Project FY22-IM-018: Integrated Management of Fusarium Head Blight in Wheat in Pennsylvania

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

1. Develop integrated management strategies for FHB and mycotoxins that are robust to conditions experienced in wheat and barley production fields.
2. Develop and validate the next generation of management tools, forecasting models, and fungicide application technologies for FHB and mycotoxin control.
3. Enhance communication and end-user education/outreach.

To accomplish the research goals, we contribute to the following:

1. Validating the integrated management strategies with the next generation of wheat and barley varieties in multiple production environments.
2. Developing economic analyses of effective integrated management strategies used alone and in combination.
3. Evaluating the flexibility of fungicide application timing within the context of the integrated management strategies.
4. Continuing to update and enhance the content of the FHB website.
5. Providing commentaries from the FHB forecasting site available on the USWBSI website and sent to users via mobile devices.

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

What were the major activities?

For FY24, we conducted four wheat trials at two locations. Two trials were part of the uniform fungicide program, and the other two were part of the integrated management coordinated project. Data were summarized and shared with the lead institution for the CP. Trials were also established to maintain the same number of trials and locations for the 2024-2025 growing season. Additionally, five on-farm participatory trials aimed to explore the combined effect of fungicide applications at flowering on the overall disease complex.

FHB was moderate in our research and on-farm trials, and we could measure and differentiate DON. On-farm trials were especially successful, allowing us to quantify the combined effects of managing FHB alongside other late-season foliar diseases. We observed reductions in FHB, DON, and foliar disease severity, and we demonstrated distinct yield differences in these trials.

Consequently, our outreach efforts concentrated on delivering timely information regarding the risk of FHB during the growing season as part of Penn State Extension's Field Crop News, which reaches approximately 11,000 people. Dr. Alyssa Collins continued to provide local commentary for the Fusarium Head Blight Prediction Center.

What were the significant results?

By continuing to conduct a standard set of trials across multiple locations, we are well-positioned to monitor and quantify FHB in Pennsylvania. We observed a moderate level of FHB in our trials, which was higher than in previous years. We successfully quantified differences among the treatments, and our on-farm trials effectively measured the combined effects of FHB control and foliar disease management.

Given our extension networks, we can provide timely information to farmers and other stakeholders. We also contributed field data to the larger CP, which includes valuable information used to validate current models. Additionally, we established four research trials and secured commitments for more on-farm research trials for 2024-2025.

List key outcomes or other achievements.

We have an established system for conducting multiple research trials annually, which includes laboratory preparations for the timing of inoculation in these trials. This is particularly important due to the year-to-year variation in flowering timing across different locations and studies. We are also training one graduate student in FHB, which is integrated into their Ph.D. dissertation. An Education Program Specialist and several undergraduate researchers have also contributed to disease assessments and quantification in small grains. Additionally, trials were established for the 2024-2025 growing season, and early reports are promising, showing higher levels of FHB compared to the past several years.

3. **What opportunities for training and professional development has the project provided?**
The Ph.D. student (Olanrewaju Shittu) was presented with results from his research in numerous programs, including the Fusarium Head Blight Forum, the American Phytopathological Society, the 13th International Epidemiology Workshop, and the 6th International Symposium on Fusarium Head Blight. This formed part of his dissertation in the International Agriculture and Development dual degree program. Lanre is in the final s tages of his dissertation, which will be completed by the end of 2025.

4. **How have the results been disseminated to communities of interest?**
Seven extension articles were written and published as part of Penn State Extension's Field Crop News. These articles provided timely information to stakeholders about the risk of FHB, among other wheat diseases. The Field Crop News is sent via email to well over 10,000 subscribers.

5. **What do you plan to do during the next reporting period to accomplish the goals and objectives?**
Trials were established in Fall 2024 as planned, with confirmations of multiple on-farm participatory trials. As we submit this report, we can indicate that the trials were successful, and the data will be analyzed and shared with the CP. We continued the research despite the delays in receiving year four funding.
Olanrewaju Shittu continues his research aligned with this project and is scheduled to complete his Ph.D. in 2025. We have been invited to write a book chapter about modeling wheat diseases, which will be finished in the next reporting cycle. We are also continuing to develop manuscripts originating from the dissertation research. Furthermore, we will participate in the next National FHB Forum in December 2025.

	Research Activities	*Extension/Outreach Activities*
Summer 2025	Harvest plots, process post-harvest samples, and submit samples to DON lab for analysis	Participate in summer field days.
Fall 2025	Establish IM and UFT wheat trials at two locations.	Small grains production workshop – participant/speaker. Provide data to the CP.
Winter 2025/2026	Attend FHB Forum	Participate in winter meetings and present results of trials.
Spring 2026	Apply fungicide treatments and conduct disease ratings	Write extension articles about FHB and seasonal risk. Contribute to FHB risk tool interpretation.