USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY05 Final Performance Report (approx. May 05 – April 06)
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Cover Page

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Fiscal Year:	**2005**
FY05 ARS Agreement ID:	**58-0790-5-079**
Agreement Title:	**Factors and Mechanisms Favoring Deoxynivalenol Presence in Asymptomatic Wheat.**
FY05 ARS Award Amount:	**$ 50,244**

USWBSI Individual Project(s)

USWBSI Research Area*	Project Title	ARS Adjusted Award Amount
EDM	Factors and Mechanisms Favoring Deoxynivalenol Presence in Asymptomatic Wheat.	$ 50,244
	Total Award Amount	**$ 50,244**

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

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

Wheat contaminated with the mycotoxin deoxynivalenol usually has a diseased appearance that is readily observed with the naked eye. However, in some years wheat buyers and millers have noted that healthy appearing grain is contaminated with unacceptable levels of toxin. This is a problem because buyers and millers may purchase grain that they are then unable to use resulting in adverse economic consequences. Our objective is to define the field conditions that lead to asymptomatic grain containing unacceptable levels of deoxynivalenol and to improve our understanding of fungal behavior on the wheat head when this occurs.

We are addressing this issue by conducting field and growth chamber studies. In the field we are utilizing two moveable greenhouse covers that are designed to move over a plot when triggered by moisture, i.e. rain. Using this tool in combination with misting we can manipulate when the wheat in the field experiences moisture. We are assessing two time periods, flowering and grain fill. Growth chamber studies are looking at the impact of temperature and will determine if and when toxin moves in the wheat head in advance of fungal hyphae.

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:

In our 2005 season field season we observed some healthy appearing wheat kernels with greater than 2 ppm deoxynivalenol. This confirms the reports from producers that phenomenon occurs and demonstrates that we can replicate this in the field. Similarly in our first round of growth chamber studies we found that when the moderately resistant cultivar Truman was point inoculated at a floret in the middle of the head and maintained at 16 ° C that there was little, up to one floret away or no spread of fungus after 14 days. This material will be analyzed for deoxynivalenol in the coming months. Our hypothesis is that florets with no fungus will contain deoxynivalenol. We observed that in general those plants maintained at 20 ° C had greater spread of *F. graminearum* within the head compared to those kept at 16° C. We have accomplished the goal of finding growth chamber conditions that result in asymptomatic kernels for a significant time after inoculation.

Impact:

Our research is identifying temperature and moisture conditions that are conducive for the development of asymptomatic kernels with >2 ppm DON. As we continue to expand this understanding we will use this information to refine existing disease prediction models and develop models specifically addressing the levels of DON in wheat and barley.

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?:

Our work has resulted in the documentation of conditions that are conducive to the development of asymptomatic grain with > 2 ppm DON. These conditions where previously undocumented in the scientific community.

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.

Nita, M., Tilley, K., DeWolf, E., and Kuldau, G. 2005. "Effects of moisture during and after anthesis on the development of Fusarium Head Blight of wheat and mycotoxin production." In: Canty, S. M., Lewis, J., Siler, L., and Ward, R. W. (Eds.), Proceedings of the National Fusarium Head Blight Forum; 2005 Dec. 11-13, Milwaukee, MN. East Lansing: Michigan State University. pp. 125-128.