

**USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY07 Final Performance Report (approx. May 07 – April 08)
July 15, 2008**

Cover Page

PI:	Paul Schwarz
Institution:	North Dakota State University
Address:	Department of Plant Sciences P.O. Box 5051 Fargo, ND 58105-5051
E-mail:	Paul.Schwarz@ndsu.edu
Phone:	701-231-7732
Fax:	701-231-7723 or 701-231-8474
Fiscal Year:	2007
USDA-ARS Agreement ID:	59-0790-4-122
USDA-ARS Agreement Title:	Malting Barley Deoxynivalenol Diagnostic Services.
FY07 ARS Award Amount:	\$ 90,143

USWBSI Individual Project(s)

USWBSI Research Area*	Project Title	ARS Adjusted Award Amount
FSTU-S	Malting Barley Deoxynivalenol Diagnostic Services.	\$90,143
	Total Award Amount	\$ 90,143

Principal Investigator

Date

* CBCC – Chemical, Biological & Cultural Control
 EEDF – Etiology, Epidemiology & Disease Forecasting
 FSTU – Food Safety, Toxicology, & Utilization of Mycotoxin-contaminated Grain
 GET – Genetic Engineering & Transformation
 HGR – Host Genetics Resources
 HGG – Host Genetics & Genomics
 IIR – Integrated/Interdisciplinary Research
 PGG – Pathogen Genetics & Genomics
 VDUN – Variety Development & Uniform Nurseries

Project 1: *Malting Barley Deoxynivalenol Diagnostic Services.*

1. What major problem or issue is being resolved 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 FY07. Supporting research and extension work requires an additional 3,000 to 4,000 samples. In total, fifteen 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.

**2. List the most important accomplishment and its impact (how is it being used?).
Complete all three sections (repeat sections for each major accomplishment):**

Accomplishment:

Approximately 15,000 samples (excluding standards) were analyzed from May 2007 to April 2008. These analyses were primarily from barley varietal development programs (n=11,560). Additional analysis were conducted for personnel involved in extension/crop production work (n=1721) and for barley FHB research projects. Samples analyzed as part of the 2007 regional barley crop quality survey indicated that average levels of DON were among the lowest observed since testing began in 1993. Our associated research work on DON analysis has demonstrated that some barley samples may contain a significant portion of bound DON. The 2007 samples were analyzed between August, 2007 and July, 2008.

Impact: This project provides essential support to all barley breeding programs working on the development of FHB-resistant varieties for the Midwestern USA. Our findings on the occurrence of bound DON in some barley samples should be of interest to both feed/food processors and to researchers. Binding or conjugation of DON may be involved in FHB resistance, and studies involving enzyme pretreatments suggest it might be released during food processing or in digestion.

As a result of that accomplishment, what does your particular clientele, the scientific community, and agriculture as a whole have now that they didn't have before?:

Timely and accurate analyses allow the breeders and support scientists to make advances in achieving the goal of developing new varieties that display reduced levels of DON accumulation. Continued monitoring of DON levels in regional grain (crop survey) is important in maintaining food and feed safety, and also helps to maintain an epidemiological record of FHB on barley in the upper Midwest. This data is important to producers and users of regional grain, pathologists, agricultural economists, and to regulatory agencies. Publication of three peer-reviewed manuscripts on bound DON in barley has made the

results of our research in this area widely available to research scientists and food processors.

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.

Publications:

Zhou, B., He, G.Q., and Schwarz, P.B. Occurrence of bound deoxynivalenol in Fusarium Head Blight infected barley (*Hordeum vulgare* L.) and malt as determined by solvolysis with trifluoroacetic Acid. *J. Food Protection* 71(6):1266-1269, 2008.

Zhou, B., Schwarz, P.B., He, G.Q., Li, Y., Gillespie, J., and Horsley, R. Effect of enzyme pretreatments on the determination of deoxynivalenol in barley. *J. Am. Soc. Brew. Chem.* 66(2):103-108, 2008.

Zhou, B., Li, Y., Gillespie, J., He, G.Q., Horsley, R., and Schwarz, P.B. Doehlert matrix design for optimization of the determination of bound deoxynivalenol in barley grain with TFA. *J. Ag. Food Chem.* 55, 10141–10149, 2007.

Presentations:

Boddeda, A., Schwarz, P., and Wolf-Hall, C. Quantification of The Tri5 Gene, Expression and Deoxynivalenol Production During the Malting of Barley. Poster. 2007 National Fusarium Head Blight Forum. December 2-4, 2007. Kansas City, MO.

Schwarz, P., Dong, Y., and Dill-Mackey, R. Deoxynivalenol Measurement: Sources of error and Sampling Recommendations. Oral Presentation. 2007 National Fusarium Head Blight Forum. December 2-4, 2007. Kansas City, MO.

Tobias, D.J., Vashisht, A., Boddeda, A., Wolf-Hall, C., and Schwarz, P. Development of a Multiplex Real-Time Pcr Assay for Rapid Detection and Quantification of *Fusarium* Spp. in Barley. 2007 National Fusarium Head Blight Forum. December 2-4, 2007. Kansas City, MO.

Tobias, D.J., Wolf-Hall, C., and Schwarz, P. Ozone as an Antimycotic Agent in Malting Barley. 2007 National Fusarium Head Blight Forum. December 2-4, 2007. Kansas City, MO.

Zhou, B., Li, Y., Gillespie, J., Horsley, R., and Schwarz, P. Doehlert Matrix Design for Optimization of the Determination of Bound Deoxynivalenol in Barley Grain with TFA. 2007 National Fusarium Head Blight Forum. December 2-4, 2007. Kansas City, MO.

Zhou, B., Gillespie, J., Horsley, R., and Schwarz, P. Effect of Enzyme Pretreatments on the determination of Deoxynivalenol in Barley. 2007 National Fusarium Head Blight Forum. December 2-4, 2007. Kansas City, MO.