

**U.S. Wheat and Barley Scab Initiative
 FY02 Final Performance Report (approx. May 02 – April 03)
 July 15, 2003**

Cover Page

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FY02 ARS Award Amount:	\$ 64,467

Project

Program Area	Project Title	USWBSI Recommended Amount
VDUN	Winter wheat breeding for scab resistance in South Dakota.	\$66,079
	Total Amount Recommended	\$66.079

 Principal Investigator

 Date

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. The objective is to use traditional breeding techniques to develop scab resistant hard winter wheat cultivars. Breeding efforts for improved head scab resistance in winter wheat focus on:

- i) characterization of scab resistance or tolerance among commercially grown cultivars and elite and preliminary lines from SDSU and regional breeding programs in addition to Asian and Latin American resistance sources.
- ii) identification of winter wheat germplasm sources that show a high level of scab resistance.
- iii) development of populations segregating for scab resistance and desirable agronomic traits.

We use mist-irrigated greenhouse and field screening nurseries to evaluate the material. Winter wheat is vernalized in the early spring and then transplanted into the field in April. The program is currently testing dormant seeding as an alternative to transplanting.

2. What were the most significant accomplishments?

The following nurseries were screened for scab resistance in 2002:

- Northern Regional Performance Nursery
- Regional Germplasm Performance Nursery
- Southern Regional Performance Nursery
- South Dakota Crop Performance Trials (commercial varieties)
- SDSU Advanced Hard Red and Hard White Yield Trials
- SDSU Preliminary Hard Red and Hard White Yield Trials
- SDSU Early Hard Red and Hard White Yield Trials
- Nebraska Interstate Nursery

Our program continues to advance segregating lines, resulting from crossing with scab-resistant sources, through a modified bulk breeding method. The F_2 and F_3 populations are grown as bulks under normal winter wheat production practices. Individual F_3 plants are evaluated for scab reaction by millet inoculation. $F_{3:4}$ progeny rows are planted under normal winter wheat production practices and selected for agronomic performance. Individual heads and the bulks are harvested. $F_{3:5}$ yield trials (1 rep, 2 locations) are grown and corresponding $F_{4:5}$ progeny rows are grown in the scab nursery. Entries with good yield and scab reaction data are advanced to the $F_{4:6}$ yield trials (1 rep, 2 locations), in the scab nursery, and are also screened in the

greenhouse for Type II scab resistance. Most promising lines are advanced to multi-location yield trials the following year.

Approximately 6000 plants were evaluated for scab resistance during the 1999 season. 1500 of the plants were kept and were planted into the field in 2000 (as $F_{3:4}$ progeny rows). Scab resistance sources included in the selected populations included adapted spring wheats from the SDSU breeding program, Sumai 3 derived spring wheat lines, eastern European winter wheat lines, entries from the 1998 regional winter wheat scab nursery, and adapted hard red and hard white breeding lines. Forty-four lines were selected out of 1500 based on agronomic performance and were planted in 2001 – 2002 season in the early yield trial nursery (as $F_{3:5}$ lines). These lines were also planted in the greenhouse for confirming resistance. Heads were also picked from the best promising $F_{3:4}$ progeny rows and planted in the mist-irrigated nursery to get scab reaction data prior to line entry in the preliminary yield trials the following year. In 2001 – 2002 season, we planted 3631 progeny rows, with resistant sources, under normal winter wheat production practices in Dakota Lakes, SD. These progeny rows were planted in spring wheat stubble with supplementary irrigation. The best 291 lines were advanced to the $F_{3:5}$ yield trials and observation rows of these are being evaluated in the mist-irrigated nurseries in the field and greenhouse in 2003.

In 2002 we investigated planting schemes to determine if direct seeded row materials are affected differently than transplanted hill plots when they are inoculated with FHB. Preliminary results suggested that there were indeed significant correlations between the two methods. We also started using point inoculation technique to evaluate winter wheat lines and varieties for scab tolerance under greenhouse conditions in 2002.

Mr. Subas Malla joined our program in fall 2002 as an M.S. student. Mr. Malla is conducting independent research regarding the genetics of scab resistance in hard winter wheat germplasm.

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.

Ibrahim, A.M.H., S.D. Haley, Y. Jin, M.A.C. Langham, C. Stymiest, J. Rickertsen, S. Kalsbeck, R. Little, O.K. Chung, B.W. Seabourn, and D.V. McVey. 2003. Registration of 'Expedition' wheat. *Crop Sci.* (submitted)

Liu, D., Y. Yen, and A.M. Ibrahim. 2003. Screening elite South Dakota winter wheat for SSR markers linked to *Fusarium* head blight resistance. In South Dakota Academy of Science proceedings. Rapid City, South Dakota (Poster presentation).

Gustafson, D.M., L. Peterson, and A. Ibrahim. 2002. Comparison of FHB development on hard winter wheat using different planting schemes. p. 247. In 2002 National Fusarium Head Blight Forum. Erlanger, KY.