

# EVALUATION OF DIFFERENT FUNGICIDE APPLICATION TIMINGS FOR MANAGEMENT OF FUSARIUM HEAD BLIGHT OF WHEAT, 2019

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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. In addition, a new fungicide known as Miravis Ace (Syngenta Crop Protection) was registered for use on wheat in the U.S., and is another tool that can be used to help manage FHB and DON. A research trial was conducted at the University of Kentucky Research & Education Center (UKREC) in Princeton, KY during the 2018-19 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 CO<sub>2</sub>-pressurized backpack sprayer, and included the following treatments:

- Nontreated 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)
- Proline applied at Feekes 10.3 (5.7 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)
- Proline applied at Feekes 10.51 (5.7 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)
- Proline applied at 4 days following Feekes 10.51 (5.7 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
- Proline 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 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, except for Feekes 10.3 applications of Prosaro and Folicur (Table 1). In general for single-applied treatments, the applications at Feekes 10.51 tended to result into the lowest FHB index values, but were not always significantly lower than treatments

applied at Feekes 10.3 or 4 days after Feekes 10.51. All sequentially-applied treatments had very low FHB index values (ranging from 0.4 to 1.4), but were not significantly lower than many of the single-applied treatments. It is important to note that some of the sequentially-applied treatments were tested for research purposes only, and that some of them, including Folicur + Folicur, would be a treatment that would not be legal according to the current EPA label for Folicur.

All fungicide treatments significantly (statistically significant with 95% confidence) reduced DON in harvested grain when compared to the non-treated check (Table 1). Despite being significantly lower than the non-treated check, many treatments were still above the grain elevator threshold of 2 ppm. Treatments that resulted into DON values less than 2 ppm included Proline applied at Feekes 10.51 and at 4 days after Feekes 10.51, and all sequential applications except Folicur followed by Folicur and Proline followed by Folicur.

When comparing a products applied at Feekes 10.3 with the corresponding products applied at Feekes 10.51, only Miravis Ace and Prosaro had significantly lower DON values when applied at Feekes 10.51 vs. 10.3. However, numerically speaking, all DON values were lower when the corresponding product was applied at Feekes 10.51 compared to its Feekes 10.3 application.

No significant differences among treatments were observed for yield (Table 1) or test weight (data not shown). In general, test weights for all treatments were very low due to delayed harvest because of consistent heavy rainfall during harvest season.

**TABLE 1. Effect of Different Fungicide Products Applied to Wheat at Different Timings and Sequentially on Fusarium Head Blight (FHB) Severity Index, on Deoxynivalenol (DON) in Harvested Grain, 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) | DON (ppm) | Yield (bu/A) |
|-------------------------|-------------------------------|-------------------|-----------|--------------|
| Non-treated             |                               | 11.9              | 5.9       | 79.3         |
| Miravis Ace             | Feekes 10.3                   | 1.0               | 4.8       | 72.4         |
| Prosaro                 | Feekes 10.3                   | 8.6               | 4.6       | 72.6         |
| Caramba                 | Feekes 10.3                   | 6.9               | 3.5       | 67.8         |
| Folicur                 | Feekes 10.3                   | 10.8              | 3.6       | 67.9         |
| Proline                 | Feekes 10.3                   | 5.6               | 2.7       | 65.7         |
| Miravis Ace             | Feekes 10.51                  | 0.6               | 2.0       | 64.5         |
| Prosaro                 | Feekes 10.51                  | 2.2               | 2.5       | 73.3         |
| Caramba                 | Feekes 10.51                  | 3.0               | 2.5       | 64.6         |
| Folicur                 | Feekes 10.51                  | 6.0               | 3.5       | 73.0         |
| Proline                 | Feekes 10.51                  | 0.3               | 1.8       | 71.4         |
| Miravis Ace             | 4 days following 10.51        | 2.6               | 2.6       | 62.6         |
| Prosaro                 | 4 days following 10.51        | 1.4               | 2.7       | 68.9         |
| Caramba                 | 4 days following 10.51        | 3.4               | 2.4       | 69.3         |
| Folicur                 | 4 days following 10.51        | 3.1               | 2.9       | 67.8         |
| Proline                 | 4 days following 10.51        | 4.6               | 1.6       | 69.4         |
| Miravis Ace fb* Folicur | Feekes 10.51 fb 4 d following | 0.4               | 1.8       | 72.8         |
| Prosaro fb Folicur      | Feekes 10.51 fb 4 d following | 0.8               | 1.5       | 78.3         |
| Caramba fb Folicur      | Feekes 10.51 fb 4 d following | 1.0               | 1.9       | 71.6         |
| Folicur fb Folicur      | Feekes 10.51 fb 4 d following | 1.4               | 2.5       | 75.3         |
| Proline fb Folicur      | Feekes 10.51 fb 4 d following | 1.1               | 2.0       | 71.7         |
|                         | LSD 0.05**                    | 4.3               | 1.1       | NS***        |

\*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.

\*\*\*No statistically significant differences were detected (NS).

## **CONCLUSIONS**

As observed in past research trials, applying a fungicide for FHB management at Feekes 10.5.1 generally will be better than applying at an earlier growth stage. Although not always significantly different, the Feekes 10.5.1 applications had lower DON values than Feekes 10.3 applications. In general, sequentially applied treatments, where either Caramba, Prosaro, Miravis Ace, Folicur, or Proline was applied at Feekes 10.5.1 and then followed with a Folicur treatment 4 days later, did not greatly differ with the corresponding solo treatment applied at Feekes 10.5.1. This suggests that sequential applications likely would not be worth considering for management of FHB.

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