Project FY22-IM-005: Fungicide and Variety Evaluation for FHB Management in Wheat in South Dakota

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

This project is part of the FHB Integrated Management Coordinated Project (MGMT_CP) with the overall goal to determine the efficacy of Prosaro Pro and Sphaerex applied at flowering to winter and
spring wheat varieties with varying levels of FHB resistance or susceptibility. The specific objectives of the proposed study are to:

1. Determine the integrated effects of Prosaro Pro and Sphaerex fungicide treatments and genetic resistance on FHB and DON in spring wheat

2. Compare the efficacy of Prosaro Pro and Sphaerex to that of Prosaro, Caramba, and Miravis Ace.

3. Generate data to further quantify the economic benefit of FHB and DON management programs.

4. Generate data to validate and advance the development of FHB risk prediction models

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

What were the major activities?

Integrated FHB management trial (IMT): Four hard red spring wheat (HRSW) cultivars, Boost (FHB-moderately resistant), CP3099A (FHB-susceptible), Samson (FHB-susceptible), and Surpass (FHB-moderately resistant) were planted at Northeast research farm (NERF) near South Shore on May 23 2023 and at Volga Research Farm on May 17 2023. The study included six treatments, **1)** inoculated-untreated check, **2)** non-inoculated untreated check, **3)** Prosaro (6.5 fl oz/ac), **4)** Miravis Ace (13.7 fl oz/ac), **5)** Prosaro Pro (10.3 fl oz/ac), and **6)** Sphaerex (7.3 fl oz/ac) applied at early flowering (Feekes 10.5.1). This study as set up as a randomized complete block design (RCBD) with a split-plot arrangement, where the cultivar was the main plot and fungicide the sub-plot.

Uniform fungicide trial (UFT): A susceptible hard red spring wheat variety, 'CP3099A' was planted at the same locations and dates as the IMT study. Treatments for this study were, **1**) Untreated – inoculated check, **2)** Prosaro (6.5 fl oz/ac), **3)** Caramba (13.5 fl oz/ac), **4)** Miravis Ace (13.7 fl oz/ac), **5)** Prosaro Pro (10.3 fl oz/ac), **6)** Sphaerex (7.3 fl oz/ac). These treatments were applied at Feekes 10.5.1. The next three treatments (7, 8, and 9) were applied in sequence, starting at Feekes 10.5.1 followed by a second application 4 to 6 days after Feekes 10.5.1. Treatment **7)** Miravis Ace (13.7 fl oz/ac) followed by Prosaro Pro (10.3 fl oz/ac), **8)** Miravis Ace (13.7 fl oz/ac) followed by Sphaerex (7.3 fl oz/ac), **9)** Miravis Ace (13.7 fl oz/ac) followed by Tebuconazole (4 fl oz/ac). The final two treatments were single applications at 4 to 6 days after Feekes 10.5.1. The treatments include, **10)** Prosaro Pro (10.3 fl oz/ac), **11)** Sphaerex (7.3 fl oz/ac). These treatments were laid out in a randomized complete block design.

Volga Research Farm plots were inoculated with corn spawn infected with *Fusarium graminearum* at 3.33 g per square foot at boot stage. An automated misting system was installed to provide damp conditions to increase disease pressure. Northeast Research Farm was left to natural infection.

Treatments in both studies were replicated four times and plots trimmed to 5 ft wide x 15 ft long. Fungicides were applied using a CO_2-pressurized backpack sprayer (40 psi) with three Twin Jet TJ- 60 8002 nozzles spaced at 15 inches apart. Field FHB incidence and severity evaluations were conducted about 21 days after treatment application.

What were the significant results?

Northeast Research Farm had low scab pressure largely due to the continuing drought conditions with FHB index less than 2% in the untreated-inoculated plots and Fusarium damaged kernels (FDK) less than 1% from the UFT study while the two susceptible varieties in the IMT study averaged about 5% or less for FHB index and less than 1% for FDK. There were no significant differences between treated and untreated plots.

In the Volga research plots, however, the sequential applications in the UFT had the lowest FHB index and FDK values and were significantly different from the untreated check. Single applications at Feekes 10.5.1 and 4 to 6 days after Feekes 10.5.1 were not significantly different I FHB index and FDK. The resistant varieties in the IMT had the lowest FHB index and FDK compared to the susceptible varieties. Plots that were treated with a fungicide had lower FHB index and FDK than plots that were not treated. Moderately resistant varieties, particularly Surpass, did not show significant differences in FHB index and FDK between untreated-inoculated and fungicide treated plots.

List key outcomes or other achievements.

Obj. 1&2: Generally, all plots treated with fungicides had lower FHB index and FDK. Higher efficacy was achieved when fungicides were applied to moderately resistant varieties than susceptible varieties which highlights the importance of integrating host resistance in FHB management. DON samples were sent for analysis at the DON Testing Lab in Fargo, ND.

Obj. 3 & 4: Data were collected and submitted to the national coordinator for economic benefit assessment of FHB and DON management programs and FHB risk prediction model generation.

3. **What opportunities for training and professional development has the project provided?**
   Six undergraduate student workers, three graduate students, and two technicians have been able to learn about FHB in South Dakota wheat and trained in the identification of FHB throughout the wheat lifecycle.

4. **How have the results been disseminated to communities of interest?**
   Results collected from the 2023 study have been disseminated to more than 2,500 producers and stakeholders through 25 extension talks given from the fall 2023- summer of 2024.A poster containing our results was also presented at the 2023 National FHB Forum meeting.

5. **What do you plan to do during the next reporting period to accomplish the goals and objectives?**
   We will continue to complete our objectives, ensuring that fungicides and inoculum are applied at the correct times and that data is collected as planned. We will take all years of data collected to develop trend lines and to infer how environmental conditions (drought, excess moisture) are affecting disease development and fungicide efficacy. This will make a more effective messaging in extension talks and publications.