USDA-ARS | U.S. Wheat and Barley Scab Initiative

FY21 FINAL Performance Progress Report

Due date: July 26, 2023

Cover Page

USDA-ARS Agreement ID:	59-0206-0-122
USDA-ARS Agreement Title:	Integrated Management Strategies and Fungicide Testing for FHB and DON in Small Grains in ND
Principle Investigator (PI):	Andrew Friskop
Institution:	North Dakota State University
Institution UEI:	EZ4WPGRE1RD5
Fiscal Year:	2021
FY21 USDA-ARS Award Amount:	$65,187
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Period of Performance:	5/5/21 - 5/4/23
Reporting Period End Date:	5/4/2023

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
MGMT-IM	Integrated Management Strategies and Fungicide Testing for FHB and DON in Small Grains	$65,187
	FY21 Total ARS Award Amount	$65,187

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

7/25/23
Date Report Submitted

ǂ 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: Integrated Management Strategies and Fungicide Testing for FHB and DON in Small Grains

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1. **What are the major goals and objectives of the research project?**
   Research objectives for this project were to assess the efficacy of the newer fungicides pydiflumetofen + propiconazole and metconazole + prothioconazole. The first objective evaluated the efficacy of host resistance and fungicides on reducing Fusarium head blight, reducing deoxynivalenol, and protection of yield on spring barley, spring durum and hard red spring wheat (IM trials). The second objective evaluated fungicides and fungicide timing on management of Fusarium head blight, management of deoxynivalenol and protection of yield on spring barley, spring durum and hard red spring wheat (UFT trials). The primary goal from this research was to update management information for Fusarium head blight with specific attention on the best time to apply pydiflumetofen + propiconazole. Results from these studies were then communicated to agricultural professionals across the state and had an immediate impact on decisions made at the producer level.

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?**
   Field experiments for both the IM and UFT were established on spring barley, spring durum and hard red spring wheat across six locations in North Dakota and included Carrington, Fargo, Langdon, Prosper, Thompson and Williston. A total of seven IM experiments were conducted and five UFT experiments were conducted. During the 2021 growing season, the state of ND experienced one of its worst droughts on record severely impacting disease pressure in the research plots.

   b) **What were the significant results?**
   Adequate disease pressure was achieved in two IM experiments (one on spring durum and one on spring barley) and in one UFT experiment (spring durum). In the experiments with adequate disease levels, most fungicide timings were able to effectively reduce both FHB and DON in the research plots. Of most interest was the application of pydiflumetofen + propiconazole at half-head (Feekes Growth Stage 10.3) did not provide satisfactory management of DON. This supports data from previous years that the timing for a fungicide application in spring durum and hard red spring wheat remains at early-flowering and up to seven days later.

   c) **List key outcomes or other achievements.**
   The highly collaborative nature of the IM and UFT trials in the USA provided much needed information on the efficacies of pydiflumetofen + propiconazole and metconazole + prothioconazole. Summarized research suggest that pydiflumetofen + propiconazole and metconazole + prothioconazole are as effective as industry standards of prothioconazole + tebuconazole and metconazole. Data also suggests the “window” to apply a fungicide extends 7 days after the onset of early-flowering.

3. **What opportunities for training and professional development has the project provided?**
   The field experiments are also used as a learning opportunity for graduate students and undergraduate students. I offer the opportunity for students to partake in a Fusarium head blight 101 session to help them understand *Fusarium* biology, growth staging, and FHB management.

4. **How have the results been disseminated to communities of interest?**
   The data from both the UFT and IM trials are sent to Dr. Pierce Paul for summary analyses. Data from the national effort and local data from ND was used extensively in presentations growers, Extension agents and other agriculture professionals through virtual Extension meetings, Crop and Pest Reports, interviews (radio, tv and print), and virtual field days.

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?

X 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).

Nothing to report.

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).

Nothing to report

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.

Conference:

Cinderella, J.A., Anderson, K., Bergstrom, G.C., Bockus, W.W., Bradley, C.A., Breunig, M., Byamukama, E., Chilvers, M.I., Cowger, C., Faske, T.R., Friskop, A.J., Kelly, J., Kleczewski, N.M., Mideros, S., Paul, P.A., Price, T., Rawat, N., Rupp, J., Shim, S., Stevens, J., Telenko, D., and Koehler, A.M. (2021). Baseline fungicide sensitivity to pydiflumetofen in *Fusarium graminearum* isolated from wheat across 16 states. Proceedings of the 2021 National FHB Forum; Virtual. December 6-7, 2021. Retrieved from: https://scabusa.org/forum/2021/2021NFHBForumProceedings.pdf

Lux, L.R., Halvorson, J.M., Hansen, B.C., Meyer, S., Fitterer, S., Carruth, D., and Friskop, A. (2021). Effect of fungicide and variety resistance on the suppression of Fusarium head blight and deoxynivalenol in dryland hard red spring wheat. Proceedings of the 2021 National FHB Forum. Virtual. December 6-7, 2021. Retrieved from: https://scabusa.org/forum/2021/2021NFHBForumProceedings.pdf

Extension Presentations:

Friskop, A. Wheat Fungicide Update. South Central Ag Training. Fargo, ND.
Status: Presentation delivered in virtually. Acknowledgment of Federal Support: Yes.

Friskop, A. Roundtable: Plant Pathogen Issues in ND. Centrol Annual Update. Fargo, ND.
Status: Presentation delivered in person. Acknowledgment of Federal Support: Yes.

Friskop, A. Wheat and Corn Disease Management Update. Arthur Companies Annual Training. Grand Forks, ND.
Status: Presentation delivered in person. Acknowledgment of Federal Support: Yes.

Friskop, A. Wheat and Corn Disease Update. Griggs County Crop Improvement Meeting. Cooperstown, ND.
Status: Presentation delivered in person. Acknowledgment of Federal Support: Yes.

Friskop, A. Wheat Disease Update. Best of Best in Wheat. Minot, ND.
Status: Presentation delivered in person. Acknowledgment of Federal Support: Yes.

Friskop, A. Wheat Disease Observations and Management. Hard Wheat Show. Williston, ND.
Status: Presentation delivered in person. Acknowledgment of Federal Support: Yes.

Friskop, A. Wheat Disease Risk and Fungicide Response. Lake Region Roundup. Devils Lake, ND.
Status: Presentation delivered in person. Acknowledgment of Federal Support: Yes.

Friskop, A. Wheat Disease Update. 2021 Langdon REC Field Day. Langdon, ND.
Status: Presentation delivered in person. Acknowledgment of Federal Support: Yes.

Friskop, A. Wheat Disease Review and Research Update. Grand Forks County Crop Improvement Field Day. Thompson, ND.
Status: Presentation delivered in person. Acknowledgment of Federal Support: Yes.

Friskop, A. Small Grain and Corn Disease Issues. 2021 Agronomy Seed Farm Field Day. Casselton, ND.
Status: Presentation delivered in person. Acknowledgment of Federal Support: Yes.

Friskop, A. Small Grain Disease Update. 2021 Hettinger REC Field Day. Hettinger, ND.
Status: Presentation delivered in person. Acknowledgment of Federal Support: Yes.

Friskop, A. Durum Disease Management. 2021 Durum Day. Carrington, ND.
Status: Presentation delivered in person. Acknowledgment of Federal Support: Yes.

Friskop, A. Late Season Disease Management in Wheat. 2021 Crop Management Field School. Carrington, ND.
Status: Presentation delivered in person. Acknowledgment of Federal Support: Yes.