

Improving fungicide application recommendations for managing *Fusarium* head blight of wheat

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INTRODUCTION

Fusarium head blight (FHB; also known as scab) is likely the most economically important disease of wheat in Kentucky. Caused by the fungus, *Fusarium graminearum*, FHB can lead to reduced quality of harvested grain and reduced yields. The fungus produces a toxin known as deoxynivalenol (DON; also known as vomitoxin), that can contaminate grain. Harvested grain that has a DON level of at least 2 ppm may be subject to discounts or outright rejection at grain elevators. Complete control of FHB and DON with foliar fungicides used alone is not possible, and the use of moderately-resistant wheat varieties along with a fungicide application at the Feekes 10.5.1 growth stage (beginning flowering) is the recommended method of management. The fungicides Prosaro (Bayer CropScience), Caramba (BASF Corporation), and Miravis Ace have been shown to be the most effective fungicides in reducing FHB and DON in multi-state research studies conducted over several years. A research trial was conducted at the University of Kentucky Research & Education Center (UKREC) in Princeton, KY during the 2019-20 growing seasons with the objective of evaluating different fungicide application timings for control of FHB and DON.

PROCEDURES

A soft red winter wheat variety susceptible to FHB (AgriMaxx 446) was no-till planted into corn stubble, and a mist-irrigation system was installed and ran during the wheat heading stages to provide an environment favorable for *F. graminearum* infection and FHB development. Fungicide treatments were applied to wheat plots using a CO₂-pressurized backpack sprayer, and included the following treatments:

- Non-treated check
- Miravis Ace applied at Feekes 10.3 (13.7 fl oz/A)
- Prosaro applied at Feekes 10.3 (6.5 fl oz/A)
- Caramba applied at Feekes 10.3 (13.5 fl oz/A)
- Folicur applied at Feekes 10.3 (4 fl oz/A)
- USF0115 applied at Feekes 10.3 (10.3 fl oz/A)
- Miravis Ace applied at Feekes 10.51 (13.7 fl oz/A)
- Prosaro applied at Feekes 10.51 (6.5 fl oz/A)
- Caramba applied at Feekes 10.51 (13.5 fl oz/A)
- Folicur applied at Feekes 10.51 (4 fl oz/A)
- USF0115 applied at Feekes 10.51 (10.3 fl oz/A)
- Miravis Ace applied at 4 days following Feekes 10.51 (13.7 fl oz/A)
- Prosaro applied at 4 days following Feekes 10.51 (6.5 fl oz/A)
- Caramba applied at 4 days following Feekes 10.51 (13.5 fl oz/A)
- Folicur applied at 4 days following Feekes 10.51 (4 fl oz/A)

- USF0115 applied at 4 days following Feekes 10.51 (10.3 fl oz/A)
- Miravis Ace applied at Feekes 10.51 followed by Folicur 4 days following Feekes 10.51
- Prosaro applied at Feekes 10.51 followed by Folicur 4 days following Feekes 10.51
- Caramba applied at Feekes 10.51 followed by Folicur 4 days following Feekes 10.51
- Folicur applied at Feekes 10.51 followed by Folicur 4 days following Feekes 10.51
- USF0115 applied at Feekes 10.51 followed by Folicur 4 days following Feekes 10.51

Note that some of the treatments evaluated are for research purposes only and may not be registered for use or may be an application that is not in accordance with the label.

At the soft dough stage, wheat heads were rated for FHB severity and incidence and a “FHB index” was calculated by (FHB incidence X FHB severity/100). The FHB index is on a scale of 0 – 100, with the most severe level of FHB having a rating of 100. Grain samples were collected at harvest from each plot and were submitted to the University of Minnesota DON Testing Laboratory (St. Paul, MN) to test for the amount of DON in each sample. The DON testing results were not yet available at the time this report was written. The trial was set up in a randomized complete block design with 4 replications. Data collected were statistically analyzed using SAS software (v. 9.4; Cary, NC).

RESULTS

All fungicide treatments significantly (statistically significant with 95% confidence) reduced FHB index when compared to the non-treated check (Table 1). Few statistically significant differences among all fungicide treatments were observed. In general, all fungicides applied provided an adequate level of control of FHB. The level of FHB index was relatively low in 2020 compared to past years, which may have been why few differences were observed among fungicides for control of FHB.

The only treatments that statistically improved test weight compared to the non-treated check were Miravis Ace, and Folicur when applied at 4 days following Feekes 10.51, and the multiple application timing treatments Miravis Ace followed by Folicur, Folicur followed by Folicur, and USF0115 followed by Folicur.

Treatments that statistically improved yield compared to the non-treated check were Miravis Ace, Caramba, and USF0115 applied at Feekes 10.51, Miravis Ace, Prosaro, Folicur, and USF0115 applied 4 days following Feekes 10.51, and all of the multiple application timing treatments.

TABLE 1. EFFECT OF DIFFERENT FUNGICIDE PRODUCTS APPLIED TO WHEAT AT DIFFERENT TIMINGS AND SEQUENTIALLY ON FUSARIUM HEAD BLIGHT (FHB) SEVERITY INDEX, ON TEST WEIGHT, AND ON GRAIN YIELD. (Note that some of the treatments evaluated are for research purposes only and may not be registered for use or may be an application that is not in accordance with the label.)

Treatment	Application timing	FHB index (0-100)	Test weight (lb/bu)	Yield (bu/A)
Non-treated		14.8	49.9	46.7

Miravis Ace	Feekes 10.3	5.2	49.9	51.0
Prosaro	Feekes 10.3	4.9	50.6	51.7
Caramba	Feekes 10.3	3.4	50.7	50.9
Folicur	Feekes 10.3	4.3	50.1	50.0
USF0115	Feekes 10.3	4.6	51.8	53.8
Miravis Ace	Feekes 10.51	3.5	51.8	62.3
Prosaro	Feekes 10.51	4.3	51.4	49.5
Caramba	Feekes 10.51	2.8	52.0	59.3
Folicur	Feekes 10.51	2.9	51.1	50.1
USF0115	Feekes 10.51	4.5	51.7	57.4
Miravis Ace	4 days following 10.51	3.6	52.5	70.7
Prosaro	4 days following 10.51	3.6	52.0	56.5
Caramba	4 days following 10.51	2.6	48.7	51.1
Folicur	4 days following 10.51	4	52.3	55.2
USF0115	4 days following 10.51	3.4	52.9	57.9
Miravis Ace fb*	Feekes 10.51 fb 4 d			
Folicur	following	2.5	54.1	62.5
Prosaro fb Folicur	Feekes 10.51 fb 4 d			
	following	2.3	51.6	62.9
Caramba fb Folicur	Feekes 10.51 fb 4 d			
	following	2.9	51.4	57.3
Folicur fb Folicur	Feekes 10.51 fb 4 d			
	following	3.2	52.3	56.7
USF0115 fb Folicur	Feekes 10.51 fb 4 d			
	following	2.2	52.5	56.8
	LSD 0.05**	3.1	2.3	8.3
*Followed by (fb).				
**Fisher's least significant difference value at the 95% level of confidence (LSD 0.05). When compared, means that have a difference of at least this value are considered significantly different.				

CONCLUSIONS

In general, lower FHB disease was observed in this 2020 research trial compared to past years. Under this lower disease pressure situation, all fungicide treatments tested provided adequate control of FHB. The largest improvements in yield tended to come from treatments applied at 4 days following Feekes 10.51 and from treatments that consisted of multiple fungicide application timings. More analyses will be conducted to help determine the effect of these treatments on DON as well as the economical benefit of each treatment.