

# **Fusarium Head Blight in 2020: Minimal to Modest Impact in Most States**

By Don Lilleboe\*

## **Annual USWBSI Survey of Small Grains Specialists again Affirms that Weather Plays Major Role in Presence/Absence of this Disease — with Moderately Resistant Varieties & Timely Fungicide Application also Key Components**

*As is typically the case, in-season weather conditions played a critical role during 2020 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 “serious” this year. As usual, weather patterns were key to the disease’s establishment and spread, or lack thereof.*

*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 that may contribute to scab development — usually pays off for those farmers who employ such a strategy.*

*Here’s an overview of the 2020 FHB situation, by region.*

### **New England & New York**

“Most of New England experienced dry and cool conditions throughout the early grain growing season,” reports Heather Darby, University of **Vermont** extension agronomist. “Mild winter temperatures led to excellent winter grain survival, and cool and dry conditions in the spring of 2020 led to optimum planting dates for spring grains.” Many farmers reported grain being planted in early April.

However, Darby adds, “the dry conditions remained throughout the growing season, causing some farmers to lose yield, test weight and, in some cases, entire fields of grain.” While parts of New England experienced severe drought conditions, most of the region experienced moderate drought conditions — keeping the infection rates of *Fusarium graminearum* low.

“The levels of DON from samples submitted to our testing lab have been very low from the Northeast,” Darby notes. “Of hundreds of samples evaluated at the University of Vermont’s commercial grain quality testing lab, roughly only 2% of samples received had DON levels exceeding 1.0 ppm.”

For many New England farmers, 2020 was a good year, she concludes, with grain planted early and harvested timely thanks to dry and warm conditions. Weather conditions resulted in low DON levels, but likewise contributed to lower test weights.

Although the Fusarium Risk Tool forecast a medium to high risk of FHB infection of susceptible winter cereals flowering in early June in certain areas of **New York**, FHB and mycotoxin contamination did not end up being a problem for wheat and barley produced in 2020, reports Cornell University plant pathologist Gary Bergstrom.

Rainfall ceased dramatically from mid-June through crop harvest in July, with several regions of the state under moderate drought. “But low disease and low toxin may have been due to more than just weather patterns,” Bergstrom points out. “Malting barley producers in New York routinely apply Caramba<sup>®</sup>, Prosaro<sup>®</sup> or Miravis<sup>®</sup> Ace fungicide between full head emergence and early flowering stages to reduce FHB, DON and foliar diseases. New York winter wheat producers are making wide use of high-yielding cultivars with moderate resistance to FHB; many wheat producers also apply a flowering-timed fungicide spray for FHB control.”

It was hard to find FHB symptoms in the summer of 2020, the Cornell plant pathologist notes. “New York flour mill and malt house operators commented that grain was of the highest quality they’d seen in years, including no or very low levels of DON,” Bergstrom says.

Production of winter wheat in New York is expected to increase dramatically in 2021 due to increased acreages sown to wheat following an early and favorable season for harvesting of soybean and other preceding crops, he concludes.

## Mid-Atlantic Soft Winter Wheat Region

The 2019/20 season provided favorable conditions for producing winter grains in **Pennsylvania**. A mild winter followed by a long, cool spring — and then a dry period during grain-fill — meant that most areas generated near-record yields and high quality, reports Alyssa Collins, Penn State plant pathologist and director of the PSU Southeast Agricultural Research & Extension Center.

“While some southern counties experienced a late freeze, resulting in damage to barley heads and reduced yield, the impact on quality was limited,” Collins says. “Scab was present at low levels across the state, except for northwestern Pennsylvania, which experienced moderate levels of FHB and subsequent development of DON.” Overall, the state’s soft red winter wheat crop was superior in quality, and other grains like barley and spelt performed well, avoiding major impacts of scab.

Spring 2020 in **Maryland** was cool, especially towards the latter part, says Nidhi Rawat, University of Maryland crops pathologist. “This led to slower-than-usual progression of flowering in wheat,” she recounts. “In fact, in our experimental plots, we had to wait for up to 10 days for fungicide application experiments at flowering. The heads did not emerge from boots for more than a week.

“We received intermittent rains; but because of cooler temperatures, weather was not very conducive to *Fusarium* growth,” Rawat notes. “We saw glume blotch across the state and wheat streak mosaic virus in some locations with late flowering dates. Towards the end of the season, leaf rust on adult plants was observed at a few locations.” DON levels in harvested grain was low, to the relief of the farmers. Overall, FHB indices and DON content were not a major concern for small grain crops in Maryland in 2020, Rawat summarizes.

FHB risk in **Virginia** was mostly low to moderate in 2020, says David Langston, extension plant pathologist at Virginia Tech’s Tidewater Agricultural Research & Extension Center. There were reports of high disease severity on the Eastern Shore, he notes, but the portion of the crop harvested early/timely had very little FHB or DON.

“As has been our pattern for the last few years, many areas received rain just before wheat could be harvested and stayed wet for a week or more. This caused many problems: low test weight, sprouting and some increase in DON,” Langston says. But moderately

resistant cultivars, coupled with the fungicide Miravis Ace applied at heading and flowering, significantly reduced FHB incidence as compared to similar treatments on susceptible cultivars.

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

Due to a warm winter, wheat matured earlier than usual in **North Carolina**, with the earliest fields across the state flowering by April 2, says Christina Cowger, USDA-ARS plant pathologist at North Carolina State University. “Fortunately, North Carolina’s spring weather was relatively dry, with low humidity; so FHB risk was low at the beginning of April,” she adds. “During the following three weeks, risk remained low in most of the state.”

But as is often the case, the northeast corner of North Carolina briefly experienced medium to high risk for susceptible varieties. “We had a ‘close call;’ but I did not hear grain elevator owners nor growers speak about having major issues with scab in wheat,” says Al Wood, extension agent in Pasquotank County, N.C. “One of the factors that I feel is helping us in not having as much problem is that growers are using MR (moderately resistant) varieties. My colleagues in northeast North Carolina are emphasizing the importance of MR wheat varieties,” Wood adds. “And I also think that we have not had quite the weather conditions during the critical time as well the last two years.”

Crop advisors in North Carolina missed the national scab forecasting site, which was not at full capacity during the key period in the Southeast, Cowger says. But advisories went out in North Carolina through the NCSU extension portal and other means.

“As with everything else, 2020 was a strange year for FHB in **Georgia**,” says Alfredo Martinez-Espinoza, University of Georgia extension plant pathologist. In some experimental plots and breeding lines located at the UGA CAES Southwest Georgia Research & Education Center in Plains, FHB was prevalent and severe, he relates. Environmental conditions at the time of flowering provided conducive conditions for FHB infections in most of the state, especially in the coastal plains growing region. “However, there were few to no reports of FHB on wheat in commercial fields — this is probably due to low wheat acreage planted and harvested in Georgia in 2020.”

Wheat acreage in **Louisiana** was very low again during the 2019/20 growing season. “Planting conditions and wheat prices resulted in very few plantings across the state and a total of 12,000 acres,” reports Trey Price, Louisiana State University associate professor-agronomic crop pathology. “Additionally, we have seen significant scab pressure during five out of the last six seasons, which has growers skittish.” Louisiana wheat yields during 2020 were above average with light to moderate scab pressure, depending on maturity date and location. “We are optimistic with increased prices for the upcoming season,” Price says.

Wheat acreage in **Arkansas** the past season was pretty limited — probably around 50,000 acres, says Jason Kelley, extension agronomist with the University of Arkansas. “There was some scab, but less than what it was in 2019,” Kelley observes. “I did not hear of any problems with DON or any loads being rejected. On susceptible varieties in plots, we did have enough scab to provide ratings on a fungicide trial — but overall, the severity was somewhat limited.”

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

Some areas of **Tennessee** were prime for FHB infection, given a warm front along with rain events in the spring, says Heather Kelly, extension/research plant pathologist with the University of Tennessee. But temperatures did cool off after that, and most fields escaped FHB. “Unfortunately,” she adds, “many fields suffered from frost/freeze damage as well as some higher-than-usual incidences of barley yellow dwarf virus, which outweighed the low incidence and severity seen of FHB in Tennessee.”

Although parts of **Kentucky** received rainfall during flowering and grain development, major problems with high DON levels were not apparent in the state for the 2020 growing season, notes Carl Bradley, University of Kentucky plant pathologist. “There were reports of sporadic fields with high DON levels; but in general, high DON levels were not a major issue in Kentucky for the 2020 season,” Bradley states. “Wheat growers in Kentucky are doing a good job choosing varieties with improved levels of resistance to scab and applying an effective fungicide at the right timing — all which has contributed towards reducing the impact of scab in the state.”

Levels of FHB and DON levels in **Missouri** winter wheat production in the 2019/20 season varied and were largely impacted by environmental conditions during the flowering period, says Kaitlyn Bissonette, University of Missouri extension plant pathologist. Overcast and cool conditions during the flowering period led to high predicted risk for FHB development for all varieties and resistance types. Those conditions persisted the longest in the northern and eastern portions of the state. Additionally, intermittent spring rains made fungicide applications difficult for some farmers.

“As a result, visibly higher FHB levels were reported in fields that did not receive a well-timed fungicide application at flowering — even in the moderately susceptible or moderately resistant varieties,” Bissonette explains. “At season’s end, grain elevators reported DON concentrations exceeding 5.0 ppm from grain collected from some fields harvested in these same regions.” Reports of stripe rust and leaf rust were sporadic, she notes, as the primary disease of concern in the 2019/20 season was the widespread presence of FHB.

The **Illinois** wheat crop was relatively unaffected by FHB in the 2020 season despite favorable conditions in many parts of the state, reports University of Illinois extension plant pathologist Nathan Kleczewski. “This is expected based on the FHB prediction tool, which was forecasting low to moderate risk levels throughout the state in MS to MR varieties during this time — but severe levels in highly susceptible varieties,” Kleczewski observes. “I am hopeful this indicates that many of our producers have access to and are planting more MR varieties, thereby reducing overall risk for scab during favorable conditions.”

As was the case in 2019, Fusarium Head Blight and deoxynivalenol (DON or vomitoxin) levels were low again in 2020 across most of **Ohio**, reports Pierce Paul, Wooster-based plant pathologist and extension state specialist with The Ohio State University (OSU). That was somewhat surprising, Paul says, given that the FHB risk assessment tool predicted moderate to high risk on susceptible varieties during the last week of May and first week of June — a period during which several wheat fields in the northern half of the state were at anthesis (flowering).

Observations from non-treated, non-inoculated research plots on the OSU farm near Wooster in northeast Ohio confirmed the low overall levels of FHB and DON. On average,

plots of untreated susceptible varieties had less than 2% scab severity (percentage of the wheat head with scab symptoms) and less than 6% scab incidence (less than six out of every 100 heads with scab symptoms). “Although conditions were wet and humid across Ohio during flowering, cool temperatures resulted in disease escape,” Paul indicates — *i.e.*, the warm, wet conditions that are ideal for infection occurred well 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. “In some fields, Septoria and powdery mildew, diseases that develop best under cool conditions, were prevalent early in the season — and, to lesser a extent, Stagonospora leaf and glume blotch developed late. However, thanks to fungicide applications, driven in part by high scab risk predictions, these diseases did not reach high enough levels to impact grain yield and quality.” Yields were above state average across Ohio Wheat Performance Trial (OWPT) locations, with means ranging from 76 to 101 bu/ac; average test weight was above 58 lb/bu. All OWPT fields were sprayed with either Prosaro or Miravis Ace.

Similar trends were observed for winter malting barley, according to Paul. “Scab and DON levels were generally low; and barring a few pockets with below-average test weight, grain yield and quality were very good,” he reports. “As is customary in the state, all malting barley fields were treated with Prosaro, Miravis Ace or Caramba at heading.”

In **Wisconsin**, winter wheat disease pressure was lower statewide than the prior several seasons, reports Damon Smith, University of Wisconsin field crops pathologist. However, some disease was observed across all locations. The major disease of winter wheat in Wisconsin in 2020 was Fusarium Head Blight. “FHB could be found in many fields throughout the state,” Smith relates, “with incidence and severity depending on variety and location. Severity was lower than in the previous two seasons, but FHB could be found at all locations examined.”

Septoria leaf blotch was found at all locations, with severity high enough to score at the Sharon and Arlington locations. “This foliar disease had not been prevalent over the last two seasons, but wet weather early in the spring caused the disease to be more active,” Smith observes.

Stripe rust was found at extremely low levels at the Arlington and Chilton sites. However, hot, dry weather mid-season kept this disease in check, and a major epidemic never materialized. Leaf rust was observed at all locations as well, but this disease moved in late enough in the season that its impact on yield was negligible.

Cephalosporium stripe, caused by the fungus *Cephalosporium gramineum*, was observed at the Arlington location. Severity and incidence was low. However, this disease has become increasingly prevalent in recent years, with major epidemics at the Sharon and Fond du Lac locations in the 2019 season. “This is the first time we have observed Cephalosporium stripe at the Arlington location,” Smith notes. The pathogen causes leaf striping and plant stunting. Cephalosporium stripe is favored by cool wet conditions, reduced tillage and short rotations.

Finally, powdery mildew was observed but never advanced past a curiosity at any location.

The 2020 Fusarium Head Blight risk forecast for **Michigan** demonstrated high levels of risk across the state during the early flowering window (late May), according to Martin Chilvers, associate professor of plant pathology with Michigan State University. But predicted head scab risk rapidly decreased heading into early June. “Resulting head scab levels in 2020 across Michigan were relatively low, and consequently there were very few cases of significantly elevated DON,” Chilvers reports.

## **Great Plains / Hard Winter Wheat Region**

Incidence and severity of Fusarium Head Blight in **Oklahoma** in 2020 was similar to 2019 in that FHB was minimal in incidence and severity, reports Oklahoma State University extension wheat pathologist Bob Hunger. “Foliar diseases and abiotic foliar browning from drought and freeze were widespread, and fungicides were used to manage the foliar diseases,” Hunger notes. “However, no inquiries or samples were received regarding FHB — and only one report of seeing FHB was confirmed from northeastern Oklahoma.” Also, no reports regarding problems with FHB mycotoxins were received.

Scab levels were generally low in **Kansas** this year, and most areas of the state were relatively unaffected by the disease, says Erick DeWolf, Kansas State University extension plant pathologist. “There were a few areas of central and south central regions that



experienced moderate levels of disease this year,” DeWolf notes. But the state’s wheat harvest “seemed to run relatively smoothly with minimal issues to DON or other mycotoxins.”

In **Nebraska** in 2020, mostly dry and hot conditions before, during and after heading prevented the development of Fusarium Head Blight in the southeast and south central parts of the state, which are the scab-prone regions. “Wheat was behind in development by about 10 to 14 days,” reports Stephen Wegulo, University of Nebraska extension plant pathologist. Scattered rainfall in the southeast in mid-June, ranging from one inch in some areas to five inches in others, led to the development of trace amounts of scab in some growers’ fields — but with negligible economic impact due to the disease or the associated mycotoxin DON.

“In breeding nurseries and state variety trials at Lincoln and Mead in southeastern Nebraska, FHB developed to low levels in susceptible lines,” Wegulo adds, “with DON levels accumulating to less than 1.0 ppm in most lines and up to 10.8 ppm in a few highly susceptible lines.”

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

“The 2020 wheat growing season in **South Dakota** had, for the most part, great weather conditions, and yields were better than the previous year,” reports Emmanuel Byamukama, extension plant pathologist with South Dakota State University. The majority of winter wheat flowering coincided with scattered rainfall events for most areas in the state, he notes, and this limited the development of scab.

“A number of winter wheat growers mentioned not spraying for scab, given that the risk was low,” Byamukama observes. “Spring wheat, however, saw moderate levels of scab on susceptible varieties — especially for the eastern half of the state.” Very few growers had grain testing above 2.0 ppm DON levels.

In **North Dakota**, high relative humidity and intermittent rainstorms caused a moderate to high scab risk for susceptible varieties for the first half of July, says Andrew Friskop, North Dakota State University cereal extension pathologist. “During the middle of

July, scab risk was moderate to high for moderately susceptible and moderately resistant varieties. The highest amount of scab risk occurred on the eastern third of the state, and risk remained high for several weeks,” according to Friskop. Another area of elevated scab risk was the top third of the state beginning the second week of July.

“Based on the reports from agricultural professionals, the use of moderately susceptible and moderately resistant varieties drastically reduced scab incidence in the field,” Friskop recounts. “Also, it appears most of the early planted small grains (first week of May) escaped the scab risk, whereas later-planted small grains (middle to late May) headed and flowered during higher levels of scab risk.”

*Spring Wheat* — Most of North Dakota’s spring wheat crop had low levels of FHB in the field and low DON levels. A few fields of later-planted spring wheat did have some FHB damage; yet DON levels were still manageable at harvest. Reports from the field generally suggested a good quality crop with few concerns with DON. “Fungicide use was common this year, and product selection was heavily influenced by estimated yield and product cost,” Friskop relates. “Very few reports of DON levels above 2.0 ppm were received.”

*Barley* — Friskop says the state’s two-row barley had lower FHB and DON than last year. “However, multiple reports were received with field samples having DON levels being between 1.0 to 2.0 ppm. Later-planted barley (middle to late May) tended to have higher levels of FHB and DON as those acres were heading during elevated scab risk. A fungicide applied at full-head tended to keep DON levels low.”

*Durum* — “Very few reports of FHB and DON were received for durum,” Friskop observes. “The area of the state with the highest amount of durum production (northwestern North Dakota) did have periods of elevated scab risk. However, most of the crop seemed to escape the scab risk window, leading to low DON levels.”

Hot and humid weather across much of **Minnesota**, combined with intermittent thunderstorms, meant that the risk of FHB infections was very high for varieties rated susceptible to very susceptible to the disease from the last week of June through the first half of July. “The risk was even moderate to high for varieties rated moderately susceptible or moderately resistant to FHB in many parts of the state,” observes Jochum Wiersma, University of Minnesota-Crookston extension agronomist.

Wiersma says the most common diseases observed in the southern half of Minnesota during the 2020 season were BYDV (barley yellow dwarf virus) and BLS (bacterial leaf streak). Both winter wheat and the early seeded spring wheat acres largely escaped FHB in southern Minnesota because anthesis and the first half of the grain fill period were completed before the conditions turned very favorable for FHB.

In northern Minnesota, Wiersma says, “the decision to apply a fungicide to suppress FHB was not a question of ‘if’ but a question of ‘when’ — despite the fact that the crop walked backward in the weeks leading up to the decision to spray due to excess rain causing temporary flooding and drownouts in the central and northern portions of the Red River Valley.

“The decision on whether to use tebuconazole or Prosaro/Caramba/Miravis Ace was not easy, given the price outlook and the overall condition — and thus yield potential — of the crop,” Wiersma affirms. “The field severities in the yield trials across the region were nowhere near disastrous, but high enough in some of the more-susceptible varieties that you would be faced with discounts upon delivery of the grain to the elevator because the DON content would have exceeded the 2.0 ppm limit.”

Severities in the few commercial fields Wiersma scouted and some of the comments he received from crop consultants indicated that FHB severities were not as bad when compared to the yield trials — and overall even a bit lower compared to 2019. “The major difference between the trials and the commercial production was variety selection and the application of a fungicide at Feekes 10.5,” the UM agronomist states.

The most common disease observed in the northern half of Minnesota was BLS. “It was both amazing and disheartening to see how quickly BLS tore through the canopy of some of the more-susceptible entries in the yield trials,” Wiersma recalls. “In a week to a week and a half, the disease had decimated a healthy green canopy to just dried, curled-up leaves from top to bottom.” Fortunately, he notes, there also were entries that fared much better.

## Northwest (Idaho & Montana)

Juliet Marshall, **Idaho** Falls-based cereal specialist and pathologist for the University of Idaho, reports that the 2020 scab situation in the state ended up being completely different than the predicted long-term forecasts, *i.e.*, unusually cooler with greater precipitation than average in May and June. “These cooler temperatures resulted in less-than-expected FHB and DON in production fields,” Marshall says. “I have heard of no reports of DON in delivered grain.”

Under inoculation and misting, “we were able to get excellent FHB in our two nurseries (Kimberly and Aberdeen), hopefully with appropriate levels of DON to separate variety reactions,” she adds.

**Montana** also fared well as far as FHB in 2020, reports Montana State University plant pathologist Frankie Crutcher. “Dry weather during heading, as well as many high-risk growers applying a fungicide at heading, certainly helped,” Crutcher says. The MSU disease diagnostic lab did not receive any samples positive for FHB this year, she notes, likewise adding that “Molson Coors in Huntley did not have any harvest deliveries or bin samples that were above the 1.0 ppm DON specification. At harvest, they had one field that had some test at 0.7 ppm, and bin samples showed five bins with 0.3 to 0.5 ppm out of 130 bins sampled.”

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