



FUSARIUM FOCUS

USWBSI Kicks Off Communication Plan with New FHB Tool Talk E-Newsletters

AMBER HOFFSTETTER / USWBSI and ANNIE HARVIEUX / University of Minnesota

All around the United States, wheat and barley stakeholders are receiving up-to-date information via USWBSI's new FHB Tool Talk e-newsletter.

As part of the USWBSI 2022 communications planning process, which combined Executive Committee priorities with focus group insights, it was determined that a top priority of the Initiative is bringing resources and research to targeted groups of extension specialists, crop consultants, and grower groups. This plan includes several new digital resources rolling out in 2023, beginning with FHB Tool Talk.

FHB Tool Talk is an e-newsletter distributed to extension specialists, crop consultants, and state grower organizations containing pertinent tools and resources about FHB for the current growing season. This plan provides an exciting opportunity to both share existing resources to those who may not have previously been in the loop, and quickly highlights and disseminates new tools and information. Each newsletter is drafted by USWBSI staff before being checked and edited in a collaborative process with an interdisciplinary advisory team featuring **Richard Magnusson** (USWBSI Grower Co-Chair), **Neal Fehringer** (Fehringer Agricultural Consulting, Inc.), and **Boyd Padgett** (Louisiana State University Ag Center), to provide a balance of perspectives. Issues are sent on a timeline structured roughly to growing seasons in the United States, for relevance and ease of use.

The first e-newsletter, distributed in April, made readers aware of the [FHB Risk Tool](#) and [FHB Alerts](#). These USWBSI tools allow users to see the forecasted risk of FHB for their wheat and barley fields to determine if FHB management using fungicide application is necessary and provides state commentary about the season's progression. The second e-newsletter in May provided new information about the best time for [fungicide application](#) in winter barley to reduce FHB. The most recent issue provides news about the [re-broadcast of Scabinar](#), a two-hour webinar that provides insights on FHB and the best ways to manage it and its associated mycotoxin, which now has the option for Certified Crop Advisors to earn up to two continuing education units in integrated pest management if they watch the recordings and take the associated quizzes.



The first issue of FHB Tool Talk focused on two USWBSI tools, the FHB Risk Tool and FHB Alerts.

The send format of the newsletter, monitored by Amber Hoffstetter and Annie Harvieux, allows for tracking which is not available in listservs, and they are proud to share that each message has been opened more than 200 times total. The information in each newsletter is intended for recipients to easily share with their contacts via forwarding or converting into part of their organizational newsletter, due to simple language and ready-to-share links.

To continue to amplify the key messages of FHB Tool Talk, recipients are encouraged to pass the e-newsletters on to their growers and contacts in a way that works best for them. If you wish to receive FHB Tool Talks, [subscribe](#) today! ●



FUSARIUM FOCUS

Fusarium Focus is an online newsletter published periodically by the U.S. Wheat & Barley Scab Initiative (USWBSI) and distributed to the USWBSI community.

Content Creation: Amber Hoffstetter
Design: Dawn Mathers

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 150 research projects in more than 30 states..

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USDA-ARS/USWBSI Funding Cycles in Action

The USWBSI is happy to report FY23-YR2 agreement amendments have all been fully executed and the distribution of ~\$8.65 million in USDA-ARS funding for the 2023 USWBSI projects is complete.

This was the second year of funding for projects in this funding cycle, with a total of 136 projects selected competitively for annual funding for a continuation award. These projects will be implemented by 91 PIs, 82% within the Land Grant University system and 18% within USDA-ARS. Projects will be implemented in a total of 30 states, 31 universities and 11 ARS facilities. While funding is released annually, the majority of projects (77%) have 4-year project terms while the remainder will be completing their 2-year term projects.

And the funding cycle continues, with the next [USWBSI RFP \(FY24\)](#) just released in June 2023. Given the new 4-year project terms, this is the first RFP released that includes both new pre-proposal submissions simultaneously with project continuation funding requests. Both new pre-proposals and continuation requests must be submitted by September 21, 2023, to be considered.

Once again, special thanks to the incredible efforts of all the volunteers who participate in expert review panels and committees to ensure a robust project portfolio for USWBSI. This year the Research Area and Coordinated Project Committees alongside the Steering Committee participated in a comprehensive review and update of the [USWBSI Action Plan](#), which is now published, and serves as the key guide for the research priorities. This community-driven and collaborative approach of USWBSI remains a highly effective model. ●

2023 USWBSI HWW-CP Mid-Year Meeting Report

JESSICA RUPP / *Kansas State University, Hard Winter Wheat Coordinated Project Chair*

Members of the Hard Winter Wheat Coordinated Project (HWW-CP) met via Zoom on May 16, 2023 at 1:00 p.m. Members and labs represented included: Francois Marais, Katherine Frels, Shaukat Ali, Sunish Seghal, Shuyu Liu, Guihua Bai, Ali Nafchi, Sathishraj Rajendran, Dal-Hoe Koo, Myron Bruce, Yuzhou Xu, Yahya, Jessica Rupp, Lan Fei, and Amir Ibrahim. Also in attendance, representing the USWBSI NFO, was Michelle Bjerkness.

The group went through introductions and welcoming of new members, students, and provided short overviews of individual labs. Rupp made announcements regarding the T3 database, congratulating the HWW-CP on 100% entry as well as a reminder to upload qualifying citations into the ScabSource database. Prior to talks, the group was also reminded to be forward-thinking regarding needs, the action plan, and the priorities of the HWW-CP. The group was asked to consider their greatest challenges and the bottlenecks unique to HWW-CP that they must work together to overcome.

Talks began with an invited speaker from the Koo project, Sathish Raj Rajendran, regarding novel sources of resistance. This included an update regarding HSD2-32 alien introgression detection, marker development, and progress on F2 population. Guihua Bai gave an update on his work of gene pyramiding, and both work on major genes and minor genes. He rounded out his talk discussing the transformative work using nanoparticle-based gene editing.

Shuyu Liu gave an update regarding the work on double haploids. Following a challenging time during and coming out of covid, work looks very promising moving forward and he and his lab are moving towards deliverables at a larger scale to

HWW-CP Meeting, continued on page 3

participating breeding programs. Ali Nafchi rounded out the section of talks regarding high-throughput phenotyping of FHB-infected wheat. His work is off to a great start employing phenotyping carts and moveable cameras in order to image wheat from a variety of different angles. His lab continues to examine the possibility to tailor the methods to help identify resistant lines with improved accuracy.

Each funded project then gave a short three-minute update of their work. Notable efforts included new variety releases with improved FHB resistance and decreased DON content,

multiple lines identified in nurseries and breeding programs, and increased training for graduate students, post-docs, and presentations at national meetings. Furthermore, deeper integration between the HWW-CP and other sections including management and transformational science work was noted.

Rupp ended the meeting with a discussion of the new action plan, the specific HWW-CP priorities, goals, and the next granting cycle. Members were encouraged to prepare their thoughts and suggestions for the next meeting. ●

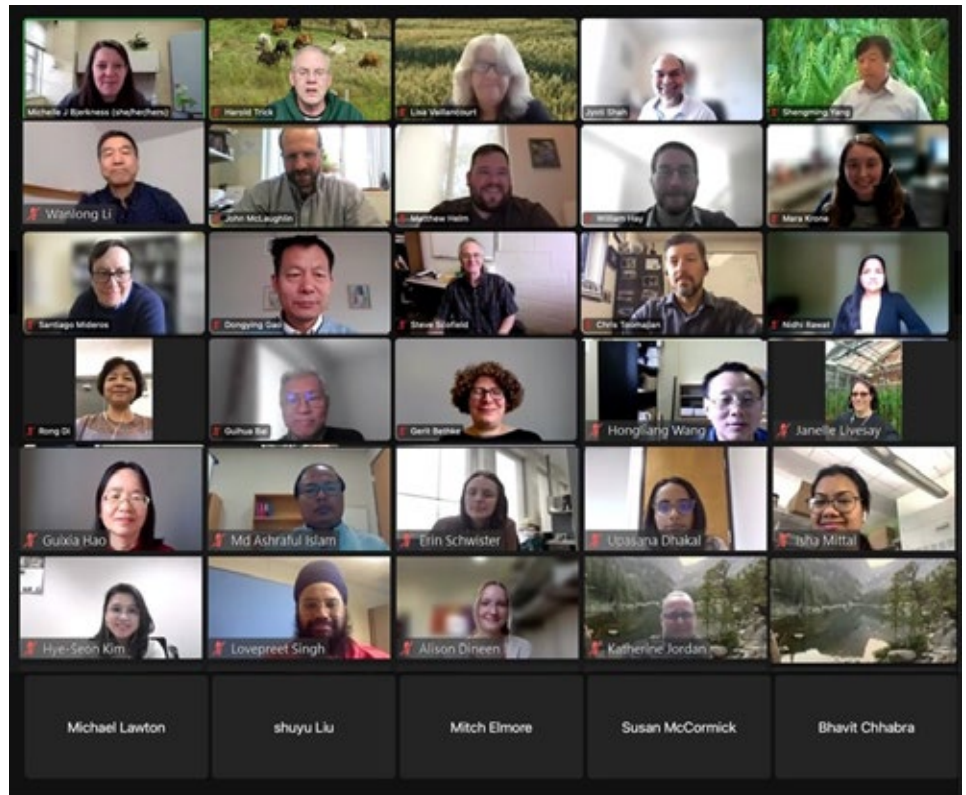
GDER and PBG Hold Joint Mid-Year Planning Meeting Virtually to Discuss Collaborations

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

At the 2022 USWBSI Forum in Tampa, Florida, the Gene Discovery and Engineering Resistance (GDER) and the Pathogen Biology and Genetics (PBG) breakout group participants agreed on the need for a mid-year research-focused half day virtual meeting with the following goals:

1. Provide a platform to share results from ongoing research, technology development, and new ideas/concepts.
2. Facilitate interactions that exploit the diverse expertise of members to find solutions for mitigating FHB in wheat and barley.
3. Identify future resource and technology needs of both Research Areas.
4. Provide directions for both Research Areas future contributions to the USWBSI's goals and priorities.
5. Provide students and junior scientists a platform for professional development.

Arrangements were put in place and the joint GDER-PBG virtual meeting was held on the afternoon of April 27, 2023. In attendance at this meeting, which was chaired by Drs. Vaillancourt and Shah, were 46 participants that included PIs, graduate students, postdocs, and technicians from 18 universities and ARS facilities. A total of 14 short talks, which were followed by Q&As were spread over four sessions: (1) Fungal Pathogenicity and Genomics; (2) Wheat and Barley Transformation and Gene Editing; (3) Host Resistance and Susceptibility



Members from both Research Areas come together virtually to develop collaborative ideas for projects in the new FY24 RFP.

Mechanisms: Targets for Enhancing FHB Resistance; (4) Enabling Technologies and Gene Discovery.

The meeting ended with an open discussion on 'Future Directions', at which areas of collaborations between GDER and PBG were discussed including fungal effector discovery and characterization, information on the availability of genotyped fungal strains, and wheat and barley transformation

and editing technologies. The need for wheat and barley mutant populations that can facilitate non-targeted and targeted approaches for identifying FHB resistance-enhancing alleles was identified as a priority. Attendees appreciated the focused interactions and valued the event. The GDER and PBG Committees plan to continue to work collaboratively to advance the goals of the USWBSI. ●

USWBSI Announces Scabinar Rebroadcast Now Available With CEUs

The USWBSI first offered its [Scabinar](#) in 2022 to educate growers, crop consultants, extension, and industry personnel on Fusarium Head Blight (FHB) of wheat and barley and the best way to manage the disease and its associated mycotoxin deoxynivalenol (DON).

Now Scabinar is being rebroadcast for those who missed the live event. Watch the recordings provided on the USWBSI YouTube Channel and take the associated quizzes to earn up to 2 CEUs in integrated pest management.

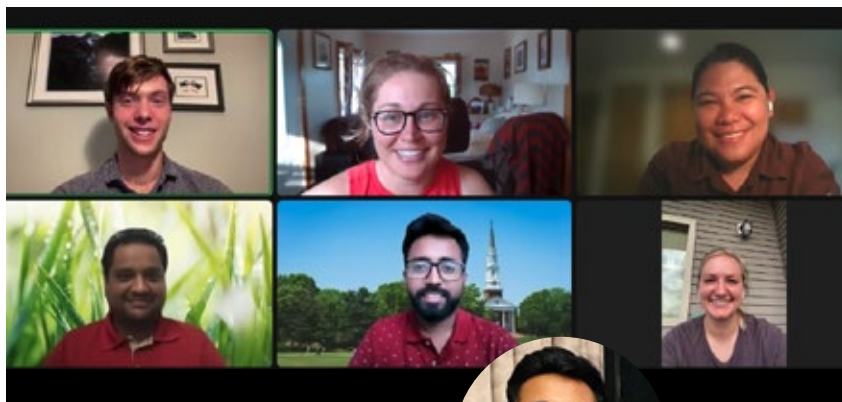
The recordings are available in two parts. In the [Part 1 Recording](#), watch presenter **Tom Baldwin**, from North Dakota State University, explain the pathogen biology of *Fusarium graminearum*, including the spores and mycotoxins produced by the fungus and the types of resistance available in wheat and barley. After the presentation, listen to panelists **Juliet Marshall** (University of Idaho), **Carl Bradley** (University of Kentucky), and **Stephen Wegulo** (University of Nebraska) provide added insights from their perspectives and address questions. Complete the [Part 1 Quiz](#) and earn 1 CEU. In the [Part 2 Recording](#), watch presenter **Kelsey Andersen Onofre**, from Kansas State University, give an overview of the different management methods and some results from the current USWBSI integrated management coordinated project. Listen to Juliet Marshall, **Alyssa Koehler** (University of Delaware), and **Heather Kelly** (University of Tennessee) provide management techniques for their regions and answer important questions. Follow up the video with the [Part 2 Quiz](#) to earn another 1 CEU. ●

ScabNet Hosts Trivia Night for Graduate Students and Post-doctoral Researchers

ScabNet Co-Organizers **Peter Oppenheimer**, North Carolina State University, and **Abbeah Navasca**, North Dakota State University, hosted Trivia Night for graduate students and post-docs on Friday, June 30, 2023 for a fun evening full of questions on FHB, Breeding and Plant Pathology, and Science in Pop Culture. **Shiv Singla**, a recent graduate of University of Nebraska-Lincoln, **Brooke Benz**, North Dakota State University, **Bhavit Chhabra**, University of Maryland shared their trivia talent answering questions that included “When and where was FHB first described?”, “Who discovered jumping genes?”, and “What type of music did Joel Sternheimer, a physicist, composer, and mathematician, create?”

It was a close game, but in the end, **Bhavit Chhabra** took the lead and won with a score of 26 out of 36!

ScabNet hopes to offer another web-based event in the Fall and a social at the [2023 National Fusarium Head Blight Forum](#) in Cincinnati, Ohio. For more details about upcoming events as well as recordings from past webinars visit the [ScabNet webpage](#) and subscribe to the [listserv](#) for all the details. ●



The graduate students and post-doctoral researchers who attended Trivia Night had a fun time competing.

Bhavit Chhabra had the most correct answers and was the evenings winner.

REGISTRATION IS OPEN!

2023
NATIONAL FHB FORUM

scabusa.org/forum23/register

Cincinnati, Ohio
December 3-5, 2023





FUSARIUM HEAD BLIGHT

A New Challenge to Wheat Production in East Africa

PABLO D. OLIVERA FIRPO / Department of Plant Pathology, University of Minnesota and MILTON T. DROTT / USDA-ARS, Cereal Disease Laboratory

Over the last two decades, the threat of rust diseases in East Africa have put this region at the center of the wheat community's attention. East African countries, including Ethiopia and Kenya, have witnessed the re-emergence of wheat stem rust, a disease with devastating impact to smallholder farmers. Virulent races in the Ug99 group have evolved quickly, resulting in localized outbreaks in many years. Additionally, large-scale epidemics in Ethiopia have been caused by other races, like TKTF which affected over 100,000 Ha in 2013. Yellow rust has also challenged wheat production in this region, with the frequent incursion of new races that cause significant yield losses reported every year. A strong international research collaboration has been organized to try to mitigate the devastating effects of these diseases by monitoring pathogen populations and developing wheat cultivars with durable resistance.

Although rust diseases are still a major constraint to wheat and barley production in East Africa, wheat growers in this region of the globe are now facing a new challenge, fusarium head blight (FHB, aka scab). There have been intermittent reports of FHB causing low-impact losses in East Africa since the 1980s. The sporadic nature of this disease has stymied research efforts to identify the species causing FHB, understand the disease epidemiology, and develop new management strategies. However, in recent years, FHB is becoming more prevalent, with severe outbreaks reported in farmer fields and research plots in Ethiopia and Kenya, and new occurrences in Tanzania and Rwanda.

In Ethiopia, FHB is rapidly emerging as one of the most challenging diseases of wheat, limiting production in some areas. Outbreaks have occurred in the last three years, including a severe epidemic in the 2022/23 growing season. FHB has become a major concern to Ethiopian wheat farmers, researchers, and government authorities. These outbreaks



FHB infection at the Debre Zeit National Research Center, Ethiopia in 2022. Photo by Dave Hodson

come at a time when Ethiopia is trying to grow its investment in wheat to achieve self-sufficiency in the commodity. Ethiopia is the largest wheat producer in sub-Saharan Africa. To reduce food insecurity threats, the government of Ethiopia has prioritized domestic wheat production by promoting irrigated wheat and increasing productivity through higher plant density, improved varieties, and nitrogen use. The area covered by irrigated wheat reached 1.32 million Ha in 2022, increasing more than two-fold from 2021 (500,000 Ha). These policies are having a big impact, as Ethiopia is reported not to have imported wheat in 2022. Protecting these production gains against the increasing threat of diseases is a major challenge.

The recent upsurge in FHB is likely the result of a confluence of factors: cropping systems leading to the build-up of inoculum, the use of infected seeds, and climate change. Surveys conducted in the major wheat-growing regions of Ethiopia during the last four years show that more than 50% of the wheat fields surveyed were infected with FHB. In the 2022 cropping season, disease incidence reached up to 90%. Importantly, very high disease severity of FHB was also observed in wheat seed multiplication farms owned by the federal government

and Oromia Seed Enterprise (OSE) during the 2021 season. A lack of disease-free seed poses a serious challenge that could impact the national capacity for sustained wheat production increases. In Ethiopia, there is little information about the *Fusarium* species affecting wheat; similarly, *Fusarium*-associated mycotoxins have not been identified. It is known that some *Fusarium* species are more common in this region (e.g., *Fusarium aethiopicum*), but the role of these fungi in the disease outbreak remains unclear. Wheat cultivars that are popular in Ethiopia including Danda'a, Kakaba, Wane, and Kubsu are highly susceptible to FHB, although most of the current Ethiopian germplasm has not been screened against FHB. A collaboration with USDA-ARS, CIMMYT/EIAR revealed that 68% of 215 East African breeding lines assessed between 2016 and 2018 were highly susceptible to FHB, with fewer than 3% showing consistent resistance (<https://conservancy.umn.edu/handle/11299/211334>). The situation in Kenya is similar, where commercially grown varieties are moderately to highly susceptible to FHB.

As an emerging disease in this region, FHB is unfamiliar to many East African wheat growers and guidance on

East Africa, continued on page 6

disease control from the local scientific community is limited. Many farmers still don't recognize the disease symptoms or understand the risks mycotoxin-contaminated grains pose to human and animal health. However, there have been efforts to build awareness and educate wheat growers about FHB. With financial support from the Ethiopian Ministry of Agriculture, the Ethiopian Institute of Agricultural Research (EIAR) has started an FHB awareness campaign for growers, extensionists, and researchers to provide information about symptom identification and disease management; this program also aims to promote awareness of the food safety threats associated with FHB. Given the limited experience of the East African scientific community with FHB, there is an urgent need to build research capacity. To this end, first contacts have been established between Ethiopian, Kenyan and U.S. scientists (University of Minnesota, USWBSI, USDA-ARS) and international institutions (CIMMYT) to establish research and training partnerships and seek needed financial support. As an example, Dr. **Milton Drott**, from the USDA-ARS Cereal Disease Laboratory, has conducted identification of *Fusarium* species from wheat samples collected by

Ashenafi Gemechu from EIAR in Ethiopia in 2022. Results reveal that the *Fusarium graminearum* species complex is prevalent and that all known trichothecene profiles are present in the wheat growing regions of Ethiopia. The presence of other genera of infected grains, including some mycotoxigenic species, further emphasize a need to understand how interactions between local species may be compounding the threat to food safety and food security in the region. The severity of FHB in Ethiopia is expected to increase further, with the potential to reach epidemic levels in large parts of the country. Indeed, there is great concern about the 2023 growing season: an early start to the rainy season coupled with the build-up of inoculum from last year's outbreak mean that environmental conditions are ripe for FHB. Furthermore, there is a tradition of seed exchanges between farmers in the region; without experience identifying FHB, such exchanges are likely to spread the disease even to fields that have been spared in previous years. Losses to bread and durum wheat and barley production this year may be severe, as these crops typically have lower FHB resistance than other types of wheat. East Africa is in need of international support to

help identify factors contributing to the outbreaks and to develop new strategies to mitigate FHB in order to safeguard food security, improve the well-being of local farmers, and improve global food equity.

The authors thank Dr. **Jemal Tola** and **Ashenafi Gemechu** from EIAR and Dr. **Dave Hodson** from CIMMYT for providing information and photographs.

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PROPOSED UPDATED GUIDELINE

Naming Wheat Genes and Genetics Elements

HIKMET BUDAK / *International Wheat Genome Sequencing Consortium Board Member*

This century is facing huge challenges such as climate change, water shortage, malnutrition, and food safety and security across the world. These challenges can only be addressed by:

- (i) the deliberate application and utilization of cutting-edge technologies
- (ii) and combining/using interdisciplinary and multidisciplinary tools and methods.

For scientists to respond to these challenges in a timely manner, the adoption of new tools and technologies is required and then the technological outcomes must be transformed into "knowledge". It is highly unlikely that we could maintain or meet the demands by 2050 unless we use scientific and technological resources effectively and efficiently. Suffice it to say that we have to use multidisciplinary and interdisciplinary approaches combined with all the available tools for our academic and industry programs. In order to have resilient crops, we have to develop and utilize tools and guidelines available and use heavily by 2050.

On Wednesday, June 7, in a webinar organized by the International Wheat Genome Sequencing Consortium (IWGSC),

Scott Boden (University of Adelaide, Australia) presented the recently published updated set of guidelines for naming newly discovered genes. The webinar recording, as well as PDFs of the slides presented and the Q&A are now available on the [IWGSC website](#).

In this webinar, we discussed proposed [updated guidelines](#) for naming wheat genes and genetic elements to improve communication among breeders and geneticists in both academia and industry. We also discussed how these guidelines could reduce complexity and improve clarity for naming wheat genes and genetic loci in the literature. These updated guidelines would be very beneficial for other cereals if applied. It would be very helpful to receive suggestions and comments from every member of the community and create a discussion platform for bridging the gaps between academia and industry.

REFERENCE

- Boden, S.A., McIntosh, R.A., Uauy, C. et al. Updated guidelines for gene nomenclature in wheat. *Theor Appl Genet* 136, 72 (2023). <https://doi.org/10.1007/s00122-023-04253-w> ●

NOTICE OF RELEASE

Hard Red Spring Wheat Near-Isogenic Line Pairs With/Without *Fhb1*

DAVID GARVIN / University of Minnesota, Adjunct Professor

In 2021 hard red spring wheat near-isogenic line pairs differing by the presence/absence of *Fhb1* were released by USDA-ARS. Several NIL pairs were developed in the backgrounds of the FHB-susceptible cultivars 'Norm' and 'Wheaton' by marker-assisted backcrossing, with the intent of creating a useful resource for FHB resistance research. Selected pairs of the NILs were deposited in the U.S. National Plant Germplasm System at Aberdeen, Idaho, where they were given the accession designations PI 699047 through PI 699054. They are being increased by USDA at Aberdeen in 2023, and seed for distribution should be available from them later this year. Details on the approach used to develop these lines can be found under the "Passport" tab located on each accession's page (<https://npgsweb.ars-grin.gov/gringlobal/search>, use the "advanced" search tab).

For information on availability please contact Dr. Harold Bockelman (USDA-ARS, Aberdeen, Idaho) at: harold.bockelman@ars.usda.gov. Any other questions about these genetic stocks can be sent to David Garvin, the developer, at garvi007@umn.edu.

This research was completed in part with funding from the USWBSI. ●



CALENDAR

USWBSI EVENTS

DECEMBER

3-5 2023 National Fusarium Head Blight Forum, Cincinnati, OH

OTHER EVENTS

AUGUST

9 Sorghum U and Wheat U, Wichita, KS

12-16 APS Plant Health 2023, Denver, CO

OCTOBER

29-Nov 1 ASA, CSSA, SSA International Annual Meeting, St. Louis, MO

NOVEMBER

7-9 National Association of Wheat Growers 2023 Fall Conference, Cincinnati, OH

JANUARY 2024

10-11 AMBA's Barley Improvement Conference, San Diego, CA

23-27 NAWG's Winter Conference, Washington DC



Nate Tyler is a new ORISE intern at the USDA-ARS MPM Unit in Peoria Illinois, who is partially funded by the USWBSI. Tyler is a central Illinois native who graduated in

May from Bradley University with dual degrees in biology and communications with a concentration in journalism. He is working with **Briana Whitaker**, PhD, contributing to the ongoing research into Fusarium Head Blight. After completing his internship, Tyler plans to pursue a graduate degree in biology and become a science journalist. In his free time, he enjoys hiking and using Photoshop to edit photos. ●



COMMUNITY UPDATES

Congrats to Those Receiving Their Degrees in 2023



Joseph Cinderella, MS, University of Delaware, Department of Plant and Soil Sciences. Advisor: **Alyssa Koehler**, PhD. Cinderella graduated in Winter 2023. His

research focused on the diversity and baseline fungicide sensitivity of Fusarium head blight in wheat and malting barley.



Rae Page, PhD, University of Minnesota, Department of Plant Pathology. Advisor: **Brian Steffenson**, PhD. Page graduated in May 2023. Her research focused

on the genetics of Fusarium head blight resistance in barley and rust resistance in the wild wheat relative *Aegilops longissima*.



Shiv Singla, MS, University of Nebraska-Lincoln, Department of Plant Pathology. Advisors: **Stephen Wegulo**, PhD, and **Deanna Funnell-Harris**, PhD. Singla graduated in May 2023. His research

focused on gene expression changes linked to phenylpropanoid-based resistance to Fusarium head blight of wheat. He will be pursuing his PhD at the University of Delaware.

Kudos On Your New Position



Mandy Bish, PhD, started in April 2023 as the new State Extension Field Crop Pathologist at the University of Missouri, Division of Plant Science & Technology.



Alexandria Haafke started a new position in April 2023 as a Senior Research Specialist with **Mandy Bish**, PhD, at the University of Missouri, Division of Plant Science & Technology.



Jamie Nesbit is a new Researcher 3 at the University of Minnesota. Nesbit is working with **Brian Steffenson**, PhD, on fine mapping FHB resistance in a multi-parent population of barley.