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

Cover Page

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Fiscal Year:	2016
USDA-ARS Agreement ID:	59-0206-4-023
USDA-ARS Agreement Title:	Diagnostic Services for DON.
FY16 USDA-ARS Award Amount:	$ 169,645
Recipient Organization:	Regents of the University of Minnesota Suite 450 Sponsored FIN RPT-P100100001 Minneapolis, MN 55455-2003
DUNS Number:	555917996
EIN:	41 -6007513
Recipient Identifying Number or Account Number:	CON000000048310
Project/Grant Reporting Period:	5/19/16 - 5/18/17
Reporting Period End Date:	05/18/17

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
FST	Diagnostic Services for DON.	$ 169,645
	FY16 Total ARS Award Amount	**$ 169,645**

7/26/2017

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

Project 1: *Diagnostic Services for DON.*

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

   The goal of this project is to provide rapid, cost-effective and accurate mycotoxin analysis - especially deoxynivalenol (DON) - for Fusarium Head Blight (FHB or scab) research projects.

2. **What was accomplished under these goals?** *Address items 1-4) below for each goal or objective.*

   1) **major activities**
   Analyzed DON and related mycotoxins in wheat, barley and fungal culture extract using GC-MS; grinded grain seeds; extracted DON from grain samples; and prepared purification columns.

   2) **specific objectives**
   Provided reliable DON analysis services to the projects funded by the USWBSI and ensured PIs to get their results in a timely manner.

   3) **significant results**
   From May 19, 2016 to May 18, 2017, our laboratory analyzed 25,181 samples (**Table** 1) submitted by 33 scab research groups from 20 states including Arkansas, Delaware, Georgia, Idaho, Illinois, Indiana, Kentucky, Louisiana, Maryland, Michigan, Minnesota, Missouri, New York, North Carolina, North Dakota, Ohio, Pennsylvanian, South Dakota, Tennessee, and Wisconsin. The samples included 22,950 regular mature grain samples (4-100 g) and 2,231 small size samples such as grain samples less than 4 g, single kernel, single spikelet, single head, small stem, and fungal culture extract. The target toxins included DON, 15-Acetyl-DON, 3-Acetyl-DON, and nivalenol. Zearalenone was analyzed for some samples submitted by Dr. Bergstrom's and Dr. Dill-Macky's projects. For the past three years, the samples submitted to our lab were 80 ~ 85% of the numbers that we anticipated based on the survey conducted before submitting the proposal. For the past year (FY16), it was 81.4%.

   4) **key outcomes or other achievements**
   The DON data has been used in all areas of scab research. By analyzing mycotoxins, the project provided support to barley and wheat breeding programs to develop resistant varieties, and to researchers to study disease mechanisms and to develop effective chemical and biological disease controls. Mycotoxin data provided to scab researchers by our laboratory gave them a means to evaluate the effectiveness of their efforts in fighting Fusarium Head Blight.

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

Nothing to report

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

The results were emailed to researchers, and were then disseminated to communities of interest via conference papers and presentations, and journal publications.

Table 1. Summary of 2016/2017 samples

PI	Number of samples			Institution
	Analyzed	Estimated	Difference	
Alyssa Collins	48	216	-168	Pennsylvania State University
Anne McKendry	1286	1200	86	University of Missouri
Bob Kratochvil Nathan Kleczewski	96	0	96	University of Maryland/University of Delaware
Brian Steffenson	341	700	-359	University of Minnesota
Carl Bradley	502	600	-98	University of Kentucky
Clay Sneller	136	120	16	Ohio State University
Corby Kistler	849	3500	-2651	University of Minnesota
Christina Cowger	265	300	-35	USDA-ARS, Raleigh, NC
Damon Smith	267	150	117	University of Wisconsin-Madison
David Van Sanford	2423	2500	-77	University of Kentucky
Elias Elias	728	500	228	North Dakota State University
Eric Olson	0	1000	-1000	Michigan State University
Eric Stockinger	336	0	336	Ohio State University
Floyd Dowell	0	480	-480	USDA-ARS, KS
Frances Trail	0	110	-110	Michigan State University
Frederic Kolb	1906	2900	-994	University of Illinois at Urbana Champaign
Gary Bergstrom	691	400	291	Cornell University
Gary Muehlbauer	472	1000	-528	University of Minnesota
Guihua Bai	0	800	-800	USDA-ARS, KS
Heather Kelly	98	50	48	University of Tennessee
Jerry Johnson	260	100	160	University of Georgia
Jianli Chen	175	400	-225	University of Idaho
Jim Anderson	638	1800	-1162	University of Minnesota
Jinrong Xu	0	50	-50	Purdue University
Jochum Wiersma	0	240	-240	University of Minnesota
Juliet Marshall	357	256	101	University of Idaho
Jyoti Shah	0	125	-125	University of North Texas
Kevin Smith	1820	2000	-180	University of Minnesota
Kiersten Wise	72	180	-108	Purdue University
Madeleine Smith	0	200	-200	University of Minnesota
Mark Sorrells	501	586	-85	Cornell University
Martin Chilvers	611	204	407	Michigan State University
Martin Nagelkirk	160	200	-40	Michigan State University
Mohamed Mergoum Jesse Underdahl	1008	1100	-92	North Dakota State University
Mohsen Mohammadi	0	1200	-1200	Purdue University
Nathan Kleczewski	455	800	-345	University of Delaware
Paul Murphy	0	400	-400	North Carolina State University
Pierce Paul	3011	2700	311	Ohio State University
Richard Esten Mason	2023	1000	1023	University of Arkansas
Ruth Dill-Macky	2194	600	1594	University of Minnesota
Shahryar Kianian	120	0	120	USDA-ARS, MN
Stephen Harrison	1261	400	861	Louisiana State University
Yang Yen	44	100	-56	South Dakota State University
QA	27	0	27	Trilogy QA samples
Total	25181	30951	-5770	

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?**
   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 FY16 award period?**
   No.
   If yes, how many?

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?**
   No.
   If yes, how many?

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?**
   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 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 (5/19/16 - 5/18/17). If you did not have any publications or presentations, state 'Nothing to Report' directly above the Journal publications section.

Journal publications.

Lofgre, L.A.; Riddle, J.; Dong, Y.; Bergstrom, G.C.; Kistler, H.C. "A high proportion of NX-2 mycotoxin producing strains are found among *Fusarium graminearum* isolates from northeastern New York State", *Mol. Plant Pathol.*
Status: Submitted.
Acknowledgement of federal support: Yes.

Li, X.; Michlmayr, H.; Schweiger, W.; Malachova, A.; Shi, S.; Huang, Y.; Dong, Y.; Wiesenberger, G.; McCormick, S.; Lemmens, M.; Fruhmann, P.; Hametner, C.; Berthiller, F.; Adam, G.; Muehlbauer, G.J. "A barley UDP-glucosyltransferase inactivates nivalenol and provides *Fusarium* head blight resistance in transgenic wheat", *Journal of Experimental Botany,* **2017**, DOI:10.1093/jxb/erx109.
Status: Published.
Acknowledgement of federal support: Yes.

Petersen, S.; Lyerly, J.H.; McKendry, A.L.; Islam, M.S.; Brown-Guedira, G.; Cowger, C.; Dong, Y.; Murphy, J.P. "Validation of Fusaruim head blight resistance QTL in U.S. winter wheat", *Crop Science,* **2017**, 57 (1), 1-12 (DOI: 10.2135/cropsci2015.07.0415).
Status: Published.
Acknowledgement of federal support: Yes.

Peiris, K.H.S; Dong, Y.; De Wolf, E.D.; Davis, M.A.; Bockus, W.W.; Dowell, F.E. "Estimation of Deoxynivalenol and Moisture Contents of Bulk Wheat Grain Samples by FT-NIR Spectroscopy" *Cereal Chemistry*, **2017**, 94(4), 677-682 (https://doi.org/10.1094/CCHEM-11-16-0271-R).
Status: Published.
Acknowledgement of federal support: Yes.

Peiris, K.H.S; Dong, Y.; Bockus, W.W.; Dowell, F.E. "Moisture effects on the prediction performance of a single kernel near-infrared deoxynivalenol calibration" *Cereal Chemistry*, **2016**, 93 (6), 631-637 (DOI: 10.1094/CCHEM-04-16-0120-R).
Status: Published.
Acknowledgement of federal support: Yes.

Petersen, S.; Lyerly, J.H.; Maloney, P.V.; Brown-Guedira, G.; Cowger, C.; Costa, J.M.; Dong, Y.; Murphy, J.P. "Mapping of Fusarium head blight resistance quantitative trait loci in winter wheat cultivar NC-Neuse" *Crop Science,* **2016,** 56(4), 1473-1483 (DOI: 10.2135/cropsci2015.05.0312)**.**
Status: Published.
Acknowledgement of federal support: Yes.

Van Sanford, D.A.; Clark, A.J.; Hershman, D.; Brown-Guedira, G.L.; Cowger, C.; Dong, Y.; Baik, B.K. "Registration of 'Pembroke 2014' soft red winter wheat", *Journal of Plant Registrations,* **2016,** 10 (1), 41-46 (DOI: 10.3198/jpr2015.07.0045crc).
Status: Published.
Acknowledgement of federal support: Yes.

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

Nothing to report.

Other publications, conference papers and presentations.

Li, X.; Michlmayr, H.; Schweiger, W.; Malachova, A.; Shin, S.; Huang, Y.; Dong, Y.; Wiesenberger, G.; McCormick, S.; Lemmens, M.; Fruhman, P.; Hametner, C.; Berthiller, F.; Adam, G.; Muehlbauer, G. J. 2016. A Barley UDP-glucosyltransferase Provides Resistance to Nivalenol and Nivaleno-Producing *Fusarium graminearum*. In: Canty, S., Clark, A.; Wolfe, K.; Van Sanford, D. (Eds.), *Proceedings of the 2016 National Fusarium Head Blight Forum*,East Lansing, MI/Lexington, KY: U.S. Wheat & Barley Scab Initiative. p. 51.
Status: Abstract published and poster presented.
Acknowledgement of federal support: Yes.

Winter, M.; Samuels, P.L.; Dong, Y.; Dill-Macky, R. 2016. Deoxynivalenol (DON) and Nivalenol (NIV) Play a Role as Virulence Factors for Wheat Root and Stem Base Infection by *Fusarium culmorum* and *F. graminearum.* In: Canty, S., Clark, A.; Wolfe, K.; Van Sanford, D. (Eds.), *Proceedings of the 2016 National Fusarium Head Blight Forum,*East Lansing, MI/Lexington, KY: U.S. Wheat & Barley Scab Initiative. p. 65.
Status: Abstract published and poster presented.
Acknowledgement of federal support: Yes.

Wang, R.; Chen, J.; Zhang, J.; Zhao, W.; Wheeler, J.; Klassen, N.; Anderson, J.A.; See, D.R.; Dong, Y. 2016. Genome-Wide Association Mapping of Fusarium Head Blight Resistance in Spring Wheat Lines Grown in Pacific Northwest and CIMMYT. In: Canty, S., Clark, A.; Wolfe, K.; Van Sanford, D. (Eds.), *Proceedings of the 2016 National Fusarium Head Blight Forum,* East Lansing, MI/Lexington, KY: U.S. Wheat & Barley Scab Initiative. p. 103.
Status: Abstract published and poster presented.
Acknowledgement of federal support: Yes.

PI: Dong, Yanhong
Project: Diagnostic Services for DON.

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

Insert below Quality Control Data/Results from the FY16 Award Period (5/19/16 - 5/18/17):

	Check 1	Check 2	Check 3
N[a]	173	501	289
Mean (ppm)	4.44	10.73	6.60
SD[b]	0.61	1.15	0.51
% CV[c]	13.7	10.7	7.7

[a]Number of check samples. [b]Standard deviation. [c]Coefficient of variance