USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY06 Final Performance Report (approx. May 06 – April 07)
July 16, 2007

Cover Page

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Fiscal Year:	2006
USDA-ARS Agreement ID:	59-0790-4-115
USDA-ARS Agreement Title:	Management of FHB in Arkansas.
FY06 ARS Award Amount:	$ 74,722

USWBSI Individual Project(s)

USWBSI Research Area*	Project Title	ARS Award Amount
CBCC	Chemical and Biological Control of FHB on Wheat in Arkansas.	$ 6,694
VDUN	Developing FHB-Resistant Wheat Cultivars for the Midsouth.	$ 68,028
	Total Award Amount	**$ 74,722**

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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: *Chemical and Biological Control of FHB on Wheat in Arkansas.*

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

The major objective has been to identify the most effective fungicides and biological control agents for reducing FHB in the field and DON in harvested grain. I have participated in the planning, implementation, and analyses of the Uniform Fungicide and Biological Control Trials that are coordinated by the CBC. Treatments that were believed to be effective were tested at multiple locations, and I conducted the test in Arkansas. I also contacted plant pathologists in Europe who evaluate fungicides for efficacy against FHB on wheat and barley to determine the most effective treatments in Europe.

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:

Prosaro fungicide, a combination of Proline and Folicur fungicides, was the most effective in Europe and in the Uniform Trials and was more effective than Folicur fungicide that has been used in several states to manage FHB under Section 18 permits.

Impact:

Bayer Crop Science, the owner of Prosaro, has received a Section 3 registration for Proline fungicide on wheat and barley in the US. Proline is the component of Prosaro that has the greatest activity against FHB.

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?:

Proline is available to growers for managing FHB on wheat and barley.

Project 2: *Developing FHB-Resistant Wheat Cultivars for the Midsouth.*

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

The major problems are that wheat cultivars currently grown in the region have little or no resistance to FHB, levels of DON in harvested grain sometimes exceed the allowable level, and a nivalenol chemotype of the FHB pathogen has been found recently at high frequency in the region.

The Arkansas program is resolving this by developing several wheat lines with more competitive yield potential and moderate to high levels of resistance to FHB and other diseases that are important in the region.

The Arkansas program also assisted other breeding programs by evaluating the Southern FHB Nursery for resistance to FHB and stripe rust and by evaluating the Northern and Preliminary Northern FHB Nurseries for resistance to stripe rust.

A Ph. D. graduate student is conducting research to determine if wheat lines with resistance to the DON chemotype also will be resistant to the nivalenol chemotype and to identify wheat lines with resistance to DON and nivalenol accumulation in harvested grain.

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 identified one line (AR97124-4-2) that exceeded the yield for the check varieties (Pat, Bess, Truman, Ernie) and five lines which equaled or exceeded Truman and Ernie in yield. AR97124-4-2 has P88288C1-6-1-2 as a source of type 1 resistance. This experimental line had a three-year average of 78.6 bu/A compared to 74.5 bu/A for the U of A release Pat. Although yield data for this year is missing because of severe freeze damage, it was evaluated in a separate FHB evaluation nursery. Again resistance was good, with an FHB severity rating of 13% compared to 23%, 1% and 20% for Bess, Truman and Ernie, respectively. In that same nursery, the line AR850-1-1 was rated with a FHB severity of 17%. AR850-1-1 was licensed to Petrus Seed and Grain, Inc. this fall and will be sold commercially within the next two years. In the FHB evaluation of the Arkansas State Variety test, FHB severity ranged from 13 to 43% and AR850 had a rating of 18%.We are also interested in AR97044-10-2 as a possible release. It was entered in this year's Uniform Eastern yield nursery as well as the Uniform Scab nursery.

The Arkansas program has collaborated closely with the LSU program to develop resistant varieties for the region by annually exchanging our best lines, populations, and parents for crosses.

The Uniform FHB Nurseries have become a valuable tool for the development of varieties with resistance to FHB.

Preliminary results from the graduate student's research indicate that FHB resistances developed for the DON chemotype are also effective against the nivalenol chemotype and that several lines adapted to the region have resistance to DON and nivalenol accumulation in harvested grain.

A severe spring freeze devastated field nurseries in 2007, thereby reducing the accomplishments of this project for this year.

Impact:

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?

A few cultivars with low levels of FHB resistance are available to growers, and lines with higher levels of resistance are at various stages of development.

Growing cultivars developed for resistance to the DON chemotype likely will reduce FHB caused by the recently discovered nivalenol chemotype. However, higher levels of resistance to toxin accumulation in grain may be needed in this region because nivalenol appears to be more toxic than DON to humans and other animals.

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.

Horevaj, P. and Milus, E.A. 2006. Evaluation of soft red winter wheat lines for resistance to mycotoxins and kernel infection: A progress report. Pages 99-102 in: Proceedings of the 2006 National Fusarium Head Blight Forum.

Horevaj, P., Milus, E.A., Gale, L.R., and Kistler, C. 2007. Resistance in soft red winter wheat lines to deoxynivalenol and nivalenol chemotypes of *Fusarium graminearum*. Phytopathology 97:S48.

Milus, E.A. and Hedge, J. 2006. Evaluations for FHB severity, Fusarium-damaged kernels, seed quality, DON, and leaf diseases. Pages 9, 13, 14, 17, and 23, respectively, in: Southern Uniform Winter Wheat Scab Nursery 2006 Nursery Report, J.P. Murphy, R.A. Navarro, and J.H. Lyerly, editors.