

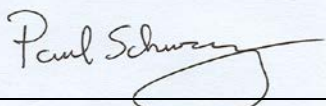
**USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY11 Final Performance Report
July 13, 2012**

Cover Page

PI:	Paul Schwarz
Institution:	North Dakota State University
Address:	Department of Plant Sciences NDSU Dept # 7670 Box 6050 Fargo, ND 58108-6050
E-mail:	Paul.Schwarz@ndsu.edu
Phone:	701-231-7732
Fax:	701-231-7723
Fiscal Year:	FY11
USDA-ARS Agreement ID:	59-0206-9-068
USDA-ARS Agreement Title:	Determination and Characterization of Deoxynivalenol in Barley.
FY11 USDA-ARS Award Amount:	\$ 165,573

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
FSTU	Malting Barley Deoxynivalenol Diagnostic Services.	\$ 165,573
	Total ARS Award Amount	\$ 165,573


Principal Investigator

July 13, 2012
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: *Malting Barley Deoxynivalenol Diagnostic Services.*

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

Mycotoxin analyses are essential for most researchers working on FHB of cereals. However, in barley DON is a major economic factor, and new varieties must display increased resistance to DON accumulation as well as to FHB. Screening barley lines for DON is requisite for any breeding program intending to develop varieties for the upper Midwestern USA. DON analytical services are primarily provided to three barley varietal developmental programs. These breeding programs stated a need for the analysis of approximately 12,000 samples in FY11. Supporting research and extension work has typically required an additional 3,000 samples. In total, eight collaborating scientists were served. The major issue is to provide DON analytical services in a cost effective, timely and accurate manner. Funds provided by the USWBSI have allowed us to hire additional personnel and to subsidize the cost of analysis.

Research on bound DON (DON-3-glucoside) is important to efforts on food safety and breeding for FHB resistance. Wheat and barley have been shown to have the ability to detoxify deoxynivalenol (DON) by forming glycosides. The presence of these DON-glucosides, or bound DON in barley and wheat are a cause for concern, as by definition, bound DON is that which escapes detection by the routine analytical methods.

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: Approximately 10,680 samples (excluding standards) were analyzed from May 2011 to June 2012. Eighty-five percent of these samples were from the NDSU, University of Minnesota and Busch Agricultural Resources barley breeding programs. Approximately 10% of samples were from NDSU barley pathology, while the remainder were from personnel involved in extension/crop production work. Commercial barley samples collected during the 2011 harvest in North Dakota had an average DON value of 2.9 mg/kg. Values ranged from non-detectable to 36.2 mg/kg. Approximately 95% samples collected were contaminated with DON.

The NDSU wheat and barley quality programs purchased a HPLC QTOF MS/MS in the spring of 2012. We are currently developing methods for the extraction and determination of tricothecene toxins, including DON-3-glucoside. This instrument will facilitate the measurement of DON3G, and also enable us to conduct metabolomics work on FHB.

Impact: This project provides essential support to all barley breeding programs working on the development of FHB-resistant varieties for the Midwestern USA. The occurrence of FHB and DON is a primary factor in the dramatic decrease in barley acreage that has been observed over the past 15 years

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.

Dong, X., Meinhardt, S. and Schwarz, P. Isolation and Characterization of Two Endoxylanases from *Fusarium graminearum*. J. Agric. Food Chem., 2012, 60 (10): 2538–2545.

Vegi, A., Schwarz, P., and Wolf-Hall, C. 2011. Quantification of *Tri5* gene, expression, and deoxynivalenol production during the malting of barley. Intl. J. Food Microbiology. 150:150-156.

Dodd, J., Vegi, A., Vashisht, A., Tobias, D., Schwarz, P., and Wolf-Hall, C. 2011. Effect of ozone treatment on the safety and quality of malting barley. J. Food Protection 74(12):2134-2141.

Massman, J., B. Cooper, R. Horsley, S. Neate, R. Dill-Macky, S. Chao, Y. Dong, P. Schwarz, G. J. Muehlbauer and K. P. Smith. 2011. Genome-wide Association Mapping of Fusarium Head Blight Resistance in Contemporary Barley Breeding Germplasm. Mol. Breeding 27:439-454.

PI: Schwarz, Paul

Project: Malting Barley Deoxynivalenol Diagnostic Services.

**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):

Barley check samples are included with each set of analysis. On average three to four checks are included for each 50 samples. Significant deviation from the expected check values, is a used as a cue to recheck or possibly repeat the set of analyses. The average CV of the checks is approximately 18%, which is on the high side of the acceptable range. The highest CV (29.6%) was for a check sample with very low DON, which is typical of samples with very low means.

Standard ID	No. of times analyzed	Average value DON (mg/kg)	CV (%)
C	37	1.38	15.0
D	127	5.03	20.0
F	96	7.93	17.1
NN	58	0.76	16.3
OO	130	1.5	19.6
PP	184	15.75	18.3
QQ	132	0.24	29.6
RR	184	28.81	14.0
Total	948		