

**USDA-ARS / USWBSI
FY04 Final Performance Report
July 15, 2005**

Cover Page

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| Year: | FY2004 (approx. May 04 – April 05) |
| FY04 ARS Agreement ID: | 59-0790-4-099 |
| FY04 ARS Agreement Title: | Enhanced Resistance to Fusarium in Two-Rowed Barley. |
| FY04 ARS Award Amount: | \$ 72,443 |

USWBSI Individual Project(s)

| USWBSI Research Area* | Project Title | ARS Adjusted Award Amount |
|--------------------------------------|--|--------------------------------------|
| VDUN | Enhanced Resistance to Fusarium in Two-rowed Barley. | \$ 72,443 |
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| | Total ARS Award Amount | \$ 72,443 |

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?

This research focuses on improved resistance to Fusarium head blight (FHB), incited primarily by *Fusarium graminearum*, in two-rowed spring malting barley (*Hordeum vulgare*) cultivars for the Upper Midwest. Cultivars must accumulate little or no deoxynivalenol (DON) to be accepted by consumers. Since many years of breeding are necessary to develop such cultivars, intermediate goals include: 1) identifying good selections from crosses to FHB resistant accessions, 2) improving FHB resistance in locally adapted cultivars by crossing among elite lines, and 3) studying genetic mechanisms that retard incorporation of FHB resistance into locally adapted cultivars. Accessions previously identified as partially resistant to FHB were crossed again to elite breeding lines. The F₅ lines from these crosses were evaluated in FHB screening nurseries near Hangzhou, China and Osnabrock, North Dakota (ND). Advanced lines with low grain protein, good agronomic traits, and low FHB reactions are identified and crossed again to elite breeding lines. Only a few lines showing low FHB infection were recovered, and most are tall and late. The inheritance of FHB reaction and genes for maturity and plant height were studied in several segregating progenies to better understand why progress in developing two-rowed barleys with better FHB has been slow.

2. Most important accomplishment and its impact (how is it being used?):

Accomplishment:

Malting barley growers in ND and their consumers want barley cultivars that have low levels of FHB and accumulate little or no DON toxin. Sources of FHB resistance from East Asia are being used to improve FHB resistance in locally adapted, two-rowed spring malting barley cultivars. Because the inheritance of FHB resistance is complex, better techniques for combining FHB resistance with desirable agronomic and malt quality traits are being developed. Studies on the early-maturing East Asia barleys have identified additional genetic factors for FHB resistance. Evaluation of the Harrington-Morex doubled haploid lines indicates that chromosome 2HL contains plant height and earliness genes that are linked in repulsion to QTL for FHB resistance. The East Asian lines are available to other barley breeders and are being used in the two-rowed barley program. A few advanced lines with low grain protein, good agronomic traits, and low FHB reactions have been identified based on FHB nursery data and DON tests.

Impact:

The two-rowed malting cultivar Conlon, released in 1996, continued to show low DON accumulation values compared to other barley cultivars recommended for production in ND. Lower DON levels are also present in a few high yielding two-rowed lines that are being evaluated for malt quality. Short-day genes aid in breeding FHB resistant, short stature lines.

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?:

New sources of FHB resistance have been identified in barley. Better FHB resistance is present in barley lines being evaluated in preliminary tests.

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 your 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. 2004. Coordinator's report: Chromosome 2H. Barley Genet. Newsl. 34:
http://wheat.pw.usda.gov/ggp/bgn/34/coordinators_reports.htm#2H

Franckowiak, J.D., B.X. Zhang, R.D. Horsley, B.J. Steffenson, K.P. Smith, and S. M. Neate.
2004. Evaluation of barley in China for Fusarium head blight resistance. p. 58. *In* S.M. Canty, T. Boring, J. Wardwell, and R.W. Ward (eds.) Proc. 2nd International Symposium on Fusarium Head Blight. Michigan State University, East Lansing MI.

Yu, G., and J.D. Franckowiak. 2004. Evaluation of East Asian barley cultivars for resistance to Fusarium head blight. p. 214-217. *In* S.M. Canty, T. Boring, J. Wardwell, and R.W. Ward (eds.) Proc. 2nd International Symposium on Fusarium Head Blight. Michigan State University, East Lansing MI.