EVALUATION OF SEQUENTIAL FUNGICIDE APPLICATIONS FOR MANAGEMENT OF 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) and Caramba (BASF Corporation) have been shown to be the most effective fungicides in reducing FHB and DON in multi-state research studies conducted over several years. Although these fungicides are the best available, improved control of FHB and DON with fungicides is still needed. In addition, a new fungicide known as Miravis Ace (Syngenta Crop Protection) is the process of being registered for use on wheat in the U.S., and may be available as another tool that could be used to help manage FHB and DON in the future. A research trial was conducted at the University of Kentucky Research & Education Center (UKREC) in Princeton, KY during the 2015-16 and the 2016-17 growing seasons with the objective of evaluating sequential fungicide applications for control of FHB and DON.

PROCEDURES

Wheat (variety Agripro W1566) was planted into no-till 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 CO_2-pressurized backpack sprayer, and included the following treatments in 2016:

- Nontreated check
- Prosaro applied at Feekes 10.5.1 (6.5 fl oz/A)
- Caramba applied at Feekes 10.5.1 (13.5 fl oz/A)
- Folicur applied at Feekes 10.5.1 (4 fl oz/A)
- Prosaro at Feekes 10.5.1 followed by Folicur 4 days later
- Caramba at Feekes 10.5.1 followed by Folicur 4 days later
- Folicur at Feekes 10.5.1 followed by Folicur 4 days later

In addition to the treatments listed above, the 2017 trial also included the following treatments:

- Miravis Ace applied at Feekes 10.5.1 (13.7 fl oz/A)
- Miravice Ace at Feekes 10.5.1 followed by Folicur 4 days later

**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. This includes Miravis Ace, which was not yet registered for use on crops grown in the U.S. when this report was written.*

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 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

As observed in Table 1, all treatments significantly reduced FHB index compared to the nontreated check. Although Folicur applied once at Feekes 10.5.1 reduced FHB index compared to the nontreated check, all other treatments had significantly lower FHB index values than this treatment. The sequential applications of Prosaro/Folicur, Caramba/Folicur, and Folicur/Folicur did not provide a significantly greater level of control of FHB index compared to solo applications of Prosaro or Caramba.

Also observed in Table 1, in 2016, all treatments significantly reduced DON compared to the nontreated check. None of the sequential application treatments provided a significantly lower DON value than Prosaro or Caramba applied once at Feekes 10.5.1. In 2017, no significant differences were observed among any of the treatments for FHB index or DON.

TABLE 1. EFFECT OF SOLO AND SEQUENTIAL FUNGICIDE APPLICATIONS ON FUSARIUM HEAD BLIGHT (FHB) INDEX OF WHEAT AND DEOXYNIVALENOL (DON) CONTAMINATION IN HARVESTED GRAIN

		2016		2017	
Fungicide	**Timing**	**FHB index (0-100)**	**DON (ppm)**	**FHB index (0-100)**	**DON (ppm)**
Nontreated check	-	29.6 a*	3.3 a	11.9 a	1.2 a
Prosaro	Feekes 10.5.1	5.8 c	1.2 bc	3.1 a	1.2 a
Caramba	Feekes 10.5.1	3.0 c	0.8 c	4.9 a	1.2 a
Folicur	Feekes 10.5.1	13.9 b	2.1 b	3.5 a	1.4 a
Miravis Ace	Feekes 10.5.1	NA**	NA	1.3 a	1.2 a
Prosaro fb Folicur	Feekes 10.5.1 / 4 d later	5.0 c	0.9 c	2.9 a	1.6 a
Caramba fb Folicur	Feekes 10.5.1 / 4 d later	1.9 c	1.3 bc	2.2 a	0.9 a
Folicur fb Folicur	Feekes 10.5.1 / 4 d later	5.9 c	1.9 b	5.1 a	1.2 a
Miravis Ace fb Folicur	Feekes 10.5.1 / 4 d later	NA	NA	1.5 a	0.7 a

*Values followed by the same letter are not significantly different at the 95% level of confidence.
**Not applicable since Miravis Ace was only tested in 2017.

CONCLUSIONS

To draw firm conclusions, it is important that this trial be repeated across multiple years to ensure that the effects of the treatments evaluated are consistent. The two years in which these treatments were evaluated differed in the level of disease pressure and resulting DON contamination in the grain (Table 1). Disease severity and DON contamination was greater in 2016, which allowed for statistical separation of treatments. However, disease and DON levels were lower in 2017, which resulted into no statistical differences among the treatments evaluated.

From the 2016 results, Prosaro or Caramba fungicide applied at the Feekes 10.5.1 growth stage reduced FHB and DON compared to the nontreated check, and sequential fungicide applications did not provide any additional control of FHB or DON compared to Prosaro or Caramba applied once. Although this research should be repeated across additional years before strong recommendations can be made, it appears that sequential fungicide applications for control of FHB and DON will not provide a benefit to wheat producers in Kentucky beyond what a single application can provide.

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