

**USDA-ARS/  
U.S. Wheat and Barley Scab Initiative  
FY09 Final Performance Report  
July 15, 2010**

**Cover Page**

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<b>Fiscal Year:</b>	2009
<b>USDA-ARS Agreement ID:</b>	59-0206-9-055
<b>USDA-ARS Agreement Title:</b>	Enhance Variety Development of Scab Resistant Hard Winter Wheat Varieties in Nebraska.
<b>FY09- USDA-ARS Award Amount:</b>	\$ 47,456

**USWBSI Individual Project(s)**

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

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Principal Investigator

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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  
 DUR-CP – Durum 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?**

a.) Our main goal is to breed FHB resistant hard winter wheat with reduced DON levels. In 2009-2010, we made 221 crosses among FHB resistant parents. In addition, 94 crosses from the previous year were sent to the USDA Genotyping Center for analysis with Fhb1 markers. In crosses where the marker should not be segregating, 5 seed of each cross were sent to ensure that we had the right parents and the cross was as we expected. In those crosses where the Fhb1 marker was segregating, we sent 20 seed and planted those carrying the Fhb1 marker separately from those seed without the Fhb1 marker. Our goal is to enrich the population for the Fhb1 QTL. This process was used last year and 68 enriched F2 populations were planted at Mead, NE. An additional, 159 F2 populations with FHB tolerant parents were planted, of which 12 were optically sorted to remove soft kernel types. Using winter hardy Eastern soft red winter wheat will continue as a useful source of germplasm for Fhb tolerance. 104 F3 populations, 5570 headrows, and 67 observation plots were planted with FHB tolerant parents. Only 4 lines in the preliminary yield trial have Fhb1. The attrition from headrow to observation plot to preliminary yield trials is very high and we believe represents the overuse of unadapted and exotic parents with FHB tolerance. As such, we are focusing on identifying elite adapted parents with Fhb1 and coupling the Fhb1 resistance with the native resistance found in Overland, Everest, Lyman, and Art. To do this we planted replicated trials of Wesley BC2 derived Fhb1 lines (developed by Dr. Bai) in NE and are collaborating with Dr. Berzonsky on similar trials in SD. Wesley remains a popular cultivar in NE and SD, hence a backcross line with good agronomic merit could be released as a cultivar. Furthermore, we have developed a RIL population segregating for Fhb1 and Fhb5As. Both of these studies should also identify elite lines with Fhb1 that can be used as parents that may not have deleterious linked genes or segregate for deleterious exotic variation. The exotic parents do have an advantage as many of them are resistant to the new race of stripe rust found in the Great Plains. We tested all later generation lines in our mist nurseries to identify Fhb1 and native resistance. b) We test Northern Hard Winter Wheat FHB Nursery (Dr. Bill Bockus) and NUWWSN nurseries along with the regional Germplasm Observations Nursery (RGON) at misted inoculated locations to provide regional data to better understand our germplasm and its level of tolerance to this devastating disease.

**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:** The most important accomplishment for 2009-2010 was the release of NE01481 which will be marketed as Husker Genetics Brand McGill in honor of a legendary Genetic Professor at the University of Nebraska. This line will be grown in the primary FHB prone region as it has relatively good disease resistance, plus very good soilborne wheat mosaic virus resistance. It is the first line developed in Nebraska in a number of years with this beneficial trait. We also are in the process of releasing NI04421 which will be marketed as Husker Genetics Brand Robidoux. Robidoux is being co-released with the

University of Wyoming and honors a French trader whose trading post was on the first pass used by the pioneers crossing from Nebraska to Wyoming.

**Impact:**

While it is too early to tell the impact of McGill or Robidoux , it is expected that McGill will be the more important for FHB tolerance as it is grown in the primary FHB region.

Robidoux will be grown in western NE under rainfed and irrigated conditions where FHB is rarely found. Overland, our best native resistance wheat cultivar for FHB tolerance was grown on 95,000 acres in NE in 2009 and based upon research and development fees, it was grown on 114,000 acres in SD, and 3,000 acres in ND.

**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.**

We have released NE01481 which will be marketed as Husker Genetics Brand McGill and are in the process of releasing NI04421 which will be marketed as Husker Genetics Brand Robidoux. McGill is moderately resistant to FHB. It will be grown in the primary FHB prone region as has relatively good disease resistance, plus very good soilborne wheat mosaic virus resistance. Robidoux is also moderately resistant to FHB. It is expected to be grown in the arid west of NE and eastern NE where FHB rarely occurs.

**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., 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. 2009. Registration of 'Camelot' wheat. *J. Plant Registrations* 3:256-263.

Mengistu, N. P. S. Baenziger, L.A. Nelson, K.M. Eskridge, R. N. Klein, D. D. Baltensperger, and R. W. Elmore. 2010. Grain yield performance and stability of cultivar blends vs. component cultivars of hard winter wheat in Nebraska. *Crop Sci.* 50: 617-623.

Bockus, W. W., Baenziger, P. S., and Berzonsky, W. 2010. Reaction of Kansas, Nebraska, and South Dakota winter wheat accessions to Fusarium head blight (FHB), 2009. *Plant Disease Management Reports* (online). Report 4:CF013. DOI:10.1094/PDMR04 The American Phytopathological Society, St. Paul, MN.