

Scab's Impact Low in Majority of U.S. Wheat & Barley Areas in 2016

By Don Lilleboe*

USWBSI Survey of Small Grains Specialists Indicates Weather Again a Major Factor in Presence or Absence of Disease

As is usually the case, in-season weather played a key role during 2016 in the development, or lack thereof, of Fusarium Head Blight (FHB, also known as “scab”). Reports provided to the U.S. Wheat & Barley Scab Initiative by small grains specialists in a number of states indicate that FHB incidence and severity levels were generally quite low this year. The same conclusion applies to levels of deoxynivalenol (DON), the vomitoxin associated with Fusarium Head Blight. Several regions (e.g., the Midwest and Central Great Plains) experienced very minimal scab problems, with some states achieving record wheat yields coupled with excellent quality. A few areas (e.g., northern North Dakota) did contend with serious DON this year, however.

The reports also underscore once again that an integrated approach to FHB management — planting scab-tolerant or -resistant cultivars, applying appropriate fungicides at the proper time, and avoiding crop rotations conducive to scab development — usually pays off for those farmers who employ that strategy.

Here's an overview of the 2016 FHB situation, by region.

New England & New York

“Most of New England experienced drought-like conditions throughout the entire growing season,” reports Heather Darby, University of **Vermont** extension

agronomist. Mild temperatures aided winter grain survival. Spring 2016 started off dry but cool, slowing the growth of winter and spring grains. “The dry weather during flowering kept *Fusarium graminearum* levels low throughout the region,” Darby notes; but above-normal temps during flowering may have contributed to higher incidence of aborted kernels and reduced yields. Of 272 samples evaluated at the University of Vermont’s commercial grain quality testing lab, only 10 had DON levels exceeding 1.0 ppm.

In adjacent **New York**, Fusarium Head Blight and mycotoxin contamination were “non-factors” in the production of small grain cereals this year, according to Gary Bergstrom, Cornell University plant pathologist. That situation was a direct reflection of record-setting drought during May, June and July. “There was scarcely a drop of moisture to be found from head emergence through grain-filling for the state’s winter and spring cereal crops,” Bergstrom relates. Yet soft winter wheat and winter malting barley yields were high — “and grain quality was spectacular, with the lowest levels of DON observed in this state in at least a decade.”

Bergstrom says yields were reduced in some spring barley fields as they matured under severe drought. But the state’s “nascent craft malting and brewing industries were delighted with the extremely high quality of DON-free barley and other grains in 2016.” There presently are nine craft malt houses in New York purchasing local grains to meet local brewer and distiller needs, Bergstrom notes. “Reducing the risk of mycotoxin contamination is paramount to the sustained success of this regional industry,” he emphasizes.

Mid-Atlantic Soft Winter Wheat Region

As in prior years, small grain production in **Pennsylvania** was variable in 2016, depending upon the weather. Alyssa Collins, Penn State plant pathologist and director of the PSU Southeast Agricultural Research & Extension Center at Manheim, says the long, warm 2015 fall continued into December across much of the state, leading to strong plant establishment. “But these same weather conditions also

avored the development of foliar disease, like powdery mildew (not often encountered before spring),” she adds.

A warm and dry spring persisted through Feekes 4-6 stage for much of the state’s 2016 small grains crop. “With the arrival of moisture in the lower tier of the state in May, most wheat and barley farmers chose to apply fungicides at flowering or heading, respectively,” Collins reports. Though some scab symptoms were observed in the majority of Pennsylvania wheat fields, most mills did not report the presence of high DON levels. “Overall, the quality of the wheat harvest appeared to be better in 2016 than the previous year,” Collins concludes.

“Interesting” is the operative word for the 2016 wheat season in **Delaware**, says Nathan Kleczewski. “Extended wet conditions throughout the flowering period resulted in elevated FHB risk throughout the growing season,” reports the University of Delaware extension plant pathologist. “However, unlike in 2013, this season our growers were prepared for it. Most growers applied a fungicide for scab suppression within the five- to six-day period, which USWBSI-funded research has shown to be efficacious.” Though some Delaware growers still planted moderately susceptible or susceptible varieties, “more planted varieties that were rated well for FHB or DON tolerance,” Kleczewski notes.

An on-farm survey/study was initiated in 2016 to provide Delaware growers with larger-scale data to aid in making FHB management decisions. In that study, several untreated fields/strips incurred DON levels of more than 2.0 ppm, with one at 8.8 ppm. Moderately resistant varieties reduced visual symptoms by more than 91% and DON by more than 60% compared to susceptible varieties, Kleczewski reports. “Fungicide treatments in the fields we surveyed reduced visual symptoms by 76%, on average, and DON by 72%,” he adds. All moderately resistant varieties — even in untreated strips — had DON levels below 2.0 ppm.

Overall, FHB was not a major issue in Delaware’s commercial wheat crop this year, Kleczewski summarizes. “I would love to think the overall low levels of DON and FHB were due simply to fungicides and varieties,” he says, “but we had difficulty seeing elevated FHB and DON in inoculated research trials in untreated susceptible

controls across several locations around the state and eastern Maryland. Thus, even though we were at a high level of risk, there may have been some other factor limiting FHB in parts of the region.” What such factor(s) could have been is unknown.

Since the majority of **Maryland's** grain production is on the Delmarva Peninsula, that state's 2016 experience would be generally reflective of Delaware, says Arv Grybauskas, retired field crops pathologist with the University of Maryland.

Hillary Mehl, plant pathologist at **Virginia** Tech's Tidewater Agricultural Research and Extension Center, says scab severity and DON contamination were generally low in the 2016 Virginia wheat crop — despite wet weather during flowering. This was likely due to temperatures that did not favor growth and spread of the pathogen, she suggests, plus perhaps an increased use of moderately resistant varieties and fungicide applications during flowering.

While scab incidence was widespread throughout the state, severity was low in most fields, Mehl states. Little scab was observed in the southwest, Shenandoah Valley and Piedmont, where the majority of Virginia's wheat is produced. “DON levels ranged from ‘not detected’ to 5.0 ppm, with the majority of the crop being below 1.0 ppm,” she observes.

Southern/Southern Atlantic Soft Winter Wheat Region

“While several other diseases and excess rain took a severe toll on the **North Carolina** wheat crop this year, the weather remained fairly dry in April, and scab was not a problem in most of [the state],” reports Christina Cowger, plant pathologist with the USDA Agricultural Research Service at North Carolina State University. However, she adds, some producers in the northeast corner of the state, along with others in the central Tidewater district who had planted late, did experience scab issues related to rains during the May 3-20 period that in turn elevated scab risk for wheat that was flowering.

Cowger says there were reports of DON levels of up to 10-12 ppm in wheat harvested north of the Albemarle Sound, especially in susceptible varieties. "County agents in that area say that scab has gone from being a problem in one of every 10 years to nearly half of all years," she notes.

Seed producers in the central Tidewater, which produces a significant portion of North Carolina's wheat, did observe more scab than normal, Cowger adds. "Growers in that area are now paying more attention to scab and want more information about the efficacy and economics of aerial fungicide applications for scab reduction," she says.

Scab was problematic in **Georgia** for the third straight year, says Alfredo Martinez-Espinoza, University of Georgia extension plant pathologist. He reports FHB incidences statewide, albeit in an intermittent fashion. While environmental conditions for FHB development were less favorable in 2016 compared to the two previous years, "it was surprising to see how quickly symptoms appeared and disease developed," he states, adding that at the university's Plains and Tifton stations in southwestern Georgia, wheat in the state trials was scored with "high" FHB incidence.

"It seems that FHB has made the state of Georgia its residency," Martinez-Espinoza observes. "Therefore, information on identification, prevention and control of FHB is actively disseminated to county agents and growers. Use of resistant cultivars (if available), as well as judicious use of fungicides and crop rotation, are all important elements for disease management." A new UGA Extension publication on control of scab in wheat is now available at <http://extension.uga.edu/publications/detail.cfm?number=C1066>, he adds.

In **Alabama**, Fusarium Head Blight was somewhat lower in Auburn University's wheat variety trial at Fairhope (near Mobile Bay) in 2016 compared to 2015. "However, disease intensity was highly variable and dependent upon the cultivar," notes Auburn plant pathologist Kira Bowen. Overall, scab intensity ranged from low to moderately high, she says.

Bowen reports generally low levels of scab in the Auburn wheat variety trial at Prattville (in central Alabama, near Montgomery), though one susceptible variety in a fungicide trial there rated as an 8 (out of 10, with 10 defined as 100% severity and incidence). No scab was noted at the Auburn trial site at Belle Mina in extreme north central Alabama.

To the west, poor planting conditions and low prices reduced **Louisiana's** wheat acreage by 63% from 2015, to an estimated 40,000 acres — the lowest in 37 years. “Rainfall during flowering resulted in moderate to severe scab epidemics across the wheat-producing regions of the state,” reports Boyd Padgett, small grains plant pathologist with Louisiana State University. Louisiana's average yield loss from scab is estimated at 10%, though some fields incurred significantly more. The scab epidemics experienced in 2015 and 2016 constitute the most severe in recent history, Padgett notes, and are likely to contribute to a further wheat acreage decline in 2017.

Arkansas, like Louisiana, experienced a big downturn in wheat acreage in 2016. Harvested acreage was placed at 150,000, with an average yield of 56 bu/ac. (The state's producers harvested 240,000 acres of wheat in 2015 and 395,000 the prior year.) “Given the amount of rain during flag leaf to harvest time, many fields suffered damage due to disease,” says Terry Spurlock, extension plant pathologist with the University of Arkansas. *Septoria tritici* blotch, stripe rust and glume blotch were observed at treatment levels.

Fusarium Head Blight was not, however, as impactful this year in Arkansas as in 2015. “Certainly, there was some scab in the field; but fungicide application was not the norm for most growers this year, or was applied earlier at timings to protect the flag leaf,” Spurlock observes. “It appears that scab pressure at flowering was not high on susceptible varieties in many areas of the state.”

Midwest/Northern Soft Winter Wheat Region

Thanks in part to cool spring conditions followed by relatively dry weather during anthesis and early grain fill, head scab and other disease levels were generally low in most wheat-producing areas of **Ohio**, reports Pierce Paul, Wooster-based plant pathologist and extension state specialist with The Ohio State University. That low disease severity translated into very good grain yield and quality in 2016.

“Stripe rust was our biggest disease problem this year,” Paul says, “but outbreaks only occurred in pockets within and across fields. Moreover, several of the affected fields were treated with a fungicide, which helped to keep this and other later-season diseases in check.” Contrary to 2015, when the Ohio wheat harvest was delayed by up to two weeks by persistent rainfall, wheat this year was harvested as early as the last two weeks of June in certain areas, with record yields in some fields. Yields as high as 120 bu/ac and test weights in the upper 50s to low 60s were reported in some fields, Paul observes.

Scab and DON were “nearly non-existent” in **Kentucky’s** 2016 wheat crop, says Carl Bradley, University of Kentucky plant pathologist. “Conditions appeared to be somewhat favorable for scab development, but cooler temperatures may have reduced infections,” he says. “In addition, a good portion of fields were sprayed with a fungicide for scab prevention.”

University of **Missouri** wheat breeder Anne McKendry reports little scab in that state during 2016. Rainfall was sporadic in some areas and persistent in others, “and yet there was very little scab; and, from what I hear, low toxin levels in the harvested crop (compared to levels as high as 30.0 ppm in 2015 and a lot of unmarketable grain).”

McKendry attributes this year’s low scab primarily to cool conditions during heading in most districts of Missouri. “Nighttime temperatures were in the high 50s/low to mid-60s throughout May and into June,” she relates. “Consequently, even though inoculum was prevalent, disease never developed.” That cool period

was followed by 19 consecutive days of temperatures above 90 degrees; but by then, the wheat was into grain fill, so scab levels remained low. “Toxin levels from our nursery ranged from ‘imperceptible’ to 1.0-2.0 ppm,” McKendry notes, “so very little problem this year.”

The major threat to Missouri’s 2016 wheat crop was very heavy pressure from stripe rust, which overcame some former sources of resistance. Yield and test weight in susceptible varieties dropped significantly as a result.

“Otherwise, in terms of grain yield and test weight, this was one of the best [crops] we’ve had in a number of years, with growers experiencing record state-wide yields,” McKendry concludes.

Illinois experienced numerous rainfall events at or just after flowering this year, but the spring of 2016 also brought cool temperatures. In the end, there was not much scab, and “generally, producers and millers indicated that the grain quality in 2016 was excellent,” says University of Illinois wheat breeder Fred Kolb.

The main problem Kolb heard about from millers involved stored wheat from 2015 that was blended off with new crop. The quality of the 2015 crop was pretty bad, he explains, due to both scab and preharvest sprouting.

“Bottom line, there was not much damage in Illinois due to scab in 2016,” Kolb relates. “Stripe rust infection on susceptible varieties was severe; but overall, Illinois set a new record state average yield at 75 bu/ac.”

The 2016 scenario was similar in neighboring **Indiana**. “The majority of Indiana did not experience problems with FHB and DON, and most had high yields and good-quality grain,” reports Purdue University extension specialist Kiersten Wise. “There were a few pockets in southern Indiana where there was some FHB and moderate DON levels, but nothing as severe as last year.”

Unlike the prior year, **Wisconsin** experienced a “relatively minimal” scab season in 2016, says Damon Smith, field crops pathologist with the University of Wisconsin. Low levels of FHB were identified in the state’s southern and eastern wheat production areas, but severity was minimal (less than 20%) — likely because conditions were very hot and mostly dry during the anthesis period in those

districts. Further north and closer to Lake Michigan, somewhat higher levels of FHB were identified, likely due to more-favorable weather for the FHB fungus during anthesis.

Statewide, the major disease of Wisconsin winter wheat in 2016 was stripe rust. It could be found in every field that was rated for disease, according to Smith.

Michigan also enjoyed a quite benign year for scab, as conditions were unfavorable for Fusarium development in most wheat-growing areas. “An unusually warm and dry weather pattern persisted from flag leaf through grain maturation,” notes Martin Nagelkirk, state extension educator for wheat with Michigan State University. “These conditions, coupled with fungicide use, made it difficult to find any heads exhibiting FHGB symptoms in the vast majority of fields.” Grain testing eventually confirmed the disease’s minimal impact, with DON levels well below discount schedules. “In fact, most receivers discontinued testing for DON early on during the harvest period,” Nagelkirk says.

Despite the mild scab forecast, most Michigan wheat acreage received a fungicide treatment at flowering. “The application has become routine — particularly for soft white wheat varieties, as they are generally more susceptible to FHB,” Nagelkirk notes. “Some of these varieties also tend to be more susceptible to foliar diseases. This was especially evident this season, as the state experienced an unprecedented level of stripe rust.”

The MSU extension educator says fungicides are also used on at least half of Michigan’s soft red winter wheat acreage, which accounts for two-thirds of the state’s 570,000 harvested acres of wheat.

Great Plains / Hard Winter Wheat Region

Wet and cool weather across **Oklahoma** during mid- to late April and May provided conditions favorable for Fusarium Head Blight, reports Oklahoma State University extension wheat pathologist Bob Hunger. That prompted concerns regarding the potential occurrence of FHB (primarily in the northeastern part of the

state), and some fungicide applications targeted at FHB likely occurred. “However, no reports of scabby wheat or high DON levels were received, and we estimate less than 1% of the crop was affected,” Hunger says, “indicating FHB was not a significant factor in Oklahoma in 2016.”

Kansas had an excellent wheat crop this year with above-average yields in most areas of the state, notes Erick DeWolf, Kansas State University extension plant pathologist. “Dry conditions dominated in the early season, and the crop was under significant drought stress in March and April,” he says. “Fortunately, May and June were characterized by below-normal temperatures and above-normal rainfall, which translated into tremendous yield potential.”

The disease forecasting tools provided by the U.S. Wheat & Barley Scab Initiative indicated the risk of scab to be low in most areas of the state when most of the crop was flowering. “There was a period of moderate risk a few weeks later,” DeWolf says, “but most of the crop appeared to escape scab. The widespread use of the scab-resistant wheat variety ‘Everest’ in the scab-prone areas of the state also helped reduce the risk of scab in Kansas this year.” While there were a few reports of low levels of scab and DON in 2016, overall neither was a problem for wheat producers in Kansas, the KSU plant pathologist concludes.

The story was similar in **Nebraska**. “FHB development was minimal in all FHB-prone wheat growing regions of the state,” observes University of Nebraska extension plant pathologist Stephen Wegulo. “Both incidence and severity in individual growers’ fields were trace to low, and DON levels were minimal.” Economic losses due to FHB and DON were negligible in Nebraska in 2016, he summarizes.

In UNL research plots at Lincoln and Mead (both in the eastern part of Nebraska), FHB developed to trace to low levels in non-inoculated plots and was low to moderate in inoculated plots, according to Wegulo. “DON measured in grain from research plots was mostly below 2.0 ppm, with 5.5 ppm as the highest concentration reported,” he says.

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

Scab's footprint in **South Dakota** was relatively light in 2016. The growing season generally brought low incidence and low severity of FHB in the state's winter wheat, and low to moderate levels in spring wheat. "There was a scarcity of rain when winter wheat was flowering; hence the low disease pressure," notes Emmanuel Byamukama, extension plant pathologist with South Dakota State University.

The good weather conditions and low-to-no disease pressure led to a record winter wheat yield for South Dakota (58 bu/ac, compared to 44 bushels the previous year). "Spring wheat flowering coincided with high humidity and rainfall; hence had slightly more FHB develop," Byamukama says. However, he adds, the level of FHB development in spring wheat was low compared to 2015.

"Producers were provided with wheat disease updates and the FHB risk outlook," Byamukama notes, "and were also reminded of the use of timely triazole fungicide in the management of FHB for spring wheat."

Scab risk was high in counties along the northern tier of **North Dakota** this season, as frequent rainfall and high relative humidity in late June and July (during heading and flowering) occurred in that section of the state. "Based on models and weather patterns, the highest amount of risk existed in the northwest and northeast portions of the state," says Andrew Friskop, North Dakota State University cereal extension pathologist. "The southern half of North Dakota experienced warm and dry weather conditions in late June and early July; thus, scab risk was low during critical periods of crop development."

By early September, harvest reports from the southern half of North Dakota were indicating low levels of DON. Early reports from the northern third of the state, however, noted high levels of DON in hard red spring wheat, durum and barley — and especially so in the northwestern district that had conducive scab conditions during heading and flowering. "Although durum yields have been above

average, high levels of DON have caused significant reduction in quality and economic returns,” according to Friskop. Elevated DON levels also developed in durum in north central North Dakota. “Fungicide applications to suppress scab and DON were often used by growers in areas of high risk,” he adds. “However, in several cases price dockage still occurred at the point of sale.”

Eastward, “the occurrence of FHB was fairly widespread through **Minnesota** this year — although severity varied greatly,” reports Madeleine Smith, extension plant pathologist with the University of Minnesota’s Northwest Research & Outreach Center at Crookston. High relative humidity, combined with warm temperatures, provided ideal disease development conditions. “Some areas of the state were very wet for most of the season,” Smith says. “There, disease levels were higher, in particular because fungicide spraying could not be achieved at the critical timing (early flowering).”

Smith notes that trials at the UM Crookston station that were not sprayed for FHB control ended up developing high levels of the disease — around 75% incidence and 60-90% severity, depending on variety and maturity date. On average, wheat was about two weeks earlier than normal in reaching maturity.

Idaho

An extremely dry summer in **Idaho** translated into very few problems with FHB and DON in the state’s wheat and barley crops. “In direct contrast to 2015, I received no reports of rejected wheat or barley due to issues associated with DON in grain,” says Juliet Marshall, Idaho Falls-based cereal specialist and pathologist for the University of Idaho. With heavy inoculation and irrigation at the UI Aberdeen research station, researchers were able to get good FHB infection in wheat — but minimal infection in barley, she notes. In sum, however, “environmental conditions were just not conducive for infection this year” in Idaho.

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