

**USDA-ARS/  
U.S. Wheat and Barley Scab Initiative  
FY08 Final Performance Report (approx. May 08 – April 09)  
July 15, 2009**

**Cover Page**

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<b>Fiscal Year:</b>	2008
<b>USDA-ARS Agreement ID:</b>	59-0790-6-072
<b>USDA-ARS Agreement Title:</b>	Enhancing Biological Strategies to Control Fusarium Head Blight and Evaluating Biological Control Agents in Uniform Tests Against FHB.
<b>FY08 USDA-ARS Award Amount:</b>	\$ 21,202

**USWBSI Individual Project(s)**

<b>USWBSI Research Category*</b>	<b>Project Title</b>	<b>ARS Adjusted Award Amount</b>
MGMT	Uniform Tests of Biocontrol Agents for Fusarium Head Blight.	\$9,189
MGMT	The Targeting of Residues as a Management Strategy for FHB of Wheat and Barley.	\$ 12,013
	<b>Total Award Amount</b>	<b>\$ 21,202</b>

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Principal Investigator

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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

(Form FPR08)

**Project 1:** *Uniform Tests of Biocontrol Agents 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?**

Although more effective fungicides and host resistance in some wheat market classes are now available for scab and DON management, these strategies are not available for all cereal crops nor completely effective. Biological control measures that can be effective in diverse environments are needed to augment current strategies. Field experiments were conducted in two Nebraska locations (Lincoln and Mead) as part of the multistate Uniform Biocontrol Trials. The biocontrol agents in this study were all strains of *Bacillus*, a group of bacteria that is favored for commercial development because of the formation of hardy survival spores and production of antifungal compounds. Two experimental strains (1BA and TrigoCor 1448) and a commercial product (Taegro) were tested alone or as a tank mix with the fungicide Prosaro 421 SC. These treatments were compared with non-treated controls and Prosaro alone. A susceptible hard red winter wheat 2137 was used in both locations, as was artificial inoculation with *Fusarium*-infested grain and mist irrigation. Scab severity, incidence, and index were determined in the field. Percent *Fusarium* diseased kernels, DON levels, and test weights were measured after harvest.

**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 all three sections (repeat sections for each major accomplishment):**

**Accomplishment:**

High scab incidence (over 95%) but low severity (less than 30%) occurred in both locations. The results from the two locations were similar. Significant treatment effects were found for scab incidence and DON levels in one experiment in which treatment with Prosaro alone and in combination with a *Bacillus* biocontrol agent decreased scab incidence and DON level compared to the control. The Prosaro plus biocontrol combinations, however, were no better than Prosaro alone, and none of the *Bacillus*-alone treatments were different than the control. Similar trends were found for all other disease parameters in both experiments. Test weights were unchanged across treatments in both experiments.

**Impact:**

While biocontrol agents and biological-fungicide combinations have been shown to provide some control of scab and DON in previous experiments, this work conducted in Nebraska demonstrates that these benefits are not always achieved. Furthermore, by comparing three biocontrol agents using *Bacillus* bacteria, we demonstrate that different *Bacillus*-based biocontrol agents are similar in efficacy

**Project 2:** *The Targeting of Residues as a Management Strategy for FHB of Wheat and Barley.*

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

**2.**

Corn debris infested with *Fusarium graminearum* is the greatest source of inoculum for infection of wheat. The concept that treatment of corn debris by physical or chemical means may impact growth or sporulation of the scab fungus in corn debris, and thus affect scab and DON levels in wheat, was test in a field experiment conducted in southeastern Nebraska. Large (40'X300') plots were established in which one of these physical treatments were applied to corn residue in the fall: chopped, buried, and no treatment. In 40'X50' areas within the physical treatment plots, surface corn residue was treated in the fall with a biocontrol agent (*Trichoderma atroviride*), urea or acetic acid; or treated in the following spring with urea, the fungicide Prosaro, or water (as the control). The biocontrol agent was thought to be an antagonist against *Fusarium*, while urea and acetic acid were thought to provide nutrients for resident antagonists in the residue. A scab susceptible hard red winter wheat 2137 was planted into the experiment after the fall treatments; scab severity, incidence, and index were measured the following summer. Grain yields and DON levels were determined after harvest.

**3. 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 all three sections (repeat sections for each major accomplishment):**

**Accomplishment:**

Wheat seed yield was increased by spring treatment of corn residue with Prosaro, while the fungicide treatment and a fall residue treatment with urea reduced DON levels in harvested wheat seed compared to the control. While there was no significant chemical treatment affect for any of the in-field disease parameters, there was a trend for lower disease levels occurring in plots in which corn debris was treated with Prosaro compared to non-treated plots. Chopping or burial of residue had no affect on scab or DON, but chopping increased yield compared to no physical treatment.

**Impact:**

Results from this experiment corroborated our findings from 2007, that treating corn residue in the spring with Prosaro can result in reduced scab and DON in the wheat crop. While this treatment alone does not provide a high level of control, the strategy might be integrated with the use of scab resistant varieties and protectant fungicides applied to wheat heads. Furthermore, the effects shown with a fall application of urea suggests that non-fungicidal chemicals might also be effective. The strategy of using chemicals to inhibit *Fusarium* sporulation might be made more practical by selection of better materials and refinement of application methods.

**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.**

Non-peer reviewed article

Jochum, C.C., G.Y. Yuen, K.R. Ruden, B.H. Bleakley, J. Morgan, L. Osbourne, L.E. Sweets, S. Halley, and K. Kinzer. 2008. “2008 Results from the Standardized Uniform Evaluation of Biological Agents for the Control of Fusarium Head Blight on Wheat and Barley. In: Canty, S.M., E. Walton, A. Clark, D. Ellis, J. Mundell and D. Van Sanford (Eds.), Proceedings of the National Fusarium Head Blight Forum.; 2008 Dec 2-4; Indianapolis, IN. University of Kentucky. pp. 32-35.

Presentation

Yuen, G.Y. “Biological Control of Scab: How Close Are We to Reality?” Invited talk presented at the National Fusarium Head Blight Forum.; 2008 Dec 2-4; Indianapolis, IN.

**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.