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:	**59-0790-1-081**
Agreement Title:	**Evaluation of Hordeum Germplasm for Resistance to Fusarium Head Blight.**
FY05 ARS Award Amount:	**$ 76,098**

USWBSI Individual Project(s)

USWBSI Research Area*	Project Title	ARS Adjusted Award Amount
GIE	Evaluation of Hordeum Germplasm for Resistance to Fusarium Head Blight.	$ 76,098
	Total Award Amount	**$ 76,098**

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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: *Evaluation of Hordeum Germplasm for Resistance to Fusarium Head Blight.*

1. What major problem or issue is being resolved and how are you resolving it?
FHB threatens the existence of the barley industry in the Upper Midwest. Deployment of resistant cultivars is the most effective and environmentally sound means of managing this disease; however, sources with high levels of resistance to *Fusarium graminearum* and its toxins are lacking. Thus, the primary objective of this research is to identify *Hordeum* germplasm with the highest level of FHB resistance possible. Our specific activities also involve the sourcing of unique *Hordeum* germplasm from foreign genebanks.

Our USWBSI research program is an ongoing effort to systematically evaluate unique *Hordeum* germplasm from USDA and foreign genebanks for resistance to FHB in the Upper Midwest and also off-season nurseries in China. The screening of the entire six-rowed spring barley collection (8,100 accessions) from the USDA National Small Grains Collection (NSGC) is complete. Additionally, we have now completed the evaluation of nearly two-thirds of the six-rowed winter barley and wild barley (*Hordeum vulgare* subsp. *spontaneum*) collections of the NSGC. We are continuing our evaluations of NSGC germplasm, but are also sourcing unique *Hordeum* accessions from other gene banks around the world, including the N. I. Vavilov All-Russian Scientific Research Institute of Plant Industry (VIR) in St. Petersburg, Russia, the Station federale de recherches en production vegetale de Changins (SFRSPP) in Nyon, Switzerland, the Nordic Gene Bank (NGB) in Alnarp, Sweden, and the Institute for Cereal Crops Improvement (ICCI) in Tel Aviv, Israel.

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:
Additional sources of resistance to FHB are needed in breeding programs. We have procured nearly 4,000 additional accessions from various genebanks and evaluated them in FHB nurseries in the Upper Midwest and/or China. From these evaluations, we have identified accessions with resistance levels comparable to the resistant six-rowed check Chevron—i.e. 20 from the NSGC, 19 from VIR, 4 from SFRSPP and 1 from the ICCI.

Impact:
We have discovered new and diverse sources of FHB resistance in barley that are likely different from those already reported. The identification of resistance sources is the first step in developing barley cultivars with enhanced resistance to FHB and the accumulation of toxins. Accessions identified as resistant in our initial screening nurseries are immediately distributed to barley breeders for crossing within their FHB resistance-breeding program. In FY05, we provided two more sources of FHB resistance to barley breeders. These sources have already been crossed to adapted material and are now in the breeding pipeline.

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?:
Our program provides breeders with the germplasm needed to pyramid additional FHB resistance loci into their lines and enhance resistance to the pathogen. Introgression of resistance

alleles from these sources into advanced barley cultivars will reduce the detrimental impact of the FHB pathogen and its associated toxins. In the Minnesota and North Dakota barley breeding programs, several advanced lines with partial resistance to FHB are in pilot and plant scale testing. These advanced lines were bred with sources of partial FHB resistance identified from our screening of NSGC germplasm in 1999-2000. These lines, pending AMBA approval, may be available to growers within the next three years.

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.

Steffenson, B. J., Dahl, S. K., and Loskutov, I. 2005. Fusarium Head Blight Resistance in Barley Accessions from the N. I. Vavilov Institute. Page 92 in: Canty, S. M., Lewis, J., Siler, L., and Ward, R. W. (Eds.), Proceedings of the National Fusarium Head Blight Forum; 2005 Dec. 11-13; Milwaukee, WI.