

Project FY22-BA-001: Identification, Characterization, and Development of FHB-resistant Germplasm

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

Major Project Goals: Identification and confirmation of FHB resistance (particularly expressed as lower DON) in USDA-ARS Aberdeen, Idaho breeding lines.

Project Objectives:

- 1) Characterize FHB resistance in Elite barley germplasm.
- 2) Incorporate a genomic selection approach to improve elite germplasm for FHB resistance.
- 3) Characterize QTL contributing to FHB resistance and lower DON.

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

What were the major activities?

- 1) Characterized more than 150 elite lines at the Kimberly nursery in Idaho. DON data was obtained for grain samples. Collaborated with North Dakota State University and University of Minnesota for FHB screening in their nurseries. Obtained DON data from collaborators for 100 lines each. Selected FHB resistance germplasm for use as parents in crosses.
- 2) Intercrossed the progeny of the first round of genomic selection crosses. Repeated with the progeny of those crosses, resulting in a total of 68 F1 progeny from three rounds of crossing in this cycle of selection. Multiple F2 seed of each cross were planted to begin the in-breeding generations.
- 3) Genotype and phenotype data is complete for 4 bi-parental populations. Linkage analysis is underway.

What were the significant results?

- 1) From selections made in FHB nurseries, made over 50 crosses using at least one FHB resistant (low DON) parent. The DON results from 2023 suggested breeding lines that may provide up to moderate resistance to FHB.
- 2) 710 new lines that will be ready for genotyping and genomic selection in FY24.
- 3) Preliminary analysis has suggested the presence of QTL influencing DON level on chromosomes 2H and 5H of Aberdeen malting lines 2AB08-X05M010-82 and 95SR316A. These are likely distinct from QTL contributed by ND Genesis or Conlon to the progeny of our bi-parental mapping crosses.

List key outcomes or other achievements.

DON results indicate that our potential malting line 16ARS067-13 will prove to have a MS to M reaction to FHB. The elite malting barley line 11ARS189-3 had an MR level of resistance to FHB as measured by DON level.

Linkage analysis identified QTL contributing to lower DON levels on chromosomes 2H and 5H.

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

This project provided the opportunity for training and career development for Two postdocs at ARS, and one undergraduate student at Idaho State University. Additionally, the project also trained one student from the local high school.

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

The barley materials developed by our group have been shared with several barley scientists in the US. The FHB testing results are being used to prepare scientific manuscripts or conference abstracts. Results have been reported to the Idaho Barley Commission and the American Malting Barley Association.

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

The work in this project will be carried over into a new USWBSI project with similar objectives. As such, evaluation of FHB resistance and DON accumulation will be carried out on experimental populations and elite germplasm although evaluation of an updated genomic selection training population will take the place of the bi-parental populations in the FHB nurseries. The results will be used to select parents for and to suggest lines for advancement towards release.