

Evaluation of UAV-applied fungicides for control of wheat diseases

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Wheat diseases are one of the most important risks that farmers in Kentucky must manage on an annual basis. From 2018 to 2022, wheat diseases caused an estimated total loss of approximately 605 million bushels worth approximately \$3.4 billion (<https://cropprotectionnetwork.org/>). Foliar fungicides can help manage important diseases such as leaf blotches and Fusarium head blight, but application at the right stages is critical to achieve the best efficacy and return on investment. Unfortunately, poor weather conditions can limit the ability to apply fungicides with a ground sprayer. Applying fungicides with fixed-wing or helicopter applicators can help alleviate the problem of applying fungicides under wet soil conditions, but availability of aerial applicators in certain regions of Kentucky is low.

The use of unmanned aerial vehicles (UAVs; “drones”) in field crop production is on the increase. One of the potential uses of drones that has been relatively untapped at this point in time is for application of foliar fungicides. UAVs could add another fungicide application option for wheat growers in Kentucky.

The aim of this research was to evaluate efficacy and leaf and head coverage of different fungicides applied by a UAV in a replicated on-farm research trial in Adair County, KY in the 2023 growing season. In addition to measuring fungicide coverage and disease control, yield, and test weight were measured.

Current status of project:

An on-farm field trial was conducted in Adair County, KY to evaluate the effect of different fungicide treatments applied to wheat by a unmanned aerial vehicle (DJI AGRAS T20 drone). The UAV applied a spray volume of 2 gal/A and used TeeJet XR 11002 VS nozzles. The treatments included an untreated check, Miravis Ace at 13.7 fl oz/A, Prosaro Pro at 10.3 fl oz/A, and Sphaerex at 7.3 fl oz/A. Each treatment was replicated 4 times, and the experimental design was a randomized complete block. Each plot was 42 ft wide × 100 ft long. Applications were made when wheat was at the Feekes 10.51 growth stage (anthesis) (May 10, 2023). Yields were measured by using a weigh wagon, and grain samples were collected from each plot to obtain test weight and grain moisture. Additionally, grain samples were sent to a laboratory for DON analysis, but those data are not yet available.

Table 1 shows the effect of fungicides on FHB severity and incidence, test weight, moisture, and yield. All fungicides significantly reduced FHB incidence and severity compared to the untreated check. Test weight was significantly improved with Miravis Ace and Prosaro Pro, but not Sphaerex. There was no significant effect of fungicides on grain moisture or yield.

Table 1. Effect of fungicides applied at Feekes growth stage 10.51 by a unmanned aerial vehicle at a wheat field in Adair County, KY in 2023.

Treatment	FHB incidence (%)	FHB severity (%)	Grain moisture (%)	Test weight (lb/bu)	Yield (bu/A)
Untreated	17.0	51.6	14.1	58.1	95.1
Miravis Ace	4.0	12.5	14.3	58.7	99.6
Prosaro Pro	4.0	6.3	15.0	59.0	92.3
Sphaerex	4.0	11.3	15.1	58.5	99.3
<i>P > F</i>	0.0006	0.0006	0.3907	0.0319	0.4529
LSD 0.05	5.3	16.7	NS	0.6	NS
CV (%)	45.3	51.2	6.3	0.6	7.5

Preliminary conclusions:

All fungicides reduced FHB incidence and severity, and Miravis Ace significantly improved test weight. From these results, it appears that UAVs are capable of applying fungicides that can protect wheat heads against FHB. More information will be available when DON data are available.

Acknowledgements:

Thank you to the Kentucky Small Grain Growers Association for funding this research, to Nick Roy (Adair County Extension) for help with coordinating the research, and to Kelsey Mehl for assisting with data collection.