

Project FY22-NW-001: Genetics and Breeding of FHB Resistant Soft White & Red Winter Wheat for the NE U.S.

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

1. Develop FHB resistant soft white and red winter wheat cultivars for the northeastern U.S. in collaboration with Gary Bergstrom, Department of Plant Pathology. Evaluate our elite lines in the Cornell University FHB Advanced Line nursery.
2. Pyramid FHB resistance genes by hybridizing elite lines with native FHB resistance to exotic sources of FHB resistance both Asian and other sources.
3. Evaluate FHB resistant lines in New York regional and state trials for release, farmer recommendations, and seed increase.
4. Participate in the coordinated evaluation of cooperative nurseries for FHB resistance.
5. Implement recurrent mass selection in dominant male sterile populations in soft winter wheat backgrounds adapted to the eastern US.
6. Participate in the coordinated sharing of information from the above activities to generate comprehensive source of information that can be used in forward breeding strategies.

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. Lines in our preliminary trial and state-wide regional trials were evaluated in our Cornell University FHB Advanced Line FHB nursery.
2. Diverse sources of FHB resistance were grown in the winter greenhouse to generate new crosses for pyramiding FHB resistance genes.
3. FHB resistance of all wheat varieties grown in NY state were evaluated in our misted, inoculated FHB nursery and recommendations were made for growing FHB resistant varieties.
4. We evaluated the NUWWSN in our FHB nursery and reported the data to the coordinators and loaded the data into T3.
5. For this objective, we have extracted lines from the half-sib recurrent selection population and evaluated them in our FHB nursery to assess the gain from selection.
6. We submit data to the T3 database and to the USWBSI web site. Our annual performance trial results include FHB and DON summaries for our state-wide trials and are distributed widely to stakeholders.

What were the significant results?

1. High quality data on FHB resistance in our soft winter wheat breeding program were recorded and analyzed.
2. About 110 crosses were made between diverse sources of FHB resistance.

3. Entries in our state-wide trials were evaluated in our misted, inoculated FHB nursery. Data were summarized within and across years and distributed to stakeholders.
4. We entered four new lines in the NUWWSN and evaluated the nursery for resistance in our FHB nursery. All data were reported to the coordinator and uploaded to T3.
5. Lines extracted from our half-sib recurrent selection population showed high levels of FHB resistance equal to resistant checks.
6. Our annual performance trial results include FHB and DON summaries for our state-wide trials and are distributed widely to stakeholders

List key outcomes or other achievements.

1. Single year and multiple year summaries of our advanced lines demonstrated that we are making progress in developing lines with above average FHB resistance. Our new soft white winter wheat variety named 'Towpath' has the highest level of FHB resistance compared to all other varieties grown in NY.
2. All of our soft wheat parents used in crosses now have some level of FHB resistance leading to a high frequency of moderately resistant lines in our testing program.
3. Only lines and varieties that have at least moderate resistance to FHB are recommended for NY growers.
4. Many of our entries in the NUWWSN continue to show good FHB resistance.
5. We are planning a germplasm release for the lines extracted from the half-sib recurrent selection population.
6. Data summaries from our FHB nursery and regional trials are distributed to stakeholders on our web site, by email and at field days and extension workshops.

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

All of our graduate and undergraduate students participate in the collection and analysis of data from our FHB nurseries. Two new field technicians received training in FHB data collection.

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

Each year we publish the results of our state regional trials for both soft red and soft white winter wheat including FHB and milling and baking quality hard copy through mail or email and online. Data for cooperative nurseries were sent to coordinators.

Cornell Small Grains Performance Trials: <https://bpb-us-e1.wpmucdn.com/blogs.cornell.edu/dist/5/8858/files/2024/12/SG-Performance-Report-Nov2024.pdf>

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

We will continue to evaluate the NUWWSN and entries in our state-wide trials. We will offer our new soft white winter wheat variety, Towpath, for commercial production. Finally, we will continue with the genomic selection in our wheat breeding program.