

**USDA-ARS / USWBSI**  
**FY04 Final Performance Report (June 3, 2004 – June 2, 2006)**  
**Includes a one-year No Cost Extension**  
**July 14, 2006**

**Cover Page**

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<b>Year:</b>	<b>FY2004 (June 04 – June 06)</b>
<b>FY04 ARS Agreement ID:</b>	<b>59-0790-4-134</b>
<b>Agreement Title:</b>	<b>Validating a Rapid Immunological Test for Fusarium graminearum.</b>
<b>FY04 ARS Award Amount:</b>	<b>\$ 14,634</b>

**USWBSI Individual Project(s)**

<b>USWBSI Research Area*</b>	<b>Project Title</b>	<b>ARS Adjusted Award Amount</b>
FSTU	Quantifying Fusarium in Seeds and Grain Products for Laboratory and Industrial Use.	\$ 14,634
	<b>Total ARS Award Amount</b>	<b>\$ 14,634</b>

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Principal Investigator

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Date

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\* 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: Validating a Rapid Immunological Test for *Fusarium graminearum*.**

### **1. What major problem or issue is being resolved and how are you resolving it?**

Disease expression (FHB) and DON production are highly variable in the field resulting in high experimental errors (CV's). Mapping studies have failed to find robust alleles associated with disease resistance with the exception of those responsible for morphology (2-row, plant height, heading date) associated with disease avoidance. Better methods are needed to assess disease to identify resistance/susceptibility phenotypes/genotypes of mapping and breeding populations. The objectives of this project were to 1) compare ELISA quantification of *Fusarium* with that of FHB scores, ergosterol, and RT-PCR with DON in commercially harvested seed; 2) compare errors associated with ELISA, FHB scores, and DON analysis in North American barley scab evaluation nurseries (NABSEN); and 3) test whether environmental conditions affect DON and ELISA by *F. graminearum* grown under different conditions in vitro.

### **2. Most important accomplishment and its impact (how is it being used?). Complete all three sections:**

**Accomplishment:** ELISA quantification gave better estimates of *Fusarium* disease infestation than RT-PCR, ocular estimates of incidence or FHB severity because of higher correlations with DON in commercial grain samples. In addition, the ELISA analyses gave lower experimental error than FHB or DON analysis. The CV's from these experiments ranged between 21 and 26 for ELISA, 30 to 66 for FHB scores, and 50 to 62.4 for DON. Isolates of *Fusarium* varied in DON production due to environmental conditions. Mass of mycelium differed, but abundance of antigen (mass of antigen per unit mass of mycelium) was similar when grown under varying laboratory conditions. Abundance of antigen did not differ in mycelium from 13 *Fusarium* species.

**Impact:** These data demonstrate that ELISA quantification of *Fusarium* provides a more precise estimate of the disease.

### **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?**

Improved diagnostics through ELISA quantification should result in improved genetic improvement for *Fusarium* resistance through traditional screening and plant breeding methods, as well as enhancing the ability to find molecular markers associated with resistance genes. ELISA technology can also be used to differentiate potentially toxic from non-toxic commercial grain samples.

**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.**

Hill, N.S., P. Schwarz, R. Horsley, S. Neate, B. Steffenson, L. Dahleen, B. Cooper, B. Kittle, and A. Jones. 2004. Simple and rapid immunoquantification of *Fusarium* in barley and its relationship with DON and FHB scores. In S.M. Canty, T. Boring, J. Wardwell, and R.W. Ward (eds). Proceedings of the 2nd International Symposium on Fusarium Head Blight; incorporating the 8th European Fusarium Seminar; 11-15 December, 2004; Orlando, FL. East Lansing: Michigan State Univ. pp. 403.

S.M. Neate, P.B. Schwarz, N.S. Hill and R.D. Horsley. 2004. The relationships between *Fusarium* head blight visual symptoms, *Fusarium* biomass and deoxynivalenol levels in barley. In S.M. Canty, T. Boring, J. Wardwell, and R.W. Ward (eds). Proceedings of the 2nd International Symposium on Fusarium Head Blight; incorporating the 8th European Fusarium Seminar; 11-15 December, 2004; Orlando, FL. East Lansing: Michigan State Univ. pp. 415.

N. Hill, A. Jones, S. Neate, P. Schwarz, K. Smith, R. Dill-Mackey, L. Dahleen, R. Horsley, B. Cooper. 2005. Simple and rapid immunoquantification of *Fusarium* in Barley. American Brewing Chemist's Society. 11-15 June, Savannah, Georgia.

N.S. Hill, P. Schwarz, L.S. Dahleen, S. Neate, R. Horsley, A.E. Glenn, K. O'Donnell. 200x. ELISA Analysis for *Fusarium* in barley: Development of methodology and field assessment. Crop Science (in press).