USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY05 Final Performance Report (approx. May 05 – April 06)
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Cover Page

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Fiscal Year:	**2005**
FY05 ARS Agreement ID:	**59-0790-4-099**
Agreement Title:	**Enhanced Resistance to Fusarium in Two-Rowed Barley.**
FY05 ARS Award Amount:	**$ 78,169**

USWBSI Individual Project(s)

USWBSI Research Area*	Project Title	ARS Adjusted Award Amount
VDUN	Enhanced Resistance to Fusarium in Two-Rowed Barley.	$ 78,169
	Total Award Amount	**$ 78,169**

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Principal Investigator Date

* BIO – Biotechnology
CBC – Chemical & Biological Control
EDM – Epidemiology & Disease Management
FSTU – Food Safety, Toxicology, & Utilization
GIE – Germplasm Introduction & Enhancement
VDUN – Variety Development & Uniform Nurseries

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?

The research focused on improved resistance to Fusarium head blight (FHB), incited primarily by *Fusarium graminearum*, in two-rowed spring malting barley (*Hordeum vulgare*) for the Upper Midwest. Malting barley growers and their consumers need cultivars in which the toxin deoxynivalenol (DON) does not accumulated or is very low. Many years of breeding are required to develop such cultivars; thus, intermediate goals were developed as follows: 1) to identify good selections from crosses to FHB resistant accessions, 2) to accumulate FHB resistance by crossing good lines and selecting superior lines from their progenies, and 3) to study genetic mechanisms that contribute to higher levels of FHB resistance. Accessions previously identified as partially resistant to FHB were crossed again to elite breeding lines. Their F_5 lines were evaluated in FHB screening nurseries near Hangzhou, China and Osnabrock, North Dakota (ND). The inheritance of genes for FHB reaction, DON accumulation, maturity, and plant height were studied in segregating progenies to better understand how to make progress in developing two-rowed barleys with better FHB resistance.

2. List the most important accomplishment and its impact (how is it being used?). Complete all three sections (repeat sections for each major accomplishment):

Accomplishment: A study of the Harrington/Morex mapping population confirmed that FHB resistance is associated with specific regions of chromosomes 2HL and 4HS from Harrington. In a study of the ZAU 7/ND16092 RIL population in which both parents were two-rowed cultivars, resistance to FHB was conferred primarily by a QTL in the terminal portion of chromosome 2HL. Several genes for plant height and maturity in Chinese barley cultivars were mapped. The chromosomal regions of Morex where factors for FHB susceptibility were observed contain the *vrs1* and *Int-c* genes, which control the six-rowed spike type of Morex. Breeding lines with better FHB resistance were identified in the nursery at Hangzhou, China; however, not all of these lines are tall and late. One line with moderate resistance, ND24510, had the compact spike trait, which was found to be associated with FHB susceptibility in the ZAU 7/ND16092 population.

Impact: The positions of the gene conferring FHB resistance in two-rowed barley should not greatly restrict the development of FHB resistant cultivars. Recombinants with desirable agronomic traits, early heading and short stature, and FHB resistance were identified and have potential as new cultivars. The recovery of a breeding line with a compact spike and FHB resistance means that FHB resistance better can be combined with lodging resistance.

As a result of that accomplishment, what does your particular clientele, the scientific community, and agriculture as a whole have now that they didn't have before?:
A clearer picture of genetic resistance to FHB has emerged. The genetic resources available for breeding FHB resistant two-rowed barley have been expanded. A few lines with potential as FHB resistant cultivars have been identified.

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. 2005. Coordinator's report: Chromosome 2H (2). Barley Genet. Newsl. 35:109-111.

Franckowiak, J.D. 2005. Coordinator's report: Semidwarf genes. Barley Genet. Newsl. 35:142-143.

Horsley, R.D., D. Schmierer, C. Maier, D. Kudrna, C.A. Urrea, B.J. Steffenson, P.B. Schwarz, J.D. Franckowiak, M.J. Green, B. Zhang, and A. Kleinhofs. 2006. Identification of QTLs associated with Fusarium head blight resistance in barley accession CIho 4196. Crop Sci. 46:145-156.

Krasheninnik, N.N. 2005. Genetic association of Fusarium head blight resistance and morphological traits in barley. Ph.D. Thesis. North Dakota State University, Fargo, ND.

Yu, G., and J.D. Franckowiak. 2005. Mapping of quantitative trait loci for Fusarium head blight resistance in two-rowed barley. p. 95 *In* S.M. Canty et al. (eds.) Proc. 2005 National Fusarium Head Blight Forum; 2005 Dec. 11-13; Milwaukee, WI; Michigan State University, East Lansing MI.