

**USDA-ARS / USWBSI
FY04 Final Performance Report
July 15, 2005**

Cover Page

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Year:	FY2004 (approx. May 04 – April 05)
FY04 ARS Agreement ID:	59-0790-4-112
FY04 ARS Agreement Title:	Malting Barley Deoxynivalenol Diagnostic Services.
FY04 ARS Award Amount:	\$ 121,395

USWBSI Individual Project(s)

USWBSI Research Area*	Project Title	ARS Adjusted Award Amount
FSTU	Malting Barley Deoxynivalenol Diagnostic Services.	\$ 121,395
	Total ARS Award Amount	\$ 121,395

Principal Investigator

Date

* BIO – Biotechnology
CBC – Chemical & Biological Control
EDM – Epidemiology & Disease Management
FSTU – Food Safety, Toxicology, & Utilization
GIE – Germplasm Introduction & Enhancement
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?

DON analytical services are provided to nine collaborating researchers at four barley varietal developmental programs. These programs stated a need for the analysis of approximately 11,000 samples in FY04. 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. What were the most significant accomplishments?

Approximately 7,800 barley samples from the 2004 crop were analyzed for DON by gas chromatography with electron capture detection (GC-ECD) or gas chromatography-mass spectrometry (GC-MS). This compares to 9,600 samples in 2003-04. The difference between sample requests (11,000) and samples analyzed in FY04 (7,800) reflects a lower prevalence of FHB and DON in 2004, and the fact that collaborators must estimate sample testing needs 1 year prior to harvest and submission of samples. Samples included breeder's lines, crop survey samples, and samples from research studies. The 2004 crop samples were analyzed beginning in August, 2004 and were completed in March, 2005.

Methodologies were developed for the determination of 8 tricothecene mycotoxins and zearalenone by GC-MS. Analysis of commercial crop samples (n=71) from 1995-2004 demonstrated that DON is still the primary mycotoxin of concern on regional barley, being found on 97% of samples selected. A small amount of T-2 toxin was detected on a single sample, and trace levels of nivalenol were detected on 25% of samples. No HT-2 toxin, zearalenone, or 15-acetoxyscirpenol were detected.

A barley check sample service was operated as a service to 16 academic and industry labs. Two samples are shipped to each collaborator on a monthly basis.

Accomplishment: The level of DON (deoxynivalenol, vomitoxin) is a market factor for barley, and producers receive discounted prices for barley with DON in excess of 0.5 mg/kg (parts per million). The resistance to accumulation of this toxin is a very important component of the overall resistance to Fusarium Head Blight (FHB). Any new variety of barley must show resistance to accumulation of DON, as well as to the visual symptoms of disease. As such, the screening of breeder's materials for DON is an essential component of the effort to develop new barley varieties that are resistant to FHB. This project provides DON testing services to all barley breeding programs in the USA that are working on the development of FHB resistant lines. In FY04 approximately 8,000 samples were screened in an accurate, timely and cost effective manner. Annual screening of the commercial barley crop provides data on the occurrence and prevalence of DON contamination.

Impact: The screening of breeder's materials for DON enables breeders to make sound selections, and advance only lines that show resistance to the accumulation of this toxin.

Development of FHB/DON resistant barley varieties is greatly facilitated by this project. Data on the occurrence and prevalence of DON in barley is essential for the determination of exposure in risk assessment models.

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?:

Barley breeders have developed lines that show tolerance to FHB and a lower accumulation of DON. These are moving to advanced stages of field testing, and industry pilot-scale testing.

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 your grant. Please reference each item using an accepted journal format. If you need more space, continue the list on the next page.

Publications

1. Schwarz, P.B., Horsley, R.D., Steffenson, B.J., Salas, B., and Barr., J.M. Quality risks associated with the utilization of Fusarium Head Blight infected malting barley. Accepted: *J. Am. Soc. Brew. Chem.* (February 24, 2005).
2. Kottapalli, B., Wolf-Hall, C.E., and Schwarz, P.B. Evaluation of gaseous ozone and hydrogen peroxide treatments for reducing Fusarium survival in malting barley. Accepted: *J. Food Prot.* 68 (6):1236–1240.
3. Dahleen, L.S., Agrama, H.A., Horsley, R.D., Steffenson, B.J., Schwarz, P.B., Mesfin, A., Franckowiak, J.D. 2004. Identification of QTLs associated with Fusarium head blight resistance in Zhedar 2 barley. *Theo. Appl. Gen.* 108(1): 95-104.

Presentations

1. Food Safety Issues in Brewing. Seminar. Southern Yangtze University. School of Food Science and School of Biotechnology. Wuxi, PRC. May 9, 2005.
2. Fusarium Head Blight of Barley: A Multi-disciplinary Research Approach. Zhejiang University. Hangzhou, PRC. May 10, 2005.