EVALUATION OF FOLIAR FUNGICIDE APPLICATION TIMING FOR MANAGEMENT OF FUSARIUM HEAD BLIGHT OF WINTER BARLEY

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INTRODUCTION

Fusarium head blight (FHB; also known as scab) is one of the most important disease of winter barley 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, and any detectable level of DON in grain used for malting purposes may be outright rejected. Since nearly every winter barley variety adapted to this region is susceptible to FHB, foliar fungicides are one of the major practices used to manage this disease; however, little data are available on fungicides applied to winter barley for this region. Since the flowering stage is considered the period in which small grain crops are most susceptible to FHB, targeting the flowering stage for the fungicide application time might make the most sense. However, many spring barley varieties flower when the head is still in the boot, making fungicide coverage of the head difficult. Depending on the variety and the growing conditions, winter barley may not always flower when the head is in the boot. Research trials were conducted at the University of Kentucky Research & Education Center (UKREC) in Princeton, KY during the 2015-16 and 2016-17 growing seasons with the objective of evaluating different fungicide application timings for management of FHB and DON in winter barley.

PROCEDURES

Winter barley (variety Thoroughbred) 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 winter barley plots using a CO_2-pressurized backpack sprayer, and included the following treatments in 2016:

- Nontreated check
- Prosaro applied at the boot stage (6.5 fl oz/A)
- Caramba applied at the boot stage (13.5 fl oz/A)
- Folicur applied at the boot stage (4 fl oz/A)
- Prosaro applied at heading
- Caramba applied at heading
- Folicur applied at heading
- Prosaro applied 5 days after heading
- Caramba applied 5 days after heading
- Folicur applied 5 days after heading

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

- Miravis Ace* applied at the boot stage (13.7 fl oz/A)
- Miravis Ace* applied at heading (13.7 fl oz/A)
- Miravis Ace* applied 5 days after heading (13.7 fl oz/A)

**Note that at the time this report was written, Miravis Ace was not yet registered for use on crops grown in the U.S.*

At the soft dough stage, barley 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. Due to barley reaching maturity rapidly in the 2017 season, FHB incidence, severity, and index values were not determined. 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, in 2016, the only treatments that had a significantly lower FHB index than the nontreated check was Caramba applied at heading or 5 days after heading, Prosaro applied 5 days after heading, and Folicur applied 5 days after heading. In general, the lowest FHB index values were achieved when Prosaro or Caramba were applied 5 days after heading. In addition, the only treatment that had a significantly lower DON value than the nontreated check was Caramba applied 5 days after heading. In 2017, the only treatment that resulted into a significantly lower DON value than the nontreated check was Miravis Ace applied 5 days after heading.

TABLE 1. EFFECT OF FUNGICIDE APPLICATION TIMING ON FUSARIUM HEAD BLIGHT (FHB) INDEX OF WINTER BARLEY AND DEOXYNIVALENOL (DON) CONTAMINATION IN HARVESTED GRAIN

		2016	2016	2017
Fungicide	**Timing**	**FHB index (0-100)**	**DON (ppm)**	**DON (ppm)**
Nontreated check	-	26.7 a*	2.5 ab	1.1 ab
Prosaro	Boot stage	20.8 ab	3.4 a	1.1 ab
Caramba	Boot stage	16.5 abc	3.4 a	1.0 ab
Folicur	Boot stage	27.0 a	2.6 ab	1.4 a
Miravis Ace	Boot stage	NA**	NA	0.6 bc
Prosaro	Heading stage	17.3 abc	2.5 ab	0.6 bc
Caramba	Heading stage	13.0 bcd	2.9 ab	1.0 ab
Folicur	Heading stage	20.9 ab	3.2 a	0.6 bc
Miravis Ace	Heading Stage	NA	NA	0.6 bc
Prosaro	5 d after heading	3.8 d	1.6 bc	0.8 b
Caramba	5 d after heading	7.5 cd	0.8 c	1.0 ab
Folicur	5 d after heading	13.7 bcd	2.2 ab	1.1 ab
Miravis Ace	5 d after heading	NA	NA	0.2 c

*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. DON levels in harvested grain were greater in 2016 compared to 2017. From our results, it appears that an application of an effective foliar fungicide should be made at 5 days after heading to achieve the best control of FHB and DON. However, it is important to note that environment and barley variety may affect when flowering occurs. The flowering stages of small grain crops is considered the most critical period when plants are susceptible to FHB. Therefore, it is critical that this study be conducted over multiple environments (and possibly additional varieties) before strong recommendations on fungicide application timing can be made.

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