



FUSARIUM FOCUS

FROM GRAIN TO MALT

Quality Parameters Maltsters Use to Ensure High Quality Products

This issue of *Fusarium Focus* highlights a malting company to provide increased awareness of the general priorities and perspectives of the malting industry.

Have you ever had a beer that gushed excessively when you open it? Probably not. That's because malthouses follow specific guidelines as to what they can accept from a raw material standpoint. Fusarium Head Blight (FHB) is a not just a concern for growers but also for maltsters and following very specific guidelines for grain acceptance from a raw material standpoint is key. "We advise farmers on proper fungicide use and when coupled with proper management techniques, it increases the chances of having low infection rates," says **Jason McCann**, director of customer quality assurance for Rahr Malting and one of the malting and brewing industry representatives on the USWBSI Steering Committee (see highlight on [pg. 4](#))

Helping customers get the ingredients they need to make high quality products is what McCann likes most about his job. Rahr Malting sources both 2-row and 6-row barley through the contract of specific varieties. The company chooses varieties known to be successful in the areas its being grown. All contracted growers are required to use only approved farming practices and the harvested barley must meet Rahr's quality standards in order to be accepted. In regards to FHB, very specific guidelines are followed for accepting raw material. If high toxin grain is accepted, malting will only elevate the mycotoxin levels and the options to control this are limited. From a malting standpoint, the best method



Barley germination in the malthouse.



"We advise farmers on proper fungicide use and when coupled with proper management techniques, it increases the chances of having low infection rates."



Barley kernels infected with fusarium graminearum pose issues for maltsters.

for controlling the impacts of FHB is by first purchasing grain that is not infected.

One of the largest challenges malting companies face is dealing with environmental fluctuations. "Climate changes have led to more unpredictable crop years and fluctuations in temperatures make

controlling a malthouse more difficult," says McCann. The malthouse isn't the only area maltsters are dealing with climate change. Most of the grain Rahr sources is from the Midwest, therefore, FHB is something the company has to deal with every year. In the last couple years, conditions in this region have

Maltsters Quality Parameters, continued next page

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The USWBSI is a national multi-disciplinary and multi-institutional research consortium whose goal is to develop effective control measures that minimize the threat of Fusarium Head Blight (scab), including the production of mycotoxins, for producers, processors and consumers of wheat and barley. The USWBSI's annual budget comes from Federal funds appropriated through the USDA-ARS and is distributed to nearly 140 research projects in more than 30 states..

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been unfavorable for FHB development but, there are always regions that are impacted. Climate change has also impacted the amount of barley acres grown making it difficult for malting companies, like Rahr, to manage the amount of raw material needed to ensure they meet the demand.

Some of the things maltsters are doing proactively are, working to keep barley competitive with other crops and

increase the regions in the U.S. where it's grown. That's why Rahr Malting Co. is dedicated to educating growers about FHB. By ensuring that FHB is at the forefront of people's minds, through initiatives like the USWBSI, breeders can continue to improve resistance in new varieties. This will allow barley to be grown in more regions across the U.S. and make it a more competitively favorable crop to growers.

ABOUT RAHR

Rahr is a family-owned malting company that provides innovative and quality ingredients and solutions in a manner that reflects their commitment to their customers, suppliers, employees, communities, and shareholders. With over 175 years of history, the company is committed to the symbiotic relationship between a business and its community. Headquartered in Shakopee, Minnesota, Rahr owns malt houses and elevators in Minnesota, North Dakota, British Columbia, and Alberta and is dedicated to driving sustainable growth by being a preferred supplier of specialty/premium products and services for the food and beverage industry globally. ●



2024 NATIONAL FHB FORUM



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USWBSI Executive Committee Holds Annual Strategy Session in Minnesota

The USWBSI Executive Committee met in-person April 11-12, 2024 at the University of Minnesota for its annual strategy session. The annual strategy session is a time for the Executive Committee to assess and discuss components of the funding process, governance of the Initiative and brainstorm approaches for enhancing efforts. Updates from the National Wheat Improvement Committee, National Barley Improvement Committee, as well as from the USDA-ARS, industry, and grower perspectives were given by the representative member. The group also had the opportunity to visit USWBSI Co-Chair **Ruth Dill-Macky's** plant pathology lab and the USDA-ARS Cereal Disease Lab to learn more about their efforts related to FHB. ●



Members of the Executive Committee toured Ruth Dill-Macky's lab at the University of Minnesota and learned about their methods for inoculum production.



During the USDA-ARS Cereal Disease Lab tour, on the University of Minnesota's St. Paul Campus, the EC learned more about Mitch Elmore's project as well as the other USDA CDL programs actively engaged in FHB research.

GDER and PBG Hold Joint Mid-Year Planning Meeting Virtually to Discuss Collaborations

JYOTI SHAH / University of North Texas, GDER Chair and LISA VAILLANCOURT / University of Kentucky, PBG Chair

At the 2023 USWBSI Forum in Cincinnati, Ohio, the Gene Discovery and Engineering Resistance (GDER) and the Pathogen Biology and Genetics (PBG) Research Area participants agreed on the continued need for a mid-year research-focused half day virtual meeting with the following goals:

- Provide a platform to share results from ongoing research, technology development, and new ideas/concepts.
- Facilitate interactions that exploit the shared expertise of members of GDER and PBG towards the common goal of finding solutions for mitigating FHB in wheat and barley.
- Facilitate collaborative projects between GDER and PBG.
- Provide a professional development platform for students, postdocs and junior scientists.

Arrangements for this meeting, which was held over Zoom on April 19, 2024, were put in place by Michelle Bjerckness, USWBSI Director of Operations. **Jyoti Shah** (University of North Texas) and **Lisa Vaillancourt** (University of Kentucky) chaired this meeting, which included 75 registrants from 29 institutions comprising universities, USDA-ARS and other federal labs, and companies in the USA, Canada, and Brazil. Participants included PIs, research scientists, postdocs, technicians, and graduate students. A total of thirteen 8–10-minute short talks, which were followed by Q&As, were spread over three sessions: (1) Fungal pathogenicity—mechanisms and regulation; (2) Targets for enhancing FHB resistance; (3) Enabling technologies and resistance mechanism discovery. [An outline of the 2024 GDER-PBG Joint Mid-Year Meeting presentations is available for reference.](#)

The meeting ended with an open discussion on future directions and facilitating collaborations across GDER, PBG and other research areas. The GDER and PBG participants plan to continue to work together to advance the goals of the USWBSI. ●



Members from both the GDER and PBG Research Areas came together virtually to share project results and develop collaborative ideas for future projects.

Welcome to the New Steering Committee Members

Elections for new Executive Committee, Steering Committee, and Research Area and Coordinated Project Committees were held in the Fall of 2023. Here are the new Steering Committee members whose terms started January 1, 2024.



Jason Cook, Montana State University, Bozeman, Montana. Cook is an assistant professor and leads the hard red spring wheat breeding and genetics program

at Montana State University. His program focuses on developing varieties adapted to Montana's unique growing environments. Cook's efforts are focused on developing high yielding, drought tolerant, wheat stem sawfly and FHB resistant spring wheat varieties with excellent end-use quality. Cook serves on the Steering Committee given he is the new chair of the Variety Development and Host Resistance Spring Wheat Coordinated Project.



Ken Davis, Grow Pro Genetics, Bourbonnais, Illinois. Davis is the co-owner and commercial director at Grow Pro Genetics. He graduated from

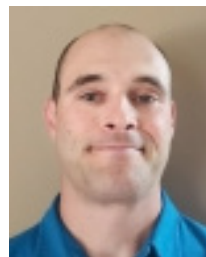
The Ohio State University with a BS in agribusiness and applied economics and received his MS in seed technology and business from Iowa State University. He has spent his entire career in the seed business managing portfolios for Monsanto, KWS, and Syngenta. Davis has worked at regional, national, and international levels of seed trade. His career functions have revolved around creating new business units for seed brands and North American product development. In 2020, Davis successfully coordinated the acquisition of Syngenta's

soft wheat breeding program for Grow Pro Genetics. Davis represents the seed industry on the Steering Committee.



Yanhong Dong, University of Minnesota, St. Paul, Minnesota. Dong received her postdoctoral training in the Department of Chemistry at the University of

Minnesota and is currently a research associate professor in the Department of Plant Pathology. She earned her MS and PhD degrees in bioinorganic chemistry and BS degree in inorganic chemistry from Nanjing University in China. Her research focuses on diagnostics of mycotoxins produced by fungi, especially *Fusarium* species. Her project facilitates wheat and barley breeding programs to develop varieties with improved *Fusarium* head blight (scab) resistance, and assists plant pathologists in studying disease mechanism and developing effective chemical and biological controls for FHB. She is one of the USWBSI DON Lab PIs and her lab analyzes more than 25,000 samples annually for the Initiative. Dong represents food safety and toxicology on the Steering Committee.



Jason McCann, Rahr Malting, Shakopee, Minnesota. McCann currently serves as the director of customer quality assurance for Rahr Malting Co. He received his BS in

biology from the University of Wisconsin-Stevens Point. After graduation, he worked in the pharmaceutical and environmental testing industries.

McCann started in the malting industry in 2007 obtaining positions in the laboratory, production, plant supervision, food safety, and technical solutions. He is an active member of the Master Brewers Association of the Americas, American Society of Brewing Chemists Research Council, American Malting Barley Association Technical Committee, Brewing and Malting Barley Research Institute Barley Quality Evaluation Team, and Prairie Recommending Committee for Oat and Barley. McCann represents the malting and brewing industry on the Steering Committee.



Sunish Sehgal, South Dakota State University, Brookings, South Dakota. Sehgal is an associate professor and the hard winter wheat breeder at South Dakota State

University. He received his PhD in plant breeding and genetics from Punjab Agricultural University. His winter wheat breeding program focuses on developing and releasing high-yielding winter wheat cultivars with resistance to biotic and abiotic stresses. In addition to research, Sehgal is also active in teaching, advising, and outreach for the wheat industry in South Dakota and has published more than 70 peer-reviewed articles. Sehgal serves on the Steering Committee given he is the new chair of the Hard Winter Wheat Coordinated Project. ●

2024 Scabinar Focused on Fungicides for FHB

On March 13, 2024, 161 individuals tuned into the live Scabinar on Fusarium Head Blight (FHB; scab) of wheat and barley, hosted by the U.S. Wheat and Barley Scab Initiative and co-organized by extension plant pathologists Carl Bradley, University of Kentucky; Juliet Marshall, University of Idaho; and Andrew Friskop, North Dakota State University. The webinar consisted of five expert presentations followed by a panel question-and-answer session.

Carl Bradley, University of Kentucky, kicked off the presentations with a “History of Fungicide Registration for Fusarium Head Blight Management in the U.S.A.” He shared important fungicide resources which includes the fungicide label. Prior to 1998, there were no registered fungicides for FHB. From 1998-2007, annual section 18 emergency exemption requests were granted by the U.S. EPA for Follicur® in multiple states. Full registrations could not move forward due to a special review of triazole fungicides. In 2007, the first registered fungicide for FHB use was registered. In 2008, Caramba®, Follicur, and Prosaro® were registered. All currently registered fungicides for FHB include a triazole as the active ingredient, meaning there is heavy reliance on this one fungicide class.

Pierce Paul, The Ohio State University, presented next on the “Efficacy of Fungicides for FHB and DON Management: Product, Timing, and Number of Applications.” Of the 20 most widely used fungicides for wheat disease control, only eight are used for FHB control. These eight products are basically built around four triazoles. Miravis® Ace is a relatively newer fungicide for FHB. Through the review of the most recent integrated management trials, conducted through a USWBSI cooperative project in 20 states, Paul concluded that Miravis Ace applied at anthesis improved control compared to Prosaro or Caramba applied at the same growth stage. Applications of Miravis Ace prior to flowering, at anthesis, and 6 days after anthesis, concluded that the anthesis application had the most reduction in FHB. Similar results were found when looking at the control of DON. When comparing a two-treatment application approach to the single treatment application, results showed



Presenters and panelists answer attendees' questions during the question-and-answer portions of the Scabinar event.

that multiple treatments were more effective at controlling FHB and DON than a single application program.

“Fusarium Head Blight in Winter Barley: Fungicides and Timing” presented by **Christina Cowger**, USDA-ARS and North Carolina State University, reviewed the efficacy trials she’s conducted on winter barley. “Unlike wheat, barley does not allow the fungus causing FHB to travel up and down the rachis,” noted Cowger. But it can grow from floret to floret. In North America, winter barley often flowers while the head is still in the boot and anther extrusion may not occur. Spring barley apparently extrudes anthers more regularly, so it’s possible *Fusarium* infects then. But there is not enough research yet to really understand when barley heads are most susceptible. Cowger’s study looked at three timings for fungicide application to winter barley: early (50% headed), mid (100% headed), and late (100% headed plus 6 days).

Every fungicide timing was significantly better at controlling FHB than the nontreated control. But the mid and late applications were best for reducing overall FHB symptoms, while the late timing performed best in controlling DON. Of the products tested, Miravis Ace reduced visual FHB symptoms most when compared to the nontreated control. In summary, for winter barley producers, fungicide applications several days after full head emergence are recommended for maximum DON reduction.

Following Cowger’s presentation, **Andrew Friskop**, North Dakota State University, shared a similar message for spring barley where suppression for FHB is best when a fungicide application occurs during heading and up to 7 days after full-heading. In Friskop’s trials, all fungicides performed similarly when applied at full heading for controlling FHB symptoms. Similarly to the winter

2024 Scabinar, continued next page

barley, the fungicides did help with reducing DON the best when applications occurred at full heading and up to seven days after.

Up next, **Rob Proulx**, North Dakota State University, presented on “*Fungicide Application Technology for FHB/DON Management*.” Proulx is currently working to update some of NDSU’s extension publications including ground applications for controlling FHB and DON in wheat and barley. The evidence suggests that the use of a dual angled spray on a vertical target provides equivalent or better coverage compared to a straight down spray. There is a benefit to asymmetrical dual sprays providing a higher coverage rate compared to shallow angled application. For FHB control, a course spray quality is recommended because larger droplets have a greater mass which means a greater chance the larger droplet makes it to the target, the wheat glume. Consistent coverage benefits from higher water volumes, height of nozzles, and application speed. Overall, the take home message is you can’t isolate any one of these variables from all the rest. While fungicide application settings are important for disease suppression, product selection and application timing have a greater influence. “Application timing is the cherry on top, if fungicide

selection and application timing are the ice cream,” said Proulx.

For the final presentation, **Martin Chilvers**, Michigan State University, presented on some newer work looking at “*Fusarium Species Composition and Fungicide Sensitivity in Michigan*.”

Chilvers’ lab collated head samples from wheat grown in Michigan along with corn and soybean samples. DNA techniques were performed to identify the *Fusarium* species recovered from these samples. The vast majority of samples contained *Fusarium graminearum* but, there were other species in the *Fusarium tricinctum* species complex identified. Through the use of “poison plates”, agar plates with fungicide added, Chilvers’ lab measured the mycelial growth and determined the EC50 level, the amount of fungicide needed to effectively reduce the growth by 50%. There were some significant differences in species sensitivity to DMI class fungicides seen in vitro. But no practical resistance was found in field experiments. Chilvers and colleague Alyssa Koehler, University of Delaware, are both accepting samples to monitor fungicide resistance. Please feel free to reach out to them directly or contact your local state university plant diagnostic lab to aid in sending samples.

After all the presentations, **Kelsey Andersen Onofre**, Kansas State University, and **Juliet Marshall**, joined the others for a panel discussion. Attendees were encouraged to continue to submit questions. Marshall provided some challenges growers see in the Pacific Northwest. She noted that the region is seeing more visual symptoms and acreage for corn production is increasing. The control recommendations are focusing on crop rotation and the increased risk that comes with planting small grains following corn. Kelsey Andersen Onofre said their perspective in Kansas is similar in that FHB is becoming more of an issue from the increase in corn production. Corn provides a large source of inoculum.

Attendees asked many good questions to the panelists, with a valuable exchange and response.


To view the presentations and panel discussion, a recording of the Scabinar is now available for ongoing access at <https://scabusa.org/scabinar>. Although attendees of the Scabinar received 2.0 CEU’s for attending the live webinar, CEUs are not yet available for the recording, but efforts are underway to be able to provide them in the coming months. Input from the attendees is being reviewed, and plans are being considered for ongoing Scabinar offerings in the future, stay tuned! ●




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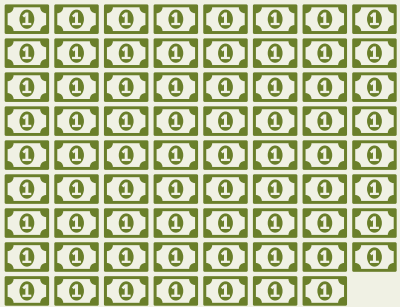
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National Barley Improvement Committee Introduces Resilient Barley Initiative on the Hill

ASHLEY MCFARLAND / NBIC Vice President & Technical Director

The National Barley Improvement Committee (NBIC), which represents the U.S. barley community of growers, researchers, processors, users, and allied industries, has just returned from its annual advocacy trip to Washington D.C. The team of nearly 30 barley enthusiasts participated in over 100 Hill visits advocating on behalf of federal research funding for the barley industry.

NBIC's priority ask sought to establish a new research venture with the USDA Agricultural Research Service and Land Grant University partners entitled the Resilient Barley Initiative (RBI). The RBI seeks to address abiotic stressors, related to climate change, that have dramatically impacted yield and quality of the barley crop in recent years. As a result, industry has felt disruptions in supply, resulting in imported barley, which is exacerbated by farmers' decision to not grow the risk-laden crop.

A collaborative team of researchers across 18 states will accelerate resilient barley line development and variety adoption, taking into account unique geographical needs posed by a changing climate. Improved genetics will promote a greater utilization of inputs, mitigation of risk, and positive ecological impact from crop adoption. Replicated cropping system trials will be deployed to better understand management practices for barley and the systems that can best support input use efficiency. Winter barley is a special focus within both approaches—genetics and management—to better understand the tangible ecosystem benefits provided while producing a high quality and profitable crop for farmers. In addition to introducing this new initiative, an annual funding request was made of \$8,000,000 annually to be included in the FY25 Agriculture, Rural Development, Food and Drug Administration Bill.

NBIC members also advocated for an increase in the funding levels for the Barley Pest Initiative (BPI). The BPI is an effort to strengthen research capacity to address over 20 insects and diseases that impact barley yield and quality through development of new resistant varieties and management strategies. In the most recent spending bill (FY24), the BPI received \$3.5 million in support, but the NBIC team is actively working to secure an additional \$1.8 million to bring the total in FY25 to \$5.3 million annually. Already, in just three years of partial funding, the researchers working on the BPI have made great progress. [You can read more about this work on the American Malting Barley Association website.](#) In addition to the RBI and BPI, [support was also vocalized for other initiatives, including the USWBSI, and agencies within the USDA](#) that are critical to the barley industry as outlined in their [legislative priorities](#).

"Once again, the NBIC brought a diverse and strong team of barley advocates to the Hill. In a year we were prepared for funding cuts, the increase in funding for the Barley Pest Initiative was welcomed news," said Ashley McFarland, who



Members of the National Barley Improvement Committee visit Capitol Hill on March 4-6, 2024.

serves as executive secretary of the NBIC. "Furthermore, the Resilient Barley Initiative received a warm reception in many offices and we are hopeful in its establishment in FY25."

Support for agricultural research once again resonated on the Hill, reinforced by a [documented \\$20:\\$1 return on investment](#), but the highly divisive culture in D.C. challenges new investments, like the RBI. Nonetheless, after warnings of flat budgets, or even possible cuts, the NBIC was thrilled to learn they had received an increase on the BPI (\$500,000 increase in FY24). Several spending bills at the time were still under consideration on the Hill, which dominated the focus of many offices, but some offices were already shifting focus to FY25 priorities. Finally, opinions on the passage of a new Farm Bill varied greatly, and although many expressed the desire to deliver on that in 2024, few lacked the optimism that would be possible. Once the FY24 budget process is completed, there will likely be a renewed focus on the important legislation. The NBIC is committed to seek the increased authorization of the U.S. Wheat and Barley Scab Initiative to \$20 million annually—a priority which received a positive reception through many of their visits.

The American Malting Barley Association is a trade organization, which represents the interests of end users of malting barley, including maltsters, brewers, distillers, and food processors. Our work seeks to maintain a stable and high-quality supply of malting barley for our members throughout the U.S. Learn more here: www.ambainc.org.

The National Barley Improvement Committee represents the U.S. barley community of growers, researchers, processors, users, and allied industries. We advocate for sound agricultural policy and strong public support for agricultural research throughout the U.S. ●



Impressions from the National Wheat Improvement Committee's Hill Visit

JOCHUM WIERSMA / National Wheat Improvement Committee Chair and JAKE WESTLIN / NAWG Vice President of Policy & Communications

The ink on the 2024 Agricultural Appropriations Bill had barely dried and DC's cherry blossoms around the Tidal Basin had just peaked before most of us landed in DC on March 18. The Wheat Resiliency Initiative received \$500,000 of (new) funding for FY24. While this is a partial funding request, it will allow some work on Hessian Fly (HS) and Wheat Stem Sawfly (WSS), two of the four priorities, to start.

The National Wheat Improvement Committee's (NWIC) ask for FY25 included the full authorized \$15 million for the U.S. Wheat & Barley Scab Initiative, \$3.44 million for the Wheat Genomics Initiative, an increase in funding for the Wheat Resiliency Initiative to \$1.6 million, and an additional \$750,000 to shore up the Wheat Stripe Rust Initiative.

Twenty-two strong, we stormed Capitol Hill the next day and a half to meet with staff of the ag appropriations committee in both the House and Senate and staff of members on the ag appropriations committee on either side of the aisle in both the Senate and the House. After some forty-plus visits, it is very clear (to me at least), that there is good support for the appropriations requests that have already been or will be submitted on behalf of NAWG and NWIC. Fiscal and political realities, however, have made the appropriations process extremely challenging, and any increase in funding will be hard-fought. Therefore, it will be important in the coming months to continue emphasizing the need to fund the asks at the requested amounts. So, to help reinforce the need for increased investment in research, I would encourage you to invite your members of Congress and their staff to visit your research facilities and farms in the area

and continue to educate them on the disease and pest challenges that persist in their constituency to reinforce the need for increased investment in our shared priorities.

The most exciting meeting, however, occurred in the offices of the National Association of Wheat Growers, just a stone-throw away from Union Station and Capitol Hill. **John Goldberg, Allan Fritz, Jake Westlin, Christina Hagerty,** and I met with **Dr. Neil Hoffman**, who serves as the Science Advisor in USDA's Animal and Plant Health Inspection Service—Biotechnology Regulatory Services Division (APHIS-BRS) to ask whether there were any unresolved questions as a result of the initial and follow-up commentaries NAWG/US Wheat Associates/NWIC had submitted in response to the proposed exemption rules for gene-edited (GE) crops.

I'm very excited to be able to tell you that our conversations with USDA lead us to be very optimistic for allopolyploids and wheat in particular; our commentaries have been well received by USDA and will likely plow the way to have GE as one of our tools in the future. Understand that having the legal framework in place that allows GE as a tool in wheat breeding does not mean acceptance of the technology by our domestic and export partners. Furthermore, Title 7 Subtitle B Chapter III Part 340 (of which these proposed rules would be the 8th revision) is currently being challenged in court. Only when the court challenge has been resolved and the new exemptions proposed by USDA go into effect will breeders (and by extension wheat producers) finally be able to reap the benefits of tools other commodities have enjoyed for much longer.



Members of the National Wheat Improvement Committee visited Capitol Hill in March to lobby for wheat research.

The National Association of Wheat Growers (NAWG) is the primary representative of U.S. wheat growers. NAWG and its 20 member-states work to coordinate and implement policy priorities in the following areas: farm policy, conservation, energy, research, trade (on Capitol Hill), biotechnology, and others. <https://wheatworld.org/>.

The National Wheat Improvement Committee (NWIC) is a non-profit organization composed of 24 voting members whose mission is to communicate, educate, and advocate on behalf of the scientific well-being of the U.S. wheat industry. NAWG is the Secretariat of the Committee, and the two organizations work together each year to outline and advocate research priorities. <https://wheatworld.org/coalitions/> ●



Synergism Between Pathogens in the 2022 Fusarium Head Blight Outbreak in Ethiopia Under Investigation

LIZA DEGENRING / Department of Agronomy and Plant Genetics, University of Minnesota, ASHENAFI GEMECHU / Ethiopian Institute of Agricultural Research (EIAR), Ethiopia, and MILTON T. DROTT / USDA-ARS, Cereal Disease Laboratory, St. Paul, MN

As Ethiopia pushes to become self-sufficient in wheat production, it has not been spared the outbreaks of Fusarium Head Blight (FHB; scab) that are prevalent in the rest of the world. While wheat growers in Eastern Africa have historically been concerned with the threat of rust disease to their fields, over the last several years, there has been an increase in outbreaks of FHB reported in Eastern Africa, and in Ethiopia, FHB reached epidemic levels in 2022. Ethiopia is the largest wheat producer in Sub-Saharan Africa with over 2 million hectares grown primarily by small-holder farmers.

FHB is caused by several species of fungi in the *Fusarium graminearum* species complex (FGSC) and is one of the most important diseases of cereal crops worldwide. In Ethiopia, the emerging disease presents a new problem for which little information is readily available. The USDA-ARS has been working with the Ethiopian Institute for Agricultural Research (EIAR), USAID, and the University of Minnesota to address the outbreak. **Ashenafi Gemechu**, of the EIAR, obtained dozens of fungal isolates from wheat fields around Addis Ababa. Molecular characterization of these isolates conducted by **Milton T. Drott** at the Cereal Disease Laboratory (USDA-ARS) revealed that a substantial portion of the isolates were *Fusarium* species; however, a high prevalence of other mycotoxigenic species has raised questions about potential synergisms in the 2022 outbreak. Interestingly, other researchers have found similar results, suggesting that *Fusarium* species are often found as part of a consortium in the wheat head. The significance of this in Ethiopia remains unclear.

Liza DeGenring, working in Drott's Lab, selected six FGSC isolates from the 2022 samples provided by EIAR for



Symptoms of fusarium head blight on wheat.

whole genome sequencing. Analysis of genome sequences revealed that three *F. graminearum* isolates that were collected from different fields appear to be clonal, raising questions about the epidemiology of the outbreak. Additionally, a *F. boothii* and a *F. aethiopicum* isolate were identified from the outbreak. *F. aethiopicum* was first isolated in 2007 from wheat grain in the Amhara region of Ethiopia¹; there has been relatively little work on the species since. The contribution of FGSC species that are rare elsewhere in the world to the 2022 outbreak emphasizes a pressing need to understand the pathogenesis of these organisms.

FHB can reduce yields and grains can be contaminated with the harmful trichothecene mycotoxins, posing significant threats to food safety and food security. In Ethiopia, there is little information about the *Fusarium*-associated mycotoxins present during this outbreak. Our analyses reveal that 15-acetyldeoxynivalenol (15ADON), 3-acetyldeoxynivalenol (3ADON), and nivalenol (NIV) chemotypes are all present in FGSC isolates from the 2022 outbreak. This mixed population is not

uncommon in other parts of the world and can even be seen within the same field. Factors maintaining the diversity of trichothecenes are not clear, but it has been hypothesized that it is associated with host range. The presence of three chemotypes raises questions about the diversity of the isolates and potential management options for growers.

Analysis of trichothecene contamination of Ethiopian wheat flours collected by Gemechu revealed that 23% had mycotoxin contamination above the 1 parts per million (ppm) limit recommended by the Food and Drug Administration (FDA) for human consumption. Some of the contaminated wheat had dangerously high mycotoxin levels, emphasizing the threat of FHB to food safety and food security in Ethiopia.

As an emerging disease in this region, most growers are unfamiliar with FHB, its symptoms, and the available disease management options. As a new disease to Ethiopian growers, the risks mycotoxin-contaminated grains pose to human and animal health are not well understood. Our preliminary results emphasize that there are pathogen dynamics present in the 2022 outbreak that are poorly understood and may call for region-specific control measures. A larger collaborative research effort to address the threat of FHB is ongoing.

To read more about the outbreak in Africa, check out the previously published [Fusarium Focus article in the Summer 2023 Issue](#).

LITERATURE CITED:

- ¹ O'Donnell, K., Ward, T. J., Abera, D., Kistler, H. C., Aoki, T., Orwig, N., Kimura, M., Bjørnstad, Å., & Klemsdal, S. S. (2008). Multilocus genotyping and molecular phylogenetics resolve a novel head blight pathogen within the *Fusarium graminearum* species complex from Ethiopia. *Fungal Genetics and Biology*, 45(11), 1514–1522. <https://doi.org/10.1016/j.fgb.2008.09.002>



Welcome New Students



Luke Whiteley recently started his doctorate degree with Shuyu Liu, in the Department of Soil and Crop Science at Texas A&M University.



Nikhil recently started his doctorate degree in February 2024 with Shyam Solanki in the Department of Agronomy, Horticulture, and Plant Science at South Dakota State University. His project is looking at dissecting spatio-temporal transcriptome and seed microbiome components during *Fusarium*-wheat interaction. ●

Kudos to Those Starting New Positions



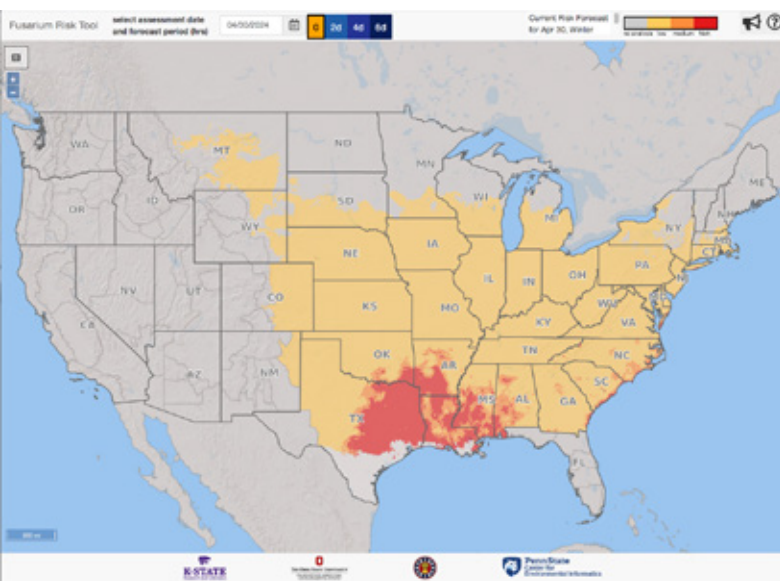
Margaret Krause, Ph.D., started in November 2023 as an assistant professor and the Warren Kronstad Wheat Research Chair in the Department of Crop and Soil Science at Oregon State University.



Shuyu Liu, Ph.D., started in January 2024 as the new Texas A&M AgriLife Research wheat breeder in the Texas A&M College of Agriculture and Life Sciences Department of Soil and Crop Sciences. Liu moved from the Research and Extension Center in Amarillo, Texas to Bryan-College Station to take on his new role. ●

FHB Risk Tool Active for 2024 Growing Season

Check out the latest predictions of risk for FHB this growing season with the [USWBSI FHB Risk Tool](#). The map provides disease risk in 35 states based on historical weather and disease data. Users can choose a date for the assessment period and expand it by 2, 4, or 6 days to view anticipated disease risk trends. [FHB Alerts](#) are also available in email and SMS format, providing additional real-time regional expert commentary and recommendations. All the [most recent expert postings](#) are also available for ongoing reference. Model enhancements with a graphing feature are being finalized and will launch soon, check back regularly for the latest updates. ●



CALENDAR

USWBSI EVENTS

2024

December 8-10 [2024 National Fusarium Head Blight Forum, Austin, TX](#)

OTHER EVENTS

MAY

20-24 [9th Edition of Genomic Selection in Breeding Course, Madrid, Spain](#)

JUNE

23-28 [2024 Fusarium Laboratory Workshop, Manhattan, KS](#)

JULY

7-10 [Plant Canada, Winnipeg, Manitoba](#)

21-25 [2024 Annual Meeting of the National Association of Plant Breeders, St. Louis, MO](#)

27-30 [Plant Health 2024, Memphis, TN](#)

SEPTEMBER

22-27 [3rd International Wheat Congress, Perth, Western Australia](#)

OCTOBER

21-24 [6th International Symposium on Fusarium Head Blight, Niagara Falls, Ontario](#)

28-31 [14th International Barley Genetics Symposium, Santa Fe, Argentina](#)

NOVEMBER

10-13 [2024 ASA, CSSA, SSA International Annual Meeting, San Antonio, TX](#)

10-14 [National Association of Wheat Growers 2024 Fall Conference, Phoenix, AZ](#)