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

Cover Page

Principle Investigator (PI):	Emmanuel Byamukama
Institution:	South Dakota State University
E-mail:	emmanuel.byamukama@sdstate.edu
Phone:	605-688-4521
Fiscal Year:	2019
USDA-ARS Agreement ID:	59-0206-8-192
USDA-ARS Agreement Title:	Fungicide Efficacy in FHB/DON Management for Hard Red Winter and Spring Wheat in SD
FY19 USDA-ARS Award Amount:	$ 31,049
Recipient Organization:	South Dakota State University SAD 133, Box 2201 Brookings, SD 57007
DUNS Number:	929929743
EIN:	46-6000364
Recipient Identifying Number or Account Number:	3F4628
Project/Grant Reporting Period:	4/6/19 - 4/5/20
Reporting Period End Date:	4/5/2020

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
MGMT	Fungicide Efficacy in FHB/DON Management for Hard Red Winter and Spring Wheat in SD	$ 31,049
	FY19 Total ARS Award Amount	**$ 31,049**

7/24/2020

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

Project 1: *Fungicide Efficacy in FHB/DON Management for Hard Red Winter and Spring Wheat in SD*

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

I. Determine the efficacy of Miravis Ace® 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 items a-b) below.)*

Obj. I. Determine the efficacy of Miravis Ace applied at heading for FHB and DON management

a) What were the major activities?

Three hard red spring wheat cultivars, Brick (FHB-resistant), Prevail (FHB-moderately resistant) and Samson (FHB-susceptible) were planted at two locations: SDSU Volga Research Farm near Brookings, and Northeast Research Farm near South shore. Treatments evaluated were: Miravis Ace 13.7 fl oz/ac applied at heading; Miravis Ace 13.7 fl oz/ac applied at flowering, Prosar®o 6.5 fl oz/ac applied at flowering and non-treated check. The plots at the Volga location were misted beginning at heading to increase FHB pressure. The plots at this location additionally had infected corn kernels (100g per plot) scattered within each plot to increase the FHB pressure. The experiment was set up as a randomized complete block design with a split-plot arrangement, where the fungicide was the main plot and cultivar the sub-plot. Treatments were replicated four times and plot size was 5 ft x 15 ft. at both locations. A CO2-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 at a spray volume of 18.6 gal/A. Twenty-one days following treatment, plots were evaluated for FHB incidence, FHB head severity, and FHB field severity. Fusarium damaged kernels (FDK), DON content, and grain yield were assessed post-harvest.

b) What were the significant results?

Miravis Ace applied at heading significantly reduced FHB index but not as high as Prosaro applied at flowering. Similarly, Miravis Ace applied at heading did not significantly reduce DON compared to Prosaro applied at flowering.

Note: Unfortunately winter wheat plots were lost at both locations due to late planting in the fall.

c) List key outcomes or other achievements.

The best timing for applying Miravis Ace is at flowering. Heading timing was not as effective as flowering.

Obj. II. Determine the efficacy of Miravis Ace fungicide treatment at flowering for FHB and DON management in wheat.

a) What were the major activities?

The experimental set up described in objective 1 above was used.

b) What were the significant results?

Miravis Ace applied at flowering timing significantly reduced FHB index and DON at similar levels as Prosaro applied at the same timing.

c) List key outcomes or other achievements.

The best timing for applying Miravis Ace in our plots was at flowering. This timing gave the best reduction in FHB index and also DON.

Obj. III. Generate data to advance the FHB and DON risk prediction effort.

a) What were the major activities?

Scouted and recorded the incidence and severity of FHB in winter and spring wheat in South Dakota.

b) What were the significant results?

FHB incidence and severity in 2019 wheat growing season was high. This was correctly predicted by FHB prediction tool. FHB and DON data collected from non-treated non inoculated plots at the two locations were sent to the model prediction team.

c) List key outcomes or other achievements.

FHB prediction system is a reliable tool to help growers make FHB and DON management decisions

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.

Yes, DON testing lab took longer to return the results. However, these have since been returned and shared with the CP coordinator.

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

The project provided training opportunities for a research associate. He presented a poster at the USWBSI National Forum.

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

Miravis Ace time of application efficacy results and FHB risk predictions for South Dakota were communicated through extension articles, radio interviews, newsletter articles, grower meetings, and during the Ag Horizon Workshop, field days, IPM field school, and pesticide applicator trainings. Twitter was also used to communicate quick updates and issue alerts on FHB development.

Training of Next Generation Scientists

Instructions: Please answer the following questions as it pertains to the FY19 award period (4/6/19 - 4/5/20). 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?**
   No

   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?**
   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 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 (4/6/19 - 4/5/20**) 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.

Journal publications.

Paul, P. A., Salgado, J. D., Bergstrom, G. C., Bradley, C., Byamukama, E., Byrne, A. M., Chapara, V., Cummings, J. A., Chilvers, M. I., Dill-Macky, R., Friskop, A. J., Kleczewski, N. M., Madden, L. V., Nagelkirk, M., Stevens, J., Smith, M., Wegulo, S. N., Wise, K. A., and Yabwalo, D. 2019. Integrated effects of genetic resistance and prothioconazole tebuconazole application timing on Fusarium head blight in wheat. Plant Dis. 103:223-237
Status: Paper Published
Acknowledgement of Federal Support: YES

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

Other publications, conference papers and presentations.

Pierce A Paul, Sin Joe Ng, Gary Bergstrom, Kaitlyn Bissonnette, Kira Bowen, Carl Bradley, Emmanuel Byamukama, Martin Chilvers, Alyssa Collins, Christina Cowger, Heather Darby, Erick DeWolf, Ruth Dill Macky, Paul Esker, Andrew Friskop, Nathan Kleczewski, Alyssa Koehler, Laurence Madden, Juliet Marshall, Hillary Mehl, Wanderson Moraes, Martin Nagelkirk, Nidhi Rawat, Damon Smith, Darcy Telenko and Stephen Wegulo, and Heather Young-Kelly. 2019 "Fusarium head blight management coordinated project: Integrated management trials 2018-2019. In S. Canty, A. Hoffstetter, H. Campbell and R. Dill-Mackey (Eds.), *Proceedings of the 2019 National Fusarium Head Blight Forum* (p. 20), Milwaukee, WI; December 8-10. University of Kentucky, Lexington, KY.
Status: Abstract Published and Poster Presented
Acknowledgement of Federal Support: YES (Abstract and Poster)

Pierce A. Paul, Sin Joe Ng, Gary Bergstrom, Kaitlyn Bissonnette, Kira Bowen, Carl Bradley, Emmanuel Byamukama, Martin Chilvers, Alyssa Collins, Christina Cowger, Heather Darby, Erick DeWolf, Ruth Dill Macky, Paul Esker, Andrew Friskop, Nathan Kleczewski, Alyssa Koehler, Laurence Madden, Juliet Marshall, Hillary Mehl, Wanderson Moraes, Martin Nagelkirk, Nidhi Rawat, Damon Smith, Darcy Telenko, Stephen Wegulo and Heather Young-Kelly. 019. "Fusarium head blight management coordinated project: Uniform fungicide trials 2018-2019." In S. Canty, A. Hoffstetter, H. Campbell and R. Dill-Mackey (Eds.), *Proceedings of the 2019 National Fusarium Head Blight Forum* (p. 25), Milwaukee, WI; December 8-10. University of Kentucky, Lexington, KY.
Status: Abstract Published and Poster Presented
Acknowledgement of Federal Support: YES (Abstract and Poster)

Salgado, J. D., Bergstrom, G. C., Bradley, C. A., Bowen, K. L., Byamukama, E., Byrne, A., Collins, A. A., Cowger, C., Cummings, J., Chapara, V., Chilvers, M., Dill-Macky, R., Darby, H. M., Friskop, A. J., Kleczewski, N. M., Madden, L. V., Marshall, J. M., Mehl, H. L., Nagelkirk, M., Stevens, J., Smith, D. L., Smith, M. J., Wegulo, S. N., Wise, K.A., Yabwalo, D., Kelly, H. M., and Paul, P. A. 2019. Effects of two-treatment fungicide programs on grain yield and quality of Fusarium head blight-affected wheat. Phytopathology 109:1010, 65-65.
Status: Abstract Published
Acknowledgement of Federal Support: YES (Oral presentation)

Yabwalo, D. N., Ali, S., Glover, K. and Byamukama, E. 2019. Field evaluation of pydiflumetofen + propiconazole and prothioconazole + tebuconazole efficacy on Fusarium graminearum in South Dakota. In: S. Canty, A. Hoffstetter, H. Campbell and R. Dill-Macky (Eds.), *Proceedings of the 2019 National Fusarium Head Blight Forum* (p. 33), Milwaukee, WI; December 8-10. University of Kentucky, Lexington, KY.
Status: Abstract Published and Poster Presented
Acknowledgement of Federal Support: YES (Abstract and Poster)

Extension publications:

Byamukama, E., Ali, S., Strunk, C., and Yabwalo, D. 2019. Diagnosing early diseases in winter wheat. SDSU Extension Crops Newsletter and online. https://extension.sdstate.edu/diagnosing-early-diseases-winter-wheat
Status: Published
Acknowledgement of Federal Support: No

Byamukama, E., Ali, S., and Edwards, L. 2019. Use the scab and leaf disease forecasting tools to decide on fungicide application in wheat. SDSU Extension Crops Newsletter and online https://extension.sdstate.edu/use-scab-and-leaf-disease-forecasting-tools-decide-fungicide-application-wheat
Status: Published
Acknowledgement of Federal Support: Yes

Byamukama, E., Strunk, C., and Ali, S. 2019. Winter wheat disease update: Leaf diseases and FHB on the increase. SDSU Extension Crops Newsletter and online. https://extension.sdstate.edu/winter-wheat-disease-update-leaf-diseases-and-fhb-increase
Status: Published
Acknowledgement of Federal Support: Yes

Byamukama, E., Ali, S., and Strunk, C. 2019. Diseases in winter wheat imply high inoculum for spring wheat. SDSU Extension Crops Newsletter and online. https://extension.sdstate.edu/diseases-winter-wheat-imply-high-inoculum-spring-wheat
Status: Published
Acknowledgement of Federal Support: No