

**USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY06 Final Performance Report (approx. May 05 – April 06)
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Cover Page

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Fiscal Year:	2006
FY06 ARS Agreement ID:	59-0790-4-130
Agreement Title:	Winter Wheat Breeding for Scab Resistance in South Dakota.
FY06 ARS Award Amount:	\$ 53,563

USWBSI Individual Project(s)

USWBSI Research Area*	Project Title	ARS Adjusted Award Amount
VDUN	Winter Wheat Breeding for Scab Resistance in South Dakota.	\$ 53,563
	Total Award Amount	\$ 53,563

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. 1,055 lines were dormant seeded in November 2005 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 first time in the last six years. A backup nursery consisting of 257 lines, including the NRPN, CPT, Advanced Yield Trial (AYT), and Preliminary Yield Trials (PYT) was transplanted in May 2006 and evaluated in July 2006. Four lines with promising FHB resistance were included in the 2007 CPT and 10 in the 2007 AYT. We included 15 experimental lines and checks in the 2006 Tri-state FHB Nursery (South Dakota, Nebraska, and Kansas). Based on preliminary FHB disease index% average from the Kansas and Nebraska sites, our lines SD97059-2, SD00111-9, ‘Harding’, SD03018, SD02480, Darrell, SD97380-2, SD01058, ‘Expedition’, SD03178, SD01122, SD03184, SD03144, ‘Alice’, and ‘Wendy’ ranked as numbers 1, 2, 3, 4, 6, 7, 11, 16, 18, 19, 20, 24, 29

,36 , and 38, respectively. About 3,800 head-rows and 51 EYT entries with tagged FHB QTL sources were planted in '06 – '07 season. Best lines out of the head-row nursery will be included in the EYT in 2008. 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. Malla, S., A.M.H. Ibrahim, and Karl Glover. 2007. Diallel Analysis of Fusarium Head Blight Resistance in Wheat. *Journal of Crop Improvement* (Accepted).
2. Ibrahim, A.M.H., S.D. Haley, P.S. Baenziger, Y. Jin, M.A.C. Langham, C. Stymiest, J. Rickertsen, S. Kalsbeck, R. Little, O.K. Chung, B.W. Seabourn, and D.V. McVey. 2007. Registration of 'Alice' wheat. *Journal of Plant Registrations* (In review).
3. Ibrahim, A.M.H., S.D. Haley, P.S. Baenziger, Y. Jin, M.A.C. Langham, C. Stymiest, J. Rickertsen, S. Kalsbeck, R. Little, O.K. Chung, B.W. Seabourn, and D.V. McVey. 2007. Registration of 'Darrell' wheat. *Journal of Plant Registrations* (In review).
4. Rickertsen J., T. Nlyea, and A. Ibrahim. 2006. 2006 Winter wheat variety results and planting tips. *South Dakota Coop. Ext. Serv. Extension Extra* 8136.
5. Malla, S., A.M.H. Ibrahim. 2006. Diallel analysis of Fusarium head blight resistance in wheat. *In the Proceedings of the 2006 National Fusarium Head Blight Forum, Raleigh, NC.*
6. Ibrahim, A.M.H, S. Malla, S. Kalsbeck, and R. Little. 2006. Evaluation of hard winter wheat for FHB resistance in South Dakota. *In the Proceedings of the 2006 National Fusarium Head Blight Forum, Raleigh, NC.*
7. Guihua, B., P. St Amand, A. Ibrahim, P.S. Baenziger, W.W. Bockus, and A. Fritz. Transfer QTL for FHB Resistance into Hard Winter Wheat Using Marker-assisted Backcross. *In the Proceedings of the 2006 National Fusarium Head Blight Forum, Raleigh, NC.*