USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY11 Final Performance Report
July 13, 2012

Cover Page

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Fiscal Year:	FY11
USDA-ARS Agreement ID:	59-0790-7-078
USDA-ARS Agreement Title:	Contribution of Local Inoculum Sources to Regional Atmospheric Populations of *G. zeae*.
FY11 USDA-ARS Award Amount:	$ 58,537

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
FSTU	Diagnostic Testing Services for Deoxynivalenol in the Eastern United States.	$ 58,537
	Total ARS Award Amount	**$ 58,537**

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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 Testing Services for Deoxynivalenol in the Eastern United States.*

1. **What major problem or issue is being resolved relevant to Fusarium head blight (scab) and how are you resolving it?**

   There is an increasing demand for USWBSI diagnostic testing services for mycotoxins across the United States. DON testing services are vital to the development of new varieties of wheat and barley with reduced mycotoxin potential and are necessary to identify and/or exclude appropriate strategies for managing FHB. FY11 DON testing services at Virginia Tech provided analytical services necessary to develop new cultivars of wheat and barley with reduced potential for DON contamination and to improve chemical and cultural practices necessary to reduce DON contamination in wheat and barley.

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:
   In FY11, DON data was delivered for 4,296 wheat and barley samples from six USWBSI investigators and stakeholders (Griffey, Glover, Grybauskas, Laskar, Schmale, and Van Sanford) in five states (Virginia, Maryland, Kentucky, Indiana, and South Dakota). This number does not include controls, checks, and re-runs. Most of the samples tested in FY11 were 100g kernel lots from FHB field trials, but some were smaller lots (0.25-5g samples) from greenhouse and laboratory experiments. We also processed samples associated with barley ethanol production in Virginia, a cooperative project associated with the USDA ARS Sustainable Biofuels and CoProducts Research Lab to reduce DON in barley ethanol co-products, and ethanol co-products from ethanol plants across the U.S. Extraction, clean-up, and quantification of DON were conducted following standard protocols using a GC/MS. DON testing services were coordinated, supported, and managed by a talented research associate (Niki McMaster). 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.

   Impact:
   The goals of this work were to provide analytical services necessary to develop new cultivars of wheat and barley with reduced potential for DON contamination and to facilitate DON testing that will improve chemical and cultural practices necessary to reduce DON contamination in wheat and barley. This work directly addresses Goal #1 of the Action Plan to 'Provide analytical support for DON/trichothecene quantitation for Initiative's stakeholders'. We are providing DON testing services for wheat and barley samples from USWBSI investigators. Schmale routinely interacts with stakeholders in the mid-Atlantic to discuss new diagnostic technologies for DON and related management strategies for FHB, an effort aligned with Goal #2 of the Action Plan to 'Provide requisite information on DON/ trichothecene safety issues to producers, millers, researchers, risk assessors and regulators'.

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.

Khatibi, P.A. 2012. Reduction of the mycotoxin deoxynivalenol in barley ethanol co-products using trichothecene 3-O-acetyltransferases. Virginia Tech. Ph.D. Dissertation.

Khatibi, P.A., Berger, G., Liu, S., Brooks, W.S., Griffey, C.A., and Schmale, D.G. 2012. Resistance to Fusarium head blight and deoxynivalenol accumulation in Virginia barley. Plant Disease 96:279-284.

Schmale, D. G., Ross, S.D., Fetters, T.L., Tallapragada, P., Wood-Jones, A.K., and Dingus, B. 2012. Isolates of *Fusarium graminearum* collected 40-320 meters above ground level cause Fusarium head blight in wheat and produce trichothecene mycotoxins. Aerobiologia 28: 1-11.

Khatibi, P.A., Montanti, J., Nghiem, N.P., Hicks, K.B., Berger, G., Brooks, W.S., Griffey, C.A., and Schmale, D.G. 2011. Conversion of deoxynivalenol in barley derived fuel ethanol co-products with yeast expressing 3-O-acetyltransferases. Biotechnology for Biofuels 4 (26):1-13.

Khatibi, P. A., Newmister, S., Rayment, I., McCormick, S. P., Alexander, N. J., and Schmale, D.G. 2011. Bioprospecting for trichothecene 3-O-acetyltransferases in the fungal genus *Fusarium* yields functional enzymes that vary in their ability to modify the mycotoxin deoxynivalenol. Applied and Environmental Microbiology 77: 1162-1170.

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FY11 FPR – USWBSI ADDENDUM
DON Service Labs – Quality Control Data

Insert below Quality Control Data/Results from the FY11 Award Period (May 2011-May 2012):

Quality control data was collected at Virginia Tech in the following ways: (1) the blind testing of samples with unknown DON levels (coordinated by the USWBSI through Trilogy Analytical Laboratories), (2) the blind testing of samples for a barley cooperative project (coordinated by Andrea Stern, ASBC technical committee), and (3) the testing of subsamples of grain lots from the Mostrom, Trilogy, and Schmale Labs 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 for a barley cooperative project in FY11 (coordinated by Andrea Stern, ASBC technical committee). Comparitive data was provided by A. Stern via email (Andrea.Stern@malteurop.com). Lab ID 'N4' is the Virginia Tech lab (highlighted in grey).

	Sample Pair		**Sample Pair**		**Sample Pair**		**Sample Pair**		**Sample Pair**	
Collaborator	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
N1	0.75	0.53	2.13	1.95	1.68	0.68	0.41	0.39	0.47	0.54
N2	0.85	0.72	2.00	2.94	2.07	0.70	0.46	0.39	0.61	0.59
N3	0.78	0.73	2.21	2.88	1.46	0.55	0.40	0.32	0.46	0.58
N4	0.89	0.58	2.13	2.35	1.70	0.80	0.38	0.33	0.51	0.49
Mean	**0.82**	**0.64**	**2.12**	**2.53**	**1.73**	**0.68**	**0.41**	**0.36**	**0.51**	**0.55**
Grand Mean	0.729		2.324		1.205		0.385		0.531	

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b. QC data from internal checks of subsamples of grain lots from the Mostrom (NDSU WP and NDSU BP), Trilogy (12-Apr-02), and Schmale Labs (VTWP1) in each GC/MS run (to test for consistency among GC/MS runs). The expected range determined by the Mostrom Lab was 0.8 to 1.3 ppm for NDSU WP and 2.5 to 3.2 ppm for NDSU BP. The expected range for the 12-Apr-02 samples was 2.8 to 3.9. The expected range for the VTWP1 samples was 0.9 to 1.3.