



FUSARIUM FOCUS

2023 National FHB Forum Offered Opportunities to Gain New Perspectives and Problem Solve

The Hilton Netherland's Plaza in Cincinnati, Ohio offered a unique historical venue for the 2023 National Fusarium Head Blight Forum.

Nearly 200 researchers, industry/organizational representatives, growers, post-doctoral researchers, graduate students, and guests, from three countries attended the NFHB Forum on December 3-5, 2023. Attendees had the opportunity to participate in six General Sessions, 18 Breakout Sessions, an Early Career game night, two Poster Sessions, and other pop-up meetings.

Ruth Dill-Macky, University of Minnesota plant pathologist and USWBSI researcher co-chair, welcomed attendees to this year's event. While giving the audience some Forum highlights including the new [Code of Conduct](#), Dill-Macky thanked the Forum Organizing Committee (FOC) for their efforts in planning this year's program. In addition, she touched on the USWBSI's new strategic communications plan which was launched in 2023. This past year, the USWBSI has created a free online resource library for extension workers, crop consultants, and grower organizations called the [Communicators](#)

[Tool Kit](#). In addition, the *FHB Tool Talk* email newsletter was launched, and three podcast episodes were recorded with USWBSI-affiliated researchers to share up-to-date information.

Dill-Macky introduced the 2023 Opening Session Speakers with the keynote presentation provided by **Dan Anderson** ([Thoughts From a Fusarium Rookie](#)), followed by the plenary presentation by **Dalton Henry** ([Impact of Fusarium and DON on the Global Import/Export of Wheat](#)). These presentations provided insight into the importance of educating growers about FHB and the impact infected grain can have on global consumption.

Anderson's presentation provided the perspective of a grower who up until 2023 hadn't experienced issues with FHB. As a third-generation family farmer and certified seed dealer, Anderson's family farms around 15,000 acres which includes 4,500 acres of wheat. Typically, northeastern Colorado receives about 18" of rainfall annually. Near record



rainfall was recorded in the Spring of 2023, causing the eighth wettest June on record providing ideal conditions for FHB development. Wet conditions prevailed into summer, extending the growing season, and allowing more time for scab development. It wasn't until post-harvest, however, that the impacts of this disease became apparent. Thrown into unfamiliar territory, Anderson and his family took their own "crash course" in educating themselves about FHB so they could remain a trusted source to their customers. Working with the Colorado State University Seed Lab and seed growers' organizations, the Andersons educated themselves, cleaned and tested their wheat seed, repeating the process until the proper seed viability was reached.

Overall, the family lost 15,000-20,000 bushels, an estimated loss of over \$200,000. The family received lots of questions from their seed clients regarding FHB, what was causing it, and how to treat it. In the end, the one thing the family settled on as an operation was learning more so they can educate others. "We could bury ourselves in information," said Anderson.

Following Anderson's presentation, Henry's presentation provided insight into how DON affects global consumption and trade. U.S. Wheat Associates has 15 offices all working to protect open market trade. Even though it's the most widely grown crop, it is the most heavily traded and shipped commodity. "Wheat consumption has

2023 National Forum, continued on page 2



Ruth Dill-Macky



Dan Anderson



Dalton Henry

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 150 research projects in more than 30 states..

USWBSI Steering Committee

Tom Baldwin, North Dakota State University
Kaitlyn Bissonnette, Cotton Inc., NC
Rick Boyles, Clemson University
Carl Bradley, University of Kentucky*
Alyssa Collins, Pennsylvania State University
Jason Cook, Montana State University
Oswald Crasta, USDA-ARS, MD*
Frankie Crutcher, Montana State University
Ken Davis, Grow Pro Genetics, IL
Ruth Dill-Macky, University of Minnesota**
Yanhong Dong, University of Minnesota
Jeff Edwards, University of Arkansas – SAAESD
Alexis “Lexi” Freier-Johnson, Dakota Growers Pasta Company, MN
Andrew Friskop, North Dakota State University
Joleen Hadrich, University of Minnesota - NCRA
Scott Heisel, American Malting Barley Association, WI*
Rich Horsley, North Dakota State University*
Dustin Johnsrud, North Dakota Wheat Commission
Bryan Jorgenson, South Dakota Wheat Commission
Dave Kendra, Cibus, CA
Louis Kuster, U.S. Durum Growers Association, ND
Richard Magnusson, Magnusson Farms, MN**
Esten Mason, Colorado State University*
Jason McCann, Rahr Malting Co., MN
Reuben McLean, Grain Craft, ID*
Molly Miller, North American Millers’ Association, VA
Gary Muehlbauer, University of Minnesota*
Scott Nelson, North Dakota Barley Council
Paul Sadosky, MillerCoors, WI
Sunish Sehgal, South Dakota State University
Jyoti Shah, University of North Texas
Kevin Smith, University of Minnesota
Clay Sneller, The Ohio State University
Kevin Thorsness, Bayer CropScience, ND
Lisa Vaillancourt, University of Kentucky
Jake Westlin, National Association of Wheat Growers, DC
Steven Xu, USDA-ARS, CA*

Marv Zutz, Minnesota Barley Council

*USWBSI Executive Committee Members

‡USWBSI Co-Chairs

U.S. Wheat & Barley Scab Initiative (USWBSI)

Networking & Facilitation Office (NFO)
Michelle Bjerkness, Director of Operations
495 Borlaug Hall / 1991 Upper Buford Circle / St. Paul, MN 55108

nfo@scabusa.org / 517.290.5023

<https://scabusa.org>

Twitter @USWBSI / LinkedIn #uswbsi

“This forum provided wonderful opportunities...I enjoyed receiving input and new information from scientists holding various perspectives. The breakout sessions offered a unique opportunity to experience what it is like to problem solve as a group when issues are faced in a specific scientific community.” —2023 NFHB FORUM ATTENDEE

remained the same over time with the U.S. still exporting about 50% of our production on a regular basis,” said Henry. Years with high DON levels are sole drivers for dips in exports over time due to importers such as the European Union, Egypt, and China all having lower detection levels.

U.S. wheat exports are currently at a 50-year low. But there were a lot of production challenges this season, mainly from the drought. “While we have seen a lot of success there is always work to be done because the world consumes more and more wheat every year,” said Henry. Over the last decade, there has been a 100-million-ton increase in global wheat consumption. “That’s a big increase and it continues on now,” added Henry.

Following the Opening Session, Sunday, Monday, and Tuesday General Sessions featured [seventeen relevant invited presentations](#) covering topics ranging from analysis of the fungicide trials data, the role of gamillin in immune response, breeding for resistance, *Fusarium* diversity in Illinois and Canada, immune signaling pathways activated upon pathogen reception, structural diversity of trichothecenes, and multi-toxin testing. General Sessions were moderated by the Forum Organizing

Committee (FOC) members with live question and answer sessions following each presentation. A full list of the presenters and their [presentation abstracts are available online](#).

Included in this year’s presentations were five speakers funded through the Transformational Science (TSCI) Research Category in FY21; **Barney Geddes**, from North Dakota State University, presented on unlocking the barley microbiome to provide resources for managing FHB such as identifying biocontrol agents ([The Impact of Environment, Host Genotype and Fusarium Head Blight on Microbiome Assembly in a Barley Breeding Population](#)); **Cory Hirsch**, from the University of Minnesota, showed the benefits of using a rover compared to human rating of FHB in a field-based experiment ([Rover Based Field Detection and Quantification of FHB](#)); by leveraging the practical haplotype graph, **Katherine Jordan**, from the USDA-ARS, explained how this bioinformatics tool could be used to create a customized database for FHB resistance alleles ([Haplotype-Informed Associations of FHB Resistance in U.S. Wheat Breeding](#)); **Wanlong Li**, of South Dakota State University, presented his project on developing a binary vector for



General Session Q & A

Transformational
Science Research
speakers



Barney Geddes



Cory Hirsch



Katherine Jordan



Wanlong Li



Mohsen Mohammadi

transferring *Fhb7* from wheat into barley marker-free to improve the resistance ([Marker-Free Transfer of *Fhb7* to Barley](#)); and finally **Mohsen Mohammadi**, Purdue University, explained his project on using graphene quantum dots to mediate the delivery of dsRNA for spray-induced gene silencing to control FHB in the host ([Graphene Quantum Dots \(GQDs\) Mediated dsRNA Delivery for the Control of Fusarium Head Blight in Wheat](#)).

There were two live poster sessions at the 2023 NFHB Forum on Sunday and Monday evening. During these sessions, fifty-five poster authors presented their research to other attendees during the reception. Attendees could also view posters in an online format using the Virtual Poster Room prior and during the Forum. Of these presenters, 15 graduate

student and post-doctoral researcher poster authors were selected to present Flash and Dashes during the General Sessions on Sunday and Monday.

Monday morning was broken out into a series of breakout sessions organized by Research Category. Chairs of the breakouts led discussions related to ideas for new research projects, changes to coordinated projects needed in the next round of funding, etc. In addition to Research Category Breakout Sessions, sessions were offered around the topics of the T3 Breeders Database Workshop, a Nuts & Bolts Workshop for students and post-docs, and Regional Genotyping Labs discussions to allow breeders to communicate their needs. On Sunday evening, a group of researchers met to discuss stem rust and hear updates on

Special Thanks to the USWBSI 2023 Forum Organizing Committee

CO-CHAIRS

Alyssa Collins, The Pennsylvania State University and Esten Mason, Colorado State University

MEMBERS

FHB MANAGEMENT

Alyssa Koehler, University of Delaware and Kelsey Andersen Onofre, Kansas State University

FOOD SAFETY & TOXICOLOGY

Jiajia Rao, North Dakota State University and Dave Kendra, Cibus

GENE DISCOVERY AND ENGINEERING RESISTANCE

Nidhi Rawat, University of Maryland and Matt Helm, USDA-ARS

PATHOGEN BIOLOGY AND GENETICS

Imane Laraba, Agriculture and Agri-Food Canada and Hye-Seon Kim, USDA-ARS

VARIETY DEVELOPMENT AND HOST RESISTANCE

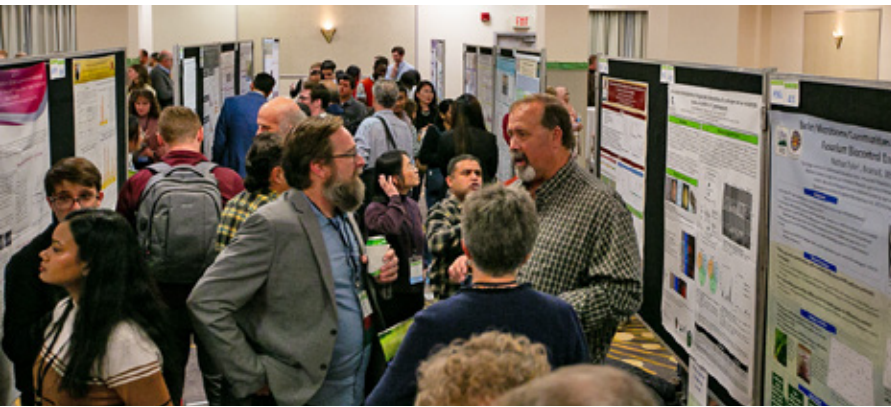
Shengming Yang, USDA-ARS and Jason Fiedler, USDA-ARS



Breakout Session



General Session audience



breeding for resistance in wheat and barley. The National Wheat Improvement Committee also met onsite (see pg. 10 for details).

Several attendees took the opportunity to network outside of scheduled sessions and arranged small meeting groups in the balcony above the Hall of Mirrors. Groups of people could be seen chatting or having private conversations in this space throughout the meeting. Besides networking during the Poster Sessions, on Monday evening, ScabNet (a network of USWBSI graduate students and post-docs) hosted a game night in the Hospitality Room for graduate students and post-doctoral researchers to interact with one another (See ScabNet article on pg. 9 for full story).

Richard Magnusson, Roseau, MN grower and USWBSI stakeholder co-chair, provided the Closing Session remarks. Magnusson offered a special



Richard Magnusson



Scabnet Game Night

thank you to all the Forum sponsors, which help make the event enjoyable. In addition, he thanked the FOC Chairs and members for organizing such a wonderful event and for the community for continuing to attend. Without them this event wouldn't be possible.

As a reminder, abstracts of all the presentations and posters continue to be

available in the online [2023 NFHB Forum Abstract Viewer](#). If you need to reference material presented during the Forum, the full [2023 NFHB Forum Proceedings](#) are also now published. An assortment of photos from the 2023 NFHB Forum were also captured, if you haven't already, make sure to check out the [online album](#). ●

Thank you sponsors

2023 NFHB FORUM FUNDING AGENCY



Agricultural Research Service
U.S. DEPARTMENT OF AGRICULTURE

2023 NFHB FORUM DINNER SPONSOR



2023 NFHB FORUM POSTER AWARD SPONSOR



NORTH AMERICAN MILLERS ASSOCIATION

2023 NFHB FORUM GENERAL SUPPORT SPONSORS



2023 NFHB FORUM RECEPTION SPONSORS



A New Spin on the NFHB Forum Poster Competition Provided More Recognition

The Poster Competition returned for the fourth year at the 2023 NFHB Forum. This year's competition featured 22 posters across five research categories presented by 16 graduate students and 6 post-doctoral researchers. 26 judges evaluated the posters in two rounds of judging to determine the top three graduate student and post-doctoral researcher winners.

For the first time this year, the second round of judging took place during the Flash-and-Dash Sessions onsite in Cincinnati, Ohio. Five judges evaluated the top five graduate students and post-doctoral researchers during quick three-minute presentations followed by one question from the judges. Scores were tallied swiftly to announce the winners at the end of Monday's General Sessions. Awards were presented by **Richard Magnusson**, Minnesota grower and USWBSI stakeholder co-chair, and **Molly Miller**, vice-president of regulatory and technical affairs for the North American Millers' Association (NAMA).

The awardees were recognized by their peers during the second Poster Session and Reception, Monday evening. Cash prizes, sponsored by NAMA, were awarded to the top 3 finalists in each category: 1st Place - \$500, 2nd Place - \$300, and 3rd Place - \$200. A huge thank you to NAMA, for generously providing these cash prizes for all the awardees.

The winners were all appreciative of their awards and grateful for the opportunity to present their research. From feedback received, the graduate students and post-docs appreciated the



L to R: Richard Magnusson (USWBSI Grower Co-Chair), Molly Miller (North American Millers' Association Representative), Peter Oppenheimer, Yejune Moon, Isha Mittal, Ruth Dill-Macky (USWBSI Researcher Co-Chair), Adenike Ige, Lovepreet Singh, and Charlotte Brault.]

opportunity to showcase their research and enjoyed this year's version of the Poster Competition. The USWBSI looks forward to organizing the competition again in 2024, details will be available in the coming months.

Congratulations to the 2023 NFHB Forum Poster Competition Winners

POST-DOCTORAL RESEARCHER AWARDEES

- 1st Place: **Lovepreet Singh**, University of Minnesota, Gene Discovery and Engineering Resistance, "High Resolution Melting (HRM) Assay for Rapid Identification and Differentiation of the *Fusarium graminearum* NX-2 Chemotype"
- 2nd Place: **Charlotte Brault**, University of Minnesota, Variety Development and Host Resistance, "Genomic Prediction for Fusarium Head Blight Resistance in the Hard Red Spring Wheat Uniform Regional Scab Nursery"
- 3rd Place: **Adenike Ige**, University of Minnesota, Variety Development

and Host Resistance, "Investigating the Potential of Weighted Genomic Relationship Matrix in Optimizing Prediction Accuracy of Deoxynivalenol Accumulation in Barley"

GRADUATE STUDENTS AWARDEES

- 1st Place: **Peter Oppenheimer**, North Carolina State University, FHB Management, "Introducing Synthetic Spike-In Metabarcoding: a Novel, Sensitive, and Quantitative Method for Identifying *Fusarium* Species"
- 2nd Place: **Isha Mittal**, University of North Texas, Gene Discovery and Engineering Resistance, "Dual RNA-Sequencing Analysis of Lpx3 Conferred Resistance in Wheat During *Fusarium graminearum* Infection"
- 3rd Place: **Yejune Moon**, North Dakota State University, Food Safety and Toxicology, "Matrix Effect in Quantitative Analysis of DON and DON-3-glucoside in Wheat, Barley, and Malt Using Liquid Chromatography-Mass Spectrometry"

To learn more about this year's poster winner's check out the [January Featured Researcher posting](#). ●

Special Thanks to All the 2023 Poster Judges

Guihua Bai, USDA-ARS
Mandy Bish, University of Missouri
Mark Busman, USDA-ARS
Xiwen Cai, USDA-ARS
Rong Di, Rutgers, the State University of New Jersey
Paul Esker, The Pennsylvania State University
Milton Drott, USDA-ARS
William Hay, USDA-ARS
Zhao Jin, North Dakota State University
David Kendra, Cibus

Xuehui Li, North Dakota State University
Shuyu Liu, Texas A&M University
Chris Maragos, USDA-ARS
Ashley McFarland, American Malting Barley Association
John McLaughlin, Rutgers, the State University of New Jersey
Santiago Mideros, University of Illinois
Dennis Pennington, Michigan State University
Nicholas Santantonio, Virginia Tech

Madalyn Shires, South Dakota State University
Erick Stockinger, The Ohio State University
Frances Trail, Michigan State University
Harold Trick, Kansas State University
Martha Vaughan, USDA-ARS
Stephen Wegulo, University of Nebraska-Lincoln
Shengming Yang, USDA-ARS
Shaobin Zhong, North Dakota State University

If you are interested in serving as a poster judge for future competitions, please contact [Amber Hoffstetter](#).

2023 FHB Disease Impact Update Available

The U.S. Wheat and Barley Scab Initiative's (USWBSI) *2023 Fusarium Head Blight Disease Impact Update* was released on November 8, 2023. **Amber Hoffstetter**, PhD, USWBSI research technical specialist, once again authored this year's article. Commentary from experts in 31 states indicated Fusarium head blight (FHB, scab) did not impact grain yield or quality for most growers in the U.S. A few states experienced FHB development in isolated regions where it's typically not a concern. Other states reported FHB concerns in late planted crops and organically managed small grains. In most cases, growers were able to mitigate FHB using fungicide applications and management practices.

"It's great to see that management practices, the risk tools, and new varieties with improved resistance, developed by experts collaborating with the USWBSI, are reducing the risk of FHB when

implemented by U.S. growers," noted **Ruth Dill-Macky**, USWBSI research co-chair. Growers and researchers utilize the information provided by the USWBSI to make production decisions, plan research in the coming years, identify issues that may need attention, and validate tools used to mitigate FHB including the Fusarium Risk Tool, fungicides, and crop varieties.

The Fusarium Head Blight Disease Impact Update provides an annual report of the crop growing conditions as well as the impact of FHB on wheat and barley in different regions of the United States. Additionally, photographs of these cereal crops were included to highlight specific crop conditions. The USWBSI has been releasing this update article annually since 2010 to provide insights into the experiences that small grains growers had with FHB during the most recent growing season.



For growing season updates subscribe to the [FHB Alerts](#) for the most up-to-date information on issues regarding FHB by state experts. ●

MARK YOUR CALENDARS

2024 National FHB Forum Heading to Austin, Texas

The 2024 National Fusarium Head Blight Forum will be held December 8-10, 2024, in Austin, Texas at the [AT&T Hotel and Conference Center](#). Conveniently located on the University of Texas at Austin's campus, visit colleagues, the Blanton Museum of Art, or the Bullock Texas State History Museum all within walking distance of the Hotel. The Austin-Bergstrom International Airport is just 25 minutes from the property. So, grab a cab, lyft, or uber, and enjoy all the city has to offer at the 2024 NFHB Forum! Mark your calendars, check the USWBSI [ScabUSA](#) website, and watch your email for more information as it becomes available. ●



Easily spread FHB facts with the Communicators' Tool Kit

scabusa.org/communicators-tool-kit



Simple resources for educators, consultants, and organizations to use or share with growers directly, including:

- fungicide timing postcards
- + integrated management slides
- + FHB Tool Talk newsletter issues
- + podcast episodes
- + photos

USWBSI Featured Researchers 2023 Highlights

Special thanks to the following individuals who were highlighted this year for their contributions to the FHB community. If you haven't had a chance to visit yet, links to all the past featured researchers are available on the [USWBSI Featured Researcher archives page](#). Have an idea for a featured researcher? Send your suggestions to amber.hoffstetter@scabusa.org.

Here is a listing of all the individuals that were featured in 2023:

2023	
2022 NFHB Forum Poster Competition Winners	JAN
	FEB ● Zhao Jin , North Dakota State University, Fargo, ND
Sue Mondal , Montana State University, Bozeman, MT	MAR ●
	APR ● Oswald Crasta , USDA-ARS, Beltsville, MD
Madalyn Shires , South Dakota State University, Brookings, SD	MAY ●
	JUN ● Thomas Baldwin , North Dakota State University, Fargo, ND
Kelsey Andersen Onofre , Kansas State University, Manhattan, KS	JUL ●
	AUG ● Scott Heisel , American Malting Barley Association, Milwaukee, WI
Paul Murphy , North Carolina State University, Raleigh, NC	SEP ●
	OCT ● Carrie Maune , Trilogy Analytical Laboratory, Washington, MO
Elizabeth Brauer , Agriculture Agri-Food Canada, Ottawa, Ontario	NOV ●
	DEC ● Erick De Wolf , Kansas State University, Manhattan, KS
2024	
2023 NFHB Forum Poster Winners	JAN ●
	FEB ● Wanlong Li , South Dakota State University, Brookings, SD



MARK YOUR CALENDARS

Scabinar 2024: Focus on Fungicides

Scabinar 2024 will feature experts from across different wheat and barley production regions in the U.S. who will provide the most current information on managing Fusarium head blight in wheat and barley. Building upon the information presented in 2022, Scabinar 2024 will focus on fungicides and their use for management of Fusarium head blight and associated mycotoxins that can contaminate grain. Information will be provided through presentations and panel discussions and will feature results of fungicide application timing and efficacy research trials in wheat and barley, fungicide resistance monitoring efforts, and much more. Scabinar 2024 will be held live on March 13, 10:00 AM – 12:00 PM central time, and Certified Crop Adviser (CCA) continuing education units (CEUs) will be offered. Registration is necessary to join Scabinar 2024 live, but it is free for all attendees. Scabinar 2024 also will be recorded to view at a later date, and CEUs will be offered for the recorded version as well. ●

DID YOU KNOW...

DISEASE MANAGEMENT

PIs in 20 states conducted Integrated Management trials to evaluate new fungicide chemistries for growers

2023 USWBSI Publications

Twenty-eight publications associated with USWBSI funding were published this past year. Take some time to read some of these impressive articles.

- Adeyemo, E., Conley, E. J., Bernardo, R., Bajgain, P., & Anderson, J. A. (2023). Combining datasets to routinely predict fusarium head blight resistance in a wheat breeding program. *Crop Science*, 63(3), 1197–1208. <https://doi.org/10.1002/csc2.20929>
- Bethke, G., Huang, Y., Hensel, G., Heinen, S., Liu, C., Wyant, S. R., Li, X., Quin, M. B., McCormick, S. P., Morrell, P. L., Dong, Y., Kumlehn, J., Salvi, S., Berthiller, F., & Muehlbauer, G. J. (2023). UDP-glucosyltransferase HvUGT13248 confers type II resistance to *Fusarium graminearum* in barley. *Plant Physiology*, 193(4), 2691–2710. <https://doi.org/10.1093/plphys/kiad467>
- Bian, R., Liu, N., Xu, Y., Su, Z., Chai, L., Bernardo, A., St. Amand, P., Fritz, A. K., Zhang, G., Shoup, J. L., Akhunov, E., Jordan, K., & Bai, G. (2023). Quantitative trait loci for rolled leaf in a wheat EMS mutant from Jagger. *Theoretical and Applied Genetics*, 136(3). <https://doi.org/10.1007/s00122-023-04284-3>
- Boyles, R., Ballén-Taborda, C., Brown-Guedira, G., Correia, M., Cowger, C., DeWitt, N., Griffey, C. A., Harrison, S. A., Ibrahim, A., Johnson, J., Lyerly, J., Marshall, D., Mason, R. E., Mohamed, M., Murphy, J. P., Santantonio, N., Saripalli, G., Sutton, R., Tiwari, V. K., & Van, D. A. (2023). Approaching 25 years of progress towards *Fusarium* head blight resistance in southern soft red winter wheat (*Triticum aestivum* L.). *Plant Breeding*, 1–16. <https://doi.org/10.1111/pbr.13137>
- Cowger, C., Read, Q. D., Clark, L. W., & Dong, Y. (2023). Optimal Timing of Fungicide Application to Manage Fusarium Head Blight in Winter Barley. *Plant Disease*, 107(7), 2054–2060. <https://doi.org/10.1094/pdis-01-23-0021-re>
- Crutcher, F. K., Lamb, P. F., Nash, D. B., Fiedler, J. D., Eberly, J. O., Kephart, K. D., McVay, K., Torrión, J. A., Beiermann, C. W., Vetch, J. M., Chen, C., Hohen, D., Blake, N. K., Heo, H., & Cook, J. P. (2023). Registration of ‘MT Sidney’ hard red spring wheat. *Journal of Plant Registrations*, 17(2), 368–375. <https://doi.org/10.1002/plr2.20268>
- Ding, Y., Zhang, F., Sun, F., Liu, J., Zhu, Z., He, X., Bai, G., Ni, Z., Sun, Q., & Su, Z. (2023). Loss of *OsHRC* function confers blast resistance without yield penalty in rice. *Plant Biotechnology Journal*, 21(8), 1516–1518. <https://doi.org/10.1111/pbi.14061>
- Gill, H. S., Brar, N. K., Halder, J., Hall, C., Seabourn, B. W., Chen, Y. R., St. Amand, P., Bernardo, A., Bai, G., Glover, K. D., Turnipseed, B., & Sehgal, S. K. (2023). Multi-trait genomic selection improves the prediction accuracy of end-use quality traits in hard winter wheat. *The Plant Genome*. <https://doi.org/10.1002/tpg2.20331>
- Green, A. J., Mohamed, M., Frohberg, R. C., Underdahl, J., Walz, A., Selland, T., Ribeiro, L., Simsek, S., Otteson, B., Heilman-Morales, A. M., Murillo, D., Friskop, A., Rickertsen, J., Ostlie, M., Schatz, B., Hanson, B., Mehlhoff, R., Eriksmoen, E., Martin, G. B., & Fiedler, J. D. (2023). Registration of ‘ND Frohberg’ hard red spring wheat. *Journal of Plant Registrations*, 17(2), 385–396. <https://doi.org/10.1002/plr2.20291>
- Hao, G., Naumann, T. A., Chen, H., Bai, G., McCormick, S. P., Kim, H., Tian, B., Trick, H. N., Naldrett, M. J., & Proctor, R. H. (2023). *Fusarium graminearum* Effector FgNls1 Targets Plant Nuclei to Induce Wheat Head Blight. *Molecular Plant-Microbe Interactions*, 36(8), 478–488. <https://doi.org/10.1094/mpmi-12-22-0254-r>
- Hu, G., Evans, C. P., Satterfield, K., Ellberg, S., Marshall, J. M., Schroeder, K. L., & Obert, D. E. (2023). Registration of ‘GemCraft’ spring malting barley cultivar. *Journal of Plant Registrations*. <https://doi.org/10.1002/plr2.20331>
- Jiang, H., Qi, X., Zhong, S., Schwarz, P., Chen, B., & Rao, J. (2023). Effect of treatment of *Fusarium* head blight infected barley grains with hop essential oil nanoemulsion on the quality and safety of malted barley. *Food Chemistry*, 421. <https://doi.org/10.1016/j.foodchem.2023.136172>
- Karmacharya, A., Li, D., Leng, Y., Shi, G., Liu, Z., Yang, S., Du, Y., Dai, W., & Zhong, S. (2023). Targeting disease susceptibility genes in wheat through wide hybridization with maize expressing Cas9 and guide RNA. *Molecular Plant-Microbe Interactions*, 36(9), 554–557. <https://doi.org/10.1094/mpmi-01-23-0004-sc>
- Li, X., Liu, D., Xuan, Y., He, Z., Zhao, L., Hao, Y., Ge, W., Xu, S., Hou, B., Wang, B., Guo, J., Liu, W., Li, M., Han, Y., Bo, C., Bao, Y., Qi, Z., Xu, S. S., Bai, G., & Wang, H. (2023). Elimination of the yellow pigment gene *PSY-E2* tightly linked to the *Fusarium* head blight resistance gene *Fhb7* from *Thinopyrum ponticum*. *Crop Journal*, 11(3), 957–962. <https://doi.org/10.1016/j.cj.2022.12.005>
- Machado, F. J., de Barros, A. V., McMaster, N., Schmale, D. G., Del, E. M., & Vaillancourt, L. J. (2023). A multivariate analysis of phenotypic traits of strains of *Fusarium graminearum* and *F. meridionale* supports structure by species. *Plant Pathology*, 72(6), 1111–1121. <https://doi.org/10.1111/ppa.13720>
- Moraes, W. B., Madden, L. V., Baik, B.-K., Gillespie, J., & Paul, P. A. (2022). Environmental Conditions after *Fusarium* Head Blight Visual Symptom Development affect Contamination of Wheat Grain with Deoxynivalenol and Deoxynivalenol-3-Glucoside. *Phytopathology*, 113(2). <https://doi.org/10.1094/phyto-06-22-0199-r>
- Navasca, A. M., Dangi, S., Baldwin, S. A., Zhao, J., & Baldwin, T. (2023). Development and Validation of a Taq-man Multiplex qPCR Assay for High-Throughput Quantification of *Fusarium graminearum* Biomass in Barley Spikes and Grains. *Plant Health Progress*. <https://doi.org/10.1094/php-07-23-0065-rs>
- Omara, S., Broz, K., Schwister, E. M., Singh, L., Dong, Y., Elmore, J. M., & H. Corby Kistler. (2023). The *Fusarium graminearum* transporters *Abc1* and *Abc6* are important for xenobiotic resistance, trichothecene accumulation, and virulence to wheat. *Phytopathology*, 113(10). <https://doi.org/10.1094/phyto-09-22-0345-r>
- Qi, X., Chen, B., & Rao, J. (2023). Natural compounds of plant origin in the control of fungi and mycotoxins in foods. *Current Opinion in Food Science*, 52, 101054–101054. <https://doi.org/10.1016/j.cofs.2023.101054>
- Qi, X., Zhong, S., Schwarz, P., Chen, B., & Rao, J. (2023). Mechanisms of antifungal and mycotoxin inhibitory properties of *Thymus vulgaris* L. essential oil and their major chemical constituents in emulsion-based delivery system. *Industrial Crops and Products*, 197, 116575–116575. <https://doi.org/10.1016/j.indcrop.2023.116575>
- Sallam, A. H., Haas, M., Huang, Y., Tandukar, Z., Muehlbauer, G. J., Smith, K. P., & Steffenson, B. J. (2023). Meta-analysis of the genetics of resistance to *Fusarium* head blight and deoxynivalenol accumulation in barley and considerations for breeding. *Plant Breeding*, 1–24. <https://doi.org/10.1111/pbr.13121>
- Shah, D. A., De, D., Paul, P. A., & Madden, L. V. (2023). Into the trees: random forests for predicting *Fusarium* head blight epidemics of wheat in the United States. *Phytopathology*, 113(8), 1483–1493. <https://doi.org/10.1094/phyto-10-22-0380-r>
- Singh, L., Sinha, A., Gupta, M., Xiao, S., Hammond, R. W., & Rawat, N. (2023). Wheat Pore-Forming Toxin-Like Protein Confers Broad-Spectrum Resistance to Fungal Pathogens in *Arabidopsis*. *Molecular Plant-Microbe Interactions*, 36(8), 489–501. <https://doi.org/10.1094/mpmi-12-22-0247-r>
- Van Sanford, D. A., Clark, A., Bradley, C. A., Brown-Guedira, G., Cowger, C., Dong, Y., & Baik, B. (2023). Registration of ‘Pembroke 2021’ soft red winter wheat. *Journal of Plant Registrations*, 17(2), 376–384. <https://doi.org/10.1002/plr2.20271>
- Wang, R., Axtman, J., Leng, Y., Salsman, E., Hegstad, J., Fiedler, J. D., Xu, S., Zhong, S., Elias, E., & Li, X. (2023). Recurrent selection for *Fusarium* head blight resistance in a durum wheat population. *Crop Science*, 00-00. <https://doi.org/10.1002/csc2.21179>
- Winn, Z. J., Lyerly, J., Brown-Guedira, G., Murphy, J. P., & Mason, R. E. (2023). Utilization of a publicly available diversity panel in genomic prediction of *Fusarium* head blight resistance traits in wheat. *The Plant Genome*, 16(3). <https://doi.org/10.1002/tpg2.20353>
- Wu, J., Ackerman, A., Gaire, R., Chowdhary, G., & Rutkoski, J. (2023). A neural network for phenotyping *Fusarium*-damaged kernels (FDKs) in wheat and its impact on genomic selection accuracy. *Plant Phenome Journal*, 6(1). <https://doi.org/10.1002/ppj2.20065>
- Xu, Y., Li, Y., Bian, R., Zhang, G., Fritz, A. K., Dong, Y., Zhao, L., Xu, Y., Ghori, N., Bernardo, A., St. Amand, P., Shoup, J. L., Bruce, M., Wang, W., Akhunov, E., Carver, B. F., & Bai, G. (2023). Genetic architecture of quantitative trait loci (QTL) for FHB resistance and agronomic traits in a hard winter wheat population. *Crop Journal*. <https://doi.org/10.1016/j.cj.2023.09.004> ●

Tips for Creating Your Scientific Poster with Dr. Monica Lewandowski

On the evening of Thursday, October 5, 2023, 23 people joined the online webinar hosted by ScabNet with **Monica Lewandowski**, from The Ohio State University to learn more about creating a scientific poster. **Peter Oppenheimer**, ScabNet co-organizer, introduced Lewandowski whom then started off the evening by reminding everyone that there were stopping points for questions and that the webinar was being recorded to review at a later time. When creating a scientific poster, the first tip is to establish your core message and make it obvious. “Sometimes your research message is obvious to you but may not be obvious to others new to the topic”, said Lewandowski. Your poster is not a research article. Remember to use white space (i.e. margins, length of paragraphs, line spacing, space around figures) to make it easier to read. It’s important to include white space because only 20% of text is remembered. When editing your poster, make sure to think about your core message and keep it at the center of your focus when designing. “Eye-catching graphics or illustrations can help get people interested in your poster,” reminded Lewandowski. The ideal poster color pallet uses maximum three colors.

Poster authors should carefully select and edit the data and images to use and limit the poster word count to approximately 1,000 words. Figure titles are very important and can help explain the main point of your figures. Lewandowski reviewed three things to consider when creating a graph: 1. Do you need a graph? Sometimes your message can be summarized in a sentence or two. 2. What types of variables do you have? Knowing your variables and the statistical analysis will guide you on deciding what type of graphs to use. 3. What is your message? Graphs should clearly communicate the message you are trying to convey. Putting labels in your graphics can make it easier for readers to get the main message. Visual articles, also



called visual abstracts and graphical abstracts, are ways to make research into infographics. “It’s easy to read and easy to skim,” says Lewandowski. Key points to include are 1. the questions, 2. the findings, and 3. the meaning.

Remember, it’s important to get feedback on your poster. Printing out your poster before sending it to the printer may help you see things you missed on screen. Ask others, especially those unfamiliar with your research, if your message and figures are clear. Finally, review the content to make sure it is supporting your core message.

Attendees asked questions throughout the presentation. One question was “Is it a must to cite articles in a poster? If it is, must the author list the references?” Lewandowski said “Yes, you should cite references and give them credit, but one way to save space is to provide a QR code for people to view a google document of references.”

You can [view the recording](#) now, or for more information about upcoming events visit the [ScabNet](#) webpage. ●

ScabNet Holds a Night of Fun and Games at the 2023 NFHB Forum

Nearly 30 graduate students and post-doctoral researchers attended a social event held at the 2023 National Fusarium Head Blight Forum. Those who attended had a fun evening playing UNO, Scattergories, and Express Yourself. The most fun was had with the game Pass the Action. **Abbeah Navasca**, ScabNet co-organizer, was the leader coming up with new categories and words. Each team had to then interpret the word into an action and pass it down the line through their team members. The last person in line then had to race back to Navasca, repeat the action, and say what they thought it was. Many laughs were had as actions altered throughout the line. The group enjoyed snacks and sodas while in good company. To receive more information about upcoming ScabNet events join the [email listserv](#).

ScabNet is a USWBSI network of graduate students and post-docs whose goal is to provide educational, career, and social opportunities for those in FHB research and beyond. The focus of ScabNet is to bring together the current generation of graduate students and post-docs with other members of this community to provide information on relative topics. ●



A fun night was had by all at the graduate student and post-doctoral researcher game night hosted by ScabNet.



2024 Fusarium Lab Workshop

The 23rd Fusarium Laboratory Workshop will be held in the Plant Pathology Department of Kansas State University in Manhattan, Kansas from June 23-28, 2024. This workshop is taught by international *Fusarium* experts. Topics covered in this workshop include: (i) morphological characters for strain identification, (ii) molecular characters for strain identification, (iii) species concepts, (iv) mating type and crosses, (v) VCG analyses, (vi) strain preservation, and (vii) mycotoxins. More than half of the time will be spent in the laboratory working with standard strains. Participants may bring some of their own strains (please contact **John Leslie** to arrange for proper USDA permits). Students are eligible for a limited number of slots with a reduced registration fee. To be added to the distribution list for electronic information on the workshop please contact: LeslieLab@ksu.edu. ●

Norgrains Meets to Discuss Big6 Test

CLAY SNELLER / *The Ohio State University*

The members of Norgrains met during the 2023 NFHB Forum to discuss their coordinated Big6 test, a project partially funded by NIFA. The Big6 test is a cooperative trial of 360 lines and grown in IL, IN, KY, MI, OH, and NY. The test was conducted in 2023 and will also be conducted in 2024, and 2025, each year with mostly new lines. Pls discussed many results from 2023 including performance of lines, new releases, planned seed increases, use of genomic selection, stability and GxE, spatial analysis, population structure, and a possible sparse testing experiment. **Jessica Rutkoski** presented on the use of factor analyses. ●

2023 Barley Variety Survey Maps Posted

The American Malting Barley Association's results of 2023 contracted malting barley is now posted. The data for the major barley producing states is combined and reported as percentages of the acreage planted by state and crop reporting districts. [View the AMBA 2023 Variety Survey Maps](#). ●

National Wheat Improvement Committee Holds 2023 Winter Meeting in Cincinnati

JOCHUM WIERSMA / *Department of Agronomy and Plant Genetics, University of Minnesota*

The National Wheat Improvement Committee held its winter business meeting immediately following the U.S. Wheat and Barley Scab Initiative's National Fusarium Head Blight Forum in Cincinnati. Beyond the regional reports that highlighted production challenges (and thus research needs) which included heat and drought, wheat stem sawfly, hessian fly, and stripe rust, the committee was updated on the USDA-ARS budget situation, the backfilling of open USDA-ARS positions, and activities of the G20's Wheat Initiative (wheatinitiative.org).

Furthermore, the committee was informed that USDA-APHIS has not yet completed its risk analysis and review of the Barberry PPQ program. The current Barberry PPQ program has been in place since the late eighties and is an integral part of the U.S. strategy to reduce or eliminate the risk of severe stem rust epidemics in the U.S.

Serendipitously, while giving an update about the status of the UG99 family of stem rust races, **Yue Jin** had relayed during the UG99 Stem rust meeting on Sunday evening that there was more stem rust found in the Great Plains this year than he had seen in years. The adoption of varieties with the CoAXium herbicide resistance trait that are also susceptible to stem rust in areas beyond the high plains of Colorado is partially debit to this unnerving observation but probably not the only reason. The very warm weather experienced last winter in the normal overwintering areas of stem rust that include Louisiana and southern Texas allowed for more generations of the disease thereby increasing the number of spores ready to take the Puccinia highway north. Taken together, there are serious worries among the membership that the relative quiet we have enjoyed for three decades might not last forever and that strategic and spatial deployment of effective stem rust resistance genes should be championed by NWIC and the membership regions.

The Committee also discussed the new exemptions for genetically engineered crops that USDA-APHIS proposed on November 15th ([see here](#)). While autopolyploids are included in this second iteration, the proposed rules fall well short of what is needed to allow wheat and other allopolyploid species to take advantage of the new gene editing tools. The discussion resulted in the formation of a committee that will submit a formal comment.

Next, the Committee discussed the progress made toward funding the Wheat Resiliency Initiative (WRI). The WRI seeks to find new federal funding for Wheat Stem Sawfly, Hessian fly, stripe rust, and Bacterial leaf streak research. At this point, \$1 million of the \$5.6 million total ask is mentioned in the appropriations language in both the House and Senate. Whether that funding will become available this coming fiscal year remains to be seen. To further the chances of receiving additional funding the NWIC committee members with the help of producers will storm Capitol Hill again on March 19th and 20th. Contact **Jochum Wiersma** (wiers002@umn.edu) if you are interested in joining us.

Finally, the National Wheat Improvement Committee created a U.S. Wheat Workers email communications channel using Mailchimp that is analogous to the National Barley Improvement Committee's U.S. Barley Workers communications channel in both setup and purpose. If you have not received an email with the invitation to not unsubscribe or the email to submit your comments to the proposed rules discussed above, contact Jochum Wiersma and he'll be happy to add you to the roster. ●



2023 Variety and Germplasm Releases

The USWBSI was recently notified of the following successful variety and germplasm releases in 2023 as a result of funding provided through the Initiative. For more information, please connect directly with the contact noted.

'GA20E36'

A moderate R/S FHB (*Fhb_1A_Ne*) soft red winter wheat variety released by the University of Georgia. GA20E36 has high grain yield, good/average test weight, good milling and baking attributes, medium-late maturity, very good rusts disease resistance (*Yr17/Lr37/Sr38, Lr18, Yr4BL*), resistance to Hessian fly (*H13*), and soil-born mosaic virus (*Sbm1*). For more information contact Mohamed Mergoum at mmergoum@uga.edu.

'IL19-5632'

A moderately resistant soft red winter wheat variety released by the University of Illinois for brand labeling. IL19-5632 is an early maturing variety that yields well in the northern half of the eastern U.S. For more information contact Jessica Rutkoski at jrut@illinois.edu.

'ND Allison'

A hard red winter wheat variety which produces high yields in North Dakota and has average to good milling and baking quality, similar to the leading winter wheat varieties in North Dakota and the regional winter wheat quality control, 'Jagalene'. ND Allison is 1-2 inches shorter in height and flowers 1 day later than the reference cultivar 'Jerry'. Marker tests suggested the presence of the aluminum tolerance gene (*Almt1*). It is heterogeneous for the presence of *Sr24/Lr24* and was resistant to 11 of 16 leaf rust races in seedling tests. In field evaluations conducted in Minnesota, Texas, and Kansas it was moderately resistant to both stem and leaf rust. It has average resistance to FHB. For more information contact Francois Marais at marais@ndsu.edu.

'WGC002'

An FHB-resistant spring wheat germplasm line jointly released by the USDA-ARS and NDSU. WGC002 is a wheat-*Th. elongatum* 7B-7E translocation line (7BS-7BL-7EL) containing the novel FHB resistance gene *Fhb7^{The2}* on the terminal 7EL segment. WGC002 consistently exhibited resistance to FHB in the greenhouse environments. Obvious linkage drag has not been observed with the 7EL segment containing *Fhb7^{The2}* in WGC002. In addition, WGC002 does not have a yellow flour pigment gene in the *Fhb7^{The2}* haplotype on 7EL, making it ready for immediate utilization in wheat breeding. One STS and two PACE markers were developed specifically for *Fhb7^{The2}* and validated in different wheat genotypes. They are highly diagnostic for *Fhb7^{The2}* and extremely useful in marker-assisted introgression of *Fhb7^{The2}* in wheat breeding. A registration [article](#) about WGC002 was published in the Journal of Plant Registrations. Seed of WGC002 is available for distribution upon requests by contacting Dr. Xiwen Cai (USDA-ARS, Lincoln, NE) at Xiwen.cai@usda.gov. ●



Welcome New Students



Sumit Chowdhury recently started his doctorate degree in Fall 2023 with **Christopher Toomajian** in the Department of Plant Pathology at Kansas State University. His project is working on mapping genetic associations of FHB traits in the *Fusarium graminearum* NA2 population.



Shannon Baker started her doctorate degree in August 2023 with **Jackie Rudd** and **Amir Ibrahim** in the Department of Soil and Crop Science at Texas A&M University. Her project focuses on using UAS-based high-throughput phenotyping to improve the selection efficiency in Texas winter wheat breeding.



Julia Eilert joined the Agronomy Department at Kansas State University as a master's student in August 2023. Her project with **Guihua Bai** and **Allen Fritz** will focus on developing a new gene editing method to improve FHB resistance in wheat.



Sandhya Gopisetty is a new Ph.D. student in the Department of Plant Pathology at Kansas State University. She started in Summer 2023 with **Christopher Toomajian** working on genetic mapping of FHB traits from the NA2 population of *Fusarium graminearum* in the U.S.



Simran Goyal received her bachelor's degree in agriculture from Punjab Agricultural University in India. She started as a new master's student in the Department of Plant Pathology at the University of Kentucky with **Lisa Vaillancourt** in January 2023. Her project will focus on the role of chemotype in aggressiveness and toxigenicity of *Fusarium graminearum* in wheat.



Lola McMullan is a new master's student in the School of Plant and Environmental Sciences at Virginia Tech. She started as a student in August 2023 with **David Schmale** and **Bastiaan Bargmann** working on an aerosol sentinel system to trap, sense, and destroy airborne plant pathogens.



Sheikh Arafat Islam Nihad, M.S., received his master's degree in crop botany from Bangabandhu Sheikh Mujibur Rahman Agricultural University in Bangladesh. He started as a PhD student in January 2024 at the University of North Texas. His advisor is **Jyoti Shah** in the Department of Biological Sciences.



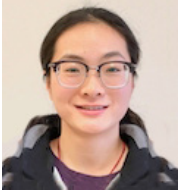
Kripa Rijal joined the Department of Plant Sciences at North Dakota State University as a master's student in August 2023. Her project with **Francois Marais** will be looking at the use of test crosses to predict the presence of, and complementation among, diverse FHB resistance QTL in F_1 lines from hard red winter wheat crosses. ●



Kudos On Your New Degrees



Lucas Alexandre Batista graduated in the Summer of 2023 from North Dakota State University with his master's degree in plant science. His project was with **Andrew Green** on using speed breeding and UAV imaging to accelerate the genetic gain in spring wheat breeding.



Ruolin Bian graduated in May 2023 from Kansas State University with her doctorate degree in agronomy. Her project with **Guihua Bai** and **Allan Fritz** focused on characterizing QTL for disease resistance and rolled leaf traits in a mutant derived RIL population.



Upasana Dhakal graduated Fall 2023 from Kansas State University with her doctorate degree in plant pathology. Her project with **Christopher Toomajian** was on the analysis of population genomics of U.S. *Fusarium graminearum* isolates and identifying the genetic basis of fitness traits.



Volodymyr Kavetskyi graduated in May 2023 from Kansas State University with his master's degree in agronomy. His project with **Guihua Bai** and **Allan Fritz** focused on using a BSMV mediated genome editing system to validate the function of *Fhb1* candidate genes in Fusarium head blight resistance.



Bipin Neupane graduated in May 2023 from North Dakota State University with his master's degree in plant sciences. His project with **Francois Marais** was looking at evaluating winter wheat and *Tritipyrum* germplasm to identify useful variation for biotic and abiotic stress tolerance.



Zhen Wang graduated in August 2023 from Texas A&M University with his doctorate degree in plant breeding and genetics. His project with **Shuyu Liu** and **Dirk Hays** focused on using biparental mapping, association analysis, and genomic prediction models to improve wheat.



Yuzhou Xu graduated in August 2023 from Kansas State University with his doctorate degree in agronomy. His project with **Guihua Bai** and **Allen Fritz** was on mapping QTL for Fusarium head blight resistance and agronomic traits in native winter common wheat.

Congratulations on Your Retirement



Wynse Brooks, the barley breeder at Virginia Tech retired March 31, 2023. During his 30-year service in the Virginia Tech small grains breeding program, Brooks developed and released 13 barley varieties, including feed barleys 'Thoroughbred' (2003) and 'Secretariat' (2014), hullless, FHB resistant,



USWBSI EVENTS

2024

March 13 Scabinar, Virtual

April 19 GDER and PBG Mid-Year Meeting, Virtual

December 8-10 2024 National Fusarium Head Blight Forum, Austin, TX

OTHER EVENTS

FEBRUARY

5 2024 Double Crop Farmers Forum, Mt. Vernon, IL

27-2 National Association of Wheat Growers 2024 Annual Conference and Commodity Classic Houston, TX

MAY

20-24 9th Edition of Genomic Selection in Breeding Course, Madrid, Spain

JUNE

23-28 2024 Fusarium Laboratory Workshop, Manhattan, KS

JULY

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

barley 'Greg' (2020) and awnless barley 'VT Beahm' (2021). Brooks also spearheaded the development of the malt barley breeding program in 2010. From those efforts, Brooks developed and released 'Avalon' in 2020, the first two-row malt barley specifically bred for adaptation to the Eastern U.S. His expertise, charm and tireless dedication to the program and barley growers will never be forgotten.

Kudos to Those Starting New Positions



Sidrat Abdullah, Ph.D., is a new research associate with **Juliet Marshall** at the University of Idaho Aberdeen Research and Extension Centre. Abdullah received his master's degree in plant biotechnology from Wageningen University, Netherlands and his doctorate degree in plant science from South Dakota State University.



Amir Ibrahim, Ph.D., started December 1, 2023 as the new associate director and chief scientific officer of Texas A&M AgriLife Research and the new associate dean for research in the Texas A&M University College of Agriculture and Life Sciences.



Ming Ma, Ph.D., is a new postdoctoral researcher with **Wanlong Li** at South Dakota State University. His research focuses on the marker-free transfer of *Fhb7* from wheat into barley. ●