

FHB in 2014: From Nonexistent to Severe

USWBSI Survey of Small Grains Specialists in Number of States Indicates Wide Range of Scab Incidence & Severity

By Don Lilleboe*

As in past years, planting date and in-season weather once again were key factors during 2014 in the development, or lack thereof, of Fusarium Head Blight (FHB, also known as “scab”). Similar to 2013, reports provided to the U.S. Wheat & Barley Scab Initiative by small grains specialists in a number of states reveal a broad range of scab incidence and severity — from “nonexistent” to “severe.” The same applies to levels of deoxynivalenol (DON), the vomitoxin associated with Fusarium Head Blight.

The state reports consistently also indicate that an integrated approach to scab management — i.e., planting scab-tolerant or –resistant varieties, applying appropriate fungicides at the proper time, and avoiding crop rotations conducive to scab development — continues to pay off for those farmers who follow that methodology.

Here’s an overview of the 2014 scab situation, by region.

Mid-Atlantic: Soft Winter Wheat

“The traditionally mild and humid weather in late spring in the mid-Atlantic region is generally conducive to the development [of Fusarium Head Blight] each year. As a result, **Pennsylvania** farmers are prepared to — and usually do — apply a fungicide to their wheat crops at flowering,” notes Alyssa Collins, director of Penn State’s Southeast Agricultural Research & Extension Center at Manheim.

Collins says there appeared to be a widespread incidence of FHB in most Pennsylvania wheat-producing counties in 2014. “However, severity was not great,” she adds. “The mycotoxin levels reported around the state were low, possibly as a result of the low FHB severity combined with timely fungicide applications and unfavorable weather conditions. DON levels reached dockage levels in only a handful of cases this year.”

While Pennsylvania wheat producers have been, in recent years, quite meticulous about the proper timing and application of fungicides, many are not yet planting FHB-resistant varieties, Collins reports. “In most cases, farmers still lack the necessary information about variety genetics to help them make this decision,” she says.

University of **Delaware** extension plant pathologist Nathan Kleczewski says FHB was present in the majority of his state’s 2014 wheat fields, “but incidence was less than 5% and severity 5-10% in most cases.” Due to substantial FHB in the region last year, “this year most elevators were keeping a close eye on what was arriving at their doorsteps, and much of the harvest was tested for DON,” Kleczewski notes. Numerous growers were docked for DON, he says, “but only a small group had loads rejected.”

Despite aerial application challenges (*e.g.*, aerial treatment scheduling and having to work around tree lines and telephone poles), “many growers applied Prosaro® or Caramba® at or around the recommended Feekes 10.5.1 timing,” Kleczewski reports. In the fields he examined, “these fungicides reduced severity by roughly 50% or more.” The majority of Delaware wheat fields were not planted to moderately resistant varieties, but Kleczewski and his colleagues continue to promote the importance of an integrated approach to FHB management.

A relatively cold and extended winter delayed development of the 2013/14 **Maryland** winter wheat crop, contributing to a less-synchronous and more-

extended flowering period. However, environmental conditions from flowering through soft dough resulted in “mostly low to moderate risk conditions” for scab, reports Arv Grybauskas, associate professor emeritus/field crops pathologist with the University of Maryland. “East of the Chesapeake Bay, a moderate risk of disease development was forecast for nearly a 10-day period encompassing late flowering to early post-flowering wheat,” he relates. Many of that area’s producers applied fungicides to reduce potential damage, and FHB on the Eastern Shore ended up predominantly of low incidence (with some exceptions). “Typically, less than 5% of the wheat heads showed symptoms of scab, and many fields had only a trace,” he observes. Likewise, most of the Eastern Shore wheat had little or no detectable DON. Some fields, planted to a susceptible cultivar, did experience more severity, though, with corresponding elevated DON levels.

“Wheat west of the Bay was exposed to a much shorter period of disease-favorable conditions, and most fields escaped significant infections,” according to Grybauskas. “I am not aware of any elevated DON levels from the current crop that was produced west of the Bay.”

In general, the 2013/14 Maryland winter wheat crop fared quite well, Grybauskas concludes. “Growers, due to past experiences, were more vigilant and responded to scab forecasts with fungicide applications,” he notes. “Many of these producers planned ground applications for fungicides, as weather and demand last season delayed air applications to the point they were no longer as effective or had to be cancelled.”

Hillary Mehl of **Virginia** Tech’s Tidewater Agricultural Research & Extension Center reported low (<5%) to moderate (~20%) scab severity in her own observations and in reports received from around southeastern Virginia. Carl Griffey, Virginia Tech wheat breeder, says his assessments at official variety trial sites around the state concur with Mehl’s observations. “Overall, I think that scab

severity was considerably lower than in 2013 in most parts of the state,” Griffey remarks.

Mehl also notes that general awareness of scab and its potential damage was higher this year among Virginia wheat growers than was the case in 2013.

“Overall, this was a year of moderate, localized, scattered scab damage in **North Carolina**,” reports Christina Cowger, plant pathologist with the USDA Agricultural Research Service at North Carolina State University. The problem generally was most serious in the northern Piedmont and northern Tidewater areas, she says — which was consistent with the FHB forecasting model website. “Much depended on whether there was substantial corn residue, whether susceptible varieties were planted — and whether planting had been early or late,” Cowger observes. “Some growers applied scab-targeted fungicides; some did not.”

In the Coastal Plain area of North Carolina, isolated fields in a couple of counties (Johnston and Lenoir) had moderate scab, while the district’s southern counties (Robeson, Columbus and Bladen) had no problems.

Southern: Soft Winter Wheat

University of **Georgia** plant pathologist Alfredo Martinez-Espinoza reports widespread incidence of Fusarium Head Blight in 2014 Georgia wheat fields, with scab severity being particularly troublesome in the state’s more-southerly counties. “At some experimental plots at the Southwest Georgia Research & Education Center at Plains, FHB severity was as high as 50%,” he observes. This was the first year in decades that FHB infection and severity ran this high and was so widespread in the state, according to Martinez-Espinoza. Environmental conditions during flowering provided very conducive conditions for FHB infections across most of the state and especially in the southern district, he points out.

To the west, “scab appeared in areas of **Alabama** where it had never before been recognized as an issue,” reports Auburn University extension plant pathologist Austin Hagan. For instance, considerable scab development was observed in later-maturing lines in a wheat variety trial at the Gulf Coast Research & Extension Center near Fairhope, just a couple miles from Mobile Bay. It was the first time Hagan had witnessed scab at that location.

While Hagan did not observe noticeable scab development in the wheat variety trials at other southern and central Alabama locations, light to moderate scab showed up at trials in the northern part of the state. “Nearly all Tennessee Valley wheat growers applied Prosaro fungicide at heading,” he reports. “As a result, I’ve not heard of significant on-farm scab issues in that area.” Fungicide use for scab control in other areas of the state remains negligible, Hagan adds.

Louisiana State University plant pathologist Clayton Hollier reports there was quite significant scab in the northeastern section of his state this year. Official variety trials there were “hammered with natural inoculum,” he says. Commercial fields had less FHB but still more than normal. Losses in commercial fields are estimated at 5% in that region, “which is a lot for us,” Hollier notes.

The wheat crop in **Arkansas** was at least two weeks later than normal and the spring unusually dry, notes retiring University of Arkansas plant pathologist Eugene Milus. He and extension wheat agronomist Jason Kelley report that wheat in the southern part of the state matured and was harvested prior to an extended rainy period. “Growers in this region had some of their best-ever yields: 100+ bushels per acre with high test weight and little or no scab,” they state.

Further north in Arkansas, wheat was impacted by the rainy period, and some scab could be seen just before the wheat turned. “Wheat from the center of the state northward to the Missouri border was impacted most by the rainy period and scab,” note Milus and Kelley. “Statewide, low test weights were a bigger issue

than scab, and discounts for low test weight were significant for some producers.” Despite excessive rainfall at harvest, Arkansas’ average wheat yield across 440,000 harvested acres was estimated at 62 bushels/acre, which ties the state record.

Midwest/Northern: Soft Winter Wheat / Winter Malting Barley

Scab and vomitoxin levels were low in **Ohio** in 2014, reports Ohio State University plant pathologist Pierce Paul. This follows on the heels of another “very low” FHB season in 2013.

“Most wheat in Ohio flowered during the weeks of May 25 and June 1, at a time when conditions were fairly cool and relatively rain-free,” Paul notes. It was relatively humid during that same period, he adds — but that apparently was not sufficient to compensate for the cool/dry conditions to put the crop at risk. “In fact, cool conditions made for an extended grain fill period, which resulted in very good yields and good grain quality across the state,” he says.

Final Ohio scab and vomitoxin levels (in those instances where samples were tested) were consistent with predictions made by the FHB risk tool, Paul observes. “Throughout most of the season, Ohio risk maps remained green, indicating low risk for scab,” he says. Despite the low risk prediction, however, some fields did receive fungicide applications (Prosaro or Caramba).

The 2013/14 wheat season in **Kentucky** was characterized by a very cold winter and late spring, notes Don Hershman, extension plant pathologist with the University of Kentucky. “Overall, foliar and head diseases were not extensive during the season,” he says, “but late-season quality issues (especially high DON, even in areas where FHB symptoms were limited) were widespread [though] spotty across the state.”

Some very early flowering wheat fields in far west Kentucky did have moderate FHB and unacceptably high DON levels, Hershman adds, even where appropriate fungicides were applied. “Apparently, late-season conditions across the state were generally favorable for late infection [by *Fusarium graminearum*] and development of DON, despite limited symptom expression in most fields,” he says.

Heather Kelly, plant pathologist with the University of **Tennessee**’s West Tennessee Research & Education Center, reports that some of the state’s wheat experienced high-than-normal levels of head scab this year, with incidence ranging as high as 50%. In western Tennessee, from May 5 to May 13, warmer temperatures favored scab infection if the wheat was flowering and received rain and/or irrigation, Kelly notes. “Furthermore, the rainy weather during and after wheat bloom in Tennessee most likely contributed to [reported] higher vomitoxin/DON levels,” she adds. Kelly is not aware of any loads rejected due to DON amounts, but some were docked (≥ 2 ppm).

Research plots in the middle and western areas of Tennessee had low scab pressure (15% or less incidence), Kelly observes, with DON levels in them ranging from 0.04 to 1.1 ppm.

University of **Missouri** extension plant pathologist Laura Sweets reports that while symptoms of Fusarium Head Blight were not widespread or severe during the 2014 growing season, “some areas of Missouri did have higher-than-expected levels of FHB and DON in the harvested grain.” Reports of dockage at elevators due to high FHB or DON levels were more numerous in southeastern Missouri, she says, with fewer such reports from the east central and northeast districts of the state.

Scab was a major issue for wheat growers in **Illinois** this year, reports University of Illinois extension plant pathologist Carl Bradley. “The majority of

the wheat in Illinois is produced in the southern portion of the state, but scab could be found at moderate to high incidence levels across the state,” he notes.

“Although yields tended to be fairly good, there were major problems with low test weight and high DON levels, which led to heavy dockage assessment at the elevators.” DON levels greater than 5 ppm were not uncommon in southern Illinois, Bradley says.

To the east, FHB levels in **Indiana** were higher than average in 2014, according to Purdue University extension specialist Kiersten Wise. “We had favorable weather conditions for infection and disease development during flowering and through grain fill,” Wise notes. “The disease was widespread across the state, but only severe in some areas. Dockage did occur in several areas due to high levels of DON in the grain.”

It was, overall, a difficult year for the winter wheat crop in **Wisconsin**, report Damon Smith and Shawn Conley. (Smith is extension field crops pathologist with the University of Wisconsin-Madison; Conley serves as UW extension soybean and small grains agronomist.) Winterkill and stand loss impacted the southern tier of counties, while spring rains hampered field operations such as nitrogen, herbicide and fungicide applications.

In terms of scab, there was very little in the winter wheat variety trials at Arlington (south central Wisconsin). At Fond du Lac (eastern part of the state), FHB levels were higher (an index rating of 7 across the entire trial), while at Chilton (east central), FHB ratings averaged a much higher 20. “This trend reflected that of commercial fields as well,” Smith and Conley observe. “Moving north along the eastern half of the state, the timing of flowering coincided with weather conditions that were favorable for Fusarium Head Blight.” Wet and humid conditions after flowering contributed to more damage from FHB from

Fond du Lac north to Green Bay. To the south, however, Wisconsin wheat fields closer to the Illinois border had little or no scab.

“Relatively warm and dry conditions during early flowering in much of **Michigan** prevented Fusarium Head Blight from causing serious losses in 2014,” reports state extension educator for wheat Martin Nagelkirk. Still, *Fusarium*-infected heads could be found in most Michigan wheat fields at low to moderate levels (mostly one head per 10 feet of row or less).

Surveyed Michigan grain elevators indicated that more than 50% of samples tested showed detectable levels of DON; “but only an occasional sample tested above discount levels (1 ppm for soft white and 2 ppm of soft red wheat),” according to Nagelkirk. “Industry representatives stated that where DON levels were exceptionally high, growers had neglected to use a fungicide, or the wheat tended to follow corn silage.”

To the east, Cornell University plant pathologist Gary Bergstrom says most of **New York**’s winter wheat and winter malting barley flowered during the first two weeks of June under low forecast risk of FHB. “The forecasts were borne out by high-quality winter cereal crops with generally low DON levels,” he reports. Queries of two of the state’s major grain buyers found that very few (less than 4%) loads were rejected due to DON. “In integrated management experimental plots, we saw significant reductions in DON as a consequence of using moderately resistant varieties as well as fungicide application in 2014,” Bergstrom adds.

Instances of elevated FBH and DON did occur this year in certain “hot spots” of winter grain production in central, northern and eastern New York, the Cornell pathologist notes. Though maltsters were disappointed by the small supply of winter barley (due to severe winter-kill the previous winter), they simultaneously were pleased with the quality of the 2014 crop, he says.

New York's modest acreage of spring wheat incurred significant development of FHB this season, "and we suspect that DON levels may be elevated," Bergstrom notes. As of early September, the state's spring malting barley crop appeared to be a "mixed bag," he adds, "with several loads showing DON above levels acceptable for malting." Fields of the moderately resistant malting barley variety "Quest" appeared to have less FHB compared to some other fields.

In **Vermont**, 2014-harvested winter barley and wheat generally had low DON levels, with some peaking at 1.5 ppm, reports University of Vermont agronomist Heather Darby. Early planted (April) spring grains with some FHB resistance also bore lower levels of DON. "However, much of the spring grain was planted late due to wet weather in April and early May," Darby adds. An extended wet period in June during flowering of the later-planted fields resulted in higher DON concentrations, she relates, with some exceeding 5 ppm.

Great Plains: Hard Winter Wheat

Fusarium Head Blight was once again a non-issue in **Oklahoma**, where Oklahoma State University extension wheat pathologist Bob Hunger says there was a complete absence of foliar diseases and FHB in 2014 due to drought conditions.

The story was similar in **Kansas**. "Drought dominated wheat production in Kansas this year, and only trace levels of FHB developed. I did not hear of any reports of DON," says Erick DeWolf, extension plant pathologist with Kansas State University.

Ditto in **Nebraska**, where University of Nebraska extension plant pathologist Stephen Wegulo reports only trace levels of scab in some growers'

fields in the south central and southeastern parts of the state. “Overall, the economic impact due to FHB and DON was negligible statewide,” he remarks.

Northern Great Plains: Hard Spring Wheat / Durum / Hard Winter Wheat / Malting Barley

The FHB experience ranged from low to severe in **South Dakota** in 2014, according to South Dakota State University extension plant pathologist Emmanuel Byamukama. The eastern region of South Dakota received high rainfall, with some locales setting rainfall records, he notes, and that situation contributed to high levels of scab development as well as some grain loads being rejected at elevators due to high DON. Growers used both ground and aerial applications of fungicide in their efforts to control FHB.

The western region of South Dakota had generally low to moderate levels of FHB, Byamukama reports.

North Dakota's 2014 winter wheat crop was severely impacted by scab, says North Dakota State University cereal extension pathologist Andrew Friskop. “Most winter wheat was flowering during the last week of June into early July,” he notes. FHB models at the time indicated a high risk of scab development for much of the state. “Fungicides were recommended; but uneven flowering within fields and wet conditions hampered timely applications,” Friskop says. “Subsequently, scab incidence in excess of 80% was reported from some fields in north central North Dakota.” DON levels subsequently were elevated as well. Most of the winter wheat delivered to elevators in the affected areas (*e.g.*, the north central and northeastern parts of the state) registered DON above 5 ppm and even as high as 30 ppm, prompting some elevators to stop receiving winter wheat.

Planting date had a significant impact on scab severity in North Dakota's 2014 spring wheat acreage. "Early planted spring wheat (late April to early May) was flowering during the last week of June to early July," Friskop relates. "Although scab incidence and severity were not as high as in the winter wheat, DON levels (in early planted spring wheat) at harvest have been above 2 ppm, with some reports above 10 ppm." Growers who applied fungicides observed a reduction in DON levels, he adds.

The majority of North Dakota's spring wheat acreage flowered during mid-July — a period when warm and dry conditions lessened the risk of scab for much of the state. "However, pockets in south central and north central North Dakota did have an elevated risk during this time frame," Friskop notes. "In these areas, fungicide applications have been benefiting producers." Most fields incurred a low amount of scab, with DON levels below 2 ppm. "The low DON levels and above-average yields should result in an excellent spring wheat crop," says the NDSU pathologist.

Friskop had not received any durum reports as of the first of September. North Dakota barley generally had low scab and DON levels, though some locales in the north central and southeastern parts of the state had barley fields with DON above the malting quality cutoff of 1 ppm. In general, "barley yields have been above average, and a good crop is expected," Friskop says.

It was another late spring in **Minnesota**. Then, after the snow finally melted, many areas received high rainfall amounts, delaying the planting of small grains and other crops. Growers trying to plant on too-wet ground commonly had compaction issues, which contributed to uneven emergence. One of the wettest Junes in the past 80 years then brought high humidity and plenty of early morning dew formation.

“As a consequence, conditions were ideal for scab,” points out Madeleine Smith, extension plant pathologist with the University of Minnesota’s Northwest Research & Outreach Center at Crookston. “Many growers in the southern part of the state who had planted winter wheat and missed the flowering window to spray got hit severely with scab. Even those who applied fungicide when the majority of the field was flowering still had a significant amount of scab due to the uneven heading in fields.” The winter wheat varieties planted in Minnesota have virtually no disease resistance, she adds.

Smith says reported DON levels have ranged from 2 ppm all the way up to 17 ppm, with the average (as of late August) being around 3.5 to 4 ppm. Numerous growers had seed lots heavily discounted or rejected at the elevator. “Significant levels of DON are also now being observed in spring wheat varieties,” Smith reported in late August.

Western Region - Idaho: Hard Spring Wheat / Malting Barley

Out in the Pacific Northwest, it was a troublesome scab season for many **Idaho** wheat producers — particularly in the south central and southeastern districts of the state, according to Juliet Marshall, Idaho Falls-based cereal specialist and pathologist with the University of Idaho. The main “scab belt” this year ran from the Twin Falls area (south central Idaho), through Burley and eastward. “It was severe enough to where we had several different [wheat] fields in different areas that were actually rejected for any use, including as cattle feed,” Marshall says.

What’s behind recent years’ increase in Idaho scab incidence and severity? Part of it is due to expanded corn acreage, much of which is used to feed the

growing number of large dairies in the state's southeastern section. "We pretty much found [scab] wherever small grains are following corn," Marshall indicates.

The trend away from furrow irrigation and toward more center-pivots also has played into Fusarium Head Blight development, she adds. "That has really changed the dynamics within fields as far as humidity" at and below the crop canopy. "The center pivot doesn't stop, so there's always — at some point in the field — the right environment for infection to occur."

Idaho produces several classes of wheat, including hard red winter, hard red spring, white winter (hard and soft) white spring (hard and soft) and durum. "The majority of the problem seems to be in the hard white and hard red spring wheats," Marshall relates. "I have not yet seen any documentation of high DON levels in winter wheat." Most current wheat varieties in Idaho are fairly susceptible to scab, she points out.

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