

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

Cover Page

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Year:	FY1999
Grant Number:	59-0790-9-043
Grant Title:	Fusarium Head Blight Research
Amount Granted:	\$78,049.00

Project

Program Area	Objective	Requested Amount
Variety Development	Accelerate development of resistant varieties.	\$70,000
Variety Development	To screen varieties for scab resistance in a uniform nursery.	\$10,000
	Requested Total	\$80,000¹

Principle Investigator

Date

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

Project 1: Accelerate development of resistant varieties.

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

Fusarium head blight (FHB), primarily incited by *Fusarium graminearum*, adversely affected the quality of barley grown in eastern North Dakota and northwestern Minnesota the last seven years. Quality of harvested grain was reduced because of blighted kernels and the presence of deoxynivalenol (DON), a mycotoxin produced by the pathogen. Seeding resistant cultivars is the only promising method of controlling FHB in barley because cultural and chemical controls of FHB have been unsuccessful. Introduced barley cultivars grown in field nurseries in China and North Dakota from 1994 to 1997 were identified with putative FHB resistance. My breeding program is incorporating FHB resistance from several of these sources into elite malting barley germplasm. Production of doubled-haploid (DH) lines and molecular marker assisted selection are being used to accelerate development of FHB resistant cultivars.

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

The objective of this project is to develop six-rowed malting barley cultivars resistant to FHB that are acceptable to producers in North Dakota and adjacent states, and acceptable to those who use and process barley. Research conducted this year was in accordance with our stated objectives. No cultivars were released this year that are resistant or tolerant to FHB.

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

Development of new cultivars takes 10-12 years and materials from the breeding program are in all stages of development. We have been breeding for FHB resistance since 1993; thus, a new cultivar would not be expected until 2003 at the earliest. We are using DH breeding for crosses we feel have the greatest potential to produce a resistant cultivar. Use of DH breeding may reduce the length of time needed to develop new cultivars by as much as three years.

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

We had materials from the F₁ generation to yield trials grown at our Osnabrock, ND research site. Research conducted at this location use to be conducted at our Langdon location. We changed sites because of poor field uniformity at Langdon and to add an additional mist-irrigated nursery in northeastern ND. Entries in our Preliminary, Intermediate, Advanced, and Varietal Yield Trials were identified that had 50% less FHB than currently grown cultivars. These entries will be evaluated for malting quality this winter by the USDA-ARS Cereal Crops Research Unit in Madison, WI and for DON content by the Department of Cereal Sciences at NDSU. The source of the lower FHB severity levels in these lines does not trace back to Asian or northern European accessions. Six-rowed lines with resistance tracing back to two-rowed Chinese accessions were grown in F₃ head rows this

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summer. Resistance in the most resistant lines was similar to the two-rowed resistant parent. In past years, we have not been able to identify lines with FHB resistance similar to the most resistant two-rowed accessions.

Project 2: To screen varieties for scab resistance in a uniform nursery.

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

Regional nurseries for many crops have existed for decades. These nurseries provide data on advanced lines from areas other than where they were developed and foster germplasm exchange. Advanced barley lines with putative FHB resistance and new sources of FHB resistance need to be evaluated in the region where FHB is affecting the crop. Mist-irrigated nurseries that are inoculated with *Fusarium graminearum* are needed so data can be collected even in years when environmental conditions are not conducive for natural infection. A mist irrigated uniform FHB screening nursery, called the MinnDak nursery, has been grown at two sites in Minnesota and two sites in North Dakota the past four growing seasons. This nursery includes breeding lines with putative FHB resistance from four upper Midwest barley breeding programs. Between 30-50 entries have been grown in the nursery each of the past four years. FHB severity and DON accumulation are determined for each entry, and each entry is replicated at least twice per location.

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

The objective of this project is to coordinate the screening of elite barley germplasm from breeding programs developing cultivars adapted to the upper Midwest barley growing region in uniform screening nurseries in Minnesota and North Dakota. Research conducted this year was in accordance with the stated objective.

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

Not Applicable

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

About 28 entries were included in this years MinnDak nursery. Entries were grown in irrigated nurseries at St. Paul and Crookston, MN, and Fargo and Langdon, ND. DON data will be collected this fall on entries grown in all nurseries. A final report that includes results from all nursery locations will be completed once DON data are available.

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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.

Publications:

Horsley, R.D. 1999. Meeting the needs of the producer and end-user through plant breeding. p. 64-69. *In* M. Davis (ed.) Proc. 32nd Barley Improvement Conference, New Orleans, LA. 6-8 Jan 1999. American Malting Barley Association, Inc., Milwaukee, WI.

Presentations:

Meeting the needs of the producer and end-user through plant breeding. Invited presentation at the 32nd Barley Improvement Conference, New Orleans, LA. 7 January 1999.

Update on the North Dakota Barley Improvement Program. Invited presentation to the North Dakota Barley Council County representatives at their annual summer meeting, Dickinson, ND. 9 July 1999.

Update on the North Dakota Malting Barley Improvement Program. Invited presentation to members of the American Malting Barley Association, Inc. at their annual tour of the upper Midwest barley growing region, Osabrock, ND. 4 August 1999.