

**USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY05 Final Performance Report (approx. May 05 – April 06)
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Cover Page

PI:	Amir Ibrahim
Institution:	South Dakota State University
Address:	Plant Science Department Box 2140C Brookings, SD 57006
E-mail:	amir_ibrahim@sdstate.edu
Phone:	605-688-4453
Fax:	605-688-4452
Fiscal Year:	2005
FY05 ARS Agreement ID:	59-0790-4-130
Agreement Title:	Winter Wheat Breeding for Scab Resistance in South Dakota.
FY05 ARS Award Amount:	\$ 58,537

USWBSI Individual Project(s)

USWBSI Research Area*	Project Title	ARS Adjusted Award Amount
VDUN	Winter Wheat Breeding for Scab Resistance in South Dakota.	\$ 58,537
	Total Award Amount	\$ 58,537

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

(Form – FPR05)

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 use traditional breeding techniques, aided by molecular markers selection, to develop scab resistant hard winter wheat varieties and germplasm with superior agronomic performance and end-use quality characteristics, winterhardness, and resistance to diseases prevalent in South Dakota and the northern Great Plains (a priority of the U.S. Wheat and Barley Scab Initiative). Our short term objectives are to: 1) characterize scab resistance among local and regional germplasm, in addition to new introduced sources, 2) identify sources with high levels of scab resistance, and develop populations segregating for scab resistance and desirable agronomic traits, and 3) enter promising resistant lines into regional nurseries to facilitate development of varieties with broad adaptation.

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: We evaluated eight hundred and forty lines for scab resistance in 2005 including the Northern Regional Performance Nursery (NRPN), Regional Germplasm Observation Nursery (RGON), Southern Regional Performance Nursery (SRPN), in addition to South Dakota Crop Performance Trials (CPT), Advanced Yield Trial (AYT), Preliminary Yield Trials (PYT), and Early Yield Trial (EYT).

Expedition hard red winter wheat, released by our program in 2002 showed better resistance to FHB than Wesley and Jagalene in producers' fields in eastern and central South Dakota in 2005. Two experimental lines, SD98102 and SD97059-2, have been increased with intention to release in 2006 and 2007, respectively. Both lines have very good FHB resistance in addition to excellent leaf and stem rust resistance. They also had good performance and stability in the NRPN which is essential for adaptation in the northern Great Plains. Seven lines with promising FHB resistance were included in the 2006 AYT, 16 in the PYT, and 58 in the EYT. Our program relied on indigenous local resistance in the past. However, with the spread of scab epidemics in winter wheat in South Dakota, the use of highly resistant sources became paramount. In the 2005 – 2006 season, we planted 151 out of 535 F₃'s and 134 out of 593 F₂'s with promising scab resistance. Sixty-six of the F₃'s and 8 of the F₂'s included resistance sources from Sumai3, Ning7840 and their derivatives.

About 7,000 head-rows with Sumai3 type sources were planted in 2005. Best lines out of the head-row nursery will be included in the EYT in 2006. FHB-resistant advanced lines from these populations 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. Two lines, SD98102 and SD97059-2, will be released in 2006 and 2008, respectively. These two lines will 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., and A.M.H. Ibrahim. 2006. Diallel Analysis of Fusarium Head Blight Resistance in Wheat. *Euphytica* (In review).
2. Ibrahim, A.M.H., S.D. Haley, Y. Jin, M.A.C. Langham, J. Rickertsen, S. Kalsbeck, R. Little, O.K. Chung, B.W. Seabourn, and D.V. McVey. 2006. Registration of 'Wendy' wheat. *Crop Sci.* 46: 1389 -1390.
3. Malla, S., A.M.H. Ibrahim. 2005. Diallel analysis of Fusarium head blight resistance in wheat. p. 58. *In* the Proceedings of the 2005 National Fusarium Head Blight Forum, Milwaukee, WI.
4. Malla, S., A.M.H. Ibrahim. 2005. Evaluation of elite hard red and white winter wheat for Fusarium head blight resistance. p. 59. *In* the Proceedings of the 2005 National Fusarium Head Blight Forum, Milwaukee, WI.