

Fusarium Head Blight in 2019: Serious Impact in Several States; Minimal to Moderate in Others

By Don Lilleboe*

USWBSI Survey of Small Grains Specialists Again Affirms That Weather Plays Major Role in Presence/Absence of This Disease

As is typically the case, in-season weather conditions played a big role during 2019 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 (USWBSI) by small grains specialists in a number of states indicate that FHB incidence and severity levels ran the gamut from “none” to “substantial” this year. As usual, weather patterns were key to the disease’s establishment and spread, or lack thereof. Portions of some regions — e.g., the northern Great Plains — were seriously impacted due to wet conditions during critical growth stages and a delayed harvest due to weather.

This year’s 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 such a strategy.

Here’s an overview of the 2019 FHB situation, by region.

New England & New York

“Most of New England experienced average precipitation but very cool temperatures throughout the early grain growing season,” reports Heather Darby, University of Vermont extension agronomist. Harsh winter temperatures led to poor winter grain survival, and cool and moist conditions in the spring of 2019 led to less-than-optimum planting dates for spring grains. Many farmers reported grain being planted well into the latter part of May. However, “the prolonged cool temperatures into early summer helped the grain produce ample tillers,” Darby says.

When it finally warmed up, the conditions became very dry for most of the flowering period and into the harvest season. These weather conditions likely kept the infection rates of *Fusarium graminearum* low. “The levels of DON from samples submitted to our testing lab have been very low for the most part,” Darby adds. “Of hundreds of samples evaluated at the University of Vermont’s commercial grain quality testing lab, roughly only 1% of samples received had DON levels exceeding 1.0 ppm.” According to many farmers, 2019 was a challenging one, especially during planting. However, where spring grain was planted in a timely manner, record yields and quality have been reported, Darby notes.

Fusarium Head Blight and DON contamination were not major problems for most soft winter wheat or winter malting barley producers in New York in 2019, reports Gary Bergstrom, Cornell University plant pathologist. “This was a relief — and somewhat of a surprise, considering that the *Fusarium Risk Assessment Tool* predicted moderate to high risk in fairly large, but scattered, areas of the state in early June when winter grains flowered,” Bergstrom states. “Indeed, there were some winter grain lots exceeding 2.0 ppm DON; but these were the exception. Some spring malting barley also had DON contamination above acceptable levels for malting, while other lots were very clean.” A timely application at head emergence of a recommended triazole fungicide is now a common practice among malting barley producers, Bergstrom notes.

The acreage of winter grains in New York was reduced because of a very wet fall 2018 and the inability to get annual crops harvested and the ground prepared for timely small grains planting, the Cornell pathologist adds. “Winter grains acreage is up in New York this fall in light of planting opportunities in many fields where no annual crop was planted in 2019 due to the very wet early season,” he points out.

Mid-Atlantic Soft Winter Wheat Region

While 2019 was not as soggy as 2018 for the Pennsylvania wheat and barley crops, it also was not without its scab challenges, report Alyssa Collins and Paul Esker. Collins is a Penn State plant pathologist and director of the PSU Southeast Agricultural

Research & Extension Center at Manheim, and Esker is an assistant professor of epidemiology and field crop pathology at PSU.

Conditions during May were variable, although scab risk remained moderate-to-high across the state for much of this period. Moderate levels of scab were witnessed across the crops. “Farmers in general were proactive about applying fungicides to both crops, and had many questions about the pros and cons of the newly registered Miravis[®] Ace versus the more traditional chemistries for scab management,” Collins and Esker report. Trial results indicated that well-timed fungicide applications reduced scab levels (although the scientists were still waiting on DON results for several trials as of latter October).

“One very important thing that we would still like to see our growers focus on is working more deliberately with their seed suppliers to identify and plant cultivars with moderate scab resistance, while also meeting their agronomic needs,” the Penn State pathologists emphasize. “Local seed companies have done well to breed varieties with good resistance — sometimes to a greater extent than national companies because the environmental conditions in this region are very often conducive to scab. Selecting a scab-resistant variety still seems to place behind growers’ concerns for yield and straw production, if it comes up at all during seed selection.”

Overall though, Pennsylvania growers were content with the quality of the 2019 harvest, Collins and Esker conclude; and given the difficult planting conditions during the prior fall establishment period, they were glad for the acreage they had and the good yields enjoyed.

Spring in Maryland is seldom dry and cool, Nidhi Rawat points out. “This year as well, we experienced heavy rainfall during wheat flowering season,” says the University of Maryland crop pathologist. “However, we also got some dry and sunny days in between that allowed growers to spray fungicides during this critical time for infection of wheat.”

Results of USWBSI-supported screening of genetic resistance of popular local cultivars were used by the farmers in making planting decisions, which goes a long way in managing scab in the field, Rawat notes. FHB risk commentaries also recommended fungicide sprays during the high FHB risk period.

“Overall, FHB indices and DON content were not a major concern for small grain crops in the state in 2019,” Rawat reports.

Hillary Mehl, plant pathologist at Virginia Tech’s Tidewater Agricultural Research & Extension Center, says FHB and DON were generally low to moderate in Virginia in 2019, with sporadic occurrence of high DON levels. “FHB risk remained low throughout April and began to increase the second week of May,” she notes. “However, the highest risk occurred after most of the wheat crop had completed flowering. The highest FHB risk (and likely most of the contamination) occurred along the Northern Neck and Eastern Shore of Virginia.”

In general, Mehl says, wheat varieties with moderate resistance to FHB are being planted in Virginia — and this, along with favorable weather conditions, reduced the incidence and severity of DON contamination. However, due to low wheat prices, fewer acres are being treated with fungicides for control of FHB and other fungal diseases.

Southern/Southern Atlantic Soft Winter Wheat Region

Despite brief periods in April of medium to high risk in the Tidewater zone of eastern North Carolina, FHB incidence ended up low throughout the state, reports Christina Cowger, USDA-ARS plant pathologist at North Carolina State University. Wheat acreage in North Carolina was down this year, and the main problems in small grains were connected to prolonged winter rains that led to waterlogged soils in the eastern part of the state. “Thankfully, FHB did not end up adding to farmers’ concerns for their wheat or barley crops in 2019,” Cowger confirms.

In Georgia, “2019 was a ‘scab year,’ and FHB was severe throughout the state,” reports Alfredo Martinez-Espinoza, University of Georgia extension plant pathologist.

“Incidences were observed from extreme southeast counties to wheat-producing counties in the northern Piedmont area.”

In some experimental plots and breeding lines located at the UGA CAES Southwest Georgia Research and Education Center in Plains, FHB severity reached up to 40-50%, Martinez says. FHB was prevalent and severe in nearby production fields, he adds. “Environmental conditions at the time of flowering provided extremely conducive conditions for FHB infections in most of the state. However, the adverse effect of FHB

was masked by the low wheat acreage planted and harvested in Georgia in 2019,” the UGA plant pathologist concludes.

Trey Price reports that wheat acreage in Louisiana was again very low during the 2018/19 growing season, due to planting conditions and wheat prices. Price is an associate professor of agronomic crop pathology and interim research coordinator for the LSU AgCenter’s Macon Ridge Research Station.

“Additionally, we have seen significant scab pressure during four of the last five seasons, which has growers leery,” Price notes. He says wheat yields during 2019 were above average with light to moderate scab pressure, depending on maturity date and location.

“In Arkansas we had a significant amount of naturally occurring scab infection on MR, MS and S varieties at our Marianna location in Lee County in southeast Arkansas, and our Newport location in Jackson county in the north central/northeast area of the state,” notes Esten Mason, University of Arkansas wheat breeder. “We had a very wet winter, with average rainfall 10 to 22 inches above normal across locations; but cool temperatures kept our relative humidity moderately low.”

Based on the scab monitor, Arkansas’ risk of scab was low until at least two weeks after anthesis — and then became very high, Mason observes. “This leads me to believe that FHB was able to infect later than what is generally thought, or that the scab monitor did not accurately predict our risk,” he says. “I did not hear of any problems with FHB in commercial fields, which I think is in part to more resistant and moderately resistant varieties available to growers, and the fact that our acreage was very low this year (<90,000).”

Midwest/Northern Soft Winter Wheat Region

Very little scab developed in Tennessee’s soft red winter wheat crop of 2018/19, reports Heather Kelly, extension/research plant pathologist with the University of Tennessee. “Stands were not as uniform as usual, due to all the rain we had in the fall,” she says, “and that did increase the window bloom for susceptibility. But on the positive side, the majority of the field wasn’t susceptible at the same time — which might have

helped reduce incidence.” In sum, very little scab was reported in Tennessee this past season, and no levels of DON were detected, to Kelly’s knowledge.

The FHB situation was similarly benign in Kentucky, says Carl Bradley, University of Kentucky plant pathologist. “Although parts of Kentucky received quite a bit of rainfall during flowering and grain development, I’m not aware of any major problems with high DON levels in the state,” he states. “Symptoms of FHB could be found in some fields; but overall, Kentucky did not experience any major problems due to FHB or DON for 2019.” University of Missouri extension plant pathologist Kaitlyn Bissonnette says winter wheat production in Missouri also largely escaped high levels of FHB and DON contamination in the 2019 growing season. “Winterkill and early season flooding led to uneven stands throughout much of the wheat growing region of the state,” she notes. “Of the acreage maintained, the uneven stands meant variation in flowering time within fields, making FHB management decisions difficult.”

Conditions at flowering were ideal in many Missouri locales for FHB development — especially in the susceptible varieties. “However, variation in flowering time and a short dry spell may have contributed to many fields having lower levels of infection,” Bissonnette says. There were some reports of DON above 5.0 ppm, but those reports were isolated, she adds.

The 2019 Illinois wheat crop did not have significant FHB or DON issues, according to University of Illinois extension plant pathologist Nathan Kleczewski. “This was surprising, given the large amount of rain that hit parts of the wheat growing region at and after flowering of the crop,” he observes. The wide variation in crop development due to issues with planting and an unusually warm winter in parts of the state may have contributed to the lack of disease. In general, the northern production region had greater issues with FHB and DON than did southern regions, with some loads reporting elevated DON, Kleczewski says.

Scab levels were moderate-to-low across the state of Ohio again in 2019, reports Pierce Paul, Wooster-based plant pathologist and extension state specialist with The Ohio State University. Pockets with moderate levels of scab, and consequently, DON above 2.0 ppm, were the exception, not the rule. “Although conditions were wet and humid across Ohio during the spring, late planting, a recurring issue in the state, coupled with cool

temperatures, resulted in disease escape,” Paul indicates — *i.e.*, the warm, wet conditions that are ideal for infection occurred before or after flowering in most areas.

If scab and DON were not concerns this year, the same cannot be said for leaf diseases in Ohio, Paul adds. “Septoria early in the season and leaf rust and Stagonospora after heading severely impacted grain yield and quality, in particular. Test weight was low in most fields,” he says.

In Wisconsin, Fusarium Head Blight was the major disease of winter wheat statewide in 2019, says Damon Smith, University of Wisconsin field crops pathologist. “FHB could be found in many fields throughout the state, with incidence and severity depending on variety and location,” he reports. “Even as we moved from the south through to the northern areas of wheat production, we found moderate levels of FHB in some fields.” Varieties with genetic resistance to the disease performed well, especially at the Sharon and Arlington variety trial locations. FHB was less at the Fond du Lac and Chilton locations compared to Sharon and Arlington, Smith says, but could be easily found in some plots.

Stripe rust was found at the Sharon location and the Fond du Lac locations at extremely low levels, Smith adds, noting that levels were not high enough to warrant rating. “In 2018, stripe rust was not found anywhere in the state; thus it isn’t surprising that levels were again very low in 2019,” he observes.

Tan spot, spot blotch and leaf rust were present in low levels to moderate levels in some fields throughout the state. Leaf rust was not yield limiting in 2019. Tan spot and spot blotch were yield limiting in some varieties in the state if the diseases moved up to the flag leaf before or near the heading timing. Powdery mildew was nearly nonexistent in the state for the sixth straight season, Smith says.

“Cephalosporium stripe, caused by the fungus *Cephalosporium gramineum*, was prevalent at our Fond du Lac location again in 2019 and present at high levels at the Sharon location,” the UW pathologist adds. “This is the first time we have observed Cephalosporium stripe at the Sharon location, while it is the third year we have observed this disease at the Fond du Lac location. The pathogen causes leaf striping and plant stunting. Cephalosporium stripe is favored by cool wet conditions, reduced tillage, and short rotations.”

“The forecast map was often painted yellow, with an occasional smattering of red in Michigan. However, the scab-friendly conditions largely missed the crop’s flowering stage and ultimately led to very few cases of significantly elevated DON,” notes Martin Nagelkirk, Michigan State University’s state extension educator for wheat.

“Of course, the disease was not entirely absent,” Nagelkirk continues. “In fact, scab symptoms could be found more readily this past season than in some of the past few crop years; but these infections rarely led to DON levels above 1.0 ppm.” Overall, those elevators testing every delivery may have had only a few loads where a DON discount was imposed, Nagelkirk observes.

Great Plains / Hard Winter Wheat Region

Although conditions (temperature and moisture) were favorable across much of Oklahoma when wheat was flowering in 2019, Fusarium Head Blight was mostly absent, reports Bob Hunger, extension wheat pathologist with Oklahoma State University. “Foliar diseases were widespread and ranged from light to severe, but tended to come in later than in a typical year,” Hunger notes.

“Fungicides were applied in Oklahoma, but mostly these applications were made earlier than flowering and targeted foliar diseases,” the OSU pathologist says. “Some fungicide applications in northeastern Oklahoma likely targeted FHB, but only a few inquiries were received regarding FHB, and no wheat plant or grain samples related to FHB were received in the diagnostic lab. Additionally, no reports regarding problems with FHB mycotoxins were received.”

Fusarium Head Blight was a serious issue for wheat producers in Kansas in 2019, says Erick DeWolf, extension plant pathologist with Kansas State University. The disease was most severe in the eastern region of the state, but many areas of central Kansas were also affected to a lesser degree. “Field observations indicate that field severity (FHB Index) exceeded 10% for susceptible wheat varieties in many areas, leading to significant yield losses,” DeWolf indicates. “Seed producers were hit hard by the disease, with many farms reporting higher-than-normal clean-out losses and reductions in seed germination.”

To the north, wet weather before, during and after wheat flowering favored development of Fusarium Head Blight in the southeastern, south central and southwestern parts of Nebraska. “Although the disease was widespread in these scab-prone wheat growing regions, some growers’ fields had very severe levels whereas others had only low to moderate levels,” says Stephen Wegulo, University of Nebraska extension plant pathologist. “This may have been due to the timing of rainfall with flowering in specific areas or the level of susceptibility of the variety planted.”

In research plots, breeding nurseries and state variety trials in the southeast and south central districts of Nebraska, susceptible lines and varieties had very high levels of FHB and DON, Wegulo adds, with up to 27.0 ppm of DON recorded in breeding nurseries.

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

The 2019 South Dakota wheat-growing season was characterized by a wet spring that in turn led to delayed spring planting. Emmanuel Byamukama, extension plant pathologist with South Dakota State University, says the eastern part of the state and a few areas in the central district continued to experience wet conditions throughout the growing season, and this led to moderate to high FHB development in most of these areas for both spring and winter wheat. “Several producers mentioned having grain above DON dockage levels, and there were a few reports of more than 10.0 ppm DON,” Byamukama relates.

Flowering stages of wheat and heading stages of barley aligned with environmental conditions conducive for Fusarium Head Blight development in North Dakota this year. Andrew Friskop, North Dakota State University cereal extension pathologist, says the highest amount of FHB risk occurred during the last week of June into the first two weeks of July. During this time, a significant portion of the small grain crop was either heading or flowering.

The areas with the highest amount of scab risk were southwestern and southeastern North Dakota, Friskop notes. “Extreme harvest delays may have also escalated DON concerns in several areas of the state,” he adds.

Here are some additional comments from Friskop specific to North Dakota grain class 2019 FHB experience:

- *Winter wheat* acreage was around 75,000 acres, and most of the crop escaped FHB.
- *Spring wheat* grown in southwestern and southeastern North Dakota experienced several weeks of moderate to high scab risk. Field reports have suggested yield losses up to 50% (on susceptible varieties) and DON levels ranging from 1.0-25.0 ppm depending on variety and use of a fungicide. There were other pockets of scab in the northeast and north central districts, and in some cases dockage occurred at the point of sale. Also, an extreme delay in harvest may have led to an increase in DON levels of HRSW that was left in the field.
- Two-row *barley* production on the eastern side of the state experienced severe problems with FHB and DON. High humidity and rainstorms prior to and at heading provided ideal conditions for FHB development and, in some cases, promoted lodging. In the lodged fields, logistical problems with fungicide coverage and timing contributed to elevated DON levels. Other areas of barley production in North Dakota had minimal problems with DON, often falling below 1.0 to 2.0 ppm.
- Very few reports of FHB and DON have been received for *durum*. The area of the state with the highest amount of durum production (northwestern North Dakota) did have periods of elevated scab risk. Although it can be expected that some durum fields had problems with FHB and DON, planting date and integrated management practices will likely dictate the severity of the problem for this market class.

“ ‘Worst ever’ and ‘Never ever’ are two adverbs I’ve learned not to use when describing (growing) seasons in Minnesota; ‘average’ is merely a mathematical concept when you talk weather or growing conditions in this state,” says Jochum Wiersma, University of Minnesota-Crookston extension agronomist. The weather challenges of the 2018 growing season were a prelude to this year, Wiersma relates. “As of the first of November (2019), there was still spring wheat acreage unharvested across Minnesota

and North Dakota; sugarbeet harvest in the Red River Valley was barely past the midpoint; and corn and soybean harvest had just started in earnest now that water was receding and the ground was frozen hard enough to carry combines across much of the western half of the state.”

The 2019 Minnesota growing season began much the same as in 2018, with a late-season blizzard and cold snap delaying the start of planting by about three weeks. By the end of April only 2% and 10% of the wheat and oats had been seeded, respectively. The pace in the first half of May remained well behind the five-year average and even 2018’s progress. “It wasn’t until the third week of May that producers got a break and caught up to the five-year average,” Wiersma relates, “with about three-quarters of the barley, oat and spring wheat getting into the ground.”

The remainder of May and the month of June were largely favorable for small grains development, with the crop advancing as expected and slowly catching up in development to the five-year average. But those favorable conditions changed after the Fourth of July holiday when temperatures and dew points increased enough for the crop to be adversely impacted.

By mid-July, the state’s small grain crop development had sped up to the point where it was ahead by nearly a week compared to both 2018 and the five-year average. “The high dew points, and with it the higher nighttime temperatures, also meant that the risk of Fusarium Head Blight (FHB) was high across much of Minnesota during anthesis and much of the grain fill period,” Wiersma observes. “Consequently, incidence of FHB was, like the previous season, not limited to the southern half of the state.”

Likewise, the incidence of Bacterial Leaf Streak (BLS) was much higher and more widespread across Minnesota when compared to recent years. In contrast, stripe rust, leaf rust and stem rust were largely absent. Crown rust, however, was rampant in the late-seeded oat cover crop acreage.

“USDA-NASS projected Minnesota’s hard red spring wheat crop to average 62 bu/ac in their July forecast,” Wiersma says. “This remained unchanged in their August forecast. In the September Small Grains Summary, with still plenty of spring wheat left in the field, Minnesota average yield was estimated at 57 bu/ac — two and 10 bushels less per acre when compared to 2018 and 2017, respectively.”

Frequent rains throughout August not only delayed harvest repeatedly, but ultimately led to declines in test weight and eventually breaking of the post-harvest dormancy. “The quality of the wheat, barley, and oats was, like 2018, much more variable than most years,” Wiersma states.

Northwest (Idaho & Montana)

Juliet Marshall, Idaho Falls-based cereal specialist and pathologist for the University of Idaho, notes that conditions in Idaho this year were unusually wet both early and late in the season, with lower-than-average growing degree days. “There were late spring plantings and late harvest of grains in many areas,” she says, and upper-elevation producers reported having to dry harvested grain to moisture levels conducive to storage. Spring frosts damaged winter and spring grain, substantially lowering yields in some areas. “While visual symptoms of FHB were found in some fields, detection of DON in harvested grain has not been reported,” Marshall states.

Two areas in Montana were affected by FHB this year, according to Montana State University plant pathologist Frankie Crutcher. “South central Montana, specifically in Hysham and the surrounding area, had particularly severe disease due to planting into corn residue,” she says. “Rainfall during flowering also increased disease pressure and made it difficult for farmers to apply fungicides. Mike Killen (Miller-Coors) has reported DON levels over 1.0 ppm in malt barley in Big Horn, greater than 8.0 ppm in Park City, and 22.0 ppm in some fields in Forsyth.”

The other area that reported high levels of FHB was in northeastern Montana, around Plentywood, affecting durum and spring wheat. “Very high levels of rainfall at harvest time caused severe lodging, and many of the affected fields were lost,” Crutcher reports. “Due to this loss, no DON levels have been reported.”

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