USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY10 Final Performance Report
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Cover Page

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Fiscal Year:	FY10
USDA-ARS Agreement ID:	59-0206-9-074
USDA-ARS Agreement Title:	Diagnostic Services for DON.
FY10 USDA-ARS Award Amount:	$ 228,703

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
FSTU-S	Diagnostic Services for DON.	$ 228,703
	Total ARS Award Amount	**$ 228,703**

Principal Investigator Date

* MGMT – FHB Management
FSTU – Food Safety, Toxicology, & Utilization of Mycotoxin-contaminated Grain
GDER – Gene Discovery & Engineering Resistance
PBG – Pathogen Biology & Genetics
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 major problem or issue is being resolved relevant to Fusarium head blight (scab) and how are you resolving it?**

   Our laboratory provided deoxynivalenol (DON) and related mycotoxin diagnostic services for Fusarium Head Blight (Scab) research projects. From May 2010 to April 2011, we received samples from 39 scab research groups funded by the USWBSI in 17 states. The major issue that we dealt with was how to efficiently handle huge amounts of samples submitted by so many groups and ensure researchers to receive their results in a timely manner. In general, we analyzed samples based on a first come, first served policy. In case we received large amounts of samples from a single group or received several submissions from different groups around same time, we contacted PI(s) about their desired dates of having DON results for each set of their samples and adjusted sample analysis schedules to make sure that each PI could receive their results in a reasonable time frame. By doing so, we were able to provide DON results to PIs within their desired dates.

2. **List the most important accomplishment and its impact (i.e. how is it being used) to minimize the threat of Fusarium head blight or to reduce mycotoxins. Complete both sections (repeat sections for each major accomplishment):**

   Accomplishment:

   From May 2010 to April 2011, the Mycotoxin Diagnostic Laboratory at the University of Minnesota analyzed 29,066 samples (**Table 1**), which was about the same as the number of samples analyzed last crop year (29,350), but was 9.4% (3,015) less than the estimate (32,081) presented in the proposal due to sample adjustments by PIs. The samples were submitted by 39 scab research groups from 17 states including Arkansas, Georgia, Idaho, Illinois, Indiana, Kansas, Kentucky, Maryland, Michigan, Minnesota, Missouri, Nebraska, New York, North Carolina, North Dakota, Ohio, and Wisconsin. They included 19,941 regular mature grain samples (6-100 g) and 9,125 small size samples such as grain samples less than 6 g, single kernels, single spikeletes, single heads, and fungal cultures extracts. The target toxins included DON, 15-Acetyl-DON, 3-Acetyl-DON, and nivalenol.

   Impact:

   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 and economical chemical and biological disease controls. Mycotoxin data provided to scab researchers by our laboratory gave researchers a means to evaluate the effectiveness of their efforts in fighting Fusarium Head Blight.

Table 1. Summary of 2010 DON samples

PI	Number of Samples			Institution
	Analyzed	Estimated	Difference	
Anne McKendry	451	0	451	University of Missouri
Arvydas Grybauskas	140	0	140	University of Maryland
Brian Steffenson	0	2000	-2000	University of Minnesota
Carl Bradley	739	900	-161	University of Illinois at Urbana Champaign
Char Hollingsworth	0	2500	-2500	University of Minnesota
Christina Cower	771	0	771	USDA-ARS, NCSU
Clay Sneller	240	800	-560	Ohio State University
Corby Kistler	1152	1000	152	University of Minnesota
David Garvin	18	0	18	University of Minnesota
David Schisler	130	200	-70	USDA-ARS, Peoria, IL
David Van Sanford	2414	2500	-86	University of Kentucky
Diane Brown-Rytlewski	0	200	-200	Michigan State University
Don Hershman	286	136	150	University of Kentucky
Elias Elias	1000	600	400	North Dakota State University
Eugene Milus	1000	2000	-1000	University of Arkansas
Frances Trail	0	75	-75	Michigan State University
Frederic Kolb	2721	1750	971	University of Illinois at Urbana Champaign
Gary Bergstrom	481	0	481	Cornell University
Gary Muehlbauer	0	500	-500	University of Minnesota
Gary Yuen	36	0	36	University of Nebraska, Lincoln
Gina Brown-Guedira	152	0	152	USDA-ARS, KS
Guihua Bai	198	500	-302	USDA-ARS, KS
Herbert Ohm	160	500	-340	Purdue University
Janet Lewis	840	1340	-500	Michigan State University
Jerry Johnson	158	100	58	University of Georgia
Jianli Chen	52	0	52	University of Idaho
Jim Anderson	417	1200	-783	University of Minnesota
Jinrong Xu	225	500	-275	Purdue University
Jochum Wiersma	184	100	84	University of Minnesota
Jose Costa	967	1500	-533	University of Maryland
Juliet Windes	55	0	55	University of Idaho
June Hancock	107	0	107	Syngenta Cereals, AR
Jyoti Shah	0	40	-40	University of North Texas
Kevin Smith	2924	2500	424	University of Minnesota
Kiersten Wise	312	200	112	Purdue University
Mark Sorrells	269	340	-71	Cornell University
Mohamed Mergoum	1044	1000	44	North Dakota State University
Paul Esker	144	0	144	University of Wisconsin
Paul Murphy	375	250	125	North Carolina State University
Paul Schwarz	12	0	12	North Dakota State University
Pierce Paul	1731	2500	-769	Ohio State University
Ruth Dill-Macky	6213	3250	2963	University of Minnesota
Shaobing Zhong	120	0	120	North Dakota State University
Stephen Harrison	0	400	-400	Louisiana State University
Steve Xu	660	0	660	USDA-ARS, ND
Willie Kirk	84	300	-216	Michigan State University
Xiwen Cai	84	0	84	North Dakota State University
Yang Yen	0	400	-400	South Dakota State University
Total	**29066**	**32081**	**-3015**	

Include below a list of the publications, presentations, peer-reviewed articles, and non-peer reviewed articles written about your work that resulted from all of the projects included in the grant. Please reference each item using an accepted journal format. If you need more space, continue the list on the next page.

1. Jayatilake, D.V.; Bai, G.H.; Dong, Y. "A novel quantitative trait locus for Fusarium head blight resistance in chromosome 7A of wheat" *Theor. Appl. Genet.,* **2011,** 122, 1189-1198.
2. Breakspear, A.; Pasquali, M.; Broz, K.; Dong, Y.; Kistler, H. C. "*Npc1*is involved in sterol trafficking in the filamentous fungus *Fusarium graminearum*" *Fungal Genetics and Biology*, **2011**, 48, 725-730.
3. Kang, J.; Clark, A.; Van Sanford, D.; Griffey, C.; Brown-Guedira, G.; Dong, Y.; Murphy, J. P.; Cost, J. "Exotic Scab Resistance Quantitative Trait Loci Effects on Soft Red Winter Wheat" *Crop Science*, **2011,** 51, 924-933.
4. Peiris, K.H.S; Pumphrey, M.O.; Dong, Y.; Dowell, F.E. "*Fusarium* Head Blight Symptoms and Mycotoxin Levels in Single Kernels of Infected Wheat Spikes" *Cereal Chemistry*, **2011,** 88(3), 291-295.
5. Peiris, K.H.S; Pumphrey, M.O.; Dong, Y.; Maghirang, E.B.; Berzonsky, W.; Dowell, F.E. "Near-Infrared Spectroscopic Method for Identification of *Fusarium* Head Blight Damage and Prediction of Deoxynivalenol in Single Wheat Kernels" *Cereal Chemistry*, **2010,** 87(6), 511-517.
6. Lewis, J.M.; Siler, L.; Souza, E.; Ng, P.K.W; Dong, Y.; Brown-Guedira, G.; Jiang, G.L.; Ward, R.W. "Registration of 'Ambassador' Wheat" *Journal of Plant Registrations,* **2010**, 4(3), 195-204.
7. Lewis, J.M.; Siler, L.; Souza, E.; Ng, P.K.W; Dong, Y.; Jiang, G.L.; Ward, R.W. "Registration of 'Coral' Wheat" *Journal of Plant Registrations*, **2010**, 4(3), 205-214.
8. Lewis, J.M.; Siler, L.; Souza, E.; Ng, P.K.W; Dong, Y.; Brown-Guedira, G.; Jiang, G.L.; Ward, R.W. "Registration of 'Red Amber' Wheat" *Journal of Plant Registrations,* **2010**, 4(3), 215-223.
9. Cai, X.; McArthur, R.I.; Zhang, Q.; Oliver, R.E.; Zhong, S.; Chao, S.; Hareland, G.A.; Berzonsky, W.; Mergoum, M.; Hanson, B.; Dong, Y.; Xu, S.S. 2010. "Development of Advanced Spring Wheat Lines with FHB Resistance through Alien Introgression" In: Canty, S.M.; Clark, A.; Anderson-Scully, A.; Ellis, D.; and Van Sanford, D. A. (Eds.), Proceedings of the 2010 National Fusarium Head Blight Forum; **2010,** Dec. 7-9; Milwaukee, WI. Lexington, KY, University of Kentucky. pp136
10. Cardwell, L.; Souza, E.; Brown-Guedira, G.; Dong, Y.; Costa, J. 2010. "Evaluation of Scab Resistance QTLs on Agronomic and Quality Traits of Soft Red Winter Wheat" In: Canty, S. M.; Clark, A.; Anderson-Scully, A.; Ellis, D.; and Van Sanford, D. A. (Eds.), Proceedings of

the 2010 National Fusarium Head Blight Forum; **2010,** Dec. 7-9; Milwaukee, WI. Lexington, KY, University of Kentucky. pp137.

11. Gao, J.; Wang, Y. Werner, T.; Cardwell, L.; Murphy, J.P.; Brown-Guedira, G.; Griffey, C.; Dong, Y.; Costa, J. 2010. "Mapping Scab Resistance in Winter Wheat Line MD01W233-06-1" In: Canty, S. M.; Clark, A.; Anderson-Scully, A.; Ellis, D.; and Van Sanford, D. A. (Eds.), Proceedings of the 2010 National Fusarium Head Blight Forum; **2010,** Dec. 7-9; Milwaukee, WI. Lexington, KY, University of Kentucky. pp138.
12. Peiris, K.H.S.; Dong, Y.; Wegulo, S.; Berzonsky, W.; Bockus, W.W.; Baenziger, P.S.; Dowell, F.E. 2010. "Development of Single Kernel NIR Technology for Evaluation of FHB Resistance and for Identification of Reduced DON in Harvested Wheat Grain" In: Canty, S. M.; Clark, A.; Anderson-Scully, A.; Ellis, D.; and Van Sanford, D. A. (Eds.), Proceedings of the 2010 National Fusarium Head Blight Forum; **2010,** Dec. 7-9; Milwaukee, WI. Lexington, KY, University of Kentucky. pp161.
13. Sallam, A.H.; Beaubien, K.A.; Dill-Macky, R.; Chao, S.; Dong, Y.; Smith, K.P. 2010. "Fine Mapping of a Region on Chromosome 6H Associated with DON in Barley" In: Canty, S. M.; Clark, A.; Anderson-Scully, A.; Ellis, D.; and Van Sanford, D. A. (Eds.), Proceedings of the 2010 National Fusarium Head Blight Forum; **2010** Dec. 7-9; Milwaukee, WI. Lexington, KY, University of Kentucky. pp164.