

**U.S. Wheat and Barley Scab Initiative  
 FY01 Final Performance Report (approx. May 01 – April 02)  
 July 15, 2002**

**Cover Page**

<b>PI:</b>	<b>Gary C. Bergstrom</b>
<b>Institution:</b>	<b>Cornell University</b>
<b>Address:</b>	<b>Dept. of Plant Pathology Ithaca, NY 14853</b>
<b>Email:</b>	<b>gcb3@cornell.edu</b>
<b>Phone:</b>	<b>607-255-7849</b>
<b>Fax:</b>	<b>607-255-4471</b>
<b>Year:</b>	<b>FY2001 (approx. May 01 – April 02)</b>
<b>Grant Number:</b>	<b>59-0790-9-027</b>
<b>Grant Title:</b>	<b>Fusarium Head Blight Research</b>
<b>FY01 ARS Award Amount:</b>	<b>\$ 58,720</b>

**Project**

<b>Program Area</b>	<b>Project Title</b>	<b>Requested Amount</b>
Chem/Bio	Uniform fungicide trials to identify safe products that are effective against Fusarium Head Blight (New York State)	\$ 5,000
Chem/Bio	Enhancement of biological control in the integrated management of Fusarium Head Blight	\$ 54,320
	<b>Total Amount Requested</b>	<b>\$ 59,320</b>

\_\_\_\_ Gary C. Bergstrom \_\_\_\_\_ July 12, 2002 \_\_\_\_\_  
 Principal Investigator Date

**Project 1: Uniform fungicide trials to identify safe products that are effective against Fusarium Head Blight (New York State)**

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

At present, there are no means to adequately control the infection of wheat and barley by *Gibberella zeae* that are both highly effective and widely regarded as safe. The objective was to evaluate a uniform set of fungicide treatments across a number of locations and crops, to achieve more information on potentially useful fungicides and bioprotectants to control FHB. Background and description of the Uniform Fungicide Trial is provided in the Final Performance report by Marcia McMullen.

2. What were the most significant accomplishments?

We were able to evaluate synthetic foliar fungicides and microbial antagonists under a mild epidemic. Since there was no significant foliar disease during early grain development, it can be inferred that spray effects were directly attributable to Fusarium head blight suppression. The synthetic fungicide Folicur 3.6 F (4 fl oz/A) was the only treatment in which disease incidence was significantly lower at the 95% confidence level than the nontreated control. For all other parameters measured, there were no significant differences between treatments. This differs from the previous field season in 2000 in which significant differences were detected between treatments for Fusarium-damaged kernels, test weight and DON contamination of the harvested grain due to higher disease pressure. The most important potential effect of scab fungicides and microbial antagonists from a New York producer viewpoint is DON reduction. AMS 21619 at 5.7 fl oz/A was the only treatment which reduced DON contamination to below the grain market threshold of 2 ppm. This was followed by Folicur 3.6F at 4 fl oz treatment which had an average DON of 2 ppm.

## **Project 2: Enhancement of biological control in the integrated management of Fusarium Head Blight**

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

While examples of the modest success of biocontrol agents in reducing FHB support the position of biological control as a component in an integrative approach to scab control, microbial antagonists have often failed to perform as well as expected in field trials. This situation points to a real need to better understand the biology of these microbial antagonists and their interaction with the environment and with the fungal pathogen, *Gibberella. zea*. Therefore, the investigations of this project continue the progress already made in the evaluation of biological and bio-rational treatments for the control of *G.zea*. Most studies will focus on the elite spore-forming bacteria, the TrigoCor 1448 strain of *Bacillus subtilis*, which has a patent pending by the Cornell Research Foundation. The performance of TrigoCor 1448 was compared with other experimental and commercial biocontrol organisms under harsh field conditions. Candidate agents were evaluated for use as a heading time field spray, seed treatment, or residue treatment. Data provided by these trials are critical for development of new products and for registration requests.

### 2. What were the most significant accomplishments?

Field evaluations of 4 antagonists and a disease resistance inducer applied to soft white winter wheat (cv. Caledonia) took place at the Musgrave Research Farm at Aurora, NY. Antagonists included 2 isolates from the collaborative Cornell/ EMBRAPA-TRIGO (Brazil) biocontrol project, two commercial products, Serenade (AgraQuest, Davis, CA) and Messenger (Eden Bioscience, Bothell, WA), and the yeast biocontrol strain OH 182.9 from Boehm and Schisler. No bioprotectant significantly decreased FHB or DON but there were trends in the data. TrigoCor 1448 reduced DON content by 0.6 ppm from the non-treated control while the USDA/Peoria yeast lowered DON by 1.1 ppm. In a satellite bioprotectant trial, treatment differences were not significant yet plants treated with TrigoCor 1448 whole broth had the lowest level of DON contamination in the harvested grain, followed closely by the TrigoCor 1448-Reconstituted (washed cells). This represents a 1.08 and 0.96 ppm reduction in DON, respectively.

In 2001, TrigoCor 1448 was included as a core treatment in the National Uniform Fungicide/Biocontrol Trials where it was tested at 15 sites in 13 states. At 11 of these sites, TrigoCor 1448 reduced disease incidence. Reduction of contamination of the harvested grain with the mycotoxin deoxynivalenol (DON) is of critical importance in management of this disease. Under severe epidemics in AR and KY, TrigoCor 1448 reduced DON contamination by 33 and 39%, respectively.

*Debris treatment*- Lab assay. Acetic acid (5 and 2%) and propionic acid (5%) completely inhibited the formation of perithecia while treatment with more dilute concentrations of these acids only delayed perithecial development slightly or not at all.

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.

Publication (peer-reviewed)

Kawamoto, S.O., Stockwell, C.A., Bergstrom, G.C., Cox, W.J. and Otis, D. J. 2001. Evaluation of foliar fungicides and bioprotectants for control of Fusarium Head Blight of winter wheat in New York, 2001. Fungicide and Nematicide Tests Vol. 56.

Stockwell, Kawamoto. S.O. and C.A., Bergstrom, G.C. 2001. Evaluation of bioprotectants for the control of Fusarium head blight of winter wheat in New York, 2001. Biological and Cultural Tests Vol. 2002.

Publication (not peer-reviewed)

Stockwell, C.A., Bergstrom, G.C. and Luz, W.C. da, 2001. Biological control of Fusarium head blight with *Bacillus subtilis* TrigoCor 1448: 2001 field Results. Pages 91-95 in: Proc. 2000 National Fusarium Head Blight Forum, Holiday Inn Cincinnati- Airport, Erlanger, KY, December 8-10, 2001.

Stockwell, C.A., Bergstrom, G.C. and Luz, W.C. da, 2001. Identification of bioprotectants for control of *Gibberella zeae*. Pages 137-14 in: Canadian Workshop on Fusarium Head Blight. Ottawa Congress Centre, Ottawa, Ontario. November 3-5, 2001.

## **Presentations**

Presentations made by Gary C. Bergstrom on Fusarium head blight research and management:

- Small Grains Management Field Day, Aurora, NY. (6/7/01)
- Seed Growers Field Day, Ithaca, NY. (7/6/01)
- Canadian Workshop on Fusarium Head Blight, Ottawa, Canada. (11/4/01)
- Finger Lakes Soybean and Small Grains Congress, Waterloo, NY. (2/13/02).
- Western New York Soybean and Small Grains Congress, Batavia, NY. (2/14/02).
- Small Grains Seed Committee, Waterloo, NY. (3/28/02)