USDA-ARS
U.S. Wheat and Barley Scab Initiative
FY19 Final Performance Report
Due date: July 24, 2020

Cover Page

Principle Investigator (PI):	Stephen Wegulo
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Fiscal Year:	2019
USDA-ARS Agreement ID:	59-0206-6-014
USDA-ARS Agreement Title:	Integrated Management and Prediction of Fusarium Head Blight and DON in Winter Wheat
FY19 USDA-ARS Award Amount:	$ 15,254
Recipient Organization:	University of Nebraska Sponsored Programs 312 N 14th, Alexander West Lincoln, NE 68588-0430
DUNS Number:	55-545-6995
EIN:	47-0049123
Recipient Identifying Number or Account Number:	25-6235-0270-001
Project/Grant Reporting Period:	6/13/19 - 6/12/20
Reporting Period End Date:	6/12/2020

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
MGMT	Integrating Strategies to Mitigate Fusarium Head Blight and DON in Winter Wheat	$ 15,254
	FY19 Total ARS Award Amount	**$ 15,254**

July 26, 2020

Principal Investigator 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

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Project 1: *Integrating Strategies to Mitigate Fusarium Head Blight and DON in Winter Wheat*

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

The overall goal of this research was to integrate cultivar resistance with fungicide application to effectively manage FHB and DON in winter wheat. The specific objectives were:

1) Evaluate the integrated effects of fungicide treatment and genetic resistance on FHB and DON in winter wheat with emphasis on a new fungicide, Miravis Ace®
2) Enhance communication and end user education/outreach on integrated management of FHB and DON

2. What was accomplished under these goals or objectives? *(For each major goal/objective, address items a-b) below.)*

a) What were the major activities?

A field experiment was conducted to investigate the effects of cultivar resistance and fungicide application on FHB and DON in winter wheat. The experiment was located at the University of Nebraska Havelock Research Farm near Lincoln, Nebraska. Four cultivars adapted to Nebraska were used: Overland (moderately resistant), Millennium (moderately resistant), Roubidoux (susceptible), and Wesley (susceptible). Fungicide x inoculation treatments were 1) untreated, inoculated check; 2) Prosaro® (6.5 fl. oz.) at anthesis, inoculated; 3) Caramba® (13.5 fl oz) at anthesis, inoculated; 4) Miravis Ace (13.7 fl. oz) at Feekes 10.3, inoculated; 5) Miravis Ace (13.7 fl. oz) at anthesis, inoculated; 6) Miravis Ace Ace (13.7 fl. oz) at anthesis, inoculated followed by Prosaro (6.5 fl oz) 4-6 days after anthesis; 7) Miravis Ace (13.7 fl. oz) at anthesis, inoculated followed by Caramba (13.5 fl oz) 4-6 days after anthesis. Fungicides were applied with a CO_2-powered backpack sprayer equipped with four Teejet 800-1 VS nozzles and calibrated to deliver 20 gallons of fungicide-water mixture per acre. Plots were spray-inoculated with spores of *Fusarium graminearum* (1×10^5 spores/mL) 24 hours after fungicide application. To enhance inoculum buildup in the plots as well as disease development, corn kernel inoculum was spread weekly on the soil surface starting at three weeks before anthesis. FHB intensity was assessed at the soft dough growth stage. At and following harvest, yield, test weight, *Fusarium*-damaged kernels (FDK), and DON concentration were determined. A weather station at the experiment site recorded weather data starting in mid-April through end of June.

b) What were the significant results?

Applying the new fungicide Miravis Ace at anthesis followed by Prosaro or Caramba 4-6 days later was more effective in controlling FHB and DON than applying Miravis Ace before anthesis or applying Miravis Ace, Prosaro, or Caramba alone at anthesis. The susceptible winter wheat cultivars Roubidoux and Wesley developed more FHB and yielded less than the moderately resistant cultivars Overland and Millennium.

c) List key outcomes or other achievements.

Miravis Ace applied at anthesis followed by Prosaro or Caramba 4-6 days later controlled FHB and DON better and resulted in higher yield than the individual fungicides applied alone at anthesis or before anthesis.

3. Was this research impacted by the COVID-19 pandemic (i.e. university shutdowns, reduced or lack of support personnel, etc.)? If yes, please explain how this research was impacted or is continuing to be impacted.

No

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

Mrs. Julie Stevens, a research technologist in the PI's lab, worked on the project. Undergraduate student workers gained research training and experience working on the project.

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

Results and information on FHB and other wheat diseases and their management were disseminated through oral presentations at the 2020 Nebraska Extension's Crop Production Clinics which were held in January at six locations in Nebraska.

Training of Next Generation Scientists

Instructions: Please answer the following questions as it pertains to the FY19 award period (6/13/19 - 6/12/20). 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 FY19 award 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 FY19 award period?**
   No

   If yes, how many?

3. **Have any post docs who worked for you during the FY19 award period and were supported by funding from your USWBSI grant taken faculty positions with universities?**
   N/A

   If yes, how many?

4. **Have any post docs who worked for you during the FY19 award period and were supported by funding from your USWBSI grant gone on to take positions with private ag-related companies or federal agencies?**
   N/A

   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 FY19 award 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

Instructions: Refer to the FY19-FPR_Instructions for detailed more instructions for listing publications/presentations about your work that resulted from all of the projects included in the FY19 grant award. Only citations for publications published (submitted or accepted) or presentations presented during the **award period (6/13/19 - 6/12/20**) should be included. If you did not publish/submit or present anything, state 'Nothing to Report' directly above the Journal publications section.

NOTE: Directly below each citation, you **must** indicate the Status (i.e. published, submitted, etc.) and whether acknowledgement of Federal support was indicated in the publication/ presentation. See example below for a poster presentation with an abstract:

> De Wolf, E., D. Shah, P. Paul, L. Madden, S. Crawford, D. Hane, S. Canty, R. Dill-Macky, D. Van Sanford, K. Imhoff and D. Miller. 2019. "Impact of Prediction Tools for Fusarium Head Blight in the US, 2009-2019." In: S. Canty, A. Hoffstetter, H. Campbell and R. Dill-Macky (Eds.), *Proceedings of the 2019 National Fusarium Head Blight Forum*, Milwaukee, WI; December 8-10. University of Kentucky, Lexington, KY. p. 12.
> Status: Abstract Published and Poster Presented
> Acknowledgement of Federal Support: YES (Abstract and Poster)

Journal publications.

Bolanos-Carriel, C., S. N. Wegulo, P. S. Baenziger, K. M. Eskridge, D. Funnel-Harris, N. McMaster, D. G. Schmale III and H. E. Hallen-Adams. 2020. *Tri5* gene expression analysis during postharvest storage of wheat grain from field plots treated with a triazole and a strobilurin fungicide. Can. J. Plant Pathol. https://www.tandfonline.com/doi/pdf/10.1080/07060661.2019.1700169?needAccess=true
Status: Published.
Acknowledgement of Federal Support: YES

Bolanos-Carriel, C., S. N. Wegulo, H. Hallen-Adams, P. S. Baenziger, K. M. Eskridge, D. Funnel-Harris, N. McMaster and D. G. Schmale III. 2020. Effects of field-applied fungicides, grain moisture, and time on deoxynivalenol during postharvest storage of winter wheat grain. Can. J. Plant Sci. 100: 304-313. https://www.nrcresearchpress.com/doi/pdf/10.1139/CJPS-2019-0075
Status: Published.
Acknowledgement of Federal Support: YES

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

Other publications, conference papers and presentations.

Paul, P.A., Ng, S. J., 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., Madden, L., Marshall, J., Mehl, H., Moraes, W., Nagelkirk, M., Rawat, N., Smith, D., Telenko, D., Wegulo, S., and Young-Kelly, H. 2019. "Fusarium head blight management coordinated project: integrated management trials 2018-2019." In: Canty, S., A. Hoffstetter, H. Campbell and R. Dill-Macky (Eds.), *Proceedings of the 2019 National Fusarium Head Blight Forum* (p. 20). Milwaukee, WI; December 8-10. University of Kentucky, Lexington, KY.
Status: Poster Presented and Short Report published
Acknowledgement of Federal Support: YES

Paul, P.A., Ng, S.J., 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., Madden, L., Marshall, J., Mehl, H., Moraes, W., Nagelkirk, M., Rawat, N., Smith, D., Telenko, D., Wegulo, S., and Young-Kelly, H. 2019. "Fusarium head blight management coordinated project: uniform fungicide trials 2018-2019." In: Canty, S., A. Hoffstetter, H. Campbell and R. Dill-Macky (Eds.), *Proceedings of the 2019 National Fusarium Head Blight Forum* (p. 25). Milwaukee, WI; December 8-10. University of Kentucky, Lexington, KY.
Status: Poster Presented and Short Report published
Acknowledgement of Federal Support: YES