

**USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY08 Final Performance Report (approx. May 08 – April 09)
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Cover Page

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Fiscal Year:	2008
USDA-ARS Agreement ID:	59-0790-4-125
USDA-ARS Agreement Title:	Uniform Trial to Evaluate Efficacy of Fungicides and Biologicals Against Fusarium Head Blight.
FY08 USDA-ARS Award Amount:	\$ 14,532

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Adjusted Award Amount
MGMT	Evaluation of Integrated Management Strategies for Fusarium Head Blight.	\$9,688
MGMT	Uniform Trial to Evaluate Efficacy of Fungicides and Biologicals against Scab.	\$ 4,844
	Total Award Amount	\$ 14,532

Principal Investigator

Date

* MGMT – FHB Management
FSTU – Food Safety, Toxicology, & Utilization of Mycotoxin-contaminated Grain
GDER – Gene Discovery & Engineering Resistance
PBG – Pathogen Biology & Genetics
BAR-CP – Barley Coordinated Project
HWW-CP – Hard Winter Wheat Coordinated Project
VDHR – Variety Development & Uniform Nurseries – Sub categories are below:
 SPR – Spring Wheat Region
 NWW – Northern Winter Wheat Region
 SWW – Southern Sinter Wheat Region

Project 1: *Evaluation of Integrated Management Strategies for Fusarium Head Blight.*

1. What major problem or issue is being resolved relevant to Fusarium head blight (scab) and how are you resolving it?

The severity of Fusarium head blight (FHB) epidemics in the United States has caused enormous yield and quality losses in both wheat and barley over the last decade. The development of this disease is dependent on host genetics, a range of favorable environmental conditions, the prevalence of the causal fungus and the survival and spread of the causal fungus. Control of this disease has been difficult because of the complex nature of the host/pathogen interaction. Management of FHB and the associated mycotoxin DON have not been achieved by any single control measure. An integrated approach is critical to attaining the best possible control of FHB in any given environment.

As a result of a workshop sponsored by the Chemical, Biological and Cultural Control Research Area in 2006, a protocol for a multi-state project focusing on integrated management strategies for FHB was developed. The research portion of this project would involve multi-state trials evaluating crop sequence, variety selection and fungicide application as an integrated management program for FHB. Timely dissemination of the research results is also a priority of this project.

The University of Missouri cooperated in this multi-state project following the protocol developed by a subcommittee from the workshop participants during the 2006-2007 season.

2. List the most important accomplishment and its impact (i.e. how is it being used) to minimize the threat of Fusarium head blight or to reduce mycotoxins. Complete both sections (repeat sections for each major accomplishment):

Accomplishment:

The 2007 data from the Missouri trial did indicate a significant difference in DON levels with varieties and with crop sequence. As expected more susceptible varieties tended to have higher levels of scabby kernels and higher DON levels than varieties with more resistance to FHB. However, all varieties had lower DON levels when planted in soybean residue rather than corn residue. Fungicide application did not seem to have an impact on yield or DON level regardless of variety or crop sequence. However, the 2007 was not particularly favorable for the development of FHB or scab and both the incidence of disease and DON levels were relatively low.

The trial was repeated during the 2007-2008 season. During 2008 weather conditions were quite conducive for the development of FHB and disease incidence and severity in the trial were high. Again, there were significant differences in both disease incidence and severity as well as DON levels between crop sequences with levels being lower in the soybean residue rather than corn residue. Varieties with more resistance had lower levels of FHB and DON. Fungicide application did decrease disease and DON levels on all varieties.

Impact:

The purpose of the Integrated Management Strategies for Fusarium Head Blight Project is to provide growers with data on the value of utilizing multiple management options to reduce both FHB and DON levels in grain crops. Compilation of data from similar trials from all locations provides valuable information on which practices and/or combination of practices may reduce the incidence and severity of FHB and may then impact the DON levels in harvested grain. For Missouri one key point would be the value of crop sequence or rotation in reducing FHB and DON in winter wheat.

The uniform trial data is compiled across all locations participating in the trial and this information is presented at the National Scab Forum, is published in the National Scab Forum proceedings and is available through the U.S. Wheat and Barley Scab Initiative web site as well as through individual state reports and web sites. Growers and agribusiness personnel in Missouri and academic and agricultural professionals throughout the United States have access to this information. Again, from the first two years of this study one important trend was the lower incidence of FHB and lower DON levels in wheat planted into soybean residue as compared to wheat planted into corn residue. The importance of crop rotation in managing FHB may have been overlooked in recent years.

Project 2: *Uniform Trial to Evaluate Efficacy of Fungicides and Biologicals against Scab.*

1. What major problem or issue is being resolved relevant to Fusarium head blight (scab) and how are you resolving it?

Scab or Fusarium head blight (FHB) continues to be a problem on soft red winter wheat grown in Missouri. Although a state wide epidemic had not occurred for several years, each year there are areas within the state that have weather conditions favorable for disease development as the winter wheat crop is flowering. However, during the 2008 season environmental conditions were conducive for the development of FHB in most areas of the state and FHB was a state wide problem. Producers see a direct impact from yield reduction and may see an indirect impact due to DON levels or quality issues when the grain is marketed. High levels of FHB in the crop or of DON in the grain also cause significant problems for elevators accepting the grain and processors trying to use the grain. One management option would be the use of fungicides or biological control agents to minimize FHB infection. The Uniform Scab Fungicide Trial was set up to identify safe fungicides that are effective against FHB. A second uniform trial to evaluate the efficacy of biological control agents against FHB has also been established. Given sets of fungicides and biological control agents are evaluated for consistency of performance across a wide range of wheat classes and varieties, barley classes and environments. For the fungicide portion of the uniform trial, the emphasis is on new fungicide chemistries, new combinations of products, more precise application timing and application techniques. In the biologicals portion of the uniform trial, the emphasis has shifted to biologicals available in formulations

that would be practical for on-farm use. The identification of safe fungicides or the development of safe, easy to use biological control agents which effectively control FHB would benefit producers, agribusinesses and ultimately consumers.

The set of fungicides and biological control agents for the Uniform Scab Trials were evaluated on two soft red winter wheat varieties in Missouri during the 2007-2008 season. The field work for this trial has been completed. Samples were submitted for DON analysis and data was analyzed for the annual trial report.

- 2. List the most important accomplishment and its impact (i.e. how is it being used) to minimize the threat of Fusarium head blight or to reduce mycotoxins. Complete both sections (repeat sections for each major accomplishment):**

Accomplishment:

The Uniform Trials to evaluate efficacy of fungicides and biological control agents against FHB were conducted in Missouri during the 2007-2008 season. Planting went well and the stands were good last fall. The Uniform Fungicide Trial was conducted on the two varieties Roane and Truman. In the Uniform Biological Trial the varieties were Elkhart and Roane. Weather conditions during flowering were conducive to the development of FHB. Fungicide treatments were applied at the appropriate timings. Biological control agents were applied under ideal conditions for growth of the biological control agents and for development of FHB. This year all of the biologicals were supplied in sufficient quantity so no additional increase of biological inoculum was necessary. Furthermore all of the biological control agents were applied with ease; the formulations didn't clog spray nozzles or cause any other application problems

Because weather conditions during and after flowering were favorable for the development of FHB, good results were obtained in these trials. Differences in disease incidence and severity, number of scabby kernels and DON levels were found in both trials. The strength of the Uniform Fungicide and Biological Trials has been and continues to be in the replication of the same sets of treatments across a number of locations. Although results in one location in a given year may not be statistically significant, across all locations there should be significant results that provide valuable information for all wheat and barley producing areas of the U. S.

Impact:

The purpose of the Uniform Fungicide Trial and the Uniform Biological Control Agent Trial is to provide growers with data on the efficacy of these materials that will help them in making management decisions related to FHB. Compilation of uniform trial data from all locations provides valuable information on which fungicides or biological control agents reduce the incidence and/or severity of FHB, which may impact the DON levels in harvested grain and application timings and techniques that provide the best results.

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.

Proceedings:

Bradley, C. A., E. Adee, S. Ebelhar, B. Young, M. Burrows, M. McMullen, J. Lukach, L. Osborne, K. Ruden, L. Sweets and K. Wise. 2008. Multi-state uniform fungicide trials to control Fusarium head blight and deoxynivalenol. Proceedings of the 2008 National Fusarium Head Blight Forum. December 2-4, 2008. Indianapolis, Indiana pp. 13-16.

Jochum, C. C., G. Y. Yuen, K. R. Ruden, J. Morgan, B. H. Bleakley, L. Osborne, L. E. Sweets, S. Halley and K. Kinser. 2008. 2008 Results from the uniform evaluation of biological agents for the control of Fusarium head blight on wheat and barley. Proceedings of the 2008 National Fusarium Head Blight Forum. December 2-4, 2008. Indianapolis, Indiana. Pp.32-35.

Paul, P., L. Madden, M. McMullen, D. Hershman, L. Sweets, S. Wegulo, S. Halley, L. Osborne, K. Ruden and B. Padgett. 2008. Integrated management of FHB and DON in small grain: 2008 uniform trials. Proceedings of the 2008 National Fusarium Head Blight Forum. December 2-4, 2008. Indianapolis, Indiana. pp. 52-55.

Extension Publications:

Manuals:

Bradley, K. W., L. E. Sweets, W. C. Bailey, J. A. Kendig, and J. A. Wrather. 2008. 2008 Missouri pest management guide. University of Missouri Extension publication M171.

Newsletter Articles:

Sweets, L. E. Foliar fungicides on wheat in Missouri. Integrated Pest and Crop Management Newsletter 18(5).

Sweets, L. E. Target diseases and application timing information for foliar fungicides labeled for use on wheat. Integrated Pest and Crop Management Newsletter 18(5).

Sweets, L. E. Management of small grain diseases (NCERA-184) fungicide efficacy for control of wheat diseases. Integrated Pest and Crop Management Newsletter 18(5).

Sweets, L. E. Fusarium head blight or scab of wheat. Integrated Pest and Crop Management Newsletter 18(7).

Sweets, L. E. Update on wheat diseases and fungicides. Integrated Pest and Crop Management Newsletter 18(7).

Sweets, L. E. Wheat disease update- May 27, 2008. Integrated Pest and Crop Management Newsletter 18(9).

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Sweets, L. E. Wheat disease update for June 9, 2008. Integrated Pest and Crop Management Newsletter 18(10).

Sweets, L. E. Wheat disease update for June 23, 2008. Integrated Pest and Crop Management Newsletter 18(11).

Sweets, L. E. Evaluate winter wheat seed quality prior to planting. Integrated Pest and Crop Management Newsletter 18(15).

Presentations:

Crop Injury Diagnostic Clinic, Field Crop Disease Session, July 2008, Columbia, MO

Crop Management Conference, Field Crop Disease Update, December 2008, Columbia, MO

Pesticide Applicator Training Recertification Sessions, Field Crop Disease Update, January 2009, multiple locations throughout Missouri

Wheat Diseases, MFA Training, February 2008, Columbia, MO

Training Session for Missouri Seed Improvement Association Wheat Inspectors, June 2008, Columbia, MO

Wheat Tour, May 2008, Lamar, MO

Teleconference phone calls with Extension field staff during the spring and summer of 2007

If your FY08 USDA-ARS Grant contained a VDHR-related project, include below a list all germplasm or cultivars released with full or partial support of the USWBSI. List the release notice or publication. Briefly describe the level of FHB resistance. If this is not applicable (i.e. no VDHR-related project) to your FY08 grant, please insert 'Not Applicable' below.

Not Applicable.