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
Recipient Organization:	South Dakota State University SAD 133, Box 2201
Recipient Organization:	,
Recipient Organization: DUNS Number:	SAD 133, Box 2201
	SAD 133, Box 2201 Brookings, SD 57007
DUNS Number:	SAD 133, Box 2201 Brookings, SD 57007 929929743
DUNS Number: EIN:	SAD 133, Box 2201 Brookings, SD 57007 929929743 46-6000364
DUNS Number: EIN: Recipient Identifying Number or	SAD 133, Box 2201 Brookings, SD 57007 929929743 46-6000364

USWBSI Individual Project(s)

USWBSI Research		ARS Award	
Category*	Project Title	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	

Principal Investigator

7/27/2021

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

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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 nontreated 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.

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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.

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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.	USWBSI grant earn ☐Yes ☐ No	udents in your research program supported by funding from your their MS degree during the FY19 award period? Click to enter number here.
2.	USWBSI grant earn ☐Yes ☐ No	udents in your research program supported by funding from your their Ph.D. degree during the FY19 award period? Click to enter number here.
3.	supported by funding ☐Yes ☐No	who worked for you during the FY19 award period and were ng from your USWBSI grant taken faculty positions with universities? Click to enter number here.
4.	Have any post docs supported by funding related companies of the Yes ⊠No	who worked for you during the FY19 award period and were ng from your USWBSI grant gone on to take positions with private agor federal agencies? 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 <u>full or partial</u> 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
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 <u>published</u> (submitted or accepted) or presentations <u>presented</u> 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.

<u>NOTE:</u> 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 <u>example below</u> 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

<u>Acknowledgement of Federal Support:</u> YES (Abstract and Poster)

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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

<u>Acknowledgement of Federal Support:</u> 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

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Reporting Period: 4/6/19 - 4/5/21

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