U.S. Wheat and Barley Scab Initiative
FY00 Final Performance Report (approx. May 00 – April 01)
July 30, 2001

Cover Page

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Year:	**FY2000 (approx. May 00 – April 01)**
Grant Number:	**59-0790-0-061**
Grant Title:	**Fusarium Head Blight Research**
2000 ARS Award Amount:	**$4,878**

Project

Program Area	Project Title	Requested Amount
Chemical & Biological Control	Management of FHB with biological control agents.	$9,000.00
	Requested Total	$9,000.00[1]

Principal Investigator Date

[1] Note: The Requested Total and the Award Amount are not equal.

Project 1: Management of FHB with biological control agents.

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

Fusarium head blight (FHB) can cause serious reductions in wheat yield in various regions of South Dakota and neighboring states. Besides use of resistant wheat varieties and/or of a few chemical fungicides, another means to combat FHB is use of biological control agents (BCAs) that can antagonize the pathogen. Several bacterial isolates from South Dakota wheat foliage and from other sources were known to antagonize the pathogen in laboratory assays, but their ability to reduce FHB symptoms on wheat in the greenhouse or in field plots was unclear. In the summer of 2000, we started a collaboration with Marty Draper at SDSU to evaluate the ability of selected BCAs to reduce FHB symptoms in field and greenhouse situations. A greenhouse study in a ground-bed was also conducted in spring of 2001 with Dr. Draper.

The identities of the BCAs isolated from South Dakota wheat residue were unclear, so plans were made to send them to one or more commercial facilities that specialize in microbial identification.

2. What were the most significant accomplishments?

In a field plot study in summer of 2000, two bacterial endospore-forming strains were applied to two spring wheat cultivars, Oxen and Ingot, in a disease nursery in Brookings, South Dakota. No Fusarium inoculum was added to the site, and no mist irrigation was used. Bacterial treatments were compared to an untreated control and a chemical control of Folicur. Due to particularly dry weather conditions, little FHB developed in the field plot, and there were no differences observed among most of the variables measured (including scab and leaf disease, yield, test weight, deoxynivalenol (DON), protein, and Fusarium damaged kernels (FDK). Such low FHB levels can make data analysis difficult. However, Folicur demonstrated significant reduction in leaf disease. Using a subjective whole plot disease rating scale of 0-5 where 0 was green and 5 was necrotic, Folicur received a 3.3 rating, whereas both BCAs resulted in a rating of 4; and whereas Folicur treatment resulted in 0.5 percent FDK, both BCAs resulted in 0.75 percent FDK. One or more BCAs might be comparable to Folicur if further trials are conducted, such as the ones with mist irrigation planned at several geographic sites in South Dakota for summer of 2001.

A greenhouse trial in a ground-bed was conducted in the spring of 2001, using some of the same BCAs as described above. However, results suggested that the pathogen inoculum density was higher than the BCAs could control, so no significant disease reduction by the BCAs was noted. However, Folicur treatment did result in noticeable control of FHB in the ground-bed trial.

Cultures of the four BCAs isolated from South Dakota wheat residue were sent to a company specializing in microbial identification. Partial 16S ribosomal RNA sequences will be obtained for each isolate, and the sequences will be compared to known 16S ribosomal RNA sequences to obtain more certain identification of these bacterial strains.

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.

Bleakley, B.H., Y. Luo, and N. Baye. 2000. Seed treatment with bacterial biocontrol agents to control head blight, abstract, p. 74. *In* 2000 National Fusarium Head Blight Forum, December 10-12, 2000. Cincinnati, OH.

Bleakley, B.H., M.A. Draper, and K.R. Ruden. 2000. Control of Fusarium head blight with biological antagonists, abstract, p. 75. *In* 2000 National Fusarium Head Blight Forum, December 10-12, 2000. Cincinnati, OH.

Draper, M.A., and K.R. Ruden. 2001. 2000 fungicide and pathology trials: field plot summaries. Plant Science Department, South Dakota State University, Brookings, SD.

Bleakley, B.H. 2001. Biological control of foliar and head diseases of wheat. AD-421 Progress Report (CRIS report).

Luo, Y. 2000. *Bacillus* strains as biological control agents of tan spot and Fusarium head blight of wheat. MS thesis, South Dakota State University, Brookings, SD.