

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

Cover Page

PI:	Brian Steffenson
Institution:	University of Minnesota
Address:	Department of Plant Pathology 495 Borlaug Hall/1991 Upper Buford Circle St. Paul, MN 55108
Email:	bsteffen@umn.edu
Phone:	612-625-4735
Fax:	612-625-9728
Year:	FY2000 (approx. May 00 – April 01)
Grant Number:	59-0790-9-067
Grant Title:	Fusarium Head Blight Research
2000 ARS Award Amount:	\$91,922

Project

Program Area	Project Title	Requested Amount
Epidemiology & Disease Management	Investigate the FHB host resistance genes in barley.	\$37,960.00
Germplasm Introduction & Enhancement	Evaluation of barley germplasm for resistance to FHB.	\$56,220.00
	Requested Total	\$94,180.00¹

Principal Investigator

Date

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

Project 1: Investigate the FHB host resistance genes in barley.

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

Part A. FHB threatens the existence of the barley industry in the Upper Midwest. Deployment of resistant cultivars is the most effective and environmentally sound means of managing this disease. Sources of resistance to *Fusarium graminearum* and its toxin have been identified in barley; however, very little is known about the reaction of these resistance sources to other *Fusarium* species (*F. poae*, *F. avenaceum*, *F. sporotrichioides*, and *F. culmorum*) causing FHB on barley in the Midwest. To effectively manage FHB using host resistance, it is important that cultivars be bred with broad-based resistance against all potential FHB pathogens. Therefore, one of the objectives of this research was to evaluate *F. graminearum* resistant barley genotypes with the four other *Fusarium* species.

Part B. In assessing the resistance of barley to FHB, researchers use either conidia of *F. graminearum* or ascospores of the perfect stage *G. zeae* for inoculum. An important factor to consider in the choice of inoculum for these tests is whether the relative infectivity of conidia and ascospores is similar. Thus, the objective of this study was to assess the relative infectivity of *F. graminearum* conidia and *G. zeae* ascospores on susceptible barley genotypes under field and greenhouse conditions.

2. What were the most significant accomplishments?

Part A. We evaluated the FHB reaction of the resistance sources Chevron, CIho 4196, Zhedar 1, Imperial, and Svanhals to five species of *Fusarium* (*F. graminearum*, *F. poae*, *F. avenaceum*, *F. sporotrichioides*, and *F. culmorum*) in the greenhouse and field. Chevron exhibited the highest level of resistance against all five *Fusarium* species, followed by the two-rowed accessions of Zhedar 1, CIho 4196, and Svanhals, listed in descending order of resistance level. Imperial was relatively susceptible to *F. culmorum*, *F. avenaceum*, and *F. graminearum*, especially under greenhouse conditions. Thus, the six-rowed accession Chevron and the two-rowed accessions Zhedar 1 and CIho 4196 possess broad-based resistance against all five *Fusarium* species causing FHB in barley fields in the Upper Midwest region.

Part B. No statistically significant differences were detected in the infectivity of conidia and ascospores on barley accessions Stander (six-rowed) and CIho 5415 (two-rowed) in greenhouse and field trials. Thus, the choice of spore type for inoculation may depend largely on the ease by which individual researchers can produce them. Moreover, this study suggests that relative comparisons can be made between experiments utilizing the different spore types for inoculum.

Project 2: Evaluation of barley germplasm for resistance to FHB.

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

In general, six-rowed barleys are more susceptible to FHB than two-rowed barleys. Unfortunately, six-rowed barley cultivars are the preferred type for malting in the Upper Midwest. Currently, the only six-rowed source of FHB resistance available is Chevron, a Swiss landrace with poor agronomic and malting traits. Additional six-rowed sources of resistance are needed to increase the genetic diversity for this trait in malting barley. Thus, the objective of this study was to evaluate the FHB reaction of the entire six-rowed spring barley collection of the USDA National Small Grains Collection (NSGC). These evaluations were conducted in 1999 and 2000.

2. What were the most significant accomplishments?

The FHB resistance of seven previously selected six-rowed accessions (CIho 2236, CIho 4095, CIho 4530, CIho 6610, CIho 6613, CIho 9114, and CIho 11526) from the 1999 NSGC screening was confirmed in additional greenhouse (North Dakota) and field (Fargo and Langdon, North Dakota and Hangzhou, China) inoculation tests. These accessions originate from the USA, Georgia, China, and Yugoslavia and will markedly increase the level of genetic diversity for FHB resistance in six-rowed barley breeding programs. The resistance level in five other accessions (CIho 4339 CIho 5809, CIho 6611, CIho 7163, and CIho 15258) selected in 1999 was found to be inadequate for use in the breeding programs based on the additional FHB evaluations.

Fifteen barley accessions exhibiting a resistance level similar to Chevron (<20% FHB severity) were identified in FHB nurseries planted in North Dakota in 2000. These accessions originated from Ethiopia (8 accessions), Romania (1), Switzerland (3), Finland (1), Canada (1), Peru (1) and China (1).

Year: 2000

Progress Report

PI: Brian Steffenson

Grant: 59-0790-9-067

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.

Scholz, U., Steffenson, B., Urrea, C. and Horsley, R. 1999. Evaluation of six-rowed spring barley accessions for resistance to Fusarium Head Blight. Pages 137-139, in: Proceedings, National Fusarium Head Blight Forum. December 5-7, 1999, Sioux Falls, SD, USA.

Scholz, U. and Steffenson, B. 2000. Screening for Fusarium Head Blight resistance in barley. Pages: 90-91, in Proceedings, 6th European Fusarium Seminar. September 11-17, 2000, Berlin, Germany.

Scholz, U. and Steffenson, B. 2000. Evaluation of Six-Rowed Spring Barley for Resistance to Fusarium Head Blight. Poster presentation made to the National Fusarium Head Blight Forum. December 10-12, 2000. Erlanger, KY.