USDA-ARS
U.S. Wheat and Barley Scab Initiative
FY18 Performance Report
Due date: July 12, 2019

Cover Page

Principle Investigator (PI):	David Schmale
Institution:	Virginia Tech.
E-mail:	dschmale@vt.edu
Phone:	540-231-6943
Fiscal Year:	2018
USDA-ARS Agreement ID:	59-0206-6-017
USDA-ARS Agreement Title:	Diagnostic Testing Services for Deoxynivalenol in the Eastern U.S.
FY18 USDA-ARS Award Amount:	$ 79,457
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:	6/6/18 - 6/5/19
Reporting Period End Date:	06/06/19

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
FST	Diagnostic Testing Services for Deoxynivalenol in the Eastern U.S.	$ 79,457
	FY18 Total ARS Award Amount	$ 79,457

July 12, 2019
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: *Diagnostic Testing Services for Deoxynivalenol in the Eastern U.S.*

1. What are the major goals and objectives of the 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? *Address items 1-4) below for each goal or objective.*

1) Major activities. In FY18, DON data was delivered for 4,786 wheat and barley samples from the following USWBSI investigators: Glover, Griffey, Marshall, Mehl, Obert (Limagrain), Schmale, and Wegulo. Griffey experienced some challenges in getting his samples to us 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 FY18 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 and PI David Schmale attended the 2018 USWBSI meeting in St Louis.

2) Specific objectives. The specific objectives of the proposed research were to (1) provide analytical services necessary to develop new cultivars of wheat and barley with reduced potential for DON contamination and to (2) facilitate DON testing that will improve chemical and cultural practices necessary to reduce DON contamination in wheat and barley.

3) 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.

4) Key outcomes or other achievements. The research has contributed to the development and release of new FHB-resistant wheat and barley varieties, (2) 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 a talented research associate (Niki McMaster).

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

McMaster help develop a unit for advanced secondary school students that highlights the potential dangers of mycotoxins in feed and food products. This unit was published in the Science Teacher.

4. 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. A lesson was published with McMaster and Schmale highlighted in (3), and communicated with USWBSI stakeholders via phone and email to coordinate sample collection, processing, and testing. Results were disseminated to stakeholders at the 2018 USWBSI meeting in St. Louis.

Training of Next Generation Scientists

Instructions: Please answer the following questions as it pertains to the FY18 award period. 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 FY18 award period?**

   If yes, how many? No

2. **Did any graduate students in your research program supported by funding from your USWBSI grant earn their Ph.D. degree during the FY18 award period?**

   If yes, how many? No

3. **Have any post docs who worked for you during the FY18 award period and were supported by funding from your USWBSI grant taken faculty positions with universities?**

   If yes, how many? No

4. **Have any post docs who worked for you during the FY18 award period and were supported by funding from your USWBSI grant gone on to take positions with private ag-related companies or federal agencies?**

   If yes, how many? No

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 FY18 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 FY18-FPR_Instructions for detailed instructions for listing publications/presentations about your work that resulted from all of the projects included in the FY18 grant. Only include citations for publications submitted or presentations given during your award period (6/6/18 - 6/5/19). If you did not have any publications or presentations, state 'Nothing to Report' directly above the Journal publications section.

NOTE: Directly below each reference/citation, you must indicate the Status (i.e. published, submitted, etc.) and whether acknowledgement of Federal support was indicated in publication/ presentation.

Journal publications.

Wilson, N., Dashiell, S., McMaster, N., Bohland, C., and Schmale, D. 2018. Could Your Food be Contaminated with Toxins? Educating High School Students about Mycotoxins in Feed and Food Products. The Science Teacher, 86 (1): 46-52.
Status: Published.
Acknowledgement of Federal Support: YES (publication)

S. N. Wegulo, E. Valverde-Bogantes, C. Bolanos-Carriel, H. Hallen-Adams, A. Bianchini, N. McMaster, and D. G. Schmale III. 2018. First Report of *Fusarium boothii* Causing Head Blight of Wheat in the United States. Plant Disease, 102(12), p. 2646.
Status: Published.
Acknowledgement of Federal Support: YES (publication)

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

Other publications, conference papers and presentations.

Celia Jimenez-Sanchez, Nina Wilson, Nicole McMaster, Dash Gantulga, Ryan Senger and David G. Schmale III. 2018. Bioprospecting for Enzymes to Transport and Modify DON from Libraries of DON-Detoxifying Microorganisms In: Proceedings of the 2018 National Fusarium Head Blight Forum, St. Louis, MO.
Status: Abstract Published and Poster Presented
Acknowledgement of Federal Support: YES

Erica Pack, Jacob Stewart, Holly Newberne, Michelle Rhoads, James Knight, Raffaella De Vita, Sherrie Clark and David Schmale. 2018. Zearalenone and Related Metabolites in Swine Feed and Reproductive Tissues. In: Proceedings of the 2018 National Fusarium Head Blight Forum, St. Louis, MO.
Status: Abstract Published and Poster Presented
Acknowledgement of Federal Support: YES

Esteban Valverde-Bogantes, Stephen N. Wegulo, Carlos Bolanos-Carriel, Heather Hallen-Adams, Andreia Bianchini, Nicole McMaster and David G. Schmale III. 2018. First Report of Fusarium boothii causing Head Blight of Wheat in the United States. In: Proceedings of the 2018 National Fusarium Head Blight Forum, St. Louis, MO.
Status: Abstract Published and Poster Presented
Acknowledgement of Federal Support: YES

Nicole McMaster, Bhupendra Acharya, Jan Grothe, Hillary Mehl and David G. Schmale. 2018. Quantification of DON in Sorghum using a Stable Isotope Dilution Assay. In: Proceedings of the 2018 National Fusarium Head Blight Forum, St. Louis, MO.
Status: Abstract Published and Poster Presented
Acknowledgement of Federal Support: YES

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FY18 FPR – USWBSI ADDENDUM
DON Service Labs – Quality Control (QC) Data

Note: What is being requested is the across lab quality control data (separate QC from Trilogy).

Insert below Quality Control Data/Results from the FY18 Award Period (6/6/18 - 6/5/19):

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 Sue Canty; nfo@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
Nov-18	Low	1.90	1.30	1.46	1.69	2.01	2.15	2.18
	Med	2.70	1.90	1.76	2.29	2.28	2.62	2.69
	High	11.00	8.75	7.21	7.85	9.27	9.04	8.72
Dec-18	Low	0.50	0.40	0.40	0.49	0.53	0.54	0.53
	Med	4.50	2.80	3.00	3.77	3.33	3.78	4.26
	High	8.60	5.70	6.50	7.79	5.84	6.65	7.15
Jan-19	Low	1.40	0.90	0.90	1.02	0.96	1.23	1.30
	Med	3.60	2.2	2.50	2.62	2.69	3.11	3.27
	High	9.30	6.80	5.90	6.49	6.54	7.29	7.47
Feb-19	Low	1.00	1.14	0.50	1.02	1.16	0.81	0.87
	Med	4.30	3.64	2.30	4.21	3.73	3.27	3.28
	High	8.60	7.50	5.70	7.12	7.00	6.35	6.61
March 2019	Low	0.50	0.60	0.41	0.74	0.68	0.47	0.45
	Med	4.50	4.30	4.10	4.91	5.07	3.10	2.98
	High	8.60	7.70	5.97	7.80	7.58	6.25	5.95
Apr-19	Low	1.20	1.00	0.60	1.10	1.22	0.86	0.88
	Med	3.40	3.7	1.80	3.70	3.78	2.58	2.52
	High	9.30	7.70	6.00	7.49	7.73	6.78	6.54

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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 206 times, and determined to have an average DON concentration of 4.50 ppm with a standard error of the mean of 0.051.