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

FY22 Performance Progress Report

Due date: July 26, 2023

Cover Page

USDA-ARS Agreement ID:	59-0206-2-124
USDA-ARS Agreement Title:	Field Research for Management of Fusarium Head Blight (FHB) in Small Grains
Principle Investigator (PI):	Andrew Friskop
Institution:	North Dakota State University
Institution UEI:	EZ4WPGRE1RD5
Fiscal Year:	2022
FY22 USDA-ARS Award Amount:	$64,927
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Period of Performance:	May 1, 2022 – April 30, 2026
Reporting Period End Date:	April 30, 2023

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
MGMT IM-CP	Evaluation of fungicides and integrated strategies for management of FHB & DON in ND	$64,927
	FY22 Total ARS Award Amount	$64,927

I am submitting this report as an: ☒ Annual 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.

_____ 7/25/23 _____

Principal Investigator Signature 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: Evaluation of fungicides and integrated strategies for management of FHB & DON in ND

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

Field trials were conducted to assess the efficacy of Prosaro Pro and Sphaerex, and compare efficacy to Prosaro, Caramba, and Miravis Ace. This was accomplished using (1) uniform fungicide trials (UFT) to assess efficacy of a fungicide on Fusarium head blight on a susceptible variety and (2) integrated management (IM) trials to assess the impact of fungicide and varietal resistance on Fusarium head blight. The third objective was to send the data to Dr. Pierce Paul's lab for inclusion of economic analyses on Fusarium head blight management tools.

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?

A total of six UFT experiments (two each on spring barley, spring durum and hard spring wheat) were conducted across five research locations (Davenport, Fargo, Langdon, Minot and Williston). Significant Fusarium head blight developed in one spring barley, one spring durum and one hard red spring UFT. Similarly, significant deoxynivalenol levels were also reported form these three experiments. The three UFTs that did not develop scab were still useful when presenting yield information pertaining to scenarios when a fungicide is applied in absence of disease risk.

A total of six IM experiments (two each on spring barley, spring durum and hard red spring wheat) were conducted across four research locations (Fargo, Langdon, Prosper and Williston). High levels of Fusarium head blight were detected in a spring durum trial conducted at Williston, and low levels of Fusarium head blight were documented in a spring barley and spring durum trial conducted at Langdon.

All of the data collected for the 12 experiments were compiled, summarized, and sent to Dr. Pierce Paul's lab for statistical analyses.

b) What were the significant results?

Results from the UFT trials suggest that both Prosaro Pro and Sphaerex were similar in efficacy to Prosaro, Caramba and Miravis Ace when applied at the early flowering growth stage (Feekes 10.51). The "late" application of Sphaerex (single application 4 to 7 days after Feekes 10.51) was equally efficacious as the Feekes 10.51 timing. Trends in fungicide efficacy were apparent across spring barley, spring durum and hard red spring wheat. The use of two fungicide applications (one at Feekes 10.51 and again 4 to 7 days later) provided the highest amount of suppression of Fusarium head blight and deoxynivalenol.

Results from the IM trials indicated that the use of a less susceptible durum or barley variety combined with a well-timed fungicide provide the most amount of DON

suppression and protection of yield. In durum, DON suppression levels as high as 77% and yield protection values as high as 24% were documented when a less susceptible variety was used with a fungicide applied at early-flowering.

c) List key outcomes or other achievements.

One of the greatest achievements with these trials is the collaboration that exists in North Dakota. My Co-PIs and I are able to generate a very diverse and robust set of data that is heavily relied upon when making FHB management decisions. Having trials positioned across the state also provides a "local" viewpoint of data. The biggest impact from the UFT and IM trials during this funding period is that they provide efficacy information on new fungicides, and this information is commonly requested by agricultural professionals for decision making in the field.

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

The field experiments are used as a learning opportunity for graduate students and undergraduate students. I offer the opportunity for students to partake in a learning session to understand *Fusarium graminearum* biology, the Fusarium head blight disease cycle, importance of host resistance, fungicide efficacy and fungicide timing. The plots are also used to explain small grain disease concepts to a visiting group of agricultural students who are in two-year agricultural degree programs.

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

The data generated from the UFT and IM trials is used during several Extension presentations such as winter Extension meetings, commodity group updates, Crop Improvement updates, and field days. Additionally, results are often summarized and referenced when writing Crop and Pest Reports and conducting interviews (radio, tv and print).

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 FY22 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 May 1, 2022 – April 30, 2023?

☒ Yes, I've included the citation reference in listing(s) below.

☐ No, I have nothing to report.

Journal publications as a result of FY22 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.

Nothing to report.

Books or other non-periodical, one-time publications as a result of FY22 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.

Nothing to report.

Other publications, conference papers and presentations as a result of FY22 award

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

Conference Proceedings (3):

Moraes, W.B., Bergstrom, G., Bissonnette, K., Bowen, K., Bradley, C., Byamukama, E., Chilvers, M., Collins, A., Cowger, C., Darby, H., DeWolf, E., Dill Macky, R., Esker, P., Friskop, A., Kleczewski, N., Koehler, A., Langston Jr., D., Madden, L., Marshall, J., Mehl, H., Nagelkirk, M., Rawat, N., Smith, D., Telenko, D., Wegulo, S., Young-Kelly, H., and Paul., P.A. (2022). Fusarium head blight management coordinated project: Uniform fungicide trials 2022. Proceedings of the 2022 National FHB Forum, Tampa, FL. December 4-6, 2022. Retrieved from:https://scabusa.org/forum/2022/2022NFHBForumProceedings.pdf

Moraes, W.B., Bergstrom, G., Bissonnette, K., Bowen, K., Bradley, C., Byamukama, E., Chilvers, M., Collins, A., Cowger, C., Darby, H., DeWolf, E., Dill Macky, R., Esker, P., Friskop, A., Kleczewski, N., Koehler, A., Langston Jr., D., Madden, L., Marshall, J., Mehl, H., Nagelkirk, M., Rawat, N., Smith, D., Telenko, D., Wegulo, S., Young-Kelly, H., and Paul., P.A. (2022). Fusarium head blight management coordinated project: Integrated management trials 2022. Proceedings of the 2022 National FHB Forum, Tampa, FL. December 4-6, 2022. Retrieved from:https://scabusa.org/forum/2022/2022NFHBForumProceedings.pdf

Lux, L., Halvorson, J., Hansen, B., Meyer, S., Chapara, V., Arens, A., Kalil, A., Tjelde, T., Teixeria, J., Bortolon, L., and Friskop, A. (2022). Summary of 2022 uniform fungicide trials (UFT) in North Dakota. Proceedings of the 2022 National FHB Forum, Tampa, FL. December 4-6, 2022. Retrieved from:https://scabusa.org/forum/2022/2022NFHBForumProceedings.pdf

Extension Presentations (15):

Friskop, A. Management of Plant Diseases in Small Grains. Centrol Consulting Annual Update. Fargo, ND.
Status: Presentation delivered in person. Acknowledgment of Federal Support: Yes

Friskop, A. Management of Cereal Diseases. International Crop Expo. Grand Forks, ND. Status: Presentation delivered virtually from Fargo (bad weather).
Acknowledgment of Federal Support: Yes

Friskop, A. Small Grain Diseases and Fungicide Update. Best of the Best in Wheat - West. Minot, ND.
Status: Presentation delivered in person. Acknowledgment of Federal Support: Yes

Friskop, A. Wheat and Barley Disease Management. North Dakota Crop Improvement Association Meeting. Bismarck, ND.
Status: Presentation delivered in person. Acknowledgment of Federal Support: Yes

Friskop, A. Cereal Disease Update - Roundtable. Ag Consultants Association of ND Meeting. Fargo, ND.
Status: Presentation delivered in person. Acknowledgment of Federal Support: Yes

Friskop, A. Small Grain and Corn Disease Update. Logan County Crop Improvement Meeting. Napoleon, ND.
Status: Presentation delivered in person. Acknowledgment of Federal Support: Yes

Friskop, A. Cereal Disease Update. Lake Region Roundup. Devils Lake, ND.
Status: Presentation delivered in person. Acknowledgment of Federal Support: Yes

Friskop, A. Fusarium Head Blight Update. NDSU Commercial Pesticide Applicator Training. Fargo, ND.
Status: Presentation delivered in person. Acknowledgment of Federal Support: Yes

Friskop, A. Small Grain Disease Update. North Dakota State College of Science Ag Student Field Day. Fargo, ND.
Status: Presentation delivered in person. Acknowledgment of Federal Support: Yes

Friskop, A. Small Grain Disease Update. Bismarck State College Ag Student Field Day. Fargo, ND.
Status: Presentation delivered in person. Acknowledgment of Federal Support: Yes

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

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

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

Friskop, A. Cereal Crop Disease Issues in 2022. Update for South Central Agricultural Extension Agents. Fargo, ND.
Status: Presentation delivered virtually. Acknowledgment of Federal Support: Yes.

Friskop, A. Cereal Disease Concerns in North Dakota. Ag Professional Training for Growers form Argentina. Fargo, ND.
Status: Presentation delivered in person. Acknowledgment of Federal Support: Yes.