Project FY22-IM-006: Evaluation of Integrated Management Programs and Fungicides for FHB & DON in Indiana

Note: Report must cover the *entire* duration of the project period of performance, May 1, 2022-July 30, 2026.

1. **What are the major goals and objectives of the research project?**
   This research served as a location in the cooperative multi-state studies of FHB Management Coordinated Project (MGMT_CP) for FHB and DON control in wheat.
   1. Evaluate the integrated effects of fungicides and resistance on FHB and DON, with emphasis on new fungicides.
   2. Compare the efficacy of new fungicides to Prosaro, Caramba, and Miravis Ace.
   3. Generate data to quantify the economic benefit of management programs.
   4. Generate data to advance the development of FHB risk prediction models.

   The proposed research was conducted at two sites in Indiana from 2022 to 2025: 1) Purdue Agronomy Center for Research and Education (ACRE) in West Lafayette, Indiana; and 2) Southwest Purdue Agriculture Center (SWPAC), Vincennes, Indiana.

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

   What were the major activities?

   Research trials were established in the fall of each year from 2021 to 2024 at both locations indicated above in Indiana, and fungicide treatments were applied in each spring from 2022 to 2025. In all trials, Fusarium head blight (FHB), concentration of deoxynivalenol (DON), Fusarium damaged kernels (FDK%), foliar disease severity, yield and test weight were collected. Values for each plot were averaged before analysis. A subsample of grain was taken from each plot and partitioned for DON analysis completed by the University of Minnesota DON testing lab and to determine Fusarium damaged kernels (FDK) by visually assessing the percentage (0-100%) of the infected heads. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least square means test (α=0.05).

   What were the significant results?

   In 2022, weather conditions were moderately favorable for Fusarium head blight (FHB). FHB was the most prominent disease in all four trials.

   Trial 1. Evaluation of fungicide efficacy for scab management in central Indiana, 2022. No differences in FHB incidence or severity were detected compared with the nontreated control. FHB index was reduced by Miravis Ace at 10.5.1 and Miravis Ace at 10.5.1 followed by Sphaerex at 6 DAT. DON was reduced by all treatments except Prosaro at 10.5.1. Harvest moisture was higher in all fungicide treatments except Prosaro Pro at 10.5.1. No significant yield differences were detected.

   Trial 2. Evaluation of foliar fungicides and varieties for fusarium head blight (FHB) management in central Indiana, 2022. P25R61 (MR) had reduced FHB incidence, severity, DON, FDK, and yield compared with P25R40 (S). All fungicides reduced FHB incidence and index, and all fungicides applied at 10.5.1 reduced DON. No treatment differences occurred for FHB severity, FDK, or yield.

   Trial 3. Evaluation of fungicide efficacy for scab management in southwestern Indiana, 2022. All fungicides reduced FHB severity, FHB Index, and DON compared to the nontreated control. There were no treatment differences for FHB incidence, FDK %, and yield.

   Trial 4. Evaluation of foliar fungicides and varieties for scab management in southwestern Indiana, 2024. P25R61 (MR) had significantly less FHB, DON, test weight, harvest moisture, and yield than

P25R40 (S). Miravis Ace and Prosaro Pro at 10.5.1 reduced FHB incidence, severity, and index compared with the nontreated inoculated control. No significant differences between treatments occurred for DON, FDK, and yield.

In 2023, weather conditions were unfavorable for FHB and leaf blotch in Indiana. Little to no FHB was detected and leaf blotch occurred at low levels.

Trial 1. Evaluation of fungicide efficacy for scab management in central Indiana, 2023. No differences in FHB incidence or severity occurred compared with the nontreated control. FHB index was reduced by Miravis Ace at 10.5.1 and Miravis Ace at 10.5.1 followed by Sphaerex at 6 DAT. DON was reduced by all treatments except Prosaro at 10.5.1. Harvest moisture was higher in fungicide treatments except Prosaro Pro at 10.5.1. There was no significant difference in yield of wheat.

Trial 2. Evaluation of foliar fungicides and varieties for fusarium head blight (FHB) management in central Indiana, 2023. No FHB was detected in the trial and low levels of leaf blotch were. No measurable FDK or DON were detected in trial. Harvest moisture was higher for Miravis Ace compared to nontreated control. P25R61 had significantly lower harvest moisture, test weight, and yield as compared to P25R40. No differences were detected between treatments for leaf blotch and FDK.

Trial 3. Evaluation of fungicide efficacy for scab management in southwestern Indiana, 2023. All fungicide applications except Caramba reduced FHB incidence and index compared to nontreated control. Incidence was most reduced by Miravis Ace, Prosaro Pro, Sphaerex, and the Miravis Ace followed by Prosaro Pro, Sphaerex, or Tebuconazole programs. All fungicides reduced DON. No significant treatment differences occurred for FDK, test weight, 100-kernel weight, and yield.

Trial 4. Evaluation of foliar fungicides and varieties for scab management in southwestern Indiana, 2023. Low FHB levels were detected. Miravis Ace, Prosaro Pro at 10.3 fl oz, and Sphaerex reduced FHB incidence. DON was reduced by P25R61 compared with P25R40 and by Prosaro Pro and Sphaerex. P23R61 had greater 100-kernel weight than P25R61. No significant differences occurred among cultivars for FHB, FDK, test weight, or yield, or among fungicides for FDK, kernel weight, test weight, or yield.

In 2024, weather conditions were moderately favorable for FHB in Indiana.

Trial 1. Evaluation of fungicide efficacy for scab management in central Indiana, 2024. All fungicide treatments reduced FHB incidence, severity, and index. Miravis Ace at 10.5.1 followed by Prosaro Pro at 10.5.1 + 5 days had the lowest FHB, although it was not significantly different from the other fungicide programs. All treatments reduced DON, and most reduced FDK%. Fungicide treatments increased harvest moisture. No significant differences between treatments for yield.

Trial 2. Evaluation of foliar fungicides and varieties for fusarium head blight (FHB) management in central Indiana, 2024. P25R61 (MR) had the lowest FHB incidence, severity, index, DON, test weight and yield compared to P25R40 (S). All fungicides reduced FHB and leaf rust, while Prosaro 421SC, Prosaro Pro 400SC, and Sphaerex had the lowest FDK. All fungicides reduced DON and increased test weight and harvest moisture. No significant yield differences occurred among treatments.

Trial 3. Evaluation of fungicide efficacy for scab management in south western Indiana, 2024. All fungicides except Miravis Era at 10.5.1 reduced FHB incidence, severity, and index. Most fungicide programs reduced FDK, while all except Prosaro 421SC reduced DON. Two-application programs increased harvest moisture, all treatments increased test weight, and all except Miravis Era increased yield over the nontreated control.

Trial 4. Evaluation of foliar fungicides and varieties for scab management in southern Indiana, 2024. P25R61 had the lowest FHB incidence, severity, index, FDK, 100-kernel weight, FDK eject, and DON comparted to P25R40 (S). All fungicides reduced FHB, leaf blotch, and leaf rust, and all reduced DON. Miravis Ace had the highest FDK%. No significant yield differences occurred.

In 2025, weather conditions were not favorable for FHB in Indiana.

Trial 1. Fusarium head blight (FHB) integrated management trial in central Indiana, 2025. No treatment differences occurred for FHB incidence, severity, or index, or for leaf blotch and leaf rust. All treatments reduced DON and FDK compared with the nontreated control. Most fungicide programs increased 100-kernel weight. No significant differences occurred for harvest moisture, test weight, and yield.

Trial 2. Evaluation of foliar fungicides and varieties for fusarium head blight (FHB) management in central Indiana, 2025. No treatment differences occurred for FHB incidence, severity, or index. DON was reduced by all treatments, while FDK was reduced by fungicide programs and by P25R61 compared with P25R40. All fungicide programs increased 100-kernel weight. No significant differences occurred for harvest moisture, test weight, and yield.
Trial 3. Evaluation of fungicide efficacy for scab management in south western Indiana, 2025. All fungicide treatments reduced FHB index, DON, and FDK compared with the nontreated control. No significant differences occurred for harvest moisture, test weight, and yield.
Trial 4. Evaluation of foliar fungicides and varieties for scab management in southern Indiana, 2025. P25R61 (MR) had significantly lower FHB index, FDK, and DON than P25R40 (S), while P25R40 had higher test weight and yield. All fungicide treatments reduced FHB index, DON, and FDK compared with the nontreated control. No significant differences occurred among fungicide treatments for yield.

List key outcomes or other achievements.

The results of these trials have continued to show that Miravis Ace and the new product Sphaerex are effective fungicides for FHB management. Continued evaluation of these products will be necessary to address some of the many questions being asked by stakeholders about the effectiveness, application timing, effectiveness towards other diseases, and yield and cost benefits of this new fungicide. The use of scab resistant cultivars is an important aspect of management and reduced risk of FHB, especially when there is only moderate disease pressure.

3. **What opportunities for training and professional development has the project provided?**
This project provided an opportunity to train one plant pathology graduate student, two visiting scholars, and two undergraduates on plant disease identification and quantification, along with general field research trial establishment and data analysis.

4. **How have the results been disseminated to communities of interest?**
The results were shared and combined with the multi-state data to summarize and publish in the Proceedings of the National Fusarium Head Blight Forum in 2022, 2023, 2024, and 2025.
They were also shared with Indiana wheat stakeholders via the annual Applied Research in Field Crop Pathology for Indiana Extension books 2022 to 2025.

In addition, Dr. Telenko has presented results to Indiana growers during winter Extension meetings.

5. **What do you plan to do during the next reporting period to accomplish the goals and objectives?**
Not applicable, this is the final report for the agreement.