Project FY22-IM-017: Integrated Disease Management for FHB and DON in Missouri

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1. **What are the major goals and objectives of the research project?**
   Objective A: Integrated Management: Evaluate the integrated effects of fungicide treatment and genetic resistance on FHB and DON in all major grain classes in Missouri, with emphasis on new fungicides.
   Objective B: Uniform Fungicides: Compare the efficacy of a standard anthesis application of new fungicides as compared to a standard application of Prosaro or Caramba.

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

   What were the major activities?
   Objective A: Trials were conducted at two locations during the spring of 2024 to evaluate integrated management tactics for Fusarium Head Blight suppression. Two soft red winter wheat varieties were tested: the moderately resistant Missouri variety Truman and the FHB-susceptible Pioneer variety 25R65. Each variety was treated with one of four fungicide programs. Plots were artificially inoculated with a Missouri-specific *Fusarium graminearum* field isolate. Control treatments included non-treated, inoculated plots and non-treated, non-inoculated plots at each location. One location included mist irrigation at the time of inoculations.

   Visual spikelet disease ratings were conducted 21 days after the last fungicide application. Grain from each plot was harvested for yield, with a subset of grain collected for Fusarium-damaged kernels assessment (FDK), and submitted for deoxynivalenol (DON) analysis. Collected data was submitted to collaborators at The Ohio State University for meta-analysis.

   Objective B: Trials were conducted at the same two locations described in Objective A in spring 2024 as part of a uniform fungicide efficacy trial. This study compared standard fungicide treatments to newly available products. The FHB-susceptible Pioneer variety 25R65 was used for all plots. Trials were inoculated with the same *F. graminearum* field isolate, and control treatments were consistent with those described in Objective A. One site also utilized mist irrigation to enhance infection. Data collection followed the same procedures as in Objective A.

   What were the significant results?
   Objective A: Across all fungicide treatments, visible disease severity was lower in plots planted with the moderately-resistant variety 'Truman' compared to plots planted with the susceptible variety '25R65'. At the Novelty location, disease severity averaged 28% in Truman plots and 45% in 25R65 plots. At the Columbia location, disease severity was lower overall, with 7% in Truman plots and 21% in 25R65 plots.

Yields were slightly higher in the susceptible (25R65) plots at both locations, although test weights were generally reduced in the same plots. Deoxynivalenol (DON) levels were similar between varieties, averaging approximately 0.4 ppm at Novelty and 1.0 ppm at Columbia.

At the Novelty location, fungicide applications reduced disease severity in both varieties. In the susceptible plots, fungicide treatments protected yield and improved test weights in the 25R65 plots while no differences were observed in the Truman plots. At the Columbia location where disease severity was generally lower, fungicide applications reduced disease severity but did not affect yield or other variables when compared to non-treated, inoculated plots. Further statistical analyses will be conducted to determine whether the differences were significant and to detect differences among the fungicide treatments. Additionally, the data is included in multi-state meta-analyses to determine the best management practices over diverse environmental conditions.

Objective B: Fungicide applications reduced visible disease severity at both locations. One location has historically been a higher yield environment, and at that site, there was a trend that DON levels were reduced from 0.8 in non-treated plots to below 0.6 ppm across fungicide treatments. There were no observable differences in DON at the second location. Yields were variable and trended higher than the non-treated at both environments. At the "higher yielding environment" grain test weights were an average of 55 for the non-treated plots and $\geq$57 pounds per bushel for treated plots. At the second environment, there were not consistent differences observed. Further statistical analyses will need to be conducted to determine whether the differences were significant.

List key outcomes or other achievements.

Information from these trials has been used to answer questions of Missouri producers and retailers on FHB management in wheat and to guide future recommendations.

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

Missouri undergraduates Daniel Bellis and Emma Rohlfing were trained on FHB ratings in the field and Fusarium Diseased Kernel (FDK) ratings in the lab.

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

Results were shared through presentations at winter meetings and extension field days.

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

We plan to finish collecting data from the 2025 trial and then analyze all Missouri data across years to guide our Fusarium Head Blight Management recommendations for Missouri wheat producers and to develop a journal article on Missouri-specific research findings.