Project FY22-BA-004: Evaluation of Winter Barley Commercial Cultivars and Breeding Lines for FHB

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1. **What are the major goals and objectives of the research project?**
   Project Goals: Evaluation of Fusarium head blight (FHB) reaction in local commercial varieties of barley is critical for growers. At the same time, barley breeders need to evaluate their breeding germplasm for FHB resistance and DON accumulation for developing resistant varieties. PI will conduct misted nursery to evaluate local commercial cultivars and breeding germplasm for their response to FHB and DON accumulation. Barley is most susceptible to FHB at heading stage. However, heading times of barley genotypes/cultivars vary in natural conditions due to differences in their genetic background. Moreover, weather conditions may not be favorable for FHB every year. The misted nursery will help to avoid these issues by consistently maintaining favorable conditions for FHB infection over a longer period. The overall project goal is to analyze barley breeding germplasm and commercial cultivars for their genetic resistance to FHB and DON accumulation.

   Project Objectives:

   1. Conduct misted nursery for evaluating FHB resistance and DON accumulation in NABSEN barley breeding lines
   2. Evaluate local barley varieties from the Mid-Atlantic region in the misted nursery. The misted nursery data generated will help: a)-breeders in selecting FHB resistant breeding germplasm, and b)- growers in the Mid-Atlantic region in selecting high-yielding barley varieties with moderate resistance to FHB and DON.

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

   What were the major activities?

   Misted nursery was conducted at the Beltsville Research Station of the University of Maryland in 2024. The 56 NABSEN lines were planted in three randomized replications of head rows of 4 feet length in the month of October 2023. Commercial barley varieties were also planted in small plots (3.5 ft x 10 ft) in the nursery in three randomized replications. Fusarium-infected corn kernel inoculum was spread in the nursery at the tillering stage of the plants. Overhead misting was applied for 2 minutes every 80 minutes from 9 pm - 9 am in the nursery from the same day. FHB severity and incidence data collected at 25 days after heading. Samples were prepared for their DON content analysis and shipped to Dr. Yanhong Dong at Minnesota. The DON content of the analyzed lines ranged from 0.97 ppm to 19 ppm.

   The activities were conducted according to the timelines outlined in the project. The data reporting results of the 2024 experiments were provided to the NABSEN team in September 2024.

In general, FHB and DON was not a major issue in 2024 for growers in the state. The temperature at Beltsville Research Station during the months of April and May ranged from 31°F to 91°F. Although the nursery was artificially misted, the weather conditions in the state and the country were relatively dry in 2024.

What were the significant results?
The FHB indices and DON data for barley commercial varieties were published as a Factsheet for 2024 and circulated among growers, commodity boards, and other stakeholders. The results were disseminated to the growers and stakeholders in commodity board meetings as poster presentations, oral talks and via emails.
The NABSEN data on barley germplasm evaluation was provided to the coordinators Dr. Tom Baldwin and Dr. Eric Stockinger in September 2024.

List key outcomes or other achievements.
Key outcomes were disease ratings and DON contamination measurement. Some lines in the barley trial and NABSEN head rows had lower FHB severity, indices and DON content as compared to others.

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

A master's student and two undergraduate students were involved in the field work. Two high school students were also trained in the project on field diseases. All the trainees worked with the PI to conduct the nursery, collect and analyze data. The graduate students and PostDocs also participated in conferences and commodity board meetings with their work.

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

The PI presented the results in oral presentations and disseminated updates on FHB in wheat and barley through emails. The graduate students in the team presented the results as posters and handouts to the stakeholders in commodity board meetings. The results were published as Barley disease Factsheets and were disseminated via emails and the UMD extension system to the broader grower community.

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

The activities planned for 2025 include: 1- planting the NABSEN and cultivar seed material in triplicate rows, 2-Preparing corn inoculum infected with local Fusarium graminearum isolates, 3- Setting up the nursery with timed misters, water supply, and field inoculation, 4-Field data recording for FHB severity, 5-Harvesting, 6- Preparing samples for DON content analysis, 7- Data compilation and sharing with the Barley-CP coordinator, growers, and stakeholders.