U.S. Wheat and Barley Scab Initiative
FY01 Final Performance Report (approx. May 01 – April 02)
July 15, 2002

Cover Page

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Year:	**FY2001 (approx. May 01 – April 02)**
Grant Number:	**59-0790-9-034**
Grant Title:	**Fusarium Head Blight Research**
FY01 ARS Award Amount:	**$ 70,186**

Project

Program Area	Project Title	Requested Amount
Variety/Uniform	Enhanced Resistance to Fusarium in Two-Rowed Barley	$ 73,500
	Total Amount Requested	**$ 73,500**

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Principal Investigator Date

(Form – FPR01)

Project 1: Enhanced Resistance to Fusarium in Two-Rowed Barley

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

This research is designed to incorporate better resistance to Fusarium head blight (FHB), incited primarily by *Fusarium graminearum*, into two-rowed spring malting barley (*Hordeum vulgare*) cultivars being developed for the Upper Midwest. Years of research are required to achieve this goal; thus, intermediate goals include: 1) identifying FHB resistant selections from crosses to FHB resistant accessions, 2) improving FHB resistance in locally adapted cultivars by crossing elite lines to FHB resistant selections, 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 F_3 and F_4 generations and were evaluated in FHB screening nurseries near Hangzhou, China and Osnabrock, North Dakota (ND). Entries 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 malt quality parameters.

Few lines resulting from the initial breeding effort had improved FHB resistance and none are promising as new cultivars because they are taller and later than recommended two-rowed cultivars. Since these agronomic deficiencies are likely caused by linkages, more crosses to FHB resistant cultivars from China were made. Linkage distances for morphological marker genes in centromeric region of chromosome 2H are being estimated. Crosses were made to identify genes controlling plant height and maturity in Chinese cultivars and ICARDA/CIMMYT lines having some FHB resistance. Additional FHB tests of Chinese and Japanese barley cultivars were conducted to identify better sources of FHB resistance.

2. What were the most significant accomplishments?

In May 2000, the two-rowed cultivar Conlon was recommended for malting in North Dakota. Samples of 2001 crop from growers' fields showed that Conlon had much lower deoxynivalenol (DON) levels than other barley cultivars. Chinese barley cultivars with lower FHB readings than those currently used in previous crosses were identified. Most recently developed Chinese and Japanese barley cultivars having some FHB resistance also have an early maturity gene (*eam9*) for early heading and reduced plant height under short-day conditions. Allelism tests showed that the *eam9* gene is present also in cultivars from the ICARDA/CIMMYT barley improvement program in Mexico. The *eam9* gene is ineffective under long-day conditions except when the semidwarf 1 (*sdw1*) gene is present. Since *eam9* is located in chromosome 4H, using it to replace the *hcm1* (short culm 1) and *Eam6* genes in chromosome 2H may be possible. Bowman backcross-derived lines were used to demonstrate that linkage, not spike type genes, likely causes the association between six-rowed spikes and FHB susceptibility. The line with the elongated outer glume (*eog*) gene had lower FHB scores other lines. The maturity-c (*mat-c*) locus was located near the centromere in chromosome 2H and proved useful in identifying recombinants near the six-rowed spike 1 *(vrs1*) locus. Recurrent selection for FHB resistance in a male-sterile facilitated population for two-rowed barley was discontinued after three cycles.

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.

Franckowiak, J.D. 2001. Accumulating genes for disease resistance in two-rowed barley for North Dakota. p. 39-46. *In* H.E. Vivar and A. McNab (eds.). Breeding Barley in the New Millennium: Proceedings of an International Symposium. CIMMYT, Mexico, D.F.

Franckowiak, J.D. 2001. Coordinator's report: Chromosome 2H (2). Barley Genet. Newsl. 31: http://wheat.pw.usda.gov/ggpages/bgn/31/ul1txt.htm#2H.

Franckowiak, J.D. 2001. Coordinator's report: Semidwarf genes. Barley Genet. Newsl. 31: http://wheat.pw.usda.gov/ggpages/bgn/31/ul1txt.htm#semidwarf.

Franckowiak, J.D., and R.D. Horsley. 2001. Development of scab resistant barley varieties for North Dakota. p. 14-20. *In* Proc. 33rd. Barley Improvement Conference. American Malting Barley Assoc., Milwaukee, WI.