

USDA-ARS | U.S. Wheat and Barley Scab Initiative  
**FY21 FINAL Performance Progress Report**

**Due date:** July 26, 2023

**Cover Page**

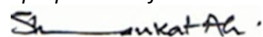
<b>USDA-ARS Agreement ID:</b>	59-0206-0-115
<b>USDA-ARS Agreement Title:</b>	Fungicide Efficacy in FHB/DON Management for Hard Red Winter and Spring Wheat in SD
<b>Principle Investigator (PI):</b>	Shaukat Ali
<b>Institution:</b>	South Dakota State University
<b>Institution UEI:</b>	DNZNC466DGR7
<b>Fiscal Year:</b>	2021
<b>FY21 USDA-ARS Award Amount:</b>	\$34,092
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<b>Period of Performance:</b>	5/6/21 - 5/5/23
<b>Reporting Period End Date:</b>	5/5/2023

**USWBSI Individual Project(s)**

USWBSI Research Category*	Project Title	ARS Award Amount
MGMT-IM	Fungicide Timing Efficacy in the Management of FHB and DON of Wheat in South Dakota	\$34,092
<b>FY21 Total ARS Award Amount</b>		<b>\$34,092</b>

I am submitting this report as a:  FINAL Report

*I certify to the best of my knowledge and belief that this report is correct and complete for performance of activities for the purposes set forth in the award documents.*



Principal Investigator Signature

7/25/2023

Date Report Submitted

† BAR-CP – Barley Coordinated Project  
 DUR-CP – Durum Coordinated Project  
 EC-HQ – Executive Committee-Headquarters  
 FST-R – Food Safety & Toxicology (Research)  
 FST-S – Food Safety & Toxicology (Service)  
 GDER – Gene Discovery & Engineering Resistance  
 HWW-CP – Hard Winter Wheat Coordinated Project

MGMT – FHB Management  
 MGMT-IM – FHB Management – Integrated Management Coordinated Project  
 PBG – Pathogen Biology & Genetics  
 TSCI – Transformational Science  
 VDHR – Variety Development & Uniform Nurseries  
 NWW – Northern Soft Winter Wheat Region  
 SPR – Spring Wheat Region  
 SWW – Southern Soft Red Winter Wheat Region

## Project 1: Fungicide Timing Efficacy in the Management of FHB and DON of Wheat in South Dakota

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### 1. What are the major goals and objectives of the research project?

- I. Determine the efficacy of Miravis Ace<sup>®</sup> applied at heading for FHB and DON management.
- II. Determine the efficacy of Miravis Ace fungicide treatment at flowering for FHB and DON management in wheat; and
- III. Generate data to advance the FHB and DON risk prediction effort.

### 2. What was accomplished under these goals or objectives? (For each major goal/objective, address these three items below.)

#### a) What were the major activities?

*Integrated FHB management trial (IMT):* Three hard red spring wheat cultivars, Boost (FHB-moderately resistant), Brick (FHB-resistant) and Samson (FHB-susceptible) were planted at three locations: SDSU Brookings & Volga Research Farms near Brookings, and Northeast Research Farm (NERF) near South shore in April and May of 2021, respectively. Treatments evaluated were: 1) untreated check; 2) Prosaro (6.5 fl oz/A) applied at early flowering [Feekes 10.5.1]; 3) Miravis Ace (13.7 fl oz/A) applied at 50% head emergence; 4) Miravis Ace (13.7 fl oz/A) applied at early flowering; 5) Miravis Ace (13.7 fl oz/A) at early flowering followed by Tebuconazole (4 fl oz/A) 4-6 days after Miravis Ace application; and 6) untreated, non-inoculated check. The study was set up as a randomized complete block design (RCBD) in a split-plot arrangement where variety as a whole-plot and fungicide treatment programs were the sub-plots.

*Uniform trial (UFT):* A uniform fungicide study was also set up at Brookings, Volga and at NERF in 2021. A susceptible hard red spring wheat variety, Samson, was planted and treatments included 1) untreated, non-inoculated check; 2) Prosaro (6.5 fl oz/A) at early flowering; 3) Caramba (13.5 fl oz/A) at early flowering; 4) Miravis Ace (13.7 fl. oz/A) at 50% heading; 5) Miravis Ace (13.7 fl. oz/A) at flowering, 6) Miravis Ace (13.7 fl. oz./A) 4-6 days after flowering; 7) Miravis Ace (13.7 fl oz/A) at early flowering, followed by Caramba (13.5 fl oz/A) 4-6 days after early flowering; 8) Miravis Ace (13.7 fl oz/A) followed by Prosaro (6.5 fl oz/A) 4-6 days after early flowering; 9) Miravis Ace (13.7 fl oz/A) at early flowering followed by Tebuconazole (4 fl oz/A) 4-6 days after early flowering. This study was laid out as an RCBD. The plots at the Brookings and Volga locations were inoculated with *Fusarium graminearum* infected corn spawn at 3.33 g per square foot for both experiments. An automated misting system was installed to increase FHB pressure. Plots at the NERF were left under natural infection. Treatments were replicated four times and plot size was 5 ft x 15 ft. A CO<sub>2</sub>-pressurized backpack sprayer (40 psi) with three nozzles (Twin Jet TJ- 60 8002) spaced 15" apart on a boom was used to deliver the fungicide products at a spray volume of 18.6 gal/ac. Twenty-one days following treatment, plots were evaluated for FHB incidence, severity and disease index. Fusarium damaged kernels (FDK), DON content, and grain yield were assessed post-harvest.

#### b) What were the significant results?

Application of fungicides at the beginning of flowering reduced FHB index and DON in all varieties compared to the checks, both inoculated and non-inoculated. However, fungicide efficacy was most pronounced in the susceptible variety. Although there were no statistically significant differences in FHB index among the fungicides, Miravis Ace applied at the beginning

of flowering and followed by a Tebuconazole application 4 – 6 days later registered the lowest FHB index, FDKs and DON. Miravis Ace applied at the beginning of flowering, Miravis + Tebuconazole and Sphaerex reduced DON more effectively in the resistant cultivars than in the susceptible variety. Interestingly, application of Miravis Ace 4 – 6 days after early flowering had DON content comparable to sequential application regimes.

**c) List key outcomes or other achievements.**

Miravis Ace was more effective at reducing FHB index and DON content when applied at early flowering than at half head out (Feekes 10.3). Additionally, all fungicide programs that included a sequential application following Miravis Ace at early flowering had the lowest mean DON content. Data generated from these studies including FHB incidence, severity, index, FDK, DON and yield have been shared with Dr. Pierce Paul to be incorporated into the modeling efforts.

**3. What opportunities for training and professional development has the project provided?**

Graduate students were trained in field FHB incidence and severity assessments as well as FDK evaluations.

**4. How have the results been disseminated to communities of interest?**

Information generated from these trials has been shared with growers, crop consultants, agronomists, extension field specialists during field days, webinars, grower meetings, and electronic Crop Newsletters/reports.

## Publications, Conference Papers, and Presentations

Please include a listing of all your publications/presentations about your FHB work that were a result of funding from your FY21 grant award. Only citations for publications published (submitted or accepted) or presentations presented during the **award period** should be included.

**Did you publish/submit or present anything during this award period?**

- Yes, I've included the citation reference in listing(s) below.  
 No, I have nothing to report.

### Journal publications as a result of FY21 award

*List peer-reviewed articles or papers appearing in scientific, technical, or professional journals. Include any peer-reviewed publication in the periodically published proceedings of a scientific society, a conference, or the like.*

Identify for each publication: Author(s); title; journal; volume: year; page numbers; status of publication (published [include DOI#]; accepted, awaiting publication; submitted, under review; other); acknowledgement of federal support (yes/no).

### Books or other non-periodical, one-time publications as a result of FY21 award

*Report any book, monograph, dissertation, abstract, or the like published as or in a separate publication, rather than a periodical or series. Include any significant publication in the proceedings of a one-time conference or in the report of a one-time study, commission, or the like.*

Identify for each one-time publication: Author(s); title; editor; title of collection, if applicable; bibliographic information; year; type of publication (book, thesis, or dissertation, other); status of publication (published; accepted, awaiting publication; submitted, under review; other); acknowledgement of federal support (yes/no).

### Other publications, conference papers and presentations as a result of FY21 award

Identify any other publications, conference papers and/or presentations not reported above. Specify the status of the publication.