

**U.S. Wheat and Barley Scab Initiative  
Annual Progress Report  
September 15, 1999**

**Cover Page**

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<b>Year:</b>	<b>FY1999</b>

**Project**

<b>Program Area</b>	<b>Objective</b>	<b>Requested Amount</b>
Chemical & Biological Control	Conduct second year field testing of microbial strains identified as being suppressive to scab and evaluate liquid culture growth kinetics of successful antagonists	\$24,000
	<b>Requested Total</b>	\$24,000 <sup>1</sup>

\_\_\_\_\_  
Principle Investigator

\_\_\_\_\_  
Date

\_\_\_\_\_  
David A. Schisler, Collaborator

\_\_\_\_\_  
Date

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

**Project 1: Conduct second year field testing of microbial strains identified as being suppressive to scab and evaluate liquid culture growth kinetics of successful antagonists.**

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

Fusarium head blight (FHB) can reach epidemic levels in causing extensive damage to wheat and barley in humid and semihumid wheat growing areas of the world. Control measures available for combating this disease are limited. In work funded by this research initiative, we are resolving this shortage of control measures for FHB by discovering, evaluating and optimizing the production and deployment environment of microbial antagonists so as to ultimately produce a maximally effective, environmentally acceptable biocontrol tool for use against FHB

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

We achieved results beyond those formally proposed as objectives for our funded research. As a prelude to 1999 field trials conducted as proposed for Peoria, IL and Wooster, OH, we conducted multiple greenhouse assays that demonstrated that our biocontrol agents were essentially equally effective when applied immediately prior to or immediately after conidial inoculum of *Fusarium graminearum*. When biocontrol agent inoculum was applied 4 h after pathogen inoculum, significant FHB disease control resulted most frequently when using antagonists at 50% of full culture broth concentrations as opposed to 10% antagonist broth. As per established objectives, two concentrations (10 and 50% of fully colonized culture broths) of a total of 7 antagonists were field tested on wheat cultivars Pioneer 2545 and Freedom at the Wooster, OH and Peoria, IL sites. Additional greenhouse testing described above delayed a portion of the liquid culture growth kinetic evaluation of top biocontrol performers. Maximal optical densities of most antagonist strains were determined to range from 7.5-9.5 OD<sub>620nm</sub>, acceptable concentrations on a commercially realistic liquid culture medium. Studies of the liquid culture growth kinetics of top antagonists will be completed by the end of October 1999.

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

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

Media and methodology for producing 5L quantities of the antagonists at high OD<sub>620nm</sub> concentrations were developed. Despite unfavorable weather conditions in Peoria and Wooster for FHB disease development, five of the seven antagonists reduced FHB disease severity and/or incidence on Pioneer 2545 at one or both of the concentrations assayed at both locations. At Peoria, the 10% rate of bacterial antagonist AS 43.4 reduced disease severity by 80% and disease incidence by 52%. On cultivar 'Freedom', all seven antagonists reduced FHB disease at one or both of the concentrations tested in Peoria and three of seven were effective in Wooster. Especially on cultivar 'Freedom', higher yeast cell concentrations tended to provide increased levels of FHB disease reduction. With these and other studies, we have demonstrated the feasibility of effectively reducing FHB under field conditions on several different varieties of wheat at two distinct geographic areas using microbial biomass produced in a commercially realistic liquid culture broth. Greenhouse results suggesting that FHB disease could be reduced even when antagonists were applied prior to flowering were confirmed at the Wooster Ohio site where antagonists were applied 3 days before wheat flowering.

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.

Scientific/Peer-Reviewed Publications from work conducted under the FY1999 grant:

KHAN, N.I., SCHISLER, D.A., BOEHM, M.J., SLININGER, P.J. and McCORMICK, S.P. 1999. Performance of selected antagonists of Fusarium head blight against a range of *Gibberella zeae* isolates. *Phytopathology* 89:S39.

SCHISLER, D.A., KHAN, N.I., BOEHM, M.J., LIPPS, P.E. and SLININGER, P.J. 1999. Selection and evaluation of microbial antagonists active against *Gibberella zeae*, a causal agent of Fusarium head blight of wheat. *Proceedings of the 99<sup>th</sup> General Meeting of the American Society of Microbiology*, pg 575.

Non-peer reviewed articles written about work conducted under the FY1999 grant:

“Fighting Fusarium”, *Agricultural Research*, USDA-ARS, June 1999, pgs 18-21.

Scientific/Peer-reviewed publications during the time period of the FY1999 grant:

KHAN, N.I., SCHISLER, D.A., BOEHM, M.J., LIPPS, P.E., SLININGER, P.J. and BOTHAST R.J. 1998. Biological control of scab of wheat incited by *Gibberella zeae*. *Proceedings of the 1998 National Fusarium Head Blight Forum*, Michigan State University, East Lansing, MI, pgs 45-46.

Non-peer reviewed articles during the time period of the FY1999 grant:

“Scientists finding answer to crop infection”, *Journal Star* Newspaper, Peoria, IL, November 29, 1998.

“Dakota Growers teams with researcher to develop natural scab fighters”, *North Dakota Agribeat*, John MacDonald, Associated Press, April 28, 1999.