Field, Cereal, and Forage Crops

Efficacy of Fungicides on Wheat for Preventing Fusarium Head Blight and Foliar Diseases in Southeast Pennsylvania, 2024

Tyler S. McFeaters, Olanrewaju M. Shittu, Alyssa A. Collins, and Dilooshi Weerasooriya, Paul D. Esker,

Department of Plant Pathology and Environmental Microbiology, Penn State University, University Park, PA16802

Corresponding author: P.Esker; pde6@psu.edu

Fusarium head blight (FHB) or head scab, caused by *Fusarium graminearum*, causes yield loss and mycotoxin contamination in wheat (*Tritici aestivum* L.) in Pennsylvania each year. Common foliar diseases that reduce wheat yield include leaf rust, caused by *Puccinia triticina*, and Stagnospora nodorum leaf blotch (SNB), caused by *Stagnospora nodorum*. *F. graminearum* infects wheat heads during flowering and is characterized by premature bleaching of the spikes, pink or orange spores, black perithecia, and shriveled or tombstone kernels. SNB and leaf rust cause foliar lesions, particularly on the flag leaf. This trial tests the effectiveness of several fungicide treatments on soft red winter wheat 'P25R40' at the Southeast Agricultural Research and Extension Center in Manheim, PA. Results from the trial help inform wheat growers of the most effective products and application timing to reduce FHB, foliar diseases, and mycotoxin contamination (DON).

Keywords: Prosaro, Miravis Ace, Prosaro Pro, Sphaerex, Miravis Era, Curezin, Tebuconazole, Fusarium Head Blight, DON

Wheat was drilled into no-till ground with a previous crop corn on 26 October 2023 to conduct a uniform fungicide study. The seeding rate was 1.6 million seeds per acre on 7.5-inch rows. Plots were 6.3 feet wide and 18 feet long. The plots were sprayed down to 14 feet in length to create alleys and were assigned treatments in a randomized complete block design with four replicates. Wheat was managed

with herbicides and nitrogen fertilizer according to local management recommendations. The trial was mist-irrigated twice daily for approximately twenty minutes in the morning and afternoon throughout the flowering period. Treatments included Prosaro (6.5 oz a^{-1}), Miravis Era (10.3 oz a^{-1}), Miravis Ace (13.7 oz a^{-1}), Prosaro Pro (10.3 oz a^{-1}), Sphaerex (7.6 oz a^{-1}), Curezin (32 oz a^{-1} and 64 oz a^{-1}) applied at FGS 10.5.1. Miravis Ace (13.7 oz a^{-1}) and Miravis Era (8.59 oz a^{-1} and 10.3 oz a^{-1}) were also tested at FGS 10.5.2. Two-pass fungicide treatments included Miravis Ace (13.7 oz a^{-1}) at FGS 10.5.1 followed by Prosaro Pro (10.3 oz a^{-1}), Sphaerex (7.3 oz a^{-1}), or Tebuconazole (4 oz a^{-1}) six days after FGS 10.5.1. One flag leaf treatment included Priaxor (2 oz a^{-1}) followed by Sphaerex (7.3 oz a^{-1}) at FGS 10.5.1. An untreated check and untreated uninoculated control were also included in the study. Fungicide applications were made at 20 gallons per acre with a backpack sprayer and TwinJet 11004 nozzles calibrated at 30 psi. Twnty-four hours after the early flowering fungicide application, plots were inoculated with *F. graminearum* using a backpack sprayer at $1.0x10^5$ spores/mL. Twenty-one days after fungicide application disease assessments were conducted by rating fifty wheat heads per plot using established methods to estimate the FHB severity and index (%). A foliar disease rating for each plot was estimated on a 0-100% scale by combining all foliar disease lesions on the flag leaf and flag -1. Yield (bu/A), corrected to 13.5% moisture, and test weight (lb/bu) were measured at harvest. Deoxynivalenol (DON) levels (ppm) were quantified from harvest subsamples. FHB index, foliar disease severity, DON, yield, and test weight were analyzed using ANOVA and a post hoc Tukey's HSD was used to assess significant difference between treatments at the 0.05 level.

Weather conditions were conducive for FHB during the flowering period. FHB index in the untreated check was 24.4% and a DON level of 0.32, while the untreated and uninoculated was 19.4% and DON at 0.32. All treatments except for the Curezin (32 oz a^{-1}) significantly decreased FHB index compared to the untreated check (α= 0.05). All treatments except for the Curezin (32 oz a^{-1} and 64 oz a^{-1}) significantly decreased foliar disease severity compared to the untreated check (α= 0.05). All treatments except for the

Curezin (32 oz a^{-1} and 64 oz a^{-1}) significantly increased yield and test weight compared to the untreated check (α= 0.05). No differences were detected in DON level.

Supplementary Table S1. Efficacy of Fungicides on Wheat for Preventing Fusarium Head Blight and Foliar Diseases in Southeast Pennsylvania, 2024

Treatment	Appl. Rate (oz a^{-1})	Appl. Timing	FHB Index (%) [yz]	Foliar Disease Severity (%) [z]	DON (ppm) [z]	Yield (bu/A) [z]	Test Weight (lb/bu) [z]
Untreated Check	-	-	24.4 a	53.4 a	0.32 a	75.0 d	45.9 e
Prosaro	6.5	FGS 10.5.1	4.1 de	32.8 b-e	0.15 a	98.6 a-c	52.3 a-c
Miravis Era	10.3	FGS 10.5.1	1.2 e	22.9 de	0.22 a	108.2 a	53.7 a
Miravis Ace	13.7	FGS 10.5.1	4.0 de	23.4 de	0.11 a	101.3 ab	52.7 a-c
Prosaro Pro	10.3	FGS 10.5.1	2.8 e	25.6 c-e	0.22 a	103.8 a	52.9 ab
Sphaerex	7.3	FGS 10.5.1	2.3 e	35.6 b-d	0.12 a	98.8 a-c	54.1 a
Miravis Ace fb Prosaro Pro	13.7 fb 10.3	FGS 10.5.1, 6 DAA	2.8 e	24.7 de	0.29a	98.6 a-c	53.4 a
Miravis Ace fb Sphaerex	13.7 fb 7.3	FGS 10.5.1, 6 DAA	2.9 e	18.3 e	0.39 a	104.0 a	53.0 ab
Miravis Ace fb Tebuconazole	13.7 fb 4	FGS 10.5.1, 6 DAA	2.7 e	18.6 e	0.14 a	102.7 ab	53.9 a
Priaxor fb Sphaerex	2 fb 7.3	FGS 9, 10.5.1	1.8 e	18.1 e	0.11 a	103.1 ab	54.0 a
Miravis Ace	13.7	FGS 10.5.2	9.8 cd	22.5 de	0.18 a	92.4 a-d	52.1 a-c
Miravis Era	8.59	FGS 10.5.2	5.6 de	20.1 de	0.15 a	98.8 a-c	53.6 a
Miravis Era	10.3	FGS 10.5.2	5.2 de	19.4 de	0.12 a	92.5 a-d	53.6 a
Curezin	32	FGS 10.5.1	21.3 ab	49.7 ab	0.24 a	80.3 cd	47.3 de
Curezin	64	FGS 10.5.1	16.9 bc	42.2 a-c	0.11 a	80.4 cd	50.0 b-d
Untreated, uninoculated	-	-	19.4 ab	50.0 ab	0.32 a	83.2 b-d	49.5 cd

[y] $FHB\ index = \frac{(percent\ disease\ severity\ x\ percent\ disease\ incidence)}{100}$

[z] Means followed by the same letter within columns are not significantly different according to Tukey's LSD ($P < 0.05$).