U.S. Wheat & Barley
Scab Initiative

Minutes

USWBSI Steering Committee Meeting

Bloomington, MN
Friday, April 14, 2023
8:00 AM – 4:00 PM CT

Attendees:

Co-Chairs: Ruth Dill-Macky (Univ. of Minnesota) and Richard Magnusson (Private Grower, MN)

SC Members: Tom Baldwin (North Dakota State Univ.), Kaitlyn Bissonnette (Cotton Inc., NC), Richard Boyles (Clemson Univ.), Carl Bradley (Univ. of Kentucky), Frankie Crutcher (Montana State Univ.), Lexi Freier-Johnson (Dakota Growers Pasta Co., MN), Andrew Friskop (North Dakota State Univ.), Pravin Gautam (BASF Wheat Breeding, NE), Joleen Hadrich (Univ. of Minnesota, NCRA Rep.), Scott Heisel (American Malting Barley Assoc., WI), Richard Horsley (North Dakota State Univ.), David Kendra (Cibus, CA), Louis Kuster (U.S. Durum Growers Assoc., ND), Reuben McLean (Grain Craft, ID), Grant Mehring (Bayer Crop Science/WestBred, ND), Gary Muehlbauer (Univ. of Minnesota), Scott Nelson (North Dakota Barley Council), Paul Sadosky (Molson Coors Beverage Co., WI), Jyoti Shah (Univ. of North Texas), Kevin Smith (Univ. of Minnesota), Kevin Thorsness (Bayer Crop Science, ND), Lisa Vaillancourt (Univ. of Kentucky), Xiang Yin (Rahr Corporation, MN), and Marv Zutz (Minnesota Barley Council)

Guests: Matt Rouse (USDA-ARS, MN) and Jochum Wiersma ((National Wheat Improvement Committee)

USDA-ARS PI: Oswald Crasta (National Program Leader for Small Grains, MD)

NFO Staff: Michelle Bjerkness (USWBSI-NFO, MN) and Amber Hoffstetter (USWBSI-NFO, OH)

Not Present: Austin Case (AB InBev – Global Barley Research, CO), Alyssa Collins (Pennsylvania State Univ.), Jeff Edwards (Univ. of Arkansas, SAAESD Rep.), Andrew Green (North Dakota State Univ.), Dustin Johnsrud (North Dakota Wheat Commission, Private Grower), Bryan Jorgensen (South Dakota Wheat Commission, Private Grower), Esten Mason (Colorado State University), Molly Miller (North American Millers' Assoc.), Jessica Rupp (Kansas State Univ.), Clay Sneller (The Ohio State Univ.), Jake Westlin (National Assoc. of Wheat Growers), and Steven Xu (USDA-ARS, CA)

Richard Magnusson called the meeting to order at 9:01 a.m. CT, a quorum was present.

1. Opening, Welcome New Members, Approval of Agenda/Minutes

Richard Magnusson provided opening remarks. Since there were new Steering Committee (SC) members, introductions were made. Richard Magnusson asked for any additions or corrections to the agenda. None were brought forth.

Motion: Kaitlyn Bissonnette motioned to approve the agenda as presented with no additions or corrections; Dave Kendra seconded the motion.

Vote: All members were in favor; the motion to accept the agenda as presented was approved.

SC Minutes Approval: December 6, 2022

Richard Magnusson asked for any additions or corrections to the December 6, 2022, minutes. No additions or corrections were brought forth.

Motion: Tom Baldwin motioned to approve the minutes as presented; Dave Kendra seconded the motion.

Vote: All members were in favor; the motion to accept the December 6, 2022, minutes as presented was approved.

2. FY24 Action Plan & Research Priorities Streamlined Approach

- Process for updating the USWBSI Action Plan
  Ruth Dill-Macky reviewed the timeline for updating the Action Plan. Research Area (RA) and Coordinated Project (CP) Committee Chairs will report during the meeting. Following the reports, breakout sessions will occur to update the goals in the Action Plan. The RA/CP Committees will then review the suggestions, make corrections, and provide final changes to the NFO. The final version will then be distributed to the SC.

- Recommendation for USWBSI Program Description/Research Priorities Document
  For the new Request for Pre-Proposals (RFP), Program Descriptions will only include the description of the Research Area/Coordinated Project and will refer and link directly to the Action Plan for specific associated goals, avoiding duplication of the same content in multiple locations on the website.

- Working Cap Modified Process
  Ruth Dill-Macky reviewed the modified process for setting the Working Caps with the SC. One role of the SC is to help guide the USWBSI in thinking about how the initiatives fiscal resources are allocated by setting the Working Caps. This year, rather than having the two-step polling process, as has been done in past years and in which the Working Caps changed little, the SC members will be polled the week following the meeting (April 17-21) to provide input on percentage allocations for the Working Caps. The EC will then review the Working Cap Recommendations provided by the individual SC members and make an overall recommendation on the percentages. The EC Recommendation will then be distributed to the SC for a final up or down vote. During the Chair presentations the SC members were encouraged to think about where the priorities of the Initiative should be and use the input from the Chair reports during their considerations for casting their Working Cap percentage votes.

3. **USWBSI Research Area and Coordinated Project Chair Reports** *(See Attachments 1-10)*

- FHB Management (MGMT)
  Kaitlyn Bissonnette provided an update from the FHB MGMT Research Area. *(See Attachment 1)*
  Questions were asked by the SC members regarding the need to make key extension materials more accessible. It was brought up that there was some variation this past year between FHB identified in the field and what the FHB Risk Tool was showing. It was recommended that there be a process for users to notify the FHB Risk Tool developers when they divergence occurring from the models so that review and possible adjustments to the model can be considered.

  Action Item: Kaitlyn will connect with Erick DeWolf on model variations and options for users to report observations.

- Food Safety and Toxicology (FST)
  Dave Kendra provided an update from the FST Research Area. *(See Attachment 2)*

- Gene Discovery and Engineering Resistance (GDER)
  Jyoti Shah provided an update from the GDER Research Area. *(See Attachment 3)*

- Pathogen Biology and Genetics (PBG)
  Lisa Vaillancourt provided an update from the PBG Research Area. *(See Attachment 4)*

- Barley (BAR-CP)
  Tom Baldwin provided an update from the Barley Coordinated Project. *(See Attachment 5)*

- Durum (DUR-CP)
  Andrew Friskop provided an update from the Durum Coordinated Project. *(See Attachment 6)*
  SC members asked about the development of resistant germplasm given the the limited number of FHB-resistant durum lines currently available. Andrew shared that the work Dr. Elias is doing in North Dakota is very promising and should offer good options in the near future.

- Hard Winter Wheat (HWW-CP)
  Jessica Rupp provided an update via recording from the Hard Winter Wheat Coordinated Project. *(See Attachment 7)*

- VDHR Spring Wheat Parents (VDHR-SPR)
  Andrew Green provided an update, via a recording, from the VDHR Spring Wheat Coordinated Project. *(See Attachment 8)*

  Ruth Dill-Macky informed the SC that Dave Garvin's VDHR-SPR nursery coordinator position at the USDA-ARS is being advertised and will hopefully be filled soon.

- VDHR Northern Soft Winter Wheat (VDHR-NWW)
  Clay Sneller provided an update, via recording, from the VDHR Northern Winter Wheat Coordinated Project. *(See Attachment 7)*

- VDHR Southern Soft Red Winter Wheat (VDHR-SWW)
  Rick Boyles provided an update from the VDHR Southern Winter Wheat Coordinated Project. *(See Attachment 8)*
  There was discussion about funding for doubled haploid facilities to aid the breeders in having access to this technology to advance material through the breeding pipelines.

- Additional Discussion Points Following Reports
  A point was made about the difficulty and inconsistency of the PIs handling their own DON sample grinding. It was shared that PIs are sending in fewer samples now given labor issues and limited staffing to handle the grinding. It was suggested this approach should be reevaluated. A final point shared was regarding the President's Budget and the focus on funds for climate resiliency efforts. All Chairs were encouraged to think about how they might incorporate this into their reports, with metrics, next year so that updates about how USWBSI connects in with this vision could be provided during Hill visits.

4. Action Plan Breakout Session

The SC broke into groups to discuss changes/updates to the Action Plan.

5. Action Plan Recommendations from Breakout Session

- MGMT 1
  Kaitlyn Bissonnette reported on the FHB MGMT breakout, Goals 1 & 3. The group recommended adding in reference to biocontrol agents as well as multi-variety research, they

also did a deal of word smithing and made recommendations for changing the performance measures.

- MGMT 2
  Andrew Friskop reported on the FHB MGMT breakout, Goals 2 & 4. The group suggested coordinating with VDHR to have MGMT push variety selection information during extension meetings in replacement of ScabSmart.

- FST
  Dave Kendra reported on the discussion from the FST breakout. Suggestions included a better standardization protocol for samples being sent from cooperators and having cooperators submit a priority list, so samples are processed in a timely manner. They also recommended changing the Research Category name to Food Safety and Utilization because toxicology research is no longer being funded by the USWBSI but there is utilization research that could be considered.
  (**Update Post-Meeting:** Given significant changes proposed during the breakout, the FST Committee determined it would be best to take additional time to work on goals and plans. They opted to maintain the goals/name as currently published for this funding cycle and will work over the coming year to address the proposed changes and update this section of the action plan)

- GDER
  Jyoti Shah reported on the discussion from the GDER breakout. Suggestions included moving the transformation labs from researcher needs to a resource since both labs are now operational. In addition, a central facility for gene editing and centralized transgenic field trial for barley and greenhouse trials for wheat and barley were added to the research needs.

- PBG
  Lisa Vaillancourt reported on the discussion from the PBG breakout. For Goal 1, the group suggested editing the Outputs section. Under Long term outputs, it was suggested to delete "using knowledge of plant resistance to improve disease control" and add two new bullets regarding a national curated effort for collecting and maintaining *Fusarium* strains and establishing a genomic database for *Fusarium* species. For Goal 2, the group suggested putting more focus on the disease and removing the references to asymptomatic infections and mycotoxin accumulation.

- VDHR
  Tom Baldwin reported on the discussion from the VDHR breakout. It was suggested here also to work with MGMT on disseminating variety information to growers, and to change commercial releases to "commercial or licensed releases." It was noted that the milestones are more goal oriented and read more as subgoals. Updates to the tracking of variety information should be made since this information is provided in the progress reports and not in databases.

6. Action Plan Wrap Up & Next Steps

Ruth Dill-Macky reviewed the plan for updating the Action Plan. The input from the breakout sessions will now be taken to the individual RA and CP Committees and final adjustments on the

language will be voted on by each committee and returned to the NFO by April 27. The NFO will compile the Action Plan with the suggested changes and distribute to the SC. The new Action Plan will be made available by June 1 to be distributed with the FY24 RFP.

7. Federal Budget, Appropriations, and Advocacy Efforts

- Federal Budget Status and USDA-ARS Updates
  - USDA-ARS Update
    Oswald Crasta provided an update from the USDA-ARS. *(See details in Addendum 1)*
- Advocacy Effort Updates – 2023 Farm Bill
  - American Malting Barley Association/NBIC
    Scott Heisel provided an update on the National Barley Growers Association visit to Capitol Hill and the Farm Bill Advocacy in February. (*See details in Addendum 2*)
  - National Wheat Improvement Committee (NWIC)
    Jochum Wiersma provided an update from NWIC. (*See details in Addendum 3*)
- Response to 2023 President's Budget
  Ruth Dill-Macky reviewed the EC's discussions regarding the response to the President's Recommended Budget and the reason for the increased authorization request from $15M to $20M. The authorization increase is being ask for to cover the increased costs associated with doing research not for new research. Although there is a lot of confidence the House and Senate will reinstate the USWBSI funds the President's budget had eliminated, it was still agreed a letter should be submitted reiterating the importance of the research supported through the USWBSI. The SC will be asked to provide potential organizational signers for the letter responding to the President's Budget and the authorization increase request letter.
  Action Item: AMBA will work with NAWG on drafting the letters and identifying the Congressional leaders the letter should be sent to, with the plan to send the letter out by the end of May. The NFO will coordinate collection of the list of potential signers to invite to participate and provide to AMBA to handle the invitation.

8. FY23-YR2 Research Plan & Budget Update/FY24 Plans

- Final FY23-YR2 funding allocation overview
  Ruth Dill-Macky provided an overview of the FY23 Funding Cap allocations. It was explained that the EC holdback is used to fund projects in the TSCI category along with Out-of-Cap and equipment requests. Upon review of the comparison of Working Caps to actual allocations for FY23, it was pointed out that the FST-Service Working Cap was reduced for Year 2 in response to significant carryover, primarily because of pandemic disruptions to one of the labs, and, as a result, the PI opted to reduce their Year 2 request. Additionally, one of the other labs had a one-time equipment request included their Year, 1 but not their Year 2, budget.

  The NFO held off on making carry over adjustments overall in Year 2 since agreements were set up with end dates in 2023. Notices were sent out in March to all PIs with funds remaining on their prior agreements and only 12 PIs asked for No-Cost Extensions. In June 2023, an assessment will be made again to determine if any carryover adjustments are needed to FY24 budgets. The unallocated funds available in FY23 due to a variety of reasons (most of which were from the the DON lab budget adjustments, as noted above), were used for 17 one-time equipment requests. The EC received positive feedback from PIs regarding the ability to purchase equipment using USWBSI funding.

- Planning for FY24 – Combination of New RFP and YR3 Continuation Requests
  Ruth Dill-Macky explained that in FY22 PIs had the option to select either a 2- or 4-year project even though all funding decisions are always made on an annual basis. Setting up these 4-year agreements reduced the workload on the USDA-ARS and 77% of the projects submitted were 4-year projects. For FY24, this means that there will be two options for PIs to select: a continuation request for Year 3 of 4-year projects with an existing agreement (~77% of the projects with be continuations) and/or new 2-year project pre-proposals (~23% of projects have end dates in 2023, which will either end or require a new pre-proposal). All projects funded in FY24 will be 2-year proposals to allow the budget to be reset every 4-years.

- Transformational Science (TSCI) Plan
  TSCI existing projects all were set up with two-year terms which will be ending in 2023. All currently funded TSCI PIs who are interested in continuing their projects will be asked to submit a pre-proposal to a CP or RA. Currently funded TSCI PIs will not be considered for re-funding in the TSCI category unless a new project proposal is submitted and/or a new PI is involved. SC members were reminded that the purpose of the TSCI was to bring in new PIs to the USWBSI. Additional criteria included new and innovative ideas as well as collaboration with existing PIs. These criteria will remain in place for the FY24 RFP.

- Working Cap Considerations
  The VDHR-SPR CP came in under budget in FY22 due to a last-minute proposal withdraw. Since the CP didn't have time to submit a new project, the funding was redistributed elsewhere. It was agreed at that time that an adjustment would be made for the next funding cycle to reinstate the intended amount to VDHR-SPR to bring the working caps for the SC poll back in alignment.

  It was also shared, that there are some funding shifts that need to occur in the VDHR Northern Winter Wheat (NWW) / Southern Winter Wheat (SWW) Research Categories. In recent years, there have been two new breeding projects added to SWW, and a departure of one breeding project from the NWW. An adjustment is likely needed to rebalance the budget of these two groups. The SC is encouraged to consider the funding for each CP as the working caps are set. The EC will review the SC's poll results and make any additional necessary adjustments to these Working Caps to help with this adjustment.

  There will not be a TSCI Working Cap. Funding for the TSCI will remain within the EC holdback. The EC has set its hold back to $800,000 to fund TSCI proposals, Out-of-Cap, and equipment requests.

  The EC's Final Recommendation for the Working Caps will be sent to SC for a final vote.

  Ruth Dill-Macky and Michelle Bjerkness will host a meeting with the Research Committee Chairs prior to them reviewing the Pre-Proposals and Continuation Requests to discuss strategies for recommending In and Out-of-Cap requests to the EC.

- PI Progress Summary Expectations
  Ruth Dill-Macky informed the SC that some of the PIs Project Summaries in their Continuation Requests lacked the needed information about project progress. In response to this concern EC is going to implement a rating scale (unacceptable, acceptable, commendable) for the Review

Panels to use. If a PI has an unacceptable summary of progress, they are at risk for funding removal. It was suggested to provide a commendable example of both a breeding and non-breeding Project Summary for PIs to reference in preparing their materials.

Action Item: The NFO will update the review forms with this rating addition and will notify the PIs of the importance of a comprehensive summary, providing examples for reference.

- Upcoming FY24 Funding Schedule
  Michelle Bjerkness reviewed the FY24 Funding timeline schedule.

  Action Item: Michelle Bjerkness will distribute the FY24 Funding timeline to the Committee Chairs.

9. Governance & Communications

- USWBSI Policies & Procedures Updates – Recommendation from EC
  Richard Magnusson explained to the SC that the EC is working on a Code of Conduct for inclusion in the Policies & Procedures. The document is very close to complete, but the NFO will send it out to the SC for suggested changes and then the NFO will have it reviewed by the UMN Office of General Counsel. The Code of Conduct will be required to be read and agreed to upon registering for any USWBSI event.

  Action Item: The NFO will send out the draft Code of Conduct to the SC for input.

- Communications Plan Update – Outreach Focus (Extension/Crop Consultants/Grower Groups)
  Richard Magnusson reviewed the Communications Plan that's being implemented. The current focus is on outreach to Extension Educators, Crop Consultants, and Grower Groups. An FHB Tool Talk e-newsletter has been initiated with the first newsletter delivered in early April. There is an Advisory Team consisting of Magnusson, Boyd Padgett, and Neal Fehringer for the review and identification of needed content and methods used with this audience.

  It was asked if the USWBSI could supply a set of slides to be used in undergraduate teaching. Ruth Dill-Macky explained that the USWBSI's research focus did not provide resources for teaching introductory plant pathology course materials. It was noted that training the next generation of extension people is important to the mission of the USWBSI. It was suggested that providing opportunities for graduate students to develop extension programming and hone their presentation skills is important.

10. USWBSI 2023 NFHB Forum Planning Update

2023 Venue in Cincinnati, Ohio

Michelle Bjerkness reviewed the planning for the 2023 NFHB Forum with the SC which will be held December 3-5. The Forum Organizing Committee is going to follow the same session layout as in previous years with a mix of General Sessions and Breakout Sessions. General Sessions will continue to be multi-disciplinary, and new this year all funded TSCI PIs will present in the first General Session after the Opening Session. The FOC is looking for a big picture speaker for the Keynote that can spark discussion throughout the Forum. In addition, this year an industry speaker will be asked to present on a relevant topic.

There will be a change to the Flash & Dash sessions to allow the presenters the ability to have a brief interaction directly with the attendees. Presenters will have 3 minutes to present and 1 minute for Q&A.

The FOC asked about inviting speakers with outside perspectives and the EC was very open to inviting speakers that might not directly work on FHB but have relevant insights to offer.

The FOC would like to focus on the onsite experience; therefore, there will be no live streaming or recordings for 2023. Speakers will have the option to present virtually. The Virtual Poster Room will remain; however, the poster videos will be optional, except for those individuals participating in the Poster Competition. Unfortunately, BASF can no longer support the Poster Competition. The NFO is looking for new sponsors.

The Cincinnati downtown location provides the ability to walk to restaurants. The Hotel has a 1920's vibe. There is interest, based on the survey, for a group activity which is being considered. Attendees really appreciated the early career visibility and interaction in 2022 which will be continued. There was great feedback on the gender equity of the speakers this past year so the FOC will continue the goal of having 30% of the forum presenters being women. Bjerkness will be checking into childcare service options, which was also a request in the attendee survey.

11. USWBSI Future NFHB Forum Venue/Timing

At the SC Meeting in December, members asked for the Forum survey to include questions about the format of the Forum and the timing/pattern. Michelle Bjerkness reviewed the survey results. 78% agreed to keep the content format as it has been. 80% of responders want to meet in person. 39% of those responding to the survey like the traditional starting pattern on Sunday. The next most liked option was starting on a Monday.

When asking for RFPs from hotels, Bjerkness asked for options to include both timeframes (starting on Sunday and starting on Monday). There are other meetings that coincide with NFHB Forum, and this will be taken into consideration when determining if the starting day will change.

Room rates at per diem rates are now difficult to obtain, as a result a variety of options are being considered included offering only a portion of rooms at reduced per diem rate for USDA-ARS attendees. With food expenses also rising, attendees should expect adjustments in what is offered at future forums.

For the 2024 Forum, the NFO is looking for locations that have walkable locations for dinner and after hours. The EC was interested in Texas. Bjerkness will schedule site visits to Austin and Corpus Christi, TX. It was suggested to also check Galveston, TX and a location outside of Dallas, TX. A suggestion was also provided after discussion to consider Jacksonville, FL.

Action Item: The NFO will look at flights across the board and schedule site visits for Austin and Corpus Christi. and will investigate additional TX options and locations in FL.

12. Next Steering Committee Meeting – December 2023

Richard Magnusson announced that the next SC meeting will be December 5, 2023, during the NFHB Forum.

13. New Business

Pravin Gautum announced that BASF is closing its North American locations. He is unsure if he will remain in wheat pathology. Depending on where he ends up, he might not remain on the SC. But he will keep the SC informed of any changes.

Motion: Tom Baldwin motioned to adjourn the meeting; Kaitlyn Bissonnette seconded the motion.
Vote: All members were in favor; the motion to adjourn the meeting was approved.

Meeting adjourned at 3:22 pm CT.

Minutes Recorded and Submitted by:

Amber L. Hoffstetter, Research Technical Specialist
USWBSI's Networking & Facilitation Office

USDA-ARS report
Oswald Crasta, National Program Leader for Grain Crops

Budget Increase for Barley Pest Initiative:

There was a $1M increase for the Barley Pest Initiative increasing the total to $3M, which will be distributed to the previous USDA-ARS and University locations involved in this research:

USDA-ARS RESEARCH LOCATIONS

- Aberdeen, Idaho: Small Grains and Potato Germplasm Research Unit. Ames, Iowa Corn Insects and Crop Genetics Research Unit.
- Fargo, North Dakota: Cereal Crops Research Unit.
- Ft. Detrick, Maryland: Foreign Disease-Weed Science Research Unit. Lincoln, Nebraska Wheat, Sorghum and Forage Research Unit.
- Pullman, Washington: Wheat Health, Genetics, and Quality Research Unit Raleigh, North Carolina Plant Science Research Unit
- St. Paul, Minnesota: Cereal Disease Laboratory
- Stillwater, Oklahoma: Wheat, Peanut, and Other Field Crops Research Unit

UNIVERSITY RESEARCH LOCATONS
Cornell University; Ohio State University; Virginia Tech; Oregon State University; Montana State University; North Dakota State University; University of California - Davis; University of Idaho; Virginia Tech University; Washington State University; University of Minnesota.

Additional Increases:

Additionally, there was a $500K increase for genetic oat research that is allocated to: Fargo, ND, (breeding and genotyping); St. Paul, MN (rust disease resistance & monitoring); Aberdeen, ID (new traits &markers); and Brooking, SD (GxExM).

Also, FY2023 appropriation contains an additional $3M for Predictive Crop Performance to ARS North Dakota, 50% of which will go to NDSU. About 18% of the total will used for crop health predictive performance in oats and barley.

Personnel:

Dr. Simon Liu has been appointed as Administrator for USDA-ARS.
Dr. Steve Kappes is the Associate Administrator for National Programs.
Mr. Joon Park is the Acting Associating Administrator for Operations, and a search has begun to fill this permanent position.
Dr. Oswald Crasta joined ARS as the National Program Leader for Grain Crops. He previously served as the Chief Scientific Officer at Equinom, Inc. and as Global R&D Leader at Corteva Agriscience.
A position has been filled in our agreements branch to help process these agreements.

Stakeholder Priorities:

1. National Wheat Improvement Committee's asks for FY2024.
    - Wheat Resilience Initiative: Increased research on resistance or management of stem sawfly and hessian fly.
    - Wheat stripe rust initiative: increased screening nurseries.
    - Continued efforts in USWBSI and SGG
2. National Barley Improvement Committee
    - Continued USWBSI efforts.
    - Further increase efforts in Barley Pest Initiative
    - Barley Resilience: Improved quality, stress tolerance, balance sprouting & dormancy.

USDA-ARS research positions that affect wheat and barley:

1. Raleigh, NC: Will be re-advertising to fill the vice-Marshall position (wheat and barley breeder/geneticist and research leader).
2. Madison, WI: Dr. Sarah Whitcomb has been hired to replace the position vacated by Mitch Wise (barley/oat) and Dr. Mali Mahalingam has been hired as the Research Leader to replace the position vacated by Cynthia Henson (barley). A new microbiome position will be announced soon that was redirected when Dr. Mahalingam took the RL position.
3. New GS12/13 position is open (vice-Dave Garvin) at Plant Science Research Unit in St. Paul, MN to study for genomics-enabled study of FHB in wheat and rust in oats.

ARS Research Updates:

1. USWBSI research at W. Lafayette, IN (S. Scofield): Wheat genes comprising the R-gene pathway and Fg effectors necessary to activate the R-pathway. The USWBSI grant served as seed money to obtain a $1.8 million grant from USDA-NIFA/NSF/BBSRC to carry this work forward.
2. USWBSI & Stripe rust research at KS (K. Jordan G. Bai and M. Guttieri): Exome capture sequencing for genomic associations for FHB resistance in winter wheat and pyramid FHB resistance genes into elite hard winter wheat germplasm. Stripe rust data to public\private breeding programs; field sites for screening germplasm; new rust resistant germplasm in observation nursery.
3. Cereal Disease Lab at MN (M. Rouse, M. Elmore, M. Moscou (new), M. Drott (new): Pathogen biology of Fusarium graminearum and its toxin production; Rust pathogen resistance genes and diagnostics; Multi-omics approach for scab pathosystem biology and molecular targets for control.
4. Cereal Crops Research, ND (J. Schachterle, J. Faris): Collaborative study of molecular and genetic basis of pathogenesis and host specificity of bacterial leaf streak in barley and wheat. Resistance screening and mapping R QTLs in hard red spring wheat.

AMERICAN MALTING BARLEY ASSOCIATION

April 13, 2023

FY2023/FY2024 NBIC Update
Scott Heisel

FY2023 Appropriations

The President signed the FY2023 Omnibus spending bill on December 29, 2022. The bill included:

- Continued funding of $15 million for the USWBSI
- Continued funding for the Small Grain Germplasm Initiative at $3.5 million
- An additional $1.0 million for the Barley Pest Initiative bringing annual funding to $3.0 million of $5.3 million requested

FY2024 Appropriation Goals

- Continued funding of $15 million of the USWBSI
- Continued funding for the Small Grain Germplasm Initiative at $3.5 million
- Additional $2.3 million for the Barley Pest Initiative to bring it to full funding of $5.3 million
- Introduced a new barley initiative targeting abiotic stress

Farm Bill Goals

- Increase authorization for *Fusarium* research on Wheat and Barley from $15 to $20 million
- Retain existing language capping indirect costs for USWBSI grants at 10%

AMBA participated in National Barley Growers Association winter meeting February 6-8, 2023 in Washington. AMBA, North American Millers Association, and growers met with majority and minority staff of the House Agriculture Committee on Feb 6 to request Farm Bill goals mentioned above. The same group carried this message to majority and minority staff of the Senate Agriculture Committee on Feb 7. There was general support for the objectives although it was clear a champion for the increase needs to be recruited if an increase in the authorization is to be realized. The Senate is where a champion is most likely to be identified.

The National Barley Improvement Committee (NBIC) had its annual fly-in March 6-8, 2023. Over 30 researchers, growers and end users participated. The NBIC had over 90 meetings with congressional staffers including those of barley growing states, appropriation committees, and agriculture committees. NBIC requests (appropriation & Farm Bill) were well received with an overall congressional response that research has broad support although budgets will be very tight.

The President's budget was not released until after NBIC visits, but it included redirecting much of the USDA-ARS's extramural funding (including the USWBSI) to the administration's climate change research priorities. While the President's budget is often ignored by Congress, efforts should be made to address the issue.

Suggested Action Items

- Letter to the majority and minority members of the House and Senate Appropriations Committees and Agricultural Appropriations Subcommittees opposing the redirection of USDA-ARS extramural funding of the USWBSI and other small grains research funding.
- Letter to the majority and minority members of the House and Senate Agriculture Committees and Subcommittees responsible for the Farm Bill Research title requesting retention of the language supporting a 10% cap on USWBSI grants and increasing the authorization for *Fusarium* research from $15 million to $20 million.
- AMBA and National Wheat Improvement Committee to circulate letters for wheat and barley organizations to sign on.

Jochum Weirsma, Chair of the National Wheat Improvement Committee

1) There is very strong support in both the Senate and House for the USWBSI and the Small Grains Genomics Initiative to be funded at the current level.

2) There is support for the Wheat Resiliency Initiative ask ($1.6 million annually initially and eventually $6.5 million annually). This support is stronger on the Senate side than the House side. This can be explained by the fact under the current House rules any new spending has to be offset by a cut somewhere else. Increased funding is needed for Wheat Stem Sawfly.

3) The same is true for National Stripe Rust Initiative ($750,000 annually in additional funds)

4) USDA-ARS leadership is very supportive of all the NWIC asks.

Breadth of the work/priorities

- Broad focus – aimed at targeted management over a wide geography
  - Prediction center
  - IM-CP
- Multiple grain classes
  - Barley, Wheat (soft, hard, red, white, spring, winter, durum)
- Integrated management strategies
  - Resistance levels
  - Fungicide application strategies
- Development of outreach and extension materials focused on BMP
- Enhancing cross-category research
  - Fungicide resistance – baseline sensitivity
  - Species diversity – implications for management

1

Key accomplishments

- Enhancing the FHB prediction center
  - Model ensembles introduced and prototyped for better predictions
  - Continued integration of new data points from CP to improve current prediction system
  - New environments represented with new states and as climates change
  - Improvements in usability with new interface
- Cross-category research
  - Connecting members of MGMT and PBG
  - Understanding diversity, fungicide sensitivity, and integrated management

2

Unmet needs that should be addressed

- Consistency in modeling between ground truthing and system itself
- Integrated management
  - Diversity of pathogen population
  - Continued monitoring for fungicide resistance in *F. graminearum*
  - Mycotoxin profiles and variability – what are the thresholds
  - Genetic contributions to resistance
  - Fungicide efficacy and economics
- Scaling management strategy plans – moving research to field scale
- Education efforts in fungicide resistance for wheat and barley

Food Safety & Toxicology RA

David Kendra

April 14, 2023

1

FST: Breadth of Work/Priorities

Project Description

- To support research on food safety and food processing issues related to the presence of *Fusarium* spp. mycotoxins in wheat and barley grain.
- Practical outcomes of research in this area include:
  - 1) analytical tools that can be used by small grain producers, elevators, millers, and processors, to rapidly and reliably identify mycotoxin-contaminated grain;
  - 2) develop appropriate strategies to deal with contaminated grain; and
  - 3) diagnostic data on *Fusarium* spp. mycotoxins required for development of FHB resistant/tolerant varieties of wheat and barley.

Research Priorities Derived from Action Plan Goals:

1. Provide analytical support for DON/trichothecene quantitation for the Initiative's stakeholders.
2. Support research on DON/trichothecene safety that is needed by producers, grain processors, researchers, risk assessors, and regulators.

2

FST: Key Accomplishments. Past 2 Years

- Delivered High Quality measurements for Deoxynivalenol and derivatives to PI's
  - Three labs:
    1. U of Minnesota
    2. NDSU
    3. Virginia Tech
  - Impact of Covid prevented:
    1. Labs from running at full staffing capacity
    2. Sourcing Supplies in a timely manner and quantity
- Characterized essential oil nanoemulsions for their antifungal and mycotoxigenic potential for reducing Fusarium infection and DON production during micro malting processing

3

FST: Unmet Needs to be Addressed

- Extraction protocol standardization to ensure ability to compare results between labs.
- Continued updating detection capabilities in order to stay competitive with industry and foreign labs
  - Human food
  - Animal food
  - Pet food
- We no longer fund toxicology-related projects. Should we in order to stay relative for the human and animal food industries?
- Rapid toxin test kits – should we evaluate and offer guidance for USWBSI members?

4

Gene Discovery and Engineering Resistance (GDER)

Primary focus is on understanding mechanisms of resistance (and susceptibility) to FHB and identification of wheat and barley gene variants that can be deployed to increase FHB resistance and/or reduce DON accumulation

Ongoing work/priorities (10 projects)

- Identifying genes and mechanisms conferring resistance and susceptibility to FHB and controlling toxin accumulation -- Muehlbauer, Scofield, Shah, Rawat, Tiwari, McLaughlin, Hao
- Susceptibility gene variants (knockdown) to promote FHB resistance -- Muehlbauer, Scofield, Shah, Bai, Rawat, Tiwari
- Gene editing technology development for wheat and barley – Trick, Bai, Di
- Wheat and barley transformation technology development-- Trick, Bai, Di, Yang

1

Gene Discovery and Engineering Resistance (GDER)

Key accomplishments

- Identification/characterization of genes involved in resistance/susceptibility and mitigating DON accumulation.
- Identification of gene variants in susceptibility genes that enhance FHB resistance -- a non GMO approach that offers potential for rapid integration into breeding programs
- Progress in CRISPR/Cas9 gene-editing technology for wheat and barley, including vector development
- Development of nanoparticle-based technology to alter gene function without going through tissue culture
- Extending nanoparticle-based technology to knockdown fungal gene expression (with support from PBG)
- Developing cultivar-independent transformation technology for wheat and barley

2

Gene Discovery and Engineering Resistance (GDER)

Unmet Needs

Need for mutant populations in additional elite backgrounds -- will facilitate identification of additional gene variants that confer FHB resistance and lower DON accumulation

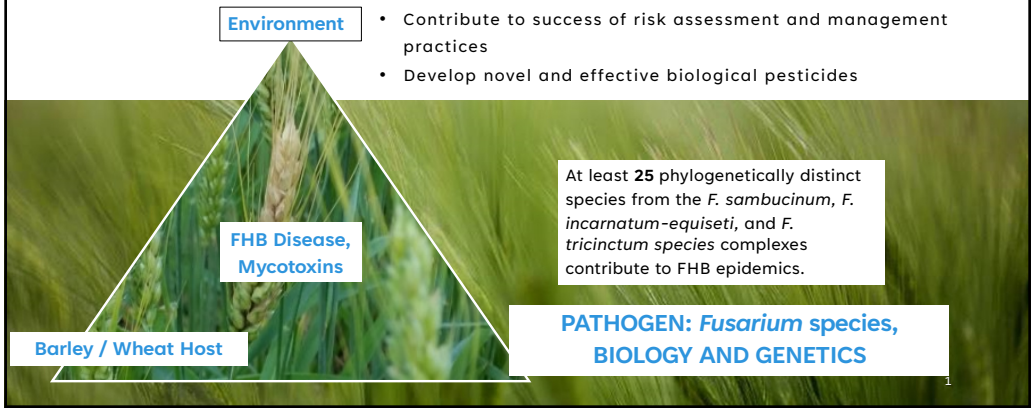
Additional support for high-throughput gene discovery and understanding mechanism of gene action

3

PATHOGEN BIOLOGY AND GENETICS (PBG)

PRIORITIES, GOALS

- Identify fungal virulence proteins for disease management
- Reduce mycotoxin levels in grain
- Contribute to increased efficacy and durability of host resistance
- Contribute to success of risk assessment and management practices
- Develop novel and effective biological pesticides



At least **25** phylogenetically distinct species from the *F. sambucinum*, *F. incarnatum-equiseti*, and *F. tricinctum species* complexes contribute to FHB epidemics.

PATHOGEN: *Fusarium* species, BIOLOGY AND GENETICS

1

1

KEY ACCOMPLISHMENTS 2021-2023

PUBLICATIONS

- 19 refereed journal articles

FUNGAL VIRULENCE PROTEINS

- Expression of a fungal transporter conferred mycotoxin resistance to yeast.
- Demonstrated feasibility of novel RNA delivery protocols (SNAs and endophytic fungi) for knockdown of candidate *F. graminearum* virulence genes.

MYCOTOXIN REDUCTION

- Co-infection with bacterial ectosymbiont reduced mycotoxin levels by 80% in greenhouse trials.

EFFICIENCY AND DURABILITY OF HOST RESISTANCE

- Deployment of resistance imposes selection pressures on *F. graminearum*, but there is no evidence that this selects more aggressive isolates.
- Developed protocol for making controlled crosses among Fusarium strains.

MANAGEMENT, RISK ASSESSMENT

- Surveys showed that multiple *Fusarium* species, populations, and chemotypes are present and causing FHB symptoms in the US.
- *F. graminearum* is also common in fields with no FHB.

BIOLOGICAL PESTICIDES

- Ectosymbiotic bacteria reduced fitness and aggressiveness of *F. graminearum* in greenhouse trials.
- Co-inoculation of *Fusarium acuminatum* with *F. graminearum* reduced disease and DON up to 25% in the field.

2

2

NEEDS AND CHALLENGES

PHENOTYPING

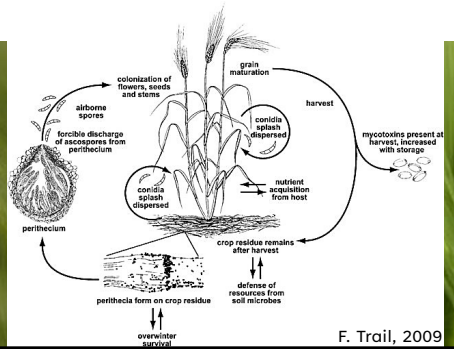
- Surveys (all hosts, all species)
- Disease assays
- Saprophytic growth phase

GENOTYPING

- Data Management
- Comparative Omics
- Population Genetics
- Genotype/Phenotype

STRAIN COLLECTIONS

- Repository, curation
- Tools for identification (Fusarium ID)
- Representation (species, hosts, geography)
- Strain collections for breeding programs



F. Trail, 2009

FGSCdb: https://fgsc.netlify.app

Global Wheat Initiative: https://www.wheatinitiative.org/

Open Wheat Blast: http://openwheatblast.net/

FungiDB: https://fungidb.org/fungidb/app/

GrainGenes: https://wheat.pw.usda.gov/GG3/

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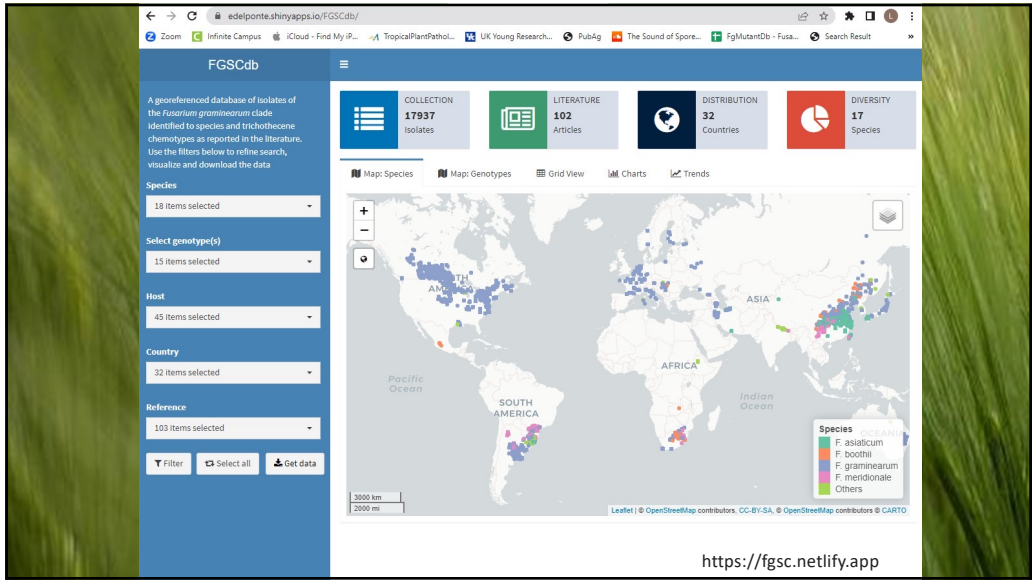


https://fgsc.netlify.app

4

USWBSI Barley Coordinated Project

4/14/2023

Steering Committee

1

Scope of work

- Supporting barley breeding programs
- Directly:
  - New York, Ohio, Virginia, Minnesota, North Dakota, South Dakota Montana, Nebraska, Idaho, California
- Indirectly
  - NABSEN – 7 location – Baldwin, NDSU
  - Winter NABSEN – 5 location – Stockinger – OSU
  - Genotyping Initiative – Fielder – USDA
  - Double haploid – Hayes- OSU
  - Research initiatives, transgenic barley, understanding resistance genes

2

Accomplishments

- Release of several malt barley lines
- Moving barley lines with FHB resistance thought the breeding pipelines
- Establishing the Winter NABSEN program
- Achieving dual hybridization probes for the Illumina chips
- Testing several transgenic lines in greenhouse assays

3

Unmeet needs:

- Making DON testing and T3 Data collection more efficient "streamlining" data collection and dissemination
- Transgenic field trials support

4

1

Breadth of Work

- Breeders, pathologists, agronomists, growers, geneticists, and industry
- Incorporation of FHB resistance into acceptable varieties, screening nurseries, characterization of resistance, and fungicide by variety trial

Key Accomplishment

- Least susceptible durum varieties on >70% acres in ND and >30% acres in MT

2

Needs

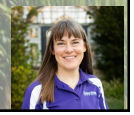
- Short-term needs are being met within the group
- Long-term needs include developing varieties with resistance similar to hexaploid wheat and having more agronomic focused research on FHB (ie: seed rate, fertility, etc).

3

U.S. Wheat & Barley Scab Initiative

Steering Committee Report
April 14, 2023

Hard Winter Wheat-CP
Jessica Rupp, Chair



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HWW-CP Model

1. Germplasm	2. Technology	3. Variety Development	4. G x F	5.Communication, Outcome & Impact
▪Identifying and characterizing new sources of FHB resistance and lower DON content. *Focus group: KSU, NDSU, USDA*	▪Expanding and calibration of mist irrigated nurseries- GXE. ▪ Identifying novel QTLs and developing new markers. ▪Developing Genomic Selection (GS) and training populations . ▪GS algorithms. ▪Doubled Haploids (DHs). ▪High throughput phenotyping for seed and for disease in the field. *Focus group: UNL, KSU, SDSU, NDSU, MSU, TAMU, USDA*	▪Develop and release cultivars with enhanced FHB resistance and lower DON content. ▪Evaluate breeding material for FHB resistance (Public: KS, NE, SD, ND, MT, CO, OK, TX , USDA-ARS; Private Industry). ▪Sharing of breeding lines, DH and bulk populations. *Focus group: UNL, SDSU, NDSU, MSU, KSU,TAMU, USDA*	▪Collaboration with FHB Management (MGMT) group to study Genotype x Fungicide interaction. ▪Elite lines tested under elite management systems. *Focus group: UNL, SDSU, NDSU, MSU, KSU,TAMU*	▪Submit all data to T3. ▪Better use of Scab Smart ▪Report FHB ratings in State Variety trials. ▪Communication with producers on field days. ▪Estimating the impact of varieties released. *Focus group: UNL, SDSU, NDSU, MSU, KSU TAMU, USDA*

2

Germplasm

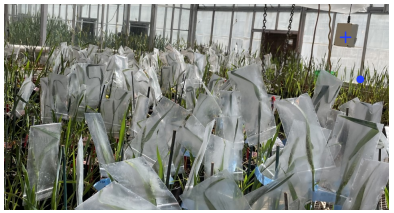
Identifying and characterizing new sources of FHB resistance and lower DON.

- Focus Group: KOO (KSU), MARAIS (NDSU), BAI (USDA)

Activities:

- Advancing genotyping (GBS) and phenotyping of up and coming germplasm HSD2-32, exotic QTL, (Fhbl, Qfhb.rwg-SA.1 and Qfhb.rwg-SA.2), the CS-Fhb7 mutant populations, and QTL Fhbl
-
- The phenotyping and genotyping data will be used to map genomic regions conferring resistance to FHB and markers will be developed to deploy the genomic regions for developing FHB resistant wheat genotype.

- These integrated efforts will then redistribute materials to breeders nationwide.



3

Variety Development

MARAIS (NDSU), MONDAL (MSU), SEGHAL (SDSU), FRELS (UNL), IBRAHIM/RUDD (TX), RUPP/FRITZ (KS), CARVER (OK), MASON (COLORADO), GUTTIERI/BAI/JORDAN (USDA), PRIVATE INDUSTRY (SYNGENTA, BAYER, BASF, AND LIMAGRAIN

Crossing of advanced breeding lines using a variety of techniques.

Greenhouse and Field evaluations under irrigated mist nursery conditions across the entire region.

Identification in last years field nurseries indicate 34 lines performing better or equal to moderately resistant check.

This number has steadily increased despite weather and Covid every year, showing improvement in our output.

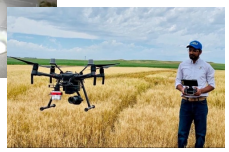
4

Technology

FRELS (UNL), LUI (TX), NATCHI, SEGHAL (SDSU),

Genomic Selection
- Begin implementation of genomic selection in breeding program

Double Haploids
High-Throughput Phenotyping



Genotype x Fungicide

- G x F trials were planted in ND, SD, NE, KS, and TX.
- This represents an increased focus on evaluating lines under challenge across the region.

Communication, Outcome, and Impact

- Numerous reports including State Variety Trials and PDMRs, presentation at multiple field days.
- Communications with producers, stakeholders, and other clientele.
- Increased communication and collaboration within the HWW-CP and into other groups with USWBSI (i.e. evaluation of Uniform Fungicide Nursery at same site as AYT x Fungicde and mist nurseries for collaborative evaluation).

5

VDHR-Spring Wheat Coordinated Project

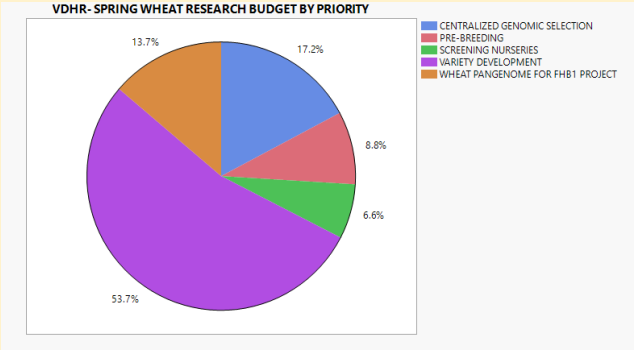
Andrew Green, Juliet Marhsal, Jason Cook, Jim Anderson, Karl Glover, Jason Fiedler, Steven Xu, Shaobin Zhong

1

Work Priorities of CP Members

- CP CENTRALIZED GENOMIC SELECTION
  - FIEDLER (USDA-ARS)
- PRE- BREEDING
  - XU (USDA-ARS)
- WHEAT PANGENOME/FHB1
  - FIEDLER (USDA-ARS)*
- SCREENING NURSERIES
  - MARSHALL (ID)
  - ZHONG (ND)
- VARIETY DEVELOPMENT
  - ANDERSON (UMN)
  - COOK (MSU)
  - GLOVER (SDSU)
  - GREEN (NDSU)

  - *Also contains Pre-Breeding Obj.



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2-YEAR ACCOMPLISHMENTS

- MR varieties released by all programs during previous cycle
  - MN- Togy
  - MN- Rothsay
  - Ascend-SD
  - ND Heron
  - ND Frohberg
- Screening in MT, ID, ND funded
- Pre-breeding lines containing Fhb1, PI277012 & Fhb7 developed and tested by S. Xu
- Develop minimal NIL for Fhb1 into elite lines from the region (investigate effects of Fhb1)
- Sequencing data for 'Rollag' and 'ND2710' aligned with 'Sumai3'
- Centralized GS Coordinator Hired (Starts 6/1/23)
  - Dr. Charlotte Brault
  - Better utilize uniform nurseries, pool resources for Fhb related genomic prediction across programs

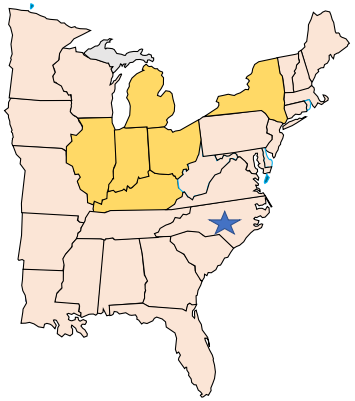
3

UNMET NEEDS

- Working to replace Illumina 90k with low cost genotyping available to all group members (Fiedler working on validation)
- Labor costs and personnel challenges make progress difficult and budgeting hard for all programs. (Breeding and USDA)
- Need ability to mark "priority" DON samples through DON labs because spring program samples are last to arrive in Fall- data from Fargo lab are not returned in time for planting decisions.
- Uniform nursery coordinator position (USDA St. Paul- formerly Garvin) was filled and now vacant again. Sarah Blecha is doing great coordinating in the interim.

4

NWW-CP



IL, IN, MI, KY, NY, OH, USDA Genotyping lab
Sharing germplasm
Sharing data
Sharing genotype information and costs

Priorities

- Breeding
  - Release new cultivars with high yield, excellent FHB, and acceptable for other traits
- Screening for FHB resistance
  - Individual programs
  - Uniform trials (6 Trials)
  - State performance trials
- Genotyping
- Basic research

1

Breeding and FHB Screening:

Activity	Annual Total	Annual Average	Annual Range
Crosses Made	1,800	300	80 - 600
New lines screened for FHB	2,400	600	300 - 800
FHB Nursery Plots	18,000	3,000	2,000 - 4,120
OWPT Entries Screened for FHB	470	95	0 - 125
Samples sent to USDA Genotyping lab	3,000	500	100 - 1,300
Samples sent for DON	3,500	580	100 - 1500

Accomplishments

- Release of 24 new cultivars since 2020
- Increased FHB resistance in uniform trials
- Initiated the Big6 test
  - Cooperative trial of 370 lines from all NWW-CP programs
  - 9 regional locations

Trait	Genetic Change per Year	
Incidence	-0.30 **	%
Severity	-0.59 **	%
FDK	-0.36 **	%
Deoxynivalenol	-0.11 *	ppm

- DON sample grinding is a burden for each program
- Access to double-haploids

2

Genotyping and Basic Research

- GBS Genotyping
  - ~18,000 in four years, ~750 samples per program per year
  - Used in GS, other applications
- Development of Allegro system
  - ~2500 markers for MAS and GS: One sample does both

- Turn around time
- Costs

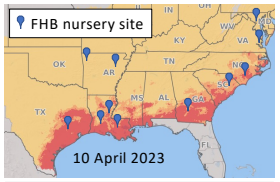
- Male sterile populations
- European germplasm
- Fhb7, Qfhs.pur-7EL - Publication
- Double-haploids
- High-throughput phenotyping (1° FDK) with machine learning - Publication
- Speed breeding
- Resistance to toxin accumulation

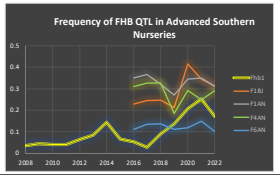
3

VDHR-SWW CP 1 Priority Areas

Assess Resistance Progress

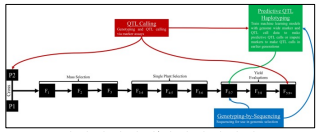
- 11 FHB nurseries in 8 states
- OVTs, USSN, USW, SunGrains
- Fhb1 cultivar releases

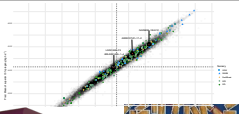




Increase Breeding Accuracy

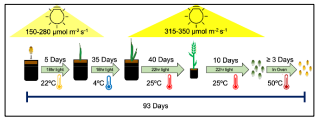
- Quantitative FDK imaging
- QTL prediction from GBS
- Simulating best cross combos

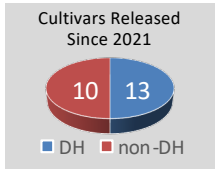




Expedite Cultivar Development

- Genomic prediction at scale
- DH production and sharing
- Speed breeding methodology





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VDHR-SWW CP 2 Notable Accomplishments

DH releases with FHB resistance

Designation	Program	Year	FHB QTL
GA-18E35	UGA	2021	F1BJ
GA-18LE43F	UGA	2021	Fhb1, F5AN
LA16020-22	LSU	2021	F1BJ, F4AN
GA-19E38	UGA	2022	F1BJ
NC11546-14	NCSU	2022	Fhb1, F1BJ, F1AN
NC12164-200T	NCSU	2022	Fhb1, F1BJ
15VDH-33-13	VA Tech	2022	Fhb1, F3BB
15VDH-38-01	VA Tech	2022	Fhb1, F1BJ, F3BB
16VDH-025	VA Tech	2022	Fhb1, F1BJ, F3BB
17VDH-077	VA Tech	2022	Fhb1, F2DLW
GA-20E48	UGA	2023	Fhb1, F1BJ, F1AN
NC15V25-20	NCSU	2023	Fhb1, F1BJ, F5ANi
SG11558-33	SunGrains	2023	F1BJ, F1AN

Active genomic-enabled breeding pipeline

Plot	GEN	DESIGNATION	Pred_QTL	gALL	gYLD	gFHB	gTW
0236	F6	SC23W218	F1BJ,Lr18,Pm54,Yr17,	194	231	312	2
0235	F6	SC23W395	H13,F1AN,F4AN,Lr18,Yr17,Sbm1	567	583	185	440
0234	F6	SC23W443	F1AN,Lr18,Yr17,Sbm1	28	103	69	101
0233	F6	SC23W195	F1BJ,Yr17,Sbm1	506	588	12	370
0232	DH	SCLA1829OLDH-070	F1AN,Yr17,Sbm1	644	632	414	591
0231	F6	SC23W369	H13,F1BJ,?,F4AN,Pm54,H7D,Yr17,	72	1	557	426
0230	F6	SC23W588	H13,Yr17,Sbm1	144	42	608	549
0229	F6	SC23W396	H13,F1AN,F4AN,Lr18,Pm54,Yr17,	279	316	213	263
0228		HILLIARD					
0227	F6	SC23W257	Pm54,Yr17,Sbm1	449	384	587	362
0226	DH	SCNCDH304	.	.	.	.	.
0225	F6	SC23W451	Fhb1,F1AN,F2BB,F5AN,Lr18,Yr17,Sbm1	192	284	15	154
0224	F6	SC23W634	H13,F3BM,F4AN,Yr17,	333	336	406	190
0223	F6	SC23W434	F4AN,Yr17,Sbm1	113	92	556	8
0222	F7	SCNC21-25674		.	.	.	.
0221	F6	SC23W468	H13,F3BB,F4AN,H7D,Yr17,Sbm1	326	343	255	365
0220	F6	SC23W133	F3BM,Lr18,Yr17,Sbm1	30	44	305	126
0219	F6	SC23W315	Lr18,Yr17,	453	490	242	243
0218		HILLIARD		.	.	.	.
0217	F6	SC23W422	Fhb1,F1AN,Lr18,Yr17,Sbm1	549	560	247	422
0216	F6	SC23W612	F1BJ,Yr17,Sbm1	612	641	228	304
0215	F6	SC23W519	Fhb1,F1AN,F6AN,Sbm1	598	597	174	627
0214	F6	SC23W562	F6AN,Lr18,Pm54,Yr17,Sbm1	276	322	248	133
0213	F6	SC23W624	F3BM,?,Pm1a,Yr17,Sbm1	385	353	371	556
0212	F6	SC23W086	Fhb1,Sbm1	362	375	326	276
0211	F6	SC23W683	F6AN,Lr18,Pm54,Yr17,Sbm1	175	185	388	23
0210	F6	SC23W676	F6AN,Lr18,Yr17,	643	604	554	509
0209	F6	SC23W186	Lr18,Pm54,Yr17,Sbm1	1	19	138	39
0208	F6	SC23W245	H13,F1AN,Yr17,Sbm1	517	438	534	623

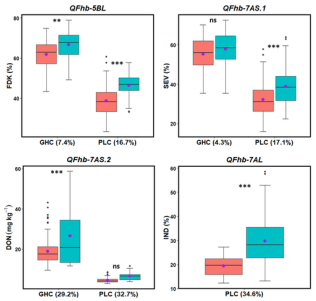
Winn *et al.* (2022) *Theor Appl Genet*

2

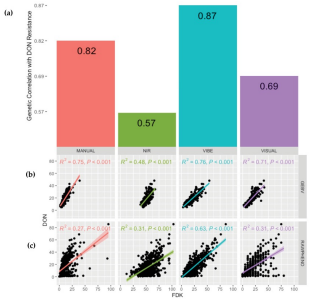
VDHR-SWW CP 2 Notable Accomplishments

Applied research efforts to support cultivar development

Ghimire *et al.* (2022) *Plant Genome*



Ackerman *et al.* (2022) *Agronomy*



Others:

- Winn *et al.* (2023) *BioRxiv*
- Ballén-Taborda *et al.* (2022) *Agronomy*
- Ghimire *et al.* (2022) *Plant Health Prog*
- Ballen-Taborda *et al.* In review

3

VDHR-SWW CP 3 Needs to Address

More programs/projects, same size pie

Project	Req	In Cap	Out of Cap	Award	% Decrease
FY22-SW-001	$ 116,560	$ 115,000	$ -	$ 115,000	1.3%
FY22-SW-002	$ 88,788	$ 82,496	$ -	$ 82,496	7.1%
FY22-SW-003	$ 97,431	$ 81,800	$ -	$ 81,800	16.0%
FY22-SW-004	$ 146,569	$ 79,806	$ 50,000	$ 129,806	11.4%
FY22-SW-005	$ 112,663	$ 101,760	$ -	$ 101,760	9.7%
FY22-SW-006	$ 39,955	$ 38,500	$ -	$ 38,500	3.6%
FY22-SW-007	$ 25,000	$ 25,000	$ -	$ 25,000	0.0%
FY22-SW-008	$ 94,630	$ 70,100	$ -	$ 70,100	25.9%
FY22-SW-009	$ 55,000	$ 42,000	-	$ 42,000	23.6%
FY22-SW-010	$ 40,000	$ -	$ 15,000	$ 15,000	62.5%
FY22-SW-011	$ 84,645	$ 35,000	$ 6,400	$ 41,400	51.1%
$ 671,462	**$ 816,596**	**$ 671,462**	**$ 71,400**	**$ 742,862**	19.3%

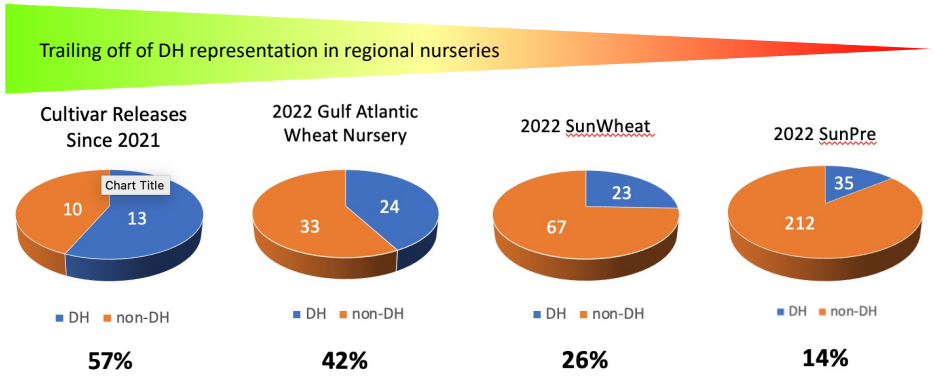
Breeding programs

- **Two critically underfunded**
- **Two other funded >15% below ask**

4

VDHR-SWW CP 3 Needs to Address

Inconsistent doubled haploid production



5