

**USDA-ARS/  
U.S. Wheat and Barley Scab Initiative  
FY07 Final Performance Report (approx. May 07 – April 08)  
July 15, 2008**

**Cover Page**

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<b>Fiscal Year:</b>	2007
<b>USDA-ARS Agreement ID:</b>	59-0790-4-121
<b>USDA-ARS Agreement Title:</b>	Spring Wheat Breeding for Scab Resistance in South Dakota.
<b>FY07 ARS Award Amount:</b>	\$ 69,681

**USWBSI Individual Project(s)**

<b>USWBSI Research Area*</b>	<b>Project Title</b>	<b>ARS Adjusted Award Amount</b>
VDUN	Spring Wheat Breeding for Scab Resistance in South Dakota.	\$69,681
	<b>Total Award Amount</b>	<b>\$ 69,681</b>

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Principal Investigator

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Date

\* CBCC – Chemical, Biological & Cultural Control  
 EEDF – Etiology, Epidemiology & Disease Forecasting  
 FSTU – Food Safety, Toxicology, & Utilization of Mycotoxin-contaminated Grain  
 GET – Genetic Engineering & Transformation  
 HGR – Host Genetics Resources  
 HGG – Host Genetics & Genomics  
 IIR – Integrated/Interdisciplinary Research  
 PGG – Pathogen Genetics & Genomics  
 VDUN – Variety Development & Uniform Nurseries

**Project 1:** *Spring Wheat Breeding for Scab Resistance in South Dakota.*

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

Fusarium head blight (FHB) is a serious wheat disease that continues to pose as a production threat within South Dakota as well as the North Central region of the USA. In an attempt to alleviate this threat to wheat production, development of resistant varieties has become a high priority within the spring wheat breeding program at South Dakota State University. An aggressive program was initiated to accelerate the development of spring wheat varieties with improved FHB resistance and desirable agronomic traits. Established off-season nurseries and mist-irrigated greenhouse and field screening nurseries are utilized to accelerate breeding efforts in improving resistance along with desirable agronomic characteristics. Three early generations of breeding materials are evaluated for scab resistance each year: two generations in the greenhouse and one in the field. Approximately 8,000 individual hills are evaluated in the greenhouse nurseries and 3,000 rows are screened in the field nurseries. Both the field and greenhouse nurseries are inoculated with infested corn and conidial suspensions. A mist-irrigation system is used to provide a favorable environment for infection and disease development. Each year we make a large number of crosses to introduce new resistance genes and create new resistance gene combinations. Sources of resistance used in the crosses include materials from the Uniform Regional Scab Nursery (URSN) for spring wheat parents, (a cooperative regional effort to identify and utilize sources of scab resistance) newly identified germplasm provided through introduction and evaluation efforts, other introduced sources, as well as both varieties and advanced breeding lines with various levels of resistance. The off-season nursery aids in the simultaneous selection for resistance and desirable agronomic characteristics.

**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:**

Our program has provided elevated levels of resistance to FHB in the form of Hard Red Spring Wheat (HRSW) varieties and germplasm made available to regional growers and other breeders that wish to utilize the germplasm. Within the past several years, three varieties have been released to growers by our program. We anticipate the release of a fourth prior to the 2009 growing season. Over three years of simultaneous testing, the FHB disease index ratings recorded for ‘Briggs’, ‘Granger’, ‘Traverse’, and SD3851 were 39.4, 34.7, 31.6, and 20.8, respectively, compared to ‘Sumai 3’, (15.4) the resistant check.

**Impact:**

Elevated resistance levels in released varieties are immediately utilized by the most apparent benefactors of our work; HRSW producers. Through utilizing the elevated resistance levels, growers are more able to protect themselves from suffering complete devastation of fields in the presence of a severe FHB epidemic. Elevated resistance levels in germplasm is also quite often utilized by a less immediately apparent benefactor group; HRSW breeders. Through utilizing both germplasm and released varieties, other breeding programs strive to further

increase FHB resistance among germplasm pools that will eventually result in the release of continually improved varieties.

**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?:**

Our efforts have led to the release of three varieties since 2002 that possess some FHB resistance. Prior to the 2009 growing season, a fourth release is planned. This experimental line, (SD3851) has shown itself to be nearly as resistant as Sumia 3 in our replicated tests and is agronomically far superior. These accomplishments have led to the release of several HRSW varieties that possess some resistance to FHB and are specifically adapted to South Dakota and the northern Great Plains region.

**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.**

### **Peer-reviewed articles**

- M. Kadariya, K. D. Glover, M. Mergoum, and L. E. Osborne. 200X. Biplot Analysis of Agronomic and Fusarium Head Blight Resistance Traits in Spring Wheat. *J. of Crop Improvement*. (Accepted).

### **Poster/abstract presentations**

- Lawrence E. Osborne, Jeffery M. Stein, Karl D. Glover, and Christopher A. Nelson. 2007. Spore Load, Disease, and DON: An Inoculum Gradient Study using Sister Wheat Lines. In: Canty, S.M., Clark, A., Ellis, D., and Van Sanford, D. (Eds.), *Proceedings of the 2007 National Fusarium Head Blight Forum; 2007, 2-4 December; Kansas City, MO, USA*. Michigan State University, East Lansing, MI. p. 114.
- K.R. Ruden, B.E. Ruden, K.D. Glover, and J.L. Kleinjan. 2007 Uniform Fungicide Performance Trials for the Suppression of Fusarium Head Blight in South Dakota. In: Canty, S.M., Clark, A., Ellis, D., and Van Sanford, D. (Eds.), *Proceedings of the 2007 National Fusarium Head Blight Forum; 2007, 2-4 December; Kansas City, MO, USA*. Michigan State University, East Lansing, MI. p. 135.
- Bhoja Raj Basnet, Yang Yen, Shiaoman Chao, .and Karl D. Glover. 2007. Genetic Linkage Mapping with DArT Markers to Detect Scab Resistance QTLs in a ‘Sumai-3’ Derived Wheat Population. In: Canty, S.M., Clark, A., Ellis, D., and Van Sanford, D. (Eds.), *Proceedings of the 2007 National Fusarium Head Blight Forum; 2007, 2-4 December; Kansas City, MO, USA*. Michigan State University, East Lansing, MI. p. 165.
- S. Malla, A.M.H. Ibrahim, .and K. Glover. 2007. Winter and Spring Wheat Parental Diallel Anaysis for Scab Resistance. In: Canty, S.M., Clark, A., Ellis, D., and Van Sanford, D. (Eds.), *Proceedings of the 2007 National Fusarium Head Blight Forum; 2007, 2-4 December; Kansas City, MO, USA*. Michigan State University, East Lansing, MI. p. 201.
- Rosarya, R.U., Maxson-Stein K.L., Glover, K.D., Stein, J.M., and Gonzalez-Hernandez, J.L. 2007. Family Based Mapping of FHB Resistance QTLs in Hexaploid Wheat. In: Canty, S.M., Clark, A., Ellis, D., and Van Sanford, D. (Eds.), *Proceedings of the 2007 National Fusarium Head Blight Forum; 2007, 2-4 December; Kansas City, MO, USA*. Michigan State University, East Lansing, MI. p. 227.