

**Project FY22-NW-002:** Conventional and Marker-based Breeding to Improve Yield and FHB Resistance in Wheat

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

The goal of this project is to develop high yielding and FHB resistant varieties. The approach will be developing breeding populations by crossing high yielding lines with moderately resistant varieties (or experimental lines), and then testing them in replicated plot experiments and disease nurseries.

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

**What were the major activities?**

**a) What were the major activities?**

The overarching goal of this project is to continue breeding procedure and produce new genetic variations that harbor both yield and FHB resistance traits, and ultimately releasing high yielding varieties to growers. The detailed objectives are: producing new breeding crosses every year, generation advancement of breeding populations, and line testing locally and regionally.

**Objective 1. Breeding crosses.** We made available few hundreds of breeding crosses between high yielding varieties and moderately resistant breeding lines from scab nursery over the last two years. These crosses will make new breeding populations that will be advanced in the field next fall.  $\gamma$  resistant germplasm. The F1 from last season were grown in greenhouse. Seeds of F2 generation were planted in long rows in the field in fall 2023.

**Objective 2. Generation advancement.** In total, 96 families of F2 were planted in 16 ft long rows in the field, 68 families of F3 were planted exactly in plot size with multiple checks of local checks and 42 families of F4 generation were planted in plots with multiple checks of local checks. After selections among families, heads from within families were selected. The heads from F2s and F3s were bulked within each family, and heads from F4s were kept separately to form the head rows of next generation. This year we have grown 966 head rows consisting of new lines and selection and hand harvesting were completed.

**Objective 3. Line testing.** For our multi-state testing, the BIG6 (6 states involved are IN, IL, OH, KY, MI, and NY) trial including 460 plots was planted in a p-rep design. Two Y1 testing trials were planted in row and column design, each accommodating 80 plots. Two Y2s and one Y3 trials were planted each accommodating 140 plots. The elite nursery consisted of 60 plots. We also conducted the uniform eastern regional winter wheat nurseries (UERWWN) trial.

**Objective 4. Scab testing of advanced lines.** We conducted the preliminary and advanced nurseries (P+NUWWSN FHB) and inoculated them with scabby corn kernels, and created a desirable environment for disease establishment. They will be threshed, FDK will be measured, and grain samples will be sent to University of Minnesota for DON testing. This year the incidence of FHB was high.

**What were the significant results?**

Breeding trials were successfully harvested. Variations in grain yield and FHB traits were observed during the season and harvest time. At this point (July 12) we have incorporated plot length and reported back cooperative trials such as BIG6. In particular PI reported FHB incidence and foliar diseases in the BIG6 trial planted in Indiana to all breeders.

**List key outcomes or other achievements.**

The key outcome after we finalize data and share them with collaborators will be selection of higher and more stable yielding lines across multi-location. The ultimate outcome will be selection of candidates for variety release. The results will also identify BIG6 lines that are resistant or moderately resistant to FHB in Indiana condition. Nearly 26% of 460 plots in BIG6 showed FHB incidence of varying degree in June 2024.

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

There was no fund for grad or postdoc. The fund only covered the technician salary.

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

Dr. Mohammadi have shared the results with the breeding network and stakeholders.

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

For the next reporting period we will continue to conduct the required activities to meet the outlined objectives: breeding crosses, generation advancement, line testing, and DON testing of advanced lines.