Project FY22-IM-012: Integrated Management of Fusarium Head Blight of Barley in Pennsylvania

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1. **What are the major goals and objectives of the research project?**
   • Evaluate the integrated effects of fungicide treatment and genetic resistance on FHB and DON in all major grain classes, with emphasis on new combination fungicides, Prosaro Pro and Sphaerex.
   • Compare the efficacy of Prosaro Pro and Sphaerex to that of Prosaro, Caramba, and Miravis Ace.
   • Generate data to further quantify the economic benefit of FHB and DON management programs.
   • 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?

During this reporting period, evaluation and harvest of the 2023 Integrated Management (IM) and Uniform Fungicide Trials (UFT) barley studies was conducted and analysed.

A third year of IM and UFT were planted at two locations (the Penn State Southeast Agricultural Research and Extension Center (SEAREC) in Lancaster County and the Russell E. Larson Agricultural Research & Education Center (Rock Springs) in Centre County) in fall of 2024. The IM were designed with three different barley varieties of differing FHB resistance levels such that Prosaro Pro, Sphaerex, Prosaro, and Miravis Ace could be applied and efficacy compared when paired with crop resistance and application timing (for Spharex only). A Uniform Fungicide Trial (UFT) was also established to evaluate these chemistries and multipass fungicide programs on a single variety of barley. The fungicide applications and F. graminearum inoculations were applied according to the shared protocols.

   What were the significant results?

DON numbers were variable across PA in 2024, with ranges from 0 to 15 ppm, and we saw higher DON in our research trials this year compared to the past several years. In general, DON was significantly reduced by fungicide treatments in our trials in 2024, whereas these impacts were not seen in the low-FHB environment of 2023. Data also revealed a good control of foliar diseases with these FHB-targeted fungicide applications.

Data analysis is now underway for the 2024 harvest.

   List key outcomes or other achievements.

In December 2024 and January 2025, intensive workshop/group discussions were conducted with high-intensity wheat and barley producers representing the majority of managed small grains in central and south central PA, northern MD, and West Virginia. These growers have

taken very deliberate actions to carefully manage their crops to reduce FHB and DON contamination and maximize quality and yield. They continually engage the PIs to help tweak their approaches to production utilizing the most current research generated by this project and the projects of other USWBSI-sponsored researchers. The group of growers engaged in this way has expanded from approximately six to over 400 reached in the 24/25 winter season.

The PIs' reach to growers across the region has increased through a partnership with Nationwide Insurance Company to provide from-the-field video training as part of the PA Farm Bureau's Pesticide Applicators Training. This education program uses videos captured in the field season to highlight issues and management solutions through in-person delivery in four locations around the commonwealth from January through March. This has resulted in an additional 450+ farmers reached each year.

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

While students are not being directly funded by this award, five undergraduate research assistants and one PhD student are participating in the establishment, maintenance, evaluation, and analysis of the field trials. This is providing exposure to experimental design and execution to these students (enrolled at Penn State, Millersville, Delaware Valley, and Bloomsburg Universities), increasing their scientific literacy and likelihood of choosing a related career path.

One of 2024's undergraduate research assistants continued winter work with the Esker lab, and then upon graduation in May 2024, joined the agricultural support industry with King's AgriSeeds, Inc, bringing his experience with FHB management into his role in seed supply and agronomic support.

PI Collins also offers guest lectures on FHB for undergraduate courses including

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

During FY23/24, PIs provided commentary to the FHB Risk Tool and published newsletter articles bringing attention to FHB Risk Tool, grain quality, and fungicide options, including:

- How Choices Made at Planting Affect Barley and Wheat Health
- Helpful Resources for Wheat and Barley Scab Prevention
- Grain Quality Is Key for Malting Barley Production and Marketing
- Evaluating Late Season Diseases in Small Grains
- Fusarium Head Blight Update
- What to Expect When You're Harvesting Wheat in 2024

In-person Extension presentations sharing this information about FHB management were offered at seven events, and PI Collins provided commentary to media outlets for six web/print pieces. Three tours of plots were also provided for growers, ag industry professionals, and secondary education providers.

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

We will wrap up analysis for the results of the 23/24 barley growing season and establish new plots in Fall 2024, again, according to the shared group protocols and reflecting any changes necessitated. A high-pressure ripening period experienced in 2025 should provide good differential results and opportunity for additional quality testing. A renewed interest in mycotoxins in general, and DON in particular, will likely spark speaking and other educational requests and the PIs are currently preparing educational materials to meet this need.