

Project FY22-NW-004: Development of Scab Resistant SRW Wheat Varieties and Cooperative Phenotyping

1. What are the major goals and objectives of the research project?

These goals of this project are to 1) Increase and document the number of varieties with improved FHB resistance and high grain yield and grain quality that are tested in statewide variety trials and available to farmers, to reduce DON in the US grain supply and 2) Increase efficiency of the development and release of FHB resistant varieties and germplasm.

2. What was accomplished under these goals or objectives? (For each major goal/objective, address these three items below.)

What were the major activities?

Between May 2023 and April 2024 we completed field experiments, analyzed data to estimate total genetic values and genomic estimated breeding values, summarized variety testing results and provided results to growers in a report, made selection decisions based on genomic estimated breeding values, planted new field experiments and crossing blocks, made crosses to generate new lines, advanced segregating populations derived from new crosses in the greenhouse, identified lines for licensing to seedsmen, and communicated to growers about controlling scab both in-person and online. Our field experiments consisted of a) yield trials across 9 locations, b) seed increases at Urbana, IL to amplify seed for eventual commercial production, and c) nurseries at Urbana, IL including a fall-planted single plant nursery to derive new lines more rapidly, and an inoculated and misted scab resistance evaluation nursery. In our scab nursery we evaluated all our breeding materials as well as several cooperative nurseries.

What were the significant results?

We obtained excellent phenotypic data from yield trials and the scab nursery. All our 2023 experiments produced reliable data; however visual scab resistance phenotypes were not useful for selection in 2023. However, DON data from our 2023 scab nursery was useful.

List key outcomes or other achievements.

In Fall 2023 we licensed 1 breeding line to an established seed company and identified 2 other excellent breeding lines that are good candidates for licensing or for release as a public variety. Also, for the first time in 2023, lines from our rapid breeding single-plant nursery pipeline were entered in multi-environment yield trials.

3. What opportunities for training and professional development has the project provided?

This project has given graduate students and undergraduates the opportunity to gain experience evaluating and identifying symptoms of FHB resistance. Undergraduate students have also learned about the technical processes of plant breeding and have gained exposure to agricultural research. Two of the undergraduate students, Federico Therisod and Vinícius Filgueiras Nogueira, were visiting student interns from Argentina and Brazil respectively. Both students stayed for 6 months and learned and gained experience with scab resistance phenotyping while participating in our breeding program.

4. How have the results been disseminated to communities of interest?

Results of the breeding program, in the form of germplasm, has been shared with private seed companies for licensing.

Results of scab resistance evaluation on varieties in the Illinois State Variety trial have been published on the variety testing website: <http://vt.cropsci.illinois.edu/wheat.html> and on scab smart <https://scabsmart.org/>

Information about controlling scab and how to select scab resistant varieties was communicated to growers in multiple presentations. One was an online presentation entitled 'Advancements in Wheat Genetics and Management' at the Illinois Extension Crop Management Conference, available Online February 16, 2024- April 30, 2024. The second presentation was entitled 'Wheat Genetics and Management Considerations for Double-Crop Bean Success'. This was presented at the Illinois Soybean Association Better Beans Event, Ina, IL, January 18, 2024. The third presentation was entitled 'Wheat Variety Selection Hints for Higher Profitability'. This was presented at the Illinois Wheat Association Double Crop Forum, Mt Vernon, IL, February 5, 2024.

In addition, we were able to communicate about our breeding program and its objectives, including improving scab resistance on National television. Our breeding program was featured on the TV Program 'U.S. Farm Report' on November 11, 2023. The TV program aired nationally on RFD-TV, a TV channel with more than 50 million subscribing households across the US.

5. What do you plan to do during the next reporting period to accomplish the goals and objectives?

During the next reporting period we will conduct the same major activities as in this reporting period. It's important that we conduct these major activities every year in order to accomplish the goals and objectives of this project.

In addition, during the next reporting period we will submit at least one publication that is in preparation. This publication results from breeding methods research that we have been working on over the past three years.