USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY07 Final Performance Report (approx. May 07 – April 08)
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Cover Page

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Fiscal Year:	**2007**
FY07 ARS Agreement ID:	**59-0790-4-130**
Agreement Title:	**Winter Wheat Breeding for Scab Resistance in South Dakota.**
FY07 ARS Award Amount:	**$ 52,257**

USWBSI Individual Project(s)

USWBSI Research Area*	Project Title	ARS Adjusted Award Amount
VDUN	Winter Wheat Breeding for Scab Resistance in South Dakota.	$52,257
	Total Award Amount	**$ 52,257**

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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: *Winter Wheat Breeding for Scab Resistance in South Dakota.*

1. What major problem or issue is being resolved and how are you resolving it?

Resistant varieties will be the main component of an integrated strategy to control scab. The development and implementation of resistant varieties is the most economical, sustainable, and long lasting means of control. We will continue to simultaneously select for resistance and desirable agronomic characteristics.

Our long term objective is to continue to use traditional breeding techniques, aided by molecular marker selection (MAS), to develop and release FHB-resistant hard winter wheat varieties and germplasm with superior agronomic performance and end-use quality characteristics, excellent winter survival ability, and resistance to diseases prevalent in South Dakota and the northern Great Plains. Our specific objectives are to 1) use elite, FHB-resistant germplasm with tagged QTLs, in addition to indigenous native resistant sources, in developing populations segregating for FHB resistance and desirable agronomic traits, 2) screen segregating populations, advanced lines, and established varieties in our mist-irrigated nursery and greenhouse for the purposes of line advancement and releasing and providing growers with accurate FHB ratings on commonly grown varieties, 3) use MAS as a complementary tool to select FHB-resistant lines, and 4) enter promising resistant lines into regional nurseries to facilitate development of varieties with broad adaptation in collaboration with the University of Nebraska and Kansas State University.

We use mist-irrigated field screening nurseries to evaluate the material. Winter wheat would be vernalized in the early spring and then transplanted into the field in April. The program has successfully tested dormant seeding as an alternative to transplanting. All scab material is planted into 5 foot rows in the mist irrigated nursery while a transplanted nursery is used as a backup.

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: 'Darrell' hard red winter wheat (HRWW) was released in 2006. It has the best FHB rating among all Great Plains HRWW varieties tested in South Dakota during the last six years. It ranked top for yield in South Dakota Crop Performance Testing (CPT) Variety Trial in 2006 and had an exceptional three-year yield average. It had exceptional performance in the state of Nebraska in the Northern Regional Performance Nursery (NRPN) in 2003 and 2004. It has acceptable milling, good baking quality, and a good diseases package. 1,500 lines were dormant seeded in November 2006 in the mist-irrigated nursery in Brookings, SD. Due to excessive early spring rain, the seed failed to germinate and the nursery was lost for the second time in the last six years. A backup nursery consisting of 397 lines, including the NRPN, CPT, Advanced Yield Trial (AYT), Nebraska Interstate Nursery (NIN), TSWWSN, and Preliminary Yield Trials (PYT) was transplanted in May 2007 and evaluated in July 2007. Four lines with promising FHB

resistance were included in the 2008 CPT and 10 in the 2008 AYT. We included 15 experimental lines and checks in the 2007 Tri-state FHB Nursery (South Dakota, Nebraska, and Kansas). Based on preliminary FHB disease index% average from the Kansas and Nebraska sites, our lines ranked as SD07359, SD00111-9, SD05133, SD05048, Darrell, SD02480, SD05267, SD05250, SD07288, SD05156, SD05W012, SD01058, SD07338, numbers 1, 2, 4, 5, 7 , 9, 11, 13, 15, 21, 24, 32, and 36 respectively. About 2,800 head-rows and 43 EYT entries with tagged FHB QTL sources were planted in '07 – '08 season. Best lines out of the head-row nursery will be included in the EYT in 2009. Resistant lines will be entered into regional nurseries to facilitate development of varieties with broad adaptation to the northern Great Plains.

Impact: Scab is a potentially very devastating disease in the eastern and central South Dakota. Yield losses as high as 90% occurred in some fields in this area. Losses were less severe in fields planted to 'Expedition' wheat which reflects the progress that we have made. Darrell hard red winter wheat was released in 2006. This line is expected to play a big role in eastern South Dakota where scab epidemics can be very devastating.

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?:

Producers in South Dakota now have access to superior cultivars with very good scab resistance that was not available in the past. Our effort will continue to meet the needs of our clientele.

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.

1. Bockus, W. W., Baenziger, P. S., and Ibrahim, A. M. H. 2008. Reaction of Kansas, Nebraska, and South Dakota winter wheat accessions to Fusarium head blight (FHB), 2007. Plant Disease Management Reports (online). Report 1:CF009. DOI: 10.1094/PDMR02. The American Phytopathological Society, St. Paul, MN.
2. 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.
3. 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.
4. Malla, S. and A.M.H. Ibrahim. 2007. Evaluation of South Dakota Winter Wheat for Fusarium Head Blight Resistance. p. 224. *In* Proc. South Dakota Academy of Science, Brookings, South Dakota, USA.
5. Malla, S., A.M.H. Ibrahim, and K. Glover. 2007. Diallel Analysis of Fusarium Head Blight Resistance in Wheat. Journal of Crop Improvement (Accepted).
6. Malla, S., A.M.H. Ibrahim and K. Glover. 2007. Winter and Spring Wheat Parental Diallel Analysis for Scab Resistance. p. 201. *In* Proc. 2007 National Fusarium Head Blight, Kansas City, Kansas, USA.