USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY08 Final Performance Report (approx. May 08 – April 09)
July 15, 2009

Cover Page

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Fiscal Year:	2008
USDA-ARS Agreement ID:	59-0790-4-092
USDA-ARS Agreement Title:	Developing Winter Wheat with Improved Fusarium Head Blight Tolerance by Conventional and Transgenic Approaches.
FY08 USDA-ARS Award Amount:	$ 47,456

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Adjusted Award Amount
HWW-CP	To Enhance Variety Development of Scab Resistant Hard Winter Wheat Varieties in Nebraska.	$47,456
	Total Award Amount	**$ 47,456**

June 15, 2009
Principal Investigator Date

* MGMT – FHB Management
FSTU – Food Safety, Toxicology, & Utilization of Mycotoxin-contaminated Grain
GDER – Gene Discovery & Engineering Resistance
PBG – Pathogen Biology & Genetics
BAR-CP – Barley Coordinated Project
HWW-CP – Hard Winter Wheat Coordinated Project
VDHR – Variety Development & Uniform Nurseries – Sub categories are below:
SPR – Spring Wheat Region
NWW – Northern Winter Wheat Region
SWW – Southern Sinter Wheat Region

Project 1: *To Enhance Variety Development of Scab Resistant Hard Winter Wheat Varieties in Nebraska.*

1. What major problem or issue is being resolved relevant to Fusarium head blight (scab) and how are you resolving it?

The major problem that we are addressing is the susceptibility of wheat cultivars grown in Nebraska and adjacent regions. We are resolving this problem through: 1. developing elite hard winter wheat cultivars that are resistant to Fusarium head blight (FHB, scab) and 2. screening experimental lines in regional FHB nurseries and hard winter wheat regional nurseries to identify the level of FHB resistance within the existing elite winter germplasm of the Great Plains. In our 2008-2009 crossing blocks we made over 200 crosses specifically for FHB tolerance including 47 with the new FHB3 gene. A brief summary of the breeding progress so far is:

F1 Crosses Made	**>200**	**47 with Fhb3**	**760**	**half seed selections**
F2's	**117**		**50**	**sorted for hard**
F3's	**162**			
Headrows	**2200**			
S4R8s	**70**			
Dup	**6, 4 heterozygous for FHB1, 12 with FHB-5As**			
Trp	**7 putative FHB1 lines.**			
NIN	**15 lines with native resistance**			
Wesley FHB1	**106 lines, Increased in the field at Lincoln and at Yuma, AZ.**			
Harding FHB1	**Gave to Bill Berzonsky**			
Released Cultivars	**Overland**			
	Settler CL			
	Camelot			
DON Accumulator	**Harry**			

As part of regional efforts, we made a number of crosses using SDSU germplasm and Harding FHB1 lines, as well as increased the Harding FHB1 lines developed by Guihua Bai. These crosses and seed increases were donated to Dr. Bill Berzonsky. Our goal was to keep the SDSU program current with the germplasm as they replaced their breeder. All of our F2 bulks were available to anyone who wanted to access our germplasm and SDSU and Westbred requested seed. To increase the frequency of known QTLs in our breeding program, we sent 760 half seed from 3-way crosses for marker analysis and increased separately those having FHB1 from those not having the gene. Fifty F_2 populations using native or major gene resistance from soft by hard wheat crosses were sorted for the hard seeded segregants by Dr. Dowell to remove soft kernel types. Allele enrichment will be a critical strategy for the future.

In addition, we released two new lines (Settler CL and Camelot) which have improved scab resistance (native sources). We also identified one line (Harry) as having more DON (often 2X) at the same disease index level as other lines. It appears Harry is a DON accumulating line and is something we will need to watch in future as it is common parent in our program. The FHB nurseries were successfully screened and submitted for DON testing.

2. List the most important accomplishment and its impact (i.e. how is it being used) to minimize the threat of Fusarium head blight or to reduce mycotoxins. Complete both sections (repeat sections for each major accomplishment):

Accomplishment: We released Settler CL (71 acres of seed production for 2009-2010) and Camelot (89 acres of seed production for 2009-2010). In 2008-2009, approximately 90,000 units of Husker Genetics Brand Overland (NE01643) were sold in Nebraska and South Dakota. In addition, we have 4018 acres of certified production in Nebraska of Husker Genetics Brand Overland (NE01643) for 2009-2010. We do not have the data from South Dakota at this time.

Impact: While none of the above cultivars have the level of resistance that we need to truly prevent the damaging effect of Fusarium head blight in Nebraska, they are all useful steps in reducing the level of DON in wheat grain produced in the upper Great Plains by reducing the production of more susceptible cultivars. We expect to continue to reduce Fusarium head blight and DON by continued genetic improvements coupled with better management and fungicide treatments.

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.

Baenziger, P.S., B. Beecher, R.A. Graybosch, A. M. H. Ibrahim, D.D. Baltensperger, L.A. Nelson, Y. Jin, S. N. Wegulo, J.E. Watkins, J. H. Hatchett, Ming-Shun Chen, and Guihua Bai. 2008. Registration of 'NE01643' wheat. J. Plant Registrations 2: 36–42.

Ibrahim, A.M.H., S.D. Haley, P. S. Baenziger, Y. Jin, M.A.C. Langham, J. Rickertsen, S. Kalsbeck, R. Little, J. Ingemansen, O.K. Chung, B.W. Seabourn, G.H. Bai, Ming-Shun Chen and D.V. McVey. 2008. Registration of 'Alice' wheat. Journal of Plant Registrations 2:110-114.

Ibrahim, A.M.H., S.D. Haley, P. S. Baenziger, Y. Jin, M.A.C. Langham, J. Rickertsen, S. Kalsbeck, R. Little, J. Ingemansen, O.K. Chung, B.W. Seabourn, G.H. Bai, Ming-Shun Chen and D.V. McVey. 2008. Registration of ‘Darrell’ wheat. Journal of Plant Registrations 2:115-119.

Baenziger, P.S., R.A. Graybosch, L.A. Nelson, R. N. Klein, D.D. Baltensperger, L. Xu, S. N. Wegulo, J.E. Watkins, Y. Jin, J. Kolmer, J. H. Hatchett, Ming-Shun Chen, and Guihua Bai. Registration of 'Camelot' wheat. J. Plant Registrations: Accepted.

If your FY08 USDA-ARS Grant contained a VDHR-related project, include below a list all germplasm or cultivars released with full or partial support of the USWBSI. List the release notice or publication. Briefly describe the level of FHB resistance. If this is not applicable (i.e. no VDHR-related project) to your FY08 grant, please insert 'Not Applicable' below.

We developed and co-released Settler CL (71 acres of seed production for 2009-2010) with South Dakota State University, the University of Wyoming, and the USDA-ARS; and released Camelot with the USDA-ARS (89 acres of seed production for 2009-2010). In 2008-2009, approximately 90,000 units of Husker Genetics Brand Overland (NE01643) were sold in Nebraska and South Dakota. Overland was co-released with the South Dakota State University and the USDA-ARS. In addition, we have 4018 acres of certified production in Nebraska of Husker Genetics Brand Overland (NE01643) for 2009-2010. We do not have the production data from South Dakota at this time. As for the level of resistance, all three lines have native resistance (no know source of resistance). We have the best data on Overland (NE01643) which is given a rank of 5 out of 9 with Overley being very susceptible and rated as a 9. Settler CL and Camelot would be similar to slightly less (5-6) than Overland. There is also a diversity of flowering dates among the lines, so their different flowering dates may help escape scab epidemics. According to data in Kansas, the best line available for scab tolerance is Everest (currently under increase and not available) with a rating of 4. The South Dakota Lines are best described by SDSU.

Baenziger, P.S., B. Beecher, R.A. Graybosch, A. M. H. Ibrahim, D.D. Baltensperger, L.A. Nelson, Y. Jin, S. N. Wegulo, J.E. Watkins, J. H. Hatchett, Ming-Shun Chen, and Guihua Bai. 2008. Registration of 'NE01643' wheat. J. Plant Registrations 2: 36–42.

Baenziger, P.S., R.A. Graybosch, L.A. Nelson, R. N. Klein, D.D. Baltensperger, L. Xu, S. N. Wegulo, J.E. Watkins, Y. Jin, J. Kolmer, J. H. Hatchett, Ming-Shun Chen, and Guihua Bai. Registration of 'Camelot' wheat. J. Plant Registrations: Accepted.