

USWBSI GDER Mid-Year Planning Meeting Report

Met via Zoom

May 27, 2021

ATTENDEES

Rong Di, Rutgers University	Yanhong Dong, UMN
Thomas Baldwin, NDSU	Ruth Dill-Macky, UMN
Guixia Hao, USDA-ARS	Jyoti Shah, UNT
Deanna Funnell-Harris, USDA-ARS	Amber Hoffstetter, USWBSI NFO
Mark Sorrells, Cornell University	Isha Mittal, UNT
Shengming Yang, USDA-ARS	Brian Meckes, UNT
Scott Heisel, AMBA EC	William Hay, USDA-ARS
Guihua Bai, USDA-ARS	Gary Muehlbauer, UMN
Dave Kendra, BASF Seeds and Traits	Vijee Mohan, UNT
Juliet Marshall, University of Idaho	Nidhi Rawat, UMD
Michelle Bjerckness, USWBSI NFO	Briana Whitaker, USDA-ARS
Anil Girija, University of North Texas	Hui Chen, KSU
Harold Trick, K-State	Wanglong Li, SDSU
Sunish Sehgal, SDSU	Katie Jordan, USDA-ARS
John McLaughlin, Rutgers	Alison Dineen
Cory Hirsch, UMN	Alyssa Leung
Aastha Acharya, SDSU	Gerit Bethke
Shiv Singla, UNL	John Thoguru

1. Welcome and introduction of incoming director, Michelle Bjerckness

2. Forum Organizing Committee – Update

- a. Rong Di gave an update on the planning of the 2021 Forum. If there are any suggestions for speakers, please provide them to Rong Di or Guihua Bai.

3. Research Project Presentations

- a. Guixia Hao
Chitin-induced ROS in wheat and barley heads tissue
- b. Deanna Funnell-Harris
Gene expression changes linked to Phenylpropanoid-based FHB Resistance.
- c. Guihua Bai
Barley stripe mosaic virus mediated CRISPR/Cas9 genome editing system to transfer *Fhb1* into adapted backgrounds. The group is working to pyramid *Fhb1* with *Fhb7*.
- d. Jyoti Shah
Mitigating FHB by knockdown of plant susceptibility and fungal virulence genes. Down regulate ‘susceptibility factors’. Fatty acids can be oxygenated by lipids. Lipid oxidation in plants is a susceptibility factor and if you down regulate *lox1-1* and *lox 5-1* these mutated plants are more resistant than the non-transgenic variety ‘Bobwhite’. Knocking down lipoxygenase genes does increase resistance in wheat.

- e. Gary Muehlbauer
Trichothecene toxins are glucosylated by *HVUGT13248*. *HVUGT13248* is required for type II resistance. Looking for mutants that give you an increase and decrease in severity. If something increases susceptibility, perhaps knocking it out will increase resistance. In the process of screening 150 families this summer in the greenhouse.

There was a six-minute discussion for Q&A with the first five presenters.

- f. Steve Scofield – not present
- g. Rong Di
Developed Barley CRISPR-gene editing platform and produced barley *Hv2OGO* mutant plants with pRD383. Working on seeing if the transformation is inherited in the next generation. Also, produced barley *HvHSK* mutant plants with pRD388. Regenerated ‘Conlon’ plants transformed with pRD403 are being characterized. Regenerated Morex plants transformed with pRC424 are being characterized to study *HvUGT*. Transgene-free gene-edited plants in barley are possible.
- h. Wanglong Li
Using wheat genes to improve FHB resistance in barley. There are reproductive barriers to transfer wheat genes to barley. CRISPR based target gene insertion can bypass these reproductive barriers. Project is looking to transfer *Fhb7* from wheat into barley using CRISPR mediated target gene insertion.

There were no questions for discussion for these two presentations.

- i. John McLaughlin
The objectives of this project are to isolate high-quality exosome preparations from mock inoculated and *F. graminearum* inoculated barley seedlings, use proteomics tools to characterize exosomal proteins in mock inoculated and *F. graminearum* inoculated barley seedlings, and characterize small RNAs in exosomes isolated from mock inoculated and *F. graminearum* inoculated barley seedlings.
- j. Cory Hirsch
Efficacy of phenotyping rover for evaluating field FHB severity. The Mineral Rover is semi-autonomous. The rover is high throughput and there have been recent breakthroughs in the machine learning. The goals are to determine the efficiency and cost benefit of the rover over conventional methods, does the phenotyping allow modeling of FHB, and measure DON levels based on imaging.
- k. Brian Meckes
Identify siRNA sequence candidates that target *F. graminearum* genes involved in growth, viability and virulence. Currently in the process of identifying and developing siRNA particles.
- l. Katherine Jordan
Leverage improved bioinformatics imputation tools and decrease cost of sequencing to construct a high-density catalog of genome variants across the wheat genome in FHB resistant lines. Working on building a database that includes characterization of 250 wheat lines. Will perform GWAS and GS.

- m. Briana Whitaker
Breeding potential for microbiome protection against Fusarium head blight with a specific focus in barley. The study objective is to identify FHB-recruited and genotype-responsive microbes.

There was a period for discussion and Q&A for the presentations.

- n. Harold Trick
Wheat transformation facility working on transforming wheat cultivars. In the future working to improve the elite cultivar transformation system.
- o. Shengming Yang
Barley genotype independent transformation assisted with *Agrobacterium*. This project is working to develop and hairy root transformation protocol in barley. Once transgenic hairy roots are obtained, regeneration of the barley plants must occur. Trouble shooting/alternative solution testing higher concentration of various hormone inducers.
- p. Sunish Sehgal
The goals are to develop and evaluate EMS lines for FHB resistance and develop TILLING techniques. There is a wide range for M4 lines in the mist irrigated FHB nursery. Average incidence in the nursery was 93% and average severity was 33%.
- q. Ruth Dill-Macky
Volunteer monitoring of the transgenic nursery since the nursery was ended. She would like to know if the PIs are still interested in field screening so she can determine if she needs to keep the nursery running. Her group is happy to screen in the greenhouse for people. CRISPR gene edited material is not treated differently at USDA-APHIS, it's still a regulated entity. This would need entered into field trials. Even if there isn't an inserted gene present, if it was edited with CRISPR, the USDA-ARS treats it as transgenic. Also, the USWBSI has decided to treat everything as transgenic.

Action Item: GDER needs to ask APHIS if CRISPR edited wheat is considered transgenic.

4. General Discussion

There was discussion of the upcoming RFP and the changes that are occurring including the move to 2- or 4-year projects.

If you have ideas on the planning meeting and how it can be changed, please provide those suggestions to Jyoti Shah. It's important for everyone to communicate with each other because without the in-person Forum, we will miss those opportunities to interact with colleagues.

Meeting Adjourned at 4:55 pm ET