

Project FY22-BA-005: Breeding Spring and Winter 2-rowed Malting Barley for FHB Resistance and Reduced DON

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

1. Evaluate FHB resistance in a Winter 2-row Malting Barley Trial coordinated by Kevin Smith at the University of Minnesota and the winter NABSEN coordinated by Eric Stockinger at Ohio State University.
2. Evaluate FHB resistance in spring and winter malting barley varieties and lines that are tested in New York State Regional Barley Trials.
3. Evaluate FHB resistance and agronomic traits in our NY winter 2-row elite line training population and use genomic selection to develop winter 2-row malting barley varieties with FHB resistance and adaptation to the northeastern U.S.

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

a) What were the major activities?

1. We are evaluating FHB resistance in the Winter 2-row Malting Barley Trial coordinated by Kevin Smith at the University of Minnesota and the winter NABSEN coordinated by Eric Stockinger at Ohio State University.
2. We are evaluating FHB resistance in our misted inoculated FHB nursery for all malting barley varieties that are tested in New York State Regional Spring and Winter Malting Barley testing programs. All of our data are published and distributed to the barley community and the public at large through print, web, field days and workshops.
3. We are evaluating FHB resistance and agronomic traits in our NY winter 2-row elite line training population and those data are used for genomic selection to develop winter 2-row malting barley varieties with FHB resistance and adaptation to the northeastern U.S.

b) What were the significant results?

1. We scored all entries in the Winter Malting Barley Trial and the NABSEN for incidence, severity, fusarium damaged kernels and DON in three replicates. Data were submitted to T3 and the nursery coordinators.
2. We scored all entries in spring and winter malting barley State-Wide Regional Trials for incidence, severity, fusarium damaged kernels and DON in three replicates. Those data were summarized and reported in our annual performance trial publication.
3. Phenotypic data were recorded for FHB and agronomic traits in our NY winter 2-row malting barley genomic selection training population. The phenotypic and genotypic data were used to train genomic prediction models to generate breeding values for our preliminary yield trial entries.
4. We have implemented genomic selection and aerial imaging in our winter malting barley breeding program to improve selection efficiency.

c) List key outcomes or other achievements.

1. Several entries in the Winter Malting Barley Trial and the NABSEN had above average resistance to FHB.
2. Almost half of the entries in our State-Wide trial had above average resistance to FHB.
3. Breeding values for FHB resistance were used to select lines in our preliminary yield trial for advancement.
4. Our two new spring malting barley varieties have gained wide acceptance by farmers, maltsters, and brewers.
5. We have evaluated our winter malting barley selections in state-wide trials for the second year. Out of 25 winter barley experimental lines in our regional trials, 13 had DON concentrations below the trial mean. In collaboration with Oregon State University, we co-released the Lightning facultative malting barley variety in 2020. Lightning is now in commercial production in NY for the fourth year and maltsters are reporting good results.
6. Probably our greatest achievement was the development of a strategy for using marker assisted selection (MAS) to identify and select genotypes that exhibit seed dormancy at harvest time but lose that dormancy within two to three months. We found that using MAS for selecting the correct allele at both SD1 and SD2 seed dormancy loci will have a very important impact on malting barley production in non-traditional regions that often experience wet, humid conditions at harvest time.
7. We are producing breeder seed of eight winter malting barley release candidates and will select one or two for Foundation seed production this fall.

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

All of our graduate and undergraduate students participated in the collection and analysis of data from our FHB nurseries. Our technicians have consistently improved the evaluation nurseries each year.

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

Summary tables and reports (annual and cumulative) are prepared and distributed to more than 400 agents, farmers, scientists, and administrators by regular mail and email. All reports are made available online at two web sites. We also deposit our data in T3.

<https://bpb-us-e1.wpmucdn.com/blogs.cornell.edu/dist/5/8858/files/2023/12/2023-SG-Performance-Trial-Publication.pdf>

We also present the results at two field days and two workshops for extension agents.

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

We will continue to evaluate the cooperative winter malting barley trials and our state-wide trials. We plan to produce foundation seed of one or two of our new winter malting barley varieties that are currently being grown for breeder seed production. Finally, we will continue with the genomic selection in our spring and winter barley breeding program.