bergstrom, feedback on wheat quality from wheat mills confirmed the year’s pattern of low FHB observations. More than 90% of winter wheat loads received as of late August tested below 1.0 ppm of DON, he reports, with just a handful of samples statewide showing levels in the 2.0 ppm area.

“Strides have been made by New York growers to reduce the planting of soft winter wheat varieties with a reputation for extremely high DON levels,” Bergstrom relates. “However, moderately susceptible (to FHB) varieties of red and white wheats still predominate in New York, and yield remains the major factor in variety choice.”

The Cornell specialist says that less than 20% of the state’s wheat acreage received a fungicide treatment in 2011. A number of producers made flowering applications of Caramba or Prosaro, aimed at control of both FHB and flag leaf diseases. Those applications resulted in modest yield boosts, he says, due primarily to control of leaf rust and leaf blotches. Research trials in New York show that Caramba and Prosaro applications “result in consistent reduction in DON levels, especially when applied to varieties with moderate resistance to FHB,” Bergstrom observes.

## Great Plains / Hard Winter Wheat

The 2011 Fusarium Head Blight situation in **Nebraska** ranged from very low to severe, depending upon the area and field. While scab occurred in the southeastern, south central and southwestern parts of the state, the most severely affected fields were in southwestern Nebraska, reports Stephen Wegulo, University of Nebraska extension plant pathologist. Such fields “were either planted with a susceptible variety or had corn stubble on the soil surface — or both,” he notes.

Overland, a scab-tolerant variety, was the top-acreage cultivar in Nebraska this year at 10.8% of total wheat acreage. Millennium, which also has shown good tolerance to scab, went in on 7.6% of the state’s wheat acreage.

“Overall, losses due to scab statewide were minimal for the most part,” Wegulo summarizes. “However, losses in several isolated fields were significant.”

Scab losses in **Kansas** likewise were very low this year, observes Kansas State University extension plant pathologist Erick DeWolf. Drought was a major reason why, as dry conditions dominated much of the growing season. “I was concerned when we saw some wet weather move through near the end of flowering in parts of eastern Kansas,” DeWolf says. “However, severe FHB did not develop.”

The situation was similar in **Oklahoma**, where most of the state was under extreme drought conditions for the entire 2011 wheat growing season. Bob Hunger, Oklahoma State University extension wheat pathologist, says neither he nor the OSU wheat extension agronomist observed any scab this year. Fungicide use likewise was minimal, given that all foliar diseases were limited due to the season’s drought and high temperatures.

## Northern Great Plains Hard Spring Wheat / Hard Winter Wheat / Malting Barley

“Scab was a major problem this year in certain areas of **South Dakota**,” reports Kay Ruden, extension/research associate with South Dakota State University. Winter wheat took the hardest hit in the state’s central and south central districts.

As of late August, Ruden was aware of DON levels ranging from 2.0 all the way up to 20.0 ppm in winter wheat, and from 2.0 up to 9.0 ppm in spring wheat samples. Yields and test weights of both wheats are down from last year, though not all of the decline can be pinned on scab. Several other diseases, along with frost in some areas, also contributed to yield and quality problems. “With the weather conditions being wet to very wet in the spring and wet during the growing season, it was a perfect set-up for all of these to get a foothold in the wheat crop and cause havoc,” Ruden observes.

South Dakota growers do have several options when it comes to selecting scab-resistant wheat varieties. In spring wheat, most of the available varieties have some level of resistance to scab, Ruden explains. “And in a year like this one, it has helped. But we also need to look at the whole picture when thinking about scab.” That includes, she emphasizes, crop rotation considerations and fungicide applications.

This year’s wet and humid conditions prompted heavy fungicide use by South Dakota wheat producers. Products included Prosaro, Caramba, Proline and generic versions of tebuconazole. While the fungicides helped protect the crop, the “almost-perfect” conditions for scab in 2011 resulted in a lower degree of protection than would be expected in a “more-normal” season, Ruden says. Still, where fungicides were not applied, “we saw a lot more scab, and the yields were a lot lower than in the treated wheat,” she adds.

“The research we have done here in South Dakota and across the nation with the help of USWBSI has helped us get information out to producers, crop consultants, elevators, etc., about the importance of choosing resistant crop varieties, crop rotation and testing for DON,” Ruden emphasizes. “With the national scab forecasting system in place, we do have producers in South Dakota checking it and seeing if and when they need to spray. They are more willing to spray their wheat crop now than they were when USWBSI first started.”

**North Dakota** small grains extension plant pathologist Marcia McMullen says symptoms of Fusarium Head Blight were observed in about 50% of surveyed post-flowering wheat fields in

2011. However, average field severity in those symptomatic fields (primarily spring wheat and winter wheat) averaged between 3-5%. “Field severities ranged from less than 1% to over 37%, with the highest levels observed in some winter wheat fields,” McMullen reports. Initial harvest and DON analyses indicated that DON levels were “generally below 1.0 ppm in spring wheat, but higher levels have been observed in winter wheat, depending on the variety grown,” she notes.

Surveys of North Dakota barley fields showed very few with obvious FHB symptoms, according to McMullen. Preliminary reports indicated variable DON levels in barley, averaging between 0 to 2.0 ppm.

In September, as more North Dakota durum wheat was harvested, McMullen received reports of higher DON levels (3.0-5.0 ppm) in durum grain.

“The biggest story from North Dakota is that the growing season had a very unfavorable environment for small grains,” McMullen observes. Excessive moisture (leading to many prevented plant acres), very high dew points, hot temperatures during July, frequent storms, drowned-out fields, and multiple root, leaf and head diseases all contributed to “very low and disappointing yields for most North Dakota producers.”

Across the Red River of the North, in **Minnesota**, the 2011 growing season served as a reminder that Fusarium Head Blight is “a nemesis that you cannot ignore,” says Jochum Wiersma, small grains specialist with the University of Minnesota’s Northwest Research & Outreach Center, Crookston. Delayed spring planting, coupled with high temperatures during the second half of the growing season, set the stage for reduced spring wheat, winter wheat and barley yields. Then FHB contributed as well. “Field severities ranged from just a few percentage points to as high as 30% in some fields,” Wiersma reports.

Early reports indicated DON levels, for the most part, hovering below 2.0 ppm — probably a reflection of growers’ efforts to remove as many visually scabby kernels as possible during harvest. Nonetheless, says Wiersma, initial estimates suggest that scab “may have caused economic losses not seen since 2005, the last year of widespread problems” in Minnesota.

This level of disease occurred in spite of a higher portion (almost 40%) of the acreage being planted to varieties rated moderately resistant or better to FHB — and a higher percentage of acreage receiving a fungicide application at the beginning of anthesis. “Industry representatives estimate that more than 85% of Minnesota’s spring wheat acreage was sprayed at Feekes 10.51,” Wiersma relates, “with a larger percentage of those acres being treated with either Prosaro or Caramba when compared to previous years.”

In terms of new varieties, the University of Minnesota released Prosper, a HRSW cultivar and sister line to Faller, jointly with North Dakota State University. Minnesota itself also released Rollag, another HRSW variety whose FHB resistance is rated as good as anything on the market. “It will be cultivars like Rollag that are needed to further increase the fraction of the acreage being planted to cultivars rated moderately susceptible or better to FHB,” Wiersma states, “as yield potential, quality and agronomic traits such as straw strength are more important (to growers) in the cultivar selection process than the cultivar’s FHB resistance.”