USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY19 Final Performance Progress Report
Due date: July 29, 2021

Cover Page

Principle Investigator (PI):	Emmanuel Byamukama
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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 - 4/5/21
Reporting Period End Date:	4/5/2021

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**

7/27/2021

Principal Investigator Date

* MGMT – FHB Management
FST – Food Safety & Toxicology
R – Research
S – Service (DON Testing Lab)
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
   II. 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 these three items below.)*

   a) What were the major activities?

   Integrated FHB management trial (IMT): 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 (NERF) near South shore in May of 2019 and 2020. Treatments evaluated were: Miravis Ace 13.7 fl oz/ac applied at heading; Miravis Ace 13.7 fl oz/ac applied at flowering, Prosaro® 6.5 fl oz/ac applied at flowering and non-treated check.

   Uniform trial: A uniform fungicide study was also set up at Volga and at NERF in 2020. One hard red spring wheat variety, Select, was planted and treatments included Miravis Ace was applied at heading (Feekes 10.3), early flowering (Feekes 10.5.1) and 4 to 6 days after early flowering. Caramba® and Prosaro were applied at early flowering as well as at 4 to 6 days following Miravis Ace application.

   The plots at the Volga location for both experiments 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 plots at the NERF were left under natural infection. The IM trial 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. The uniform trial was laid out as a randomized complete block design. Treatments in both trials 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 across the varieties.

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.

These data have been shared with Dr. Pierce Paul to be incorporated into the modeling efforts.

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

Yes, we struggled to get field help because of restrictions due to COVID-19

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

A graduate student was trained in scouting and assessing FHB. 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?

Results that were generated from the trials were shared with producers, agronomists, crop consultants, and other stakeholders via extension presentations, radio interviews, field research days, and social media.

Training of Next Generation Scientists

Instructions: Please answer the following questions as it pertains to the **FY19 award period (4/6/19 - 4/5/21)**. 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?**
   ☐Yes ☒No
   If yes, how many? Click to enter number here.

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?**
   ☐Yes ☒No
   If yes, how many? Click to enter number here.

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?**
   ☐Yes ☒No
   If yes, how many? Click to enter number here.

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?**
   ☐Yes ☒No
   If yes, how many? Click to enter number here.

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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 (4/6/19 - 4/5/21)**. 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	FHB Rating (0-9)	Year Released
Not applicable to this project.	Select Grain Class	Select what represents your most resistant check	Enter as text 0-9 rating	Select Year
Click here to enter text.	Select Grain Class	Select what represents your most resistant check	Enter as text 0-9 rating	Select Year
Click here to enter text.	Select Grain Class	Select what represents your most resistant check	Enter as text 0-9 rating	Select Year
Click here to enter text.	Select Grain Class	Select what represents your most resistant check	Enter as text 0-9 rating	Select Year
Click here to enter text.	Select Grain Class	Select what represents your most resistant check	Enter as text 0-9 rating	Select Year
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Click here to enter text.	Select Grain Class	Select what represents your most resistant check	Enter as text 0-9 rating	Select Year
Click here to enter text.	Select Grain Class	Select what represents your most resistant check	Enter as text 0-9 rating	Select Year

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

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Publications, Conference Papers, and Presentations

Instructions: Refer to the 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 - 4/5/21**) 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:

Z.J. Winn, R. Acharya, J. Lyerly, G. Brown-Guedira, C. Cowger, C. Griffey, J. Fitzgerald, R.E. Mason and J.P. Murphy. 2020. "Mapping of Fusarium Head Blight Resistance in NC13-20076 Soft Red Winter Wheat." In: S. Canty, A. Hoffstetter, and R. Dill-Macky (Eds.), *Proceedings of the 2020 National Fusarium Head Blight Forum (*p. 12.), Virtual; December 7-11. Online: https://scabusa.org/pdfs/NFHBF20_Proceedings.pdf.
Status: Abstract Published and Poster Presented
Acknowledgement of Federal Support: YES (Abstract and Poster)

Journal publications.

Nothing to report.

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

Nothing to report.

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)

Byamukama, E., and Ali, S. 2020. The Fusarium head blight prediction tool indicate high risk. SDSU Extension Crops Newsletter and online.

Status: Produced 6/5/2020 online.

Acknowledgement of Federal Support: Not applicable to this type of publication

Byamukama, E., Ali, S., Strunk, C. and Yabwalo, D. 2019. Diagnosis of early diseases in winter wheat. SDSU Extension Crops Newsletter.

Status: Published

Acknowledgement of Federal Support: Not applicable to this type of publication

Byamukama, E., and Ali, S. 2020. Fusarium head blight predicted risk for spring wheat. SDSU Extension Crops Newsletter and online.
Status: Produced 6/25/2020.
Acknowledgement of Federal Support: Not applicable to this type of publication

Byamukama, E., Ali, S., and Sehgal, S. 2020. Winter wheat diseases update. SDSU Extension Crops Newsletter and online.
Status: Published
Acknowledgement of Federal Support: Not applicable to this type of publication