USDA-ARS
U.S. Wheat and Barley Scab Initiative
FY17 Final Performance Report – NCE for FY18
Due date: July 12, 2019

Cover Page

Principle Investigator (PI):	Andrew Friskop
Institution:	North Dakota State University
E-mail:	andrew.j.friskop@ndsu.edu
Phone:	701-231-7627
Fiscal Year:	2017 (NCE for FY18)
USDA-ARS Agreement ID:	59-0206-4-012
USDA-ARS Agreement Title:	Evaluation of Management Tools for FHB and DON in Multiple Wheat Classes and Barley in ND.
FY17 USDA-ARS Award Amount:	$ 101,479
Recipient Organization:	North Dakota State University Office of Grant & Contract Accouting NDSU Dept 3130, PO Box 6050 Fargo, ND 58108-0650
DUNS Number:	80-388-2299
EIN:	45-6002439
Recipient Identifying Number or Account Number:	FAR0022045
Project/Grant Reporting Period:	5/5/18 - 5/4/19
Reporting Period End Date:	05/04/19

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
MGMT	Developing Integrated Management Strategies for FHB and DON in Small Grains.	$ 55,452
MGMT	Development and Distribution of Educational Material on Scab and Mycotoxins.	$ 46,027
	FY17 Total ARS Award Amount	$ 101,479

Principal Investigator 7-12-19 Date

* MGMT – FHB Management
FST – Food Safety & Toxicology
GDER – Gene Discovery & Engineering Resistance
PBG – Pathogen Biology & Genetics
EC-HQ – Executive Committee-Headquarters
BAR-CP – Barley Coordinated Project
DUR-CP – Durum Coordinated Project
HWW-CP – Hard Winter Wheat Coordinated Project
VDHR – Variety Development & Uniform Nurseries – Sub categories are below:
SPR – Spring Wheat Region
NWW – Northern Soft Winter Wheat Region
SWW – Southern Soft Red Winter Wheat Region

Project 1: *Developing Integrated Management Strategies for FHB and DON in Small Grains.*

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

The goal of this research project is to look at the role host resistance and the use of fungicide applications serve in reducing FHB and DON in spring barley, hard red winter wheat, hard red spring wheat and spring durum. This study will help address grower based questions pertaining to fungicide timing issues when field conditions prevent them from spraying or when scab risk remains high throughout the flowering to grain filling process.

2. What was accomplished under these goals?

1) major activities

Integrated management research experiments were conducted at five locations in North Dakota; Carrington, Fargo, Langdon, Prosper and Williston. Four locations housed trials for hard red spring wheat, one for hard red winter wheat, three for spring barley and three for spring durum.

2) specific objectives

Research trials examined the role of host resistance and double/split fungicide application (ie: a triazole fungicide applied at anthesis and a different triazole applied 4-7 days later) on reducing FHB and DON in hard red spring wheat, hard red winter wheat, spring barley and spring durum in North Dakota.

3) significant results

Varying levels of scab pressure developed at the research sites. This is advantageous as the varieties and fungicide timings were evaluated under varying levels of disease pressure. Field data showed that a double/split fungicide application reduced both FHB and DON more than a single fungicide application. The field data also corresponded with DON level reductions from the double/split fungicide application. On average, the double/split fungicide application provided anywhere from 10-15% more DON suppression than a fungicide applied at the recommended time of early-anthesis in wheat or full-head in spring barley. More information is needed to test the economic validity of double/split fungicide applications.

4) key outcomes or other achievements

Future studies on double/split applications are needed to strengthen in-season management recommendations. This type of data is heavily needed for spring durum growers, as most varieties are susceptible, and the flowering window (infection window) is longer.

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

Research trials were used as an outside classroom for graduate students and research specialists in the NDSU Extension program. Individuals were taught about *Fusarium graminearum* biology, FHB management and principles of field research. Although no formal course was designed, students gained valuable insight and awareness on a very important disease in North Dakota. The research trials at the Fargo location were used when educating students from Bismarck State College and North Dakota State College of Science o plant pathology.

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

Data was included in a meta-analysis (submitted to Pierce Paul – Ohio State University) that provides a robust summary of the collaborative work of the MGMT team and be used in future presentations. The results of the ND trials were communicated and disseminated to growers, Extension agents and other agriculture professionals through Extension meetings, agricultural expo shows, internet, interviews (radio, tv and print), CCA trainings and field days.

Project 2: *Development and Distribution of Educational Material on Scab and Mycotoxins.*

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

A recent USWBSI-funded survey indicated areas of disconnect between research and the dissemination of information on FHB and mycotoxins to producers. Areas of greatest concern were the use of inappropriate fungicides, improper timing of fungicides, and confusion on varietal resistance. To help address these concerns, the goal of this project is to develop and deliver FHB information to growers and agricultural professionals using multiple communication medias.

2. What was accomplished under these goals?

1) major activities

At the annual NCERA-184 meeting, video was recorded of interviews with Extension specialists. These interviews were conversational and highlighted key topics of FHB and FHB management. A video arts and marketing company was identified to facilitate the production of a FHB video and iBook.

2) specific objectives

The specific objectives of the project are to (1) generate hard copy Extension materials detailing FHB and mycotoxin information (2) take images and videos highlighting topics pertaining to FHB and mycotoxins (3) compile information, images, and videos into an interactive iBook.

3) significant results

A blended 3D/2D video has been created depicting the understanding and management of Fusarium head blight. This video is less than 5 minutes in length and can be used so support FHB information delivery in county and state Extension programs and Land Grant Universities.

Interviews were recorded with Extension specialists within the USWBSI. These interviews highlighted frequently asked on FHB and management of FHB. For example, host resistance, fungicide selection and fungicide timing were thoroughly covered in these interviews.

An iBook was created with information pertaining to FHB and FHB management. This includes photos, audio interviews (from Extension specialists), and summative data from the IM-CP efforts.

4) key outcomes or other achievements

The Extension information will be used in upcoming Extension events and will be a relevant resource for a long time.

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

The Extension information generated can be used by researchers, growers and other agricultural professionals when training interns and students.

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

The CPN publication pertaining to optimizing fungicide use on FHB is available on the website and will be handed out at summer Extension events. The video will be made available for general use.

Training of Next Generation Scientists

Instructions: Please answer the following questions as it pertains to the FY17-NCE period. The term "support" below includes any level of benefit to the student, ranging from full stipend plus tuition to the situation where the student's stipend was paid from other funds, but who learned how to rate scab in a misted nursery paid for by the USWBSI, and anything in between.

1. **Did any graduate students in your research program supported by funding from your USWBSI grant earn their MS degree during the FY17-NCE period?**

   No

   If yes, how many?

2. **Did any graduate students in your research program supported by funding from your USWBSI grant earn their Ph.D. degree during the FY17-NCE period?**

   No

   If yes, how many?

3. **Have any post docs who worked for you during the FY17-NCE period and were supported by funding from your USWBSI grant taken faculty positions with universities?**

   No

   If yes, how many?

4. **Have any post docs who worked for you during the FY17-NCE period and were supported by funding from your USWBSI grant gone on to take positions with private ag-related companies or federal agencies?**

   No

   If yes, how many?

Release of Germplasm/Cultivars

Instructions: In the table below, list all germplasm and/or cultivars released with full or partial support through the USWBSI during the FY17-NCE period. All columns must be completed for each listed germplasm/cultivar. Use the key below the table for Grain Class abbreviations.

NOTE: Leave blank if you have nothing to report or if your grant did NOT include any VDHR-related projects.

Name of Germplasm/Cultivar	**Grain Class**	**FHB Resistance** (S, MS, MR, R, where R represents your most resistant check)	**FHB Rating** (0-9)	**Year Released**

Add rows if needed.

NOTE: List the associated release notice or publication under the appropriate sub-section in the 'Publications' section of the FPR.

Abbreviations for Grain Classes

Barley - BAR
Durum - DUR
Hard Red Winter - HRW
Hard White Winter - HWW
Hard Red Spring - HRS
Soft Red Winter - SRW
Soft White Winter - SWW

Publications, Conference Papers, and Presentations

Journal publications.

Paul, P.A., Salgado, J.D., Bergstrom, G., Bradley, C., Byamukama, E., Byrne, A.M., Chapara, V., Cummings, J.A., Chilvers, M.I., Dill-Macky, R., Friskop, A., Kleczewski, N., Madden, L.V., Nagelkirk, M., Stevens, J., Smith, M., Wegulo, S., Wise, K., and Yabwalo, D. 2019. Integrated effects of genetic resistance and prothioconazole + tebuconazole application timing on Fusarium head blight in wheat. Plant Dis 1003:223-237.

Books or other non-periodical, one-time publications.

Other publications, conference papers and presentations.

Conference

Green, A., Leier, J., Lin Y., Zhong, S., Li, X., Friskop, A., Xu, S., Cai, X., Frohberg, R., Stack, R., and Mergoum, M. 2018. Breeding for FHB Resistance in North Dakota: More questions than answers. Proceedings of the 2018 National FHB Forum, Dec 2-4, 2018, St. Louis, MO. US Wheat and Barley Scab Initiative publishers, East Lansing, MI/Lexington, KY.
Status: Poster presentation given by lead author.
Acknowledgement of Federal Support: Yes.

Gross, P.L., Bauske, E., Halvorson, J., Meyer, S., Schuh, C., Chapara, V., Hanson, B., Henry, L., Hakanson, T., Arens, A., Brueggeman, R., and **Friskop, A**. 2018. Evaluating adepidyn and host resistance to reduce Fusarium head blight and deoxynivalenol in spring barley. Proceedings of the 2018 National FHB Forum, Dec 2-4, 2018, St. Louis, MO. US Wheat and Barley Scab Initiative publishers, East Lansing, MI/Lexington, KY.
Status: Poster presentation given by lead author.
Acknowledgement of Federal Support: Yes.

Halvorson, J., Bauske, E., Meyer, S., Schuh, C., Chapara, V., Hanson, B., Henry, L., Hakanson, T., Arens, A., and **Friskop, A**. 2018. Evaluation of fungicide efficacy and timing for management of Fusarium head blight in spring barley and hard red spring wheat. Proceedings of the 2018 National FHB Forum, Dec 2-4, 2018, St. Louis, MO. US Wheat and Barley Scab Initiative publishers, East Lansing, MI/Lexington, KY.
Status: Poster presentation given by lead author.
Acknowledgement of Federal Support: Yes.

Kalil, A., Fonseka, D., Tjelde, T., Ransom, J., Deplazes, C., Eisinger, D., Schatz, B., Bausek, E., Halvorson, J., Meyer, S, Schuh, C. and **Friskop, A**. 2018. Evaluation of fungicides individually or as part of an integrated approach for management of Fusarium head blight in durum. Proceedings of the 2018 National FHB Forum, Dec 2-4, 2018, St. Louis, MO. US Wheat and Barley Scab Initiative publishers, East Lansing, MI/Lexington, KY.
Status: Poster presentation given by lead author.
Acknowledgement of Federal Support: Yes.

Ransom, J., Friskop, A. and Buetow, R. 2018. Variation in spike emergence timing in spring wheat varieties sown at different densities. Proceedings of the 2018 National FHB Forum, Dec 2-4, 2018, St. Louis, MO. US Wheat and Barley Scab Initiative publishers, East Lansing, MI/Lexington, KY.
Status: Poster presentation given by lead author.
Acknowledgement of Federal Support: Yes.

Salgado, J.D., Bergstrom, G., Bradley, C., Bowen, K., Byamukama, E., Byrne, A., Collins, A., Cowger, C., Cummings, J., Chapara, V., Chilvers, M.I., DeWolf, E., Dill-Macky, R., Darby, H.M., Esker, P.D., Friskop, A., Halvorson, J., Kleczewski, N., Madden, L.V., Marshall, J., Mehl, H., Nagelkirk, M., Starr, J., Stevens, J., Smith, D., Smith, M., Wegulo, S., Wise, K., Yabwalo, H.M., Young-Kelly, H., and Paul, P.A. 2018. Efficacy of Miravis Ace® for FHB and DON management across environments and grain market classes: A progress report. Proceedings of the 2018 National FHB Forum, Dec 2-4, 2018, St. Louis, MO. US Wheat and Barley Scab Initiative publishers, East Lansing, MI/Lexington, KY.
Status: Poster presentation given by lead author.
Acknowledgement of Federal Support: Yes.

Salgado, J.D., Bergstrom, G., Bradley, C., Bowen, K., Byamukama, E., Byrne, A., Collins, A., Cowger, C., Cummings, J., Chapara, V., Chilvers, M.I., Dill-Macky, R., Darby, H.M., Friskop, A., Kleczewski, N., Madden, L.V., Marshall, J., Mehl, H., Nagelkirk, M., Stevens, J., Smith, D., Smith, M., Wegulo, S., Wise, K., Yabwalo, H.M., Young-Kelly, H., and Paul, P.A. 2018. Efficacy of two-treatment fungicide programs for FHB management: a multi-state coordinated project. Proceedings of the 2018 National FHB Forum, Dec 2-4, 2018, St. Louis, MO. US Wheat and Barley Scab Initiative publishers, East Lansing, MI/Lexington, KY.
Status: Poster presentation given by lead author.
Acknowledgement of Federal Support: Yes.

Extension Presentations

Friskop, A. Management of Cereal Crop Diseases. Dickinson Research Extension Center – Dickinson, ND. June 2018.
Status: Oral and hands-on presentation.
Acknowledgement of Federal Support: Yes.

Friskop, A. Cereal Disease Update. Hettinger Research Extension Center Field Day– Hettinger, ND. July 2018.
Status: Oral presentation.
Acknowledgement of Federal Support: Yes.

Friskop, A. Plant Disease Clinic. North Central Research Extension Center Field Day – Minot, ND. July 2018.
Status: Oral presentation.
Acknowledgement of Federal Support: No.

Friskop, A. Cereal Disease Update. Langdon Research Extension Center Field Day– Langdon, ND. July 2018.
Status: Oral presentation.
Acknowledgement of Federal Support: Yes.

Friskop, A. Wheat Disease Update. Grand Forks County Field Day – Grand Forks, ND. July 2018.
Status: Oral presentation.
Acknowledgement of Federal Support: Yes.

Friskop, A. Fusarium Head Blight Management Update. Arthur Companies Ag Day – Pilsbury, ND. September 2018.
Status: Oral presentation.
Acknowledgement of Federal Support: Yes.

Friskop, A. Ergot and a Fungicide Update on Scab. International Durum Forum – Minot, ND. November 2018.
Status: Oral presentation.
Acknowledgement of Federal Support: Yes.

Friskop, A. Update on Scab and Ergot. Lake Region Roundup – Devils Lake, ND. January 2019.
Status: Oral presentation.
Acknowledgement of Federal Support: Yes.

Friskop, A. Management of FHB and Update on Ergot. Hefty Ag Day – New Rockford, ND. January 2019.
Status: Oral presentation.
Acknowledgement of Federal Support: Yes.

Friskop, A. Keeping Diseases at Bay in Wheat. Wheat University – Bismarck, ND. January 2019.
Status: Oral presentation.
Acknowledgement of Federal Support: Yes.

Friskop, A. Management of FHB – State Side. Manitoba Ag Day – Brandon, Manitoba Canada. January 2019.
Status: Oral presentation.
Acknowledgement of Federal Support: Yes.

Friskop, A. Fungicide update on Scab. Best of the Best in Wheat Research – Minot. January 2019.
Status: Oral presentation.
Acknowledgement of Federal Support: Yes.

Friskop, A. Fungicide update on Scab. Best of the Best in Wheat Research – Minot. January 2019.
Status: Oral presentation.
Acknowledgement of Federal Support: Yes.

Friskop, A. Cereal Disease Management Update. Nelson County Crop Improvement Meeting – Tolna, ND. February 2019.
Status: Oral presentation.
Acknowledgement of Federal Support: Yes.