USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY16 Final Performance Report
Due date: July 28, 2017

Cover Page

Principle Investigator (PI):	David Schmale
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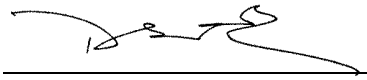
Fiscal Year:	2016
USDA-ARS Agreement ID:	59-0206-2-082 (NCE) & 59-0206-6-017
USDA-ARS Agreement Title:	Diagnostic Testing Services for Deoxynivalenol in the Eastern U.S.
FY16 USDA-ARS Award Amount:	$ 54,368
Recipient Organization:	Virginia Polytechnic Institute and State University 1880 Pratt Drive, Suite 2006 Blacksburg, VA 24060
DUNS Number:	003137015
EIN:	54-6001805
Recipient Identifying Number or Account Number:	422288 & 422533
Project/Grant Reporting Period:	6/7/16 - 6/6/17
Reporting Period End Date:	06/06/17

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
FST	Diagnostic Testing Services for Deoxynivalenol in the Eastern U.S.	$ 54,368
	FY16 Total ARS Award Amount	**$ 54,368**



July 25, 2017
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.*

a) Major activities. In FY16, DON data was delivered for 6,122 wheat and barley samples from the following USWBSI investigators: Griffey, Glover, Mehl, Wegulo, Bowen, Schmale, and Holshouser. Rideout, Laskar, and Grybauskas originally planned to submit samples, but did not send any for analysis. The testing number does not include controls, checks, and re-runs. Most of the samples tested in FY16 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 2016 USWBSI meeting in St Louis, MI.

b) 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.

c) 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.

d) 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 helped develop a unit for advanced secondary school students that highlights the potential dangers of mycotoxins in feed and food products. Students worked in small groups to detect the mycotoxin (DON) from common grocery store products. A safe, easy-to-use enzyme-linked immunosorbent assay (ELISA) was used to determine if DON was present in these products. Students were asked to think about ways of mitigating these toxins in commercial scenarios, ranging from toxin removal strategies to policies to regulate them.

4. **How have the results been disseminated to communities of interest?**
   Schmale gave a series of lectures on mycotoxins for about 115 undergraduate students at Virginia Tech. McMaster coordinated the lesson 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 2016 USWBSI meeting in St. Louis.

Training of Next Generation Scientists

Instructions: Please answer the following questions as it pertains to the FY16 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 FY16 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 FY16 award period?**

   If yes, how many? Yes, 1

3. **Have any post docs who worked for you during the FY16 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 FY16 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 FY16 award period. All columns must be completed for each listed germplasm/cultivar. Use the key below the table for Grain Class abbreviations. *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 FY16-FPR_Instructions for detailed instructions for listing publications/presentations about your work that resulted from all of the projects included in the FY16 grant. Only include citations for publications submitted or presentations given during your award period (6/7/16 - 6/6/17). If you did not have any publications or presentations, state 'Nothing to Report' directly above the Journal publications section.

Journal publications.

Wilson, N., McMaster, N., Gantulga, D., Soyars, C., McCormick, S., Knott, K., Senger, R., and Schmale, D. 2017. Modification of the Mycotoxin Deoxynivalenol Using Microorganisms Isolated from Environmental Samples. Toxins 9(4): 141.
Status. Paper published.
Acknowledgement of Federal Support: YES

Wilson, N., Dashiell, S., McMaster, N., Bohland, C., and Schmale, D. 2017**.** Could Your Food be Contaminated with Toxins? Educating High School Students about Mycotoxins in Feed and Food Products. Submitted to the Science Teacher.
Status. Submitted. Paper in revision.
Acknowledgement of Federal Support: YES

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

Other publications, conference papers and presentations.

Bolanos-Carriel, C., Wegulo, S.N., Hallen-Adams, D., Baenziger, P.S., Eskridge, K.M., Funnell-Harris, D., McMaster, M., and Schmale, D.G. 2016. Effects of fungicides, time, and grain moisture content on postharvest accumulation of DON in winter wheat. In: S. Canty, A. Clark, K. Wolfe and D. Van Sanford (Eds.), Proceedings of the 2016 National Fusarium Head Blight Forum (pp. 11-12). East Lansing, MI/Lexington, KY: U.S. Wheat & Barley Scab Initiative.
Status: Abstract published and poster presented.
Acknowledgement of Federal Support: YES

Wilson N., Gantulga D., McMaster N., Knott K., McCormick S., Senger R.S., Schmale D. 2016. "DON modification in naturally-contaminated wheat samples using microorganisms isolated from the environment." In: S. Canty, A. Clark, K. Wolfe and D. Van Sanford (Eds.), *Proceedings of the 2016 National Fusarium Head Blight Forum* (pp. 64). East Lansing, MI/Lexington, KY: U.S. Wheat & Barley Scab Initiative.
Status: Abstract published and poster presented.
Acknowledgement of Federal Support: YES

Carpenter, N., Ward, B., Malla, S., Griffey, C., Fitzgerald, J., McMaster, N., and Schmale, D.G. 2016. "Implementation of genomic selection for resistance to Fusarium head blight into a traditional wheat breeding program." In: S. Canty, A. Clark, K. Wolfe and D. Van Sanford (Eds.), *Proceedings of the 2016 National Fusarium Head Blight Forum* (pp. 76). East Lansing, MI/Lexington, KY: U.S. Wheat & Barley Scab Initiative.
Status: Abstract published and poster presented.
Acknowledgement of Federal Support: YES

Ullrich, J., Malla, S., Griffey, C., Carpenter, N., Brooks, W., Van Sanford, D., Clark, A., Murphy, J.P., Brueggeman, R., Cowger, C., McMaster, N., Schmale, D.G., Chao, S., and Brown-Guedira, G. 2016. "Evaluation of winter barley cultivar eve for quantitative resistance to Fusarium head blight." In: S. Canty, A. Clark, K. Wolfe and D. Van Sanford (Eds.), *Proceedings of the 2016 National Fusarium Head Blight Forum* (pp. 101). East Lansing, MI/Lexington, KY: U.S. Wheat & Barley Scab Initiative.
Status: Abstract published and poster presented.
Acknowledgement of Federal Support: YES

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Project: Diagnostic Testing Services for Deoxynivalenol in the Eastern U.S.

FY16 FPR – USWBSI ADDENDUM
DON Service Labs – Quality Control Data

Insert below Quality Control Data/Results from the FY16 Award Period (6/7/16 - 6/6/17):

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; scabusa@scabusa.org). Lab ID 'Lab3' is the Virginia Tech lab (highlighted in grey). Lab IDs 1-4 are other USWBSI labs. Data are in ppm.

Testing Period	Trilogy Sample	Trilogy Quant	Lab 1	Lab 2	Lab 3	Lab 4-1	Lab 4-2
	Low	1.00	1.28	0.90	0.72	0.77	0.80
	High	7.00	7.06	5.30	5.35	4.41	4.48
August 2016	**Med**	4.50	4.66	3.50	3.63	2.77	2.89
	Low	0.50	0.46	0.50	0.66	0.48	0.51
	High	6.40	4.60	5.20	5.53	4.45	4.57
Sept 2016	**Med**	2.60	2.00	2.20	2.42	2.07	2.14
	Low	1.50	1.25	1.30	1.43	1.58	1.80
	High	8.90	7.25	6.90	7.50	7.04	7.44
Oct 2016	**Med**	3.60	3.02	2.60	3.15	3.21	3.27
	Low	0.50	0.64	0.50	0.45	0.56	0.56
	High	6.40	5.41	5.00	4.87	5.16	5.17
Nov 2016	**Med**	3.80	3.06	3.20	2.78	3.32	3.31
	Low	1.50	1.21	1.50	1.36	1.56	1.54
	High	6.40	4.22	5.40	4.73	4.90	4.87
Dec 2016	**Med**	5.00	3.50	4.80	4.44	4.43	4.52
	Low	1.5	1.25	1.30	1.44	1.45	1.47
	High	9.3	6.14	7.10	7.08	7.43	7.12
Jan 2017	**Med**	4.5	3.85	3.80	3.80	3.50	3.50
	Low	1.20	0.68	1.00	0.92	1.09	1.14
	High	6.40	3.69	5.10	4.52	5.24	5.26
Feb 2017	**Med**	3.60	2.12	3.20	2.59	2.69	2.71
	Low	1.60	1.30	1.30	1.29	1.45	1.49
	High	8.60	7.74	8.30	7.66	6.91	6.61
March 2017	**Med**	3.60	2.98	3.10	2.37	3.10	3.03
	Low	0.50	0.77		0.52	0.62	0.62
	High	9.30	9.07		7.40	6.69	6.45
April 2017	**Med**	3.80	4.09		3.26	3.03	3.04

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b. QC data from internal checks of subsamples of grain lots from Trilogy (14-Apr-03) in each GC/MS run (to test for consistency among GC/MS runs). Trilogy sample 14-Apr-03 was measured 254 times and determined to have an average DON concentration of 6.49 ppm with a standard error of 0.41.