USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY06 Final Performance Report (approx. May 06 – April 07)
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Cover Page

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Fiscal Year:	2006
USDA-ARS Agreement ID:	58-0790-5-079
USDA-ARS Agreement Title:	Factors and Mechanisms Favoring Deoxynivalenol Presence in Asymptomatic Wheat.
FY06 ARS Award Amount:	$ 40,447

USWBSI Individual Project(s)

USWBSI Research Area*	Project Title	ARS Award Amount
EEDF	Factors and Mechanisms Favoring Deoxynivalenol Presence in Asymptomatic Wheat.	$ 40,447
	Total Award Amount	**$ 40,447**

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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
PGG – Pathogen Genetics & Genomics
VDUN – Variety Development & Uniform Nurseries

Project 1: *Factors and Mechanisms Favoring Deoxynivalenol Presence in Asymptomatic Wheat.*

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

Most reports of wheat head scab indicate a strong positive correlation between disease severity assessed visually and amount of the toxin deoxynivalenol (DON) in grain. Similarly, there is usually a positive correlation between the level of *Fusarium* damaged kernels (FDK) and toxin level. However there are accounts both from the peer-reviewed literature and from anecdotal sources that wheat grain with good test weight and low FDK sometimes contains DON at levels unacceptable to grain buyers, millers and human consumers. We are working to understand the environmental conditions that lead to the presence of unacceptable levels of DON in good appearing grain so that this information can be used to better predict when DON levels in grain will be a concern. Since DON does not always correlate with disease severity or FDK it is important to build models that predict DON levels and the information generated in this project will help address this.

We are conducting field and growth chamber studies to assess the impact of timing of infection and temperature on development of asymptomatic wheat kernels containing DON. In the field we employ a set of movable greenhouse enclosures that allow us to exclude rainfall and dew on wheat plots planted underneath. This in combination with misting chambers that can be placed over the plots allows us to manipulate the timing of infection of the wheat head. We hypothesize that infections during the grain fill period will result in grain with DON greater than 2 ppm but with little visible kernel damage. We are exploring the impact of temperature by conducting studies of disease development in growth chambers at different temperatures.

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:

We conducted a field study harvested in July 2006. We found that plots that were dry during flowering and misted during grain fill (dry-wet treatment) had lower levels of disease severity than plots that experienced ambient conditions. However the dry-wet plots had higher levels of DON than the ambient plot despite having a lower disease severity. And, for two of the three cultivars used in the experiment DON levels exceeded 3 ppm a level that is unacceptable for use in flour production. This research shows that moisture during the grain fill period plays a role in development of kernels with low symptom levels but high levels of DON.

Impact:

Scientists developing models to predict DON accumulation in the field will be able to use this information to refine and expand their 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?

Scientists have new information on conditions that can lead to asymptomatic wheat kernels containing high levels of DON. In particular, scientists will have the specific knowledge that moisture during the grain fill period can lead to asymptomatic kernels containing DON. It may be important to incorporate information on rainfall and humidity during the grain filling period into models for predicting DON.

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.

Tilley, K. T., Nita, M., DeWolf, and Kuldau, G. A**.** 2006. "Timing of infection: the effects on Fusarium Head Blight severity and toxin accumulation." In Canty, S.M., Clark, A., and Van Sanford, D. (Eds.) *Proceedings of the National Fusarium Head Blight Forum*; Dec. 10-12, 2006, Research Triangle Park, NC. University of Kentucky, Lexington, KY. pp. 52.