

Project FY22-IM-019: Evaluation of FHB Management Strategies in DE following the MGMT Protocol

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

Winter wheat and malting barley are important crops to small grain producers in Delaware. Fusarium Head Blight is the top disease concern of growers in the region. Many growers utilize risk model forecasting and rely on the application of fungicides when environmental conditions favor high risk for FHB. The release of a new fungicide, Miravis[®] Ace, drew attention from growers and new combination products continue to enter the market. There is need for local data on performance of these new products. This project followed the FHB Management Coordinated Project (MGMT_CP) to address the following objectives:

- 1) 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.
- 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?

As part of this project, 4 trials were conducted following the MGMT_CP. A malting barley trial with two cultivars and a winter wheat trial with two cultivars were planted to assess fungicide performance on susceptible and moderately resistant varieties (objective 1). Using a susceptible variety of wheat and a susceptible malting barley cultivar, two additional trials were established to analyze fungicide efficacy of designated products (objective 2). After fungicide application, plots were monitored and rated for FHB incidence and severity, flag leaf disease severity, yield, test weight, kernels damaged by FHB, and DON level. Trial results were shared with Dr. Pierce Paul for further analysis in support of objectives 3 and 4. State results were also disseminated through extension programming, plant disease management reports, and at winter meetings.

What were the significant results?

The 2023 season had very low disease pressure and excellent environmental conditions for extended grain fill and record-breaking yield averages across the Mid-Atlantic region. Disease levels were very low in barley with no differences in FHB incidence, severity, FDK, or yield. No DON was detected in any of the barley trials. Disease also remained low in wheat, with differences only detected in FHB severity (Table 1). Within the wheat variety trial, FHB

incidence, severity, and index were lower in the partially resistant variety, but differences within variety among fungicide treatment were not observed. (Figures 1,2,3). No differences in FDK or yield were observed among variety or fungicide treatment within variety (Figures 4,5).

Table 1: 2023 Wheat Fungicide Efficacy Trial Results

Treatment and Rate/A ^z	Application timing ^y	FHB incidence,% ^x	FHB severity,% ^w	FDK, % ^u	DON (ppm) ^t	Yield (bu/A) ^s
Non-Treated Control	--	39.4	9.8 a ^v	5.8	0.064	72.6
Prosaro 421 SC 6.5 oz	Anthesis	42.1	7.1 ab	3.6	0.048	77.1
Caramba 90 EC 13.5 oz	Anthesis	28.9	3.3 abc	4.0	ND	74.5
Miravis Ace 2.3 SE 13.7 oz	Anthesis	30.6	3.6 abc	5.4	ND	78.3
Prosaro Pro 400 SC 10.3 oz	Anthesis	20.1	3.2 abc	4.8	ND	79.1
Sphaerex 2.5 SC 7.3 oz	Anthesis	33.1	5.4 abc	4.0	ND	78.8
Miravis Ace 2.3 SE 13.7 oz fb Prosaro 421 SC 10.3 oz	Anthesis fb 4 DAA	22.7	2.4 bc	4.4	ND	80.0
Miravis Ace 2.3 SE 13.7 oz fb Sphaerex 2.5 SC 7.3 oz	Anthesis fb 4 DAA	15.8	1.3 c	3.4	ND	79.2
Miravis Ace 2.3 SE 13.7 oz fb Tebuconazole 3.6F 4 oz	Anthesis fb 4 DAA	21.7	2.0 bc	5.4	ND	82.2
Prosaro Pro 10.3 oz	50% heading	36.5	7.4 ab	5.6	0.040	74.9
Miravis Ace 13.7 oz	50% heading	40.4	6.0 ab	4.4	ND	79.7
Prosaro Pro 10.3 oz	4 DAA	26.7	4.5 abc	3.0	ND	85.1
Sphaerex 7.3 oz	4 DAA	32.8	6.4 ab	2.6	ND	78.7
Miravis Ace 13.7 oz	4 DAA	31.3	3.8 abc	2.6	ND	78.3
<i>p</i> -value	--	0.0555	0.0003	0.0591	0.5944	0.4249

^z All treatments included 0.125% non-ionic surfactant Induce 90SL; fb= followed by.

^y Applications were made at 50% heading (Feekes 10.3) on 24 Apr 2023, Anthesis (Feekes 10.5.1) on 1 May 2023, and 4 days after anthesis (DAA) on 5 May 2023.

^x Fusarium head blight incidence was visually assessed as the % of 20 wheat heads per plot displaying symptoms.

^w Fusarium head blight severity was visually assessed as the average percent of symptomatic glumes present per head on 20 wheat heads per plot.

^v Means followed by the same letter are not significantly different based on Tukey’s Honest Significant Difference (p=0.05, Tukey's HSD).

^u Fusarium Damaged Kernels (FDK) were visually assessed as % out of 100 kernels showing tomb-shaped, shriveled, pinkish, or bleached symptoms.

^t DON= deoxynivalenol, ppm= parts per million, ND= none detected.

^s Yield adjusted to 13.5% moisture.

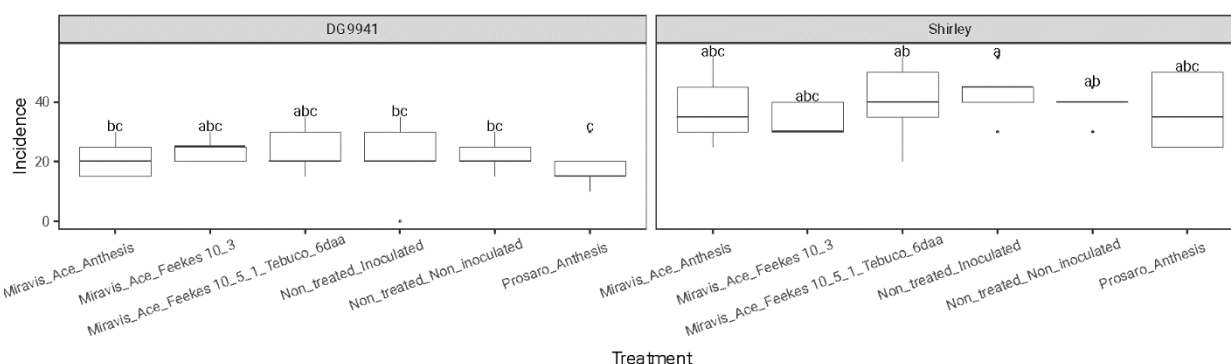


Figure 1: 2023 FHB % Incidence in wheat varieties DG9941 and Shirley

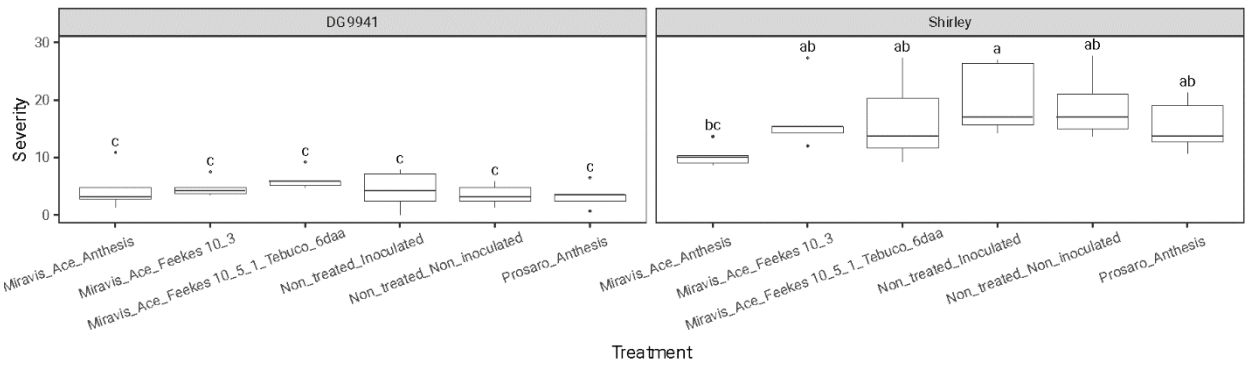


Figure 2: 2023 FHB % Severity in wheat varieties DG9941 and Shirley

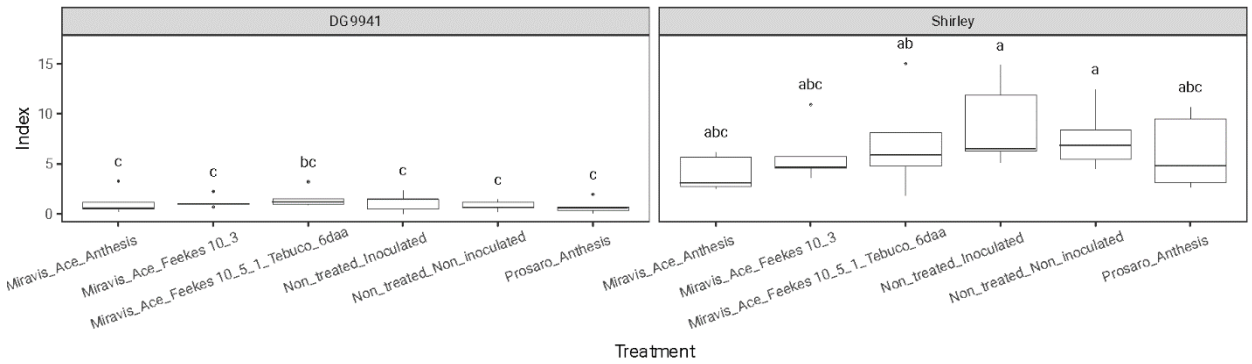


Figure 3: 2023 FHB Index in wheat varieties DG9941 and Shirley

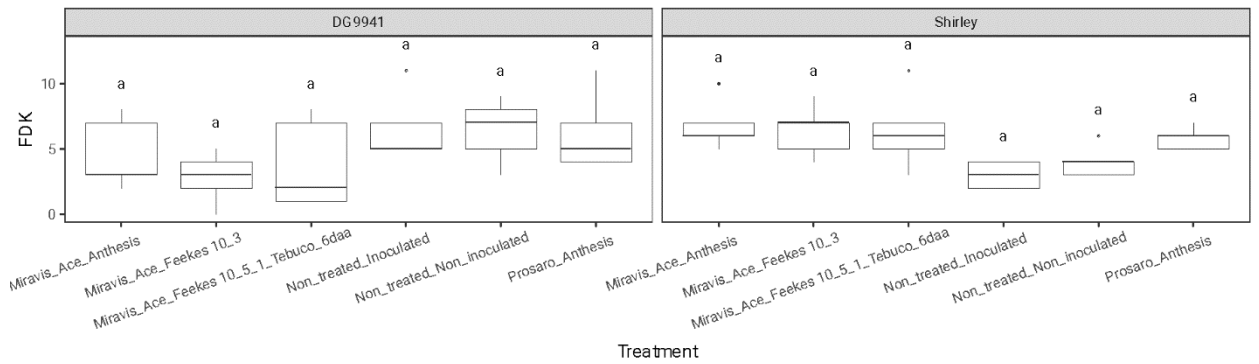


Figure 4: 2023 FDK in wheat varieties DG9941 and Shirley

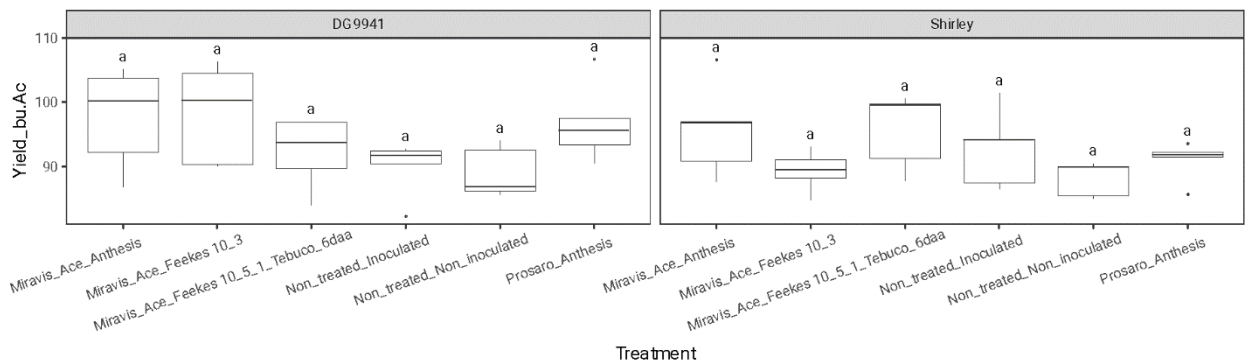


Figure 5: 2023 Yield in wheat varieties DG9941 and Shirley

List key outcomes or other achievements.

Expected Outcome: Regional product performance for the effects of fungicide treatment and genetic resistance on FHB and DON, with emphasis on new combination fungicides, Prosaro Pro and Sphaerex.

Actual Outcome: Data on new combination fungicides was generated and shared at winter meetings.

Expected Outcome: Regional performance on efficacy of Prosaro Pro and Sphaerex to that of Prosaro, Caramba, and Miravis Ace.

Actual Outcome: Products were assessed in a low disease environment and observations were added to national dataset.

Expected Outcome: Contribute data to further quantify the economic benefit of FHB and DON management programs.

Actual Outcome: Data was contributed to a pooled data set for continued economic analysis.

Expected Outcome: Contribute data to validate and advance the development of FHB risk prediction models.

Actual Outcome: Data was contributed and interactions of relatively low disease symptoms and exceptional grain fill period will be used to help improve model development.

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

Data from the project was presented at the Maryland Grain Improvement Board Meeting in December 2023 and parts of the national data set were shared at DE Ag Week in January 2024. Delaware Ag Week provides training and pesticide certification credit to hundreds of stakeholders. Funding currently supports a research technician, but a graduate student was able to assist with aspects of the trials to building professional networks and increase familiarity with the FHB system.

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

Updates on disease risk, efficacy of new products, and optimal application periods were disseminated through articles in the University of Delaware's Weekly Crop Update, which reaches over 700 growers, consultants, and stakeholders and provides a platform to discuss disease concerns and other production issues. Small grain research updates, including the results from this project were presented in the small grains session of Delaware Ag Week held in January 2024. Updates were also shared via social media platforms and two Plant Disease Management Reports were submitted in May 2024. Nationally, these results were used in support of two posters at the 2023 Scab Forum and the wheat fungicide efficacy guide that is updated annually through the NCERA-184 working group and published through the Crop Protection Network.

<https://cropprotectionnetwork.org/publications/fungicide-efficacy-for-control-of-wheat-diseases>

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

We plan to replicate the trial in the next reporting period to generate year 3 project data.