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

Cover Page

Principle Investigator (PI):	David Schmale
Institution:	Virginia Tech
E-mail:	dschmale@vt.edu
Phone:	540-231-6943
Fiscal Year:	2019
USDA-ARS Agreement ID:	59-0206-6-017
USDA-ARS Agreement Title:	Diagnostic Testing Services for Deoxynivalenol in the Eastern U.S.
FY19 USDA-ARS Award Amount:	$ 67,829
Recipient Organization:	Virginia Polytechnic Institute and State University 1880 Pratt Drive, Suite 2006 Blacksburg, VA 24060
DUNS Number:	003137015
EIN:	54-6001805
Recipient Identifying Number or Account Number:	422288 & 422533
Project/Grant Reporting Period:	6/7/19 - 6/6/20
Reporting Period End Date:	6/6/2020

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
FST-S	Diagnostic Testing Services for Deoxynivalenol in the Eastern U.S.	$ 67,829
	FY19 Total ARS Award Amount	**$ 67,829**

July 19, 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: *Diagnostic Testing Services for Deoxynivalenol in the Eastern U.S.*

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

The overall goals of our project were to (1) provide diagnostic testing services for DON for wheat and barley samples associated with USWBSI-supported research projects in the eastern U.S. and (2) reduce DON contamination in wheat and barley.

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?

In FY19, DON data was delivered for 4,786 wheat and barley samples from the following USWBSI investigators: Glover (1,000 samples), Griffey (2,342 samples), Marshall (200 samples), Mehl (218 samples), Obert (200 samples), Schmale (200 samples), and Wegulo (626 samples). Griffey experienced some challenges in getting his samples to our lab for testing in timely manner, and consequently, we still have 993 samples slated for testing from his group. The testing number does NOT include controls, checks, and re-runs. Most of the samples tested in FY19 were 100g kernel lots from FHB field trials, but some were smaller lots (~5g samples) from laboratory experiments. We also processed samples associated with DON during detoxification studies. Extraction, clean-up, and quantification of DON were conducted following standard protocols using a GC/MS. Research associate Niki McMaster attended the 2019 USWBSI meeting in Milwaukee.

b) What were the significant results?

The proposed project provided essential DON testing services for the USWBSI, and supported the only USWBSI-associated DON testing lab in the eastern U.S. Many of the wheat and barley lines had not been tested previously for mycotoxins.

c) List key outcomes or other achievements.

The research has contributed to the development and release of new FHB-resistant wheat and barley varieties and has ensured rigorous testing of both new and historical wheat and barley varieties for mycotoxin contamination. The Schmale Lab at Virginia Tech continues to be committed to the long-term management of a successful and productive mycotoxin testing lab for the USWBSI. DON testing services were coordinated, supported, and managed by research associate Niki McMaster.

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. In response to the COVID19-pandemic, Virginia Governor Northam issued a series of executive orders that ultimately led to the temporary shutdown of our physical Virginia Tech DON testing lab spaces on March 27, 2020. These physical lab spaces remained closed until June 8, 2020, when they were opened again under modified operations following strict safety guidelines and procedures. During the closure of the physical lab spaces, Niki McMaster worked remotely to improve curating, analyzing, and reporting DON data to our stakeholders, and attend a series of virtual training sessions outlined in the professional development section below.

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

Research associate Niki McMaster participated in a series of webinars to enhance her knowledge of GC/MS, improve her analytical skills, and understand current and future impacts of COVID-19 on the workplace. These included virtual training sessions (webinars) on topics including: (1) Instrumentation shutdown information and lab considerations for GC and GC/MS, (2) GC Analysis Workshop- Tips, Tricks and Tools to Speed Up your Analysis and Increase your Throughput, (3) GCMS Sources- Tips, Tricks and Maintenance, (4) A Tail of Two Peaks: Troubleshooting Poor Peak Shape, (5) Chromatographic Methods to Speed Up Your Analysis and Increase Your Throughput, (6) Powering up: GC and GC/MS, and (7) After the Shutdown: Back to Business as Unusual – a look at how labs are changing and adapting operations post-crisis.

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

Schmale gave a series of lectures on mycotoxins for about 100 undergraduate students at Virginia Tech. McMaster communicated with USWBSI stakeholders via phone and email to coordinate sample collection, processing, and testing. Results were disseminated to stakeholders at the 2019 USWBSI meeting in Milwaukee.

Training of Next Generation Scientists

Instructions: Please answer the following questions as it pertains to the FY19 award period (6/7/19 - 6/6/20). 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 (6/7/19 - 6/6/20**) 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.

Valverde-Bogantes, E., Bolanos-Carriel, C., Hallen-Adams, H.E., McMaster, N., Schmale, D.G., and Wegulo, S. 2020. Aggressiveness and Deoxynivalenol Production of Nebraska Isolates of *Fusarium boothii* and *F. graminearum.* Plant Health Progress, 10.1094/PHP-01-20-0001-RS.
Status: Published
Acknowledgement of Federal Support: Yes

Jimenez-Sanchez, C., Wilson, N., McMaster, N., Gantulga, G., Freedman, B., Senger, R., and Schmale, D.G. 2020. A Mycotoxin Transporter (4D) from a Library of Deoxynivalenol-Tolerant Microorganisms. Toxicon X, 5, 100023.
Status: Published
Acknowledgement of Federal Support: Yes

Bolanos-Carriel, C., Wegulo, S., Hallen-Adams, H., Baenziger, P., Eskridge, K., Funnell-Harris, D., McMaster, N., and Schmale, D.G. 2020. Effects of field-applied fungicides, grain moisture, and time on deoxynivalenol during postharvest storage of winter wheat grain. Canadian Journal of Plant Science, 100(3): 304-313.
Status: Published
Acknowledgement of Federal Support: Yes

McMaster, N., Acharya, B., Harich, K., Grothe, J., Mehl, H., and Schmale, D.G. 2019. Quantification of the Mycotoxin Deoxynivalenol (DON) in Sorghum using GC-MS and a Stable Isotope Dilution Assay (SIDA). Food Analytical Methods 12 (10): 2334-2343.
Status: Published
Acknowledgement of Federal Support: Yes

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

Other publications, conference papers and presentations.

Fitzgerald, J., Griffey, C., Brooks, W., Meier, N., Van Sanford, D., Murphy, J.P., McMaster, N., and Schmale, D.G. 2019. "Evaluation of Winter Barley Cultivar Nomini for Resistance to Fusarium Head Blight." In: S. Canty, A. Hoffstetter, H. Campbell and R. Dill-Macky (Eds.), *Proceedings of the 2019 National Fusarium Head Blight Forum* (p. 90), Milwaukee, WI; December 8-10 University of Kentucky, Lexington, KY.
Status: Published
Acknowledgement of Federal Support: Yes

PI: Schmale, David
Project: Diagnostic Testing Services for Deoxynivalenol in the Eastern U.S.

FY19 PR – USWBSI ADDENDUM
DON Service Labs – Quality Control (QC) Data

Note: What is being requested is the lab's quality control (i.e. check) data.

Insert below Lab's Quality Control Data/Results from the FY19 Award Period (6/7/19 - 6/6/20):

Quality control data were collected at Virginia Tech through (a) the blind testing of samples with unknown DON levels (coordinated by the USWBSI through Trilogy Analytical Laboratories), and (b) the testing of subsamples of grain lots in each GC/MS run (to test for consistency among GC/MS runs). Known standards are run throughout the the GC/MS run to establish our standard curves.

a. QC data for blind testing of samples from Trilogy Labs (coordinated by Trilogy Labs, and communicated through Amber Hoffstetter; amber.hoffstetter@scabusa.org). Lab ID 'Lab3' is the Virginia Tech lab (highlighted in grey). 3-1 and 3-2 represent two different GC-MS machines. Lab IDs 1-4 are other USWBSI labs. Data are in ppm.

Testing Period	Trilogy Sample	Trilogy Quant	Lab 1	Lab 2	Lab 3-1	Lab 3-2	Lab 4-1	Lab 4-2
Aug19	Low	1.40	1.00	0.53	1.06	0.92	1.01	0.97
	Med	4.50	3.60	2.90	4.20	3.72	3.08	3.04
	High	11.00	8.00	6.30	8.58	8.11	7.63	8.37
Sep19	Low	2.10	2.10	2.90	1.24	1.36	1.37	1.36
	Med	3.80	4.30	5.60	2.41	2.56	2.40	2.38
	High	8.60	9.60	11.00	6.01	6.13	5.67	5.79
Oct19	Low	1.00	1.30	1.40	0.87	0.95	0.88	0.89
	Med	3.60	2.90	4.50	2.71	3.01	2.34	2.53
	High	8.60	10.00	8.90	7.55	7.37	6.35	6.39
Nov19	Low	0.50	0.38	0.38	0.49	0.47	0.50	0.48
	Med	3.60	2.80	2.19	2.66	2.53	2.86	2.86
	High	9.30	5.65	5.30	6.76	6.80	7.13	7.09
Dec19	Low	1.20	1.10	0.95	0.76	0.77	0.88	0.82
	Med	3.80	4.10	3.20	2.28	2.71	2.91	2.65
	High	8.60	9.40	7.00	6.23	6.52	6.93	6.41
Jan20	Low	0.70	0.90	0.68	0.58	0.60	0.66	0.61
	Med	3.80	5.80	2.90	3.18	3.04	3.17	3.28
	High	8.60	10.20	7.90	6.02	5.92	7.15	7.13
Feb20	Low	1.00	0.90	0.85	0.86	0.84	0.94	0.85
	Med	3.60	2.60	2.71	2.69	2.63	2.68	2.49
	High	8.60	5.80	5.97	5.94	5.60	6.73	6.69
Mar20	Low	0.50	0.50	0.50	0.52		0.52	0.52

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Testing Period	Trilogy Sample	Trilogy Quant	Lab 1	Lab 2	Lab 3-1	Lab 3-2	Lab 4-1	Lab 4-2
	Med	**3.40**	**2.70**	**3.40**	**3.42**		**2.73**	**2.68**
	High	**9.30**	**7.50**	**6.70**	**6.32**		**6.48**	**6.38**

b. QC data from internal checks of subsamples of grain lots from Trilogy (13-Aug-03) in each GC/MS run (to test for consistency among GC/MS runs). Trilogy sample 13-Aug-03 was measured 225 times, and determined to have an average DON concentration of 4.44 ppm with a standard error of the mean of 0.046.