Project FY22-BA-025: Screening for Scab Resistance in Barley Lines Adapted for South Dakota

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1. **What are the major goals and objectives of the research project?**
   The overall goal of the project is to fulfill the need for locally adapted FHB resistant barley varieties for South Dakota growers.
   The research Objectives are:
   1) Field evaluation of winter and spring barley lines for FHB resistance response as a breeding trait for growing in the eastern region of South Dakota and neighboring states

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) Establishing a winter barley misted, inoculated disease nursery at Volga Research Farm, SDSU, and evaluating it for winter hardiness and FHB disease severity and DON (mycotoxin) estimation at 21 and 28 days post inoculation.
   2) Establishing a spring barley misted, inoculated disease nursery at Volga Research Farm, SDSU, and evaluating it for FHB disease severity and DON (mycotoxin) estimation at 21 and 28 days post inoculation.

   What were the significant results?
   - Out of 26 winter barley lines/varieties tested, 21 contained winter hardiness in 2024 in all four replicated plots. Unlike previous years, 2024 was a mild winter in South Dakota, which could be the reason for the higher survivability in the region.
   - Out of the survived 21 lines four lines (Charles, Wintmalt, Eight-eleven and Maja) showed moderate resistance to FHB at 21 days post inoculation; however only one (Wintmalt) remained below 40 % and Charles as the second best performing variety after 28 days post inoculation in 2024.
   - Out of the 32 lines/varieties tested for spring barley, S2M190, S2M196 and S2M197 showed lower disease severity and are considered moderately resistance for FHB.
   - The correlation with DON was not significant and even the moderately resistant varieties showed higher DON accumulation compared to the higher FHB diseases severity lines tested in 2024. The DON accumulation could also be elevated due to rainfall before manual harvesting of the plots.

   List key outcomes or other achievements.
   Same as significant Results.

3. **What opportunities for training and professional development has the project provided?**
   1. **Tapish Pawar,** a Full-time Research Associate transitioned into **PhD program** under my supervision and was partially supported by the USWBSI funding. His Research activities pertaining to the USWBSI grant was planning, establishing the Fusarium Head Blight disease nursery, collecting the data, analysis and preparing the first draft of the manuscript. Tapish presented his research at the North Central APS conference and was the awarded a **Travel Award** and **second place** for Student Oral Presentation Competition.

2. **Joseph Tilstra** (Undergraduate) January 2023 to August 2024, partially supported by the USWBSI funding. Joseph conducted research for 18 months as an undergraduate student in my research Program. His passion for science led him to pursue graduate school at Purdue University. His research experience pertaining to the reporting was supporting the graduate student to inoculate and collect the disease severity data, and analyze the results. He presented the research at the North Central *American Phytopathological Society Conference*.

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

Results were presented at small grains growers meeting, Agronomy presentation at SDSU, American Phytopathological Society (APS) North Central, Plant Animal Genome and at the USWBSI forum 2024. One manuscript on the three year summary of Spring barley FHB disease severity testing in under review and one manuscript on winter barley, winter hardiness and FHB disease severity in in preparation.

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

Projected timeline

Part 1: FHB resistance trials planting, September 2024 for winter barley- completed.
Part 2: Inoculum preparation, Nursery inoculation of barley with *F. graminearum* April- May 2025
Part 3: Field evaluation of FHB disease severity June -August 2025
Part 4: Harvest and post-harvest processing/ data analysis August 2025
Part 5: DON analysis for 2025 FHB nursery in grain kernels. September-October 2025.
Part 6: FHB resistance trials analysis November-Dec 2025
Part 7: Manuscript preparation and revisions for dissemination of the three year study.