

**U.S. Wheat and Barley Scab Initiative  
Annual Progress Report  
September 18, 2000**

**Cover Page**

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<b>Year:</b>	<b>FY2000</b>
<b>Grant Number:</b>	
<b>Grant Title:</b>	<b>Fusarium Head Blight Research</b>
<b>Amount Granted:</b>	<b>\$40,000.00</b>

**Project**

<b>Program Area</b>	<b>Objective</b>	<b>Requested Amount</b>
Chemical & Biological Control	Identify other fungal antagonists, such as bacteria, that may be effective in controlling FHB when used as a heading time field spray, seed treatment, or residue treatment. Also, to examine other residue treatments that might interfere with perithecial development or spore release.	\$116,200
	<b>Requested Total</b>	\$116,200 <sup>1</sup>

\_\_\_\_\_  
Principal Investigator

\_\_\_\_\_  
Date

<sup>1</sup> Note: The Requested Total and the Amount Granted are not equal.

**Project 1: Identify other fungal antagonists, such as bacteria, that may be effective in controlling FHB when used as a heading time field spray, seed treatment, or residue treatment. Also, to examine other residue treatments that might interfere with perithecial development or spore release.**

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

The proposed research is part of an ongoing investigation on the use of naturally occurring biological control agents to reduce the severity of Fusarium head blight (FHB) in wheat and barley. Our goal is to develop key strategies and microorganisms that may ultimately play a vital role in the integrated management of FHB. The primary goals of this research are to optimize liquid culture fermentation conditions to maximize biocontrol agent activity and to subsequently evaluate the efficacy of biocontrol agents produced using the aforementioned liquid culture techniques in greenhouse bioassays and field tests in sites located in North Dakota, Illinois and Ohio. To accomplish these objectives, seven highly efficacious FHB biocontrol strains representing yeasts and *Bacillus* species were selected for media optimization studies. Development of a defined medium was determined to allow for nutritional control over metabolite accumulation. Medium composition factors such as carbon and nitrogen sources and C:N ratios were evaluated along with pH and O<sub>2</sub> effects. Biomass produced in media capable of promoting superior cell accumulation was tested for biocontrol efficacy in both greenhouse bioassays and field trials located in Peoria, IL, Wooster, OH, and Langdon, ND.

**2. Please provide a comparison of the actual accomplishments with the objectives established.**

Both of the stated objectives were successfully accomplished. In addition, the effects of storage on biocontrol agent efficacy was evaluated to determine what influence transportation of biomass produced in Peoria, IL to field sites in Wooster, OH and Langdon, ND might have on antagonist performance. Survival and efficacy of two antagonists stored as fully colonized broth at 4 C for 8 d was comparable to freshly produced cells.

**3. What were the reasons established objectives were not met? If applicable.**

NA

**4. What were the most significant accomplishments this past year?**

A liquid culture nutrient medium was developed that produced antagonist biomass with enhanced efficacy when tested on durum wheat in both greenhouse and field efficacy trials. All 7 antagonists evaluated for biocontrol efficacy in 1998 and 1999 were screened in 2000 at Peoria, IL, Wooster, OH and Langdon, ND. All 7 biocontrol strains

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effectively reduced FHB severity on the winter wheat cultivar Pioneer 2545 (Peoria, IL and Wooster, OH) as compared to the buffer controls. FHB severity was reduced by as much as 65% (yeast OH 71.4). On tests on the more resistant winter wheat cultivar Freedom, disease severity was less than 1% in Peoria and no significant reduction was seen at Wooster. Preliminary results from the Langdon, ND site indicate that 2 of 6 antagonists reduced FHB severity compared to the noninoculated control on variety Russ, whereas 5 of the 6 antagonists reduced FHB severity on variety Grandin. Disease severity on variety Grandin was reduced by as much as 50% (yeast antagonist OH181.1).

**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.**

Schisler, D.A., Khan, N.I., and Boehm, M.J. 2000. Reduction of Fusarium head blight disease severity and deoxynivalenol levels in grain via application of choline metabolizing antagonists at wheat flowering. Proceedings of the American Chemical Society 220<sup>th</sup> National Meeting, Washington DC., #46.

Khan, N.I., Schisler, D.A., Boehm, M.J., Slininger, P.J., and Bothast, R.J. 2000. Choline utilization, a method for screening organisms for biocontrol of fusarium head blight of wheat incited by *Gibberella zeae*. Plant Dis. 84:(ACCEPTED, *IN PRESS*)

Khan, N.I., Schisler, D.A., Boehm, M.J., and Lipps, P.E. 2000. Biocontrol of Fusarium head blight (FHB) of wheat; influence of spray order of pathogen and antagonist inoculum, and field evaluation of antagonists. Phytopathology 90:S42.

Schisler, D.A., Khan, N.I., and Boehm, M.J. 2000. Application of naturally occurring yeasts and bacteria to reduce the severity of Fusarium head blight. Proceedings of the 3<sup>rd</sup> Annual National Wheat Industry Research Forum, pg 37.

MacNeil, J.S. 2000. Hungry fungi blight less wheat. ScienceNOW 823:3, (<http://sciencenow.sciencemag.org> - Verified September 17, 2000).