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

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

1. Evaluate FHB resistance in spring malting barley varieties 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.

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

What were the major activities and significant results?

Objective 1. We have released two spring malting barley varieties, Excelsior Gold and HudsonNY from our public program with improved FHB resistance, high grain yield and grain quality and tested them in statewide variety trials. These varieties have been made available to farmers, to reduce DON in New York-grown barley. We have recently released a new winter malting barley called LakeEffect. Foundation seed will be available for fall planting. We evaluated the Winter NABSEN coordinated by Eric Stockinger at Ohio State and the Winter 2-row Malting Barley Trial coordinated by Kevin Smith at the University of Minnesota in our misted, inoculated FHB nursery.

Objective 2. We evaluated spring and winter malting barley varieties, both public and private, in state-wide trials this past year and based on those trials made recommendations on which varieties have improved agronomic characteristics and FHB resistance. We have collaborated with other barley researchers by using doubled haploids and germplasm exchange. We submit data to the T3 database, and we have increased the efficiency for scoring barley for resistance in our FHB nursery, so we have expanded our testing.

Objective 3. We have implemented modern breeding technologies including genomic selection and doubled haploids to further enhance short term and long-term improvement of FHB resistance in spring and winter barley. We have implemented genomic selection and aerial imaging in our winter malting barley breeding program to improve selection efficiency.

List key outcomes or other achievements.

Our key accomplishments include the public release of two spring malting barley varieties and a winter malting barley variety adapted to northeastern U.S. growing conditions. Out of 24 winter barley experimental lines in our regional trials, 16 had DON concentrations below the trial mean. We have released a new winter malting barley LakeEffect, and Foundation seed will be harvested in 2025. In collaboration with Oregon State University, we co-released the Lightning facultative malting barley variety in 2020, and it has the lowest DON content over years. Lightning is now in commercial production in NY for the sixth year and maltsters are reporting good results. 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 alleles at both SD1 and SD2 seed dormancy loci, we can predict the level of dormancy in the seed. This could have a very positive impact on malting barley production in non-traditional regions that often experience wet, humid conditions at harvest time. The release of a new winter malting barley variety with low DON in only eight years is also one of our greatest accomplishments.

3. 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.

4. 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/2024/12/SG-Performance-Report-Nov2024.pdf
We also present the results at two field days and two workshops for extension agents.

5. 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 are producing foundation seed of our new winter malting barley variety, LakeEffect, this summer. Finally, we will continue with the genomic selection in our spring and winter barley breeding programs.