Project FY22-HW-008: Development of Montana Adapted FHB Resistant Winter Wheat Varieties

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

To continue with FHB resistance breeding and screening efforts to develop Montana adapted FHB resistant winter wheat varieties. The specific objectives of the research projects were

Objective 1: Improvement in FHB resistance in MSU's winter wheat breeding program using both conventional and MAB breeding. MAB will be aimed to increase frequency of FHB resistant alleles in the winter wheat program.

Objective 2: Screen Montana adapted winter wheat experimental lines for FHB resistance in a mist irrigated screening nursery located at the Southern Agriculture Research Center (SARC) in Huntley, MT. Experimental lines with FHB resistance will be advanced in the breeding program and considered for public release.

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

What were the major activities?

Each year 2022, 2023 and 2024 crosses were conducted to increase frequency of FHB resistant alleles in the winter wheat program. Parental lines Emerson, AAC Gateway, Overland-*FHB1* and Decade-*FHB1* were used in the conventional crossing program. Populations derived from the crosses were advanced in the greenhouse and currently in different advancement stages in the breeding program.
Breeding lines were screened were for presence of *Fhb1* and *Sr2*. Unfortunately, the crosses with *Fhb5A* did not have adequate winter survival and further crossing and backcrossing have been initiated.
Each year hundred winter wheat experimental lines for FHB resistance were screened in a replicated trial sown in a mist irrigated nursery at Southern Agriculture Research Center (SARC) in Huntley, MT. Lines were scored for disease severity and harvested seed were analyzed for accumulation of DON.

What were the significant results?

Three experimental lines were identified with moderate resistance to FHB and lower DON values. These lines are currently being evaluated in multiple environments across Montana for yield and agronomic performance.
With the support from USWBSI there has been an increase in frequency of number of lines with Fhb resistance in the program. The change in strategy to screen early generation experimental lines has helped to advance lines with moderate resistance and reduced DON values in the breeding program.

List key outcomes or other achievements.

The key outcome has been selection of advanced breeding lines with moderate resistance and reduced DON values which have been part of multi-location evaluations in 2024 and 2025. The lines will be considered for public release if the lines meet all standard criteria for yield and agronomic performance for release.

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

The project suffered initially from research personnel changes in 2022 and 2023. In 2024, a MS graduate student was involved in the project specifically with utilizing aerial phenotyping to estimate disease severity

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

The lines identified with moderate FHB resistance were included in multi-location trials are also part of the demonstration in Annual field days held at Montana Agricultural Experiment Stations in 2023 and 2024. Growers were informed on the ongoing work in integrating FHB resistance in winter wheat in Montana.