

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

Cover Page

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Year:	FY2000
Grant Number:	59-0790-9-034
Grant Title:	Fusarium Head Blight Research
Amount Granted:	\$65,000.00

Project

Program Area	Objective	Requested Amount
Variety Development & Uniform Nurseries	Enhance resistance to Fusarium in 2-row barley.	\$65,000.00
	Requested Total	\$65,000.00

Principal Investigator

Date

Project 1: Enhance resistance to Fusarium in 2-row barley.

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

Development of two-rowed malting barley (*Hordeum vulgare*) cultivars suitable for production in the Upper Midwest and with resistance to Fusarium head blight (FHB), incited primarily by *Fusarium graminearum*, is major goal of this research effort. Since this requires years of barley breeding, intermediate goals include: 1) identifying FHB resistant lines in progeny from crosses to FHB resistant accessions, 2) placing the FHB genes in locally adapted breeding material by crossing to the resistant lines and selection of better lines from their progenies, and 3) accumulating FHB resistance genes in a male-sterile facilitated recurrent population. Adapted cultivars and breeding lines were crossed to accessions previously identified as partially resistant to FHB. Selections were made in the F₃ to F₅ generations and were planted in FHB screening nurseries at Hangzhou, China and Osnabrock, North Dakota (ND). Selections from the regular breeding program were also tested for FHB response because two-rowed barley cultivars have some resistance to FHB. The best selections were tested in ND for agronomic performance, reactions to other barley diseases, and malting quality parameters.

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

Many breeding lines with moderate levels of FHB resistance were identified, but few lines had high levels of resistance. Agronomic trials and disease reaction tests revealed that none of the FHB resistant lines were suitable for commercial production in ND. This was anticipated because the donor accessions are not adapted to ND. Another cycle of crossing and selection should improve the situation. Seedling tests of greenhouse reactions to spot blotch (*Bipolaris sorokiniana*) and net blotch (*Pyrenophora teres*) were conducted, and seed lots of the best lines were submitted for malt quality tests. Notes on reactions to septoria leaf blotch (*Septoria passerinii*), barley yellow dwarf virus (BYDV), leaf rust (*Puccinia hordei*), and powdery mildew (*Erysiphe graminis*) were taken as natural disease development permitted. The results should help identify parents for next cycle of crosses.

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

Greater than expected genetic differences were found between donor accessions and elite breeding materials. Since the barley genome has a $2n = 14$ complement of chromosomes, some linkage problems were anticipated as genes are moved into a different genetic background. However, genetic control of plant height and maturity in barley is very complex and several of these genes are closely linked in repulsion to FHB resistance genes. Recombinants between the linkage genes must be found or alternative genetic systems for matching plant height and maturity with environment conditions must be generated.

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

The two-rowed cultivar Conlon, which was previously shown to have a moderate level of FHB resistance, was recommended by the American Malting Barley Association, Inc. (AMBA) as a

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Progress Report

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malting barley for the Upper Midwest. Several breeding lines with more resistance to FHB were isolated. The expression patterns of genes controlling plant height and maturity in FHB resistant barley accessions were better defined in several environments.

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.

Horsley, R.D., and J.D. Franckowiak. 1998. Development of scab tolerant barley varieties at North Dakota State University. p. 25-30. *In* M. Davis (ed.) Proc. Red River Barley Day, Grand Forks, ND 8 Jan 1998. American Malting Barley Association, Inc., Milwaukee, WI.