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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Year:	**FY2002 (approx. May 02– April 03)**
Grant Number:	**58-5430-2-323**
Grant Title:	**Fusarium Head Blight Research**
FY02 ARS Award Amount:	**$ 29,740**

Project

Program Area	Project Title	USWBSI Recommended Amount
VDUN	Development of scab resistant wheat cultivars for Kansas.	$30,483
	Total Amount Recommended	**$30,483**

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Principal Investigator Date

(Form – FPR02)

Project 1: Development of scab resistant wheat cultivars for Kansas.

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

Serious Fusarium head blight (scab) epidemics have occurred in Kansas in 1982, 1990, 1993, and 1995 with most of the losses occurring in the eastern quarter of the state. Since 1980, wheat acreage in the eastern quarter of Kansas has declined by two thirds mostly due to farmer aversion to the risk of scab. Scab also has the potential to become more prevalent in central Kansas due to decreasing tillage and increasing cultivation of corn, the main reservoir for inoculum. The best long-term solution to the problem is to produce winter wheat cultivars that have high levels of resistance to scab. Until involvement in the USDA Scab Initiative, there was virtually no effort to identify sources of resistance in Kansas breeding programs. The Initiative has resulted in the development of greenhouse and field screening nurseries that are providing accurate ratings for current cultivars in Kansas, advanced breeding lines, and participation in the Regional Scab Nursery. Respectively, these nurseries allowed dissemination of information to growers on the reaction of current commercial cultivars, selection for scab resistance in breeding lines, and identification of additional sources of resistance from other breeding efforts in the region. The long-term goal is to develop, deploy, and advertise winter wheat cultivars adapted for Kansas with improved levels of resistance to scab.

2. What were the most significant accomplishments?

Because of the scab screening efforts, a new column for reaction to Head Scab was added to the popular extension publication *Wheat Variety Disease and Insect Ratings* for the fall, 2000 issue, updated for the 2001 and 2002 issues, and will be updated in subsequent issues. For the first time, this has allowed producers in Kansas to use the reaction to scab to help select cultivars for planting. Similarly, data produced from nurseries funded by the Scab Initiative have recently been incorporated into another popular KSU extension bulletin (*Kansas Performance Tests with Winter Wheat Varieties*). Additionally, two commercial cultivars in Kansas (Hondo and Heyne) were identified in 2000 (and confirmed in 2001 and 2002) as having good levels of resistance (3 and 4 on the 1-9 scale where 1=immune and 9=highly susceptible). During the past few years, these cultivars have averaged 12 and 15% scab, respectively compared with about 50% in highly susceptible cultivars. Similarly, the newly-released cultivar Lakin has shown moderate levels of resistance with 22-34% scab. Five other commercial cultivars have also displayed moderate levels of resistance equal to, or better than, Lakin. Therefore, there are genes for scab resistance already present in cultivars adapted to Kansas that can be used by producers and may be potential sources of resistance for the development of future cultivars. Finally, both KSU wheat breeders and the USDA wheat geneticist have been involved in the project by having their breeding lines evaluated for resistance to scab. This has resulted in a proposal, to be reviewed in August 2003, for a germplasm release from Kansas State University with resistance to scab derived from *T. armeniacum*.

The objective to develop scab resistant cultivars for Kansas is still in its early stages. It normally takes about 10 years to produce a cultivar from the time initial crosses are made until release. Even though two Kansas cultivars have been identified with good levels of resistance, over 70% of the acreage for 2003 was seeded with cultivars that are susceptible to scab and most of the remaining 30% were seeded with cultivars that have an intermediate reaction to scab which is not high enough for acceptable control. Clearly, a long-term effort in providing resistance-screening nurseries is needed to help Kansas breeders select and release cultivars that have acceptable resistance to scab.

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. Anand, A., Zhou, T., Trick, H. N., Gill, B. S., Bockus, W. W., and Muthukrishnan, S. 2003. Greenhouse and field testing of transgenic wheat plants stably expressing genes for thaumatin-like protein, chitinase and glucanase against *Fusarium graminearum*. J. of Experimental Bot. 54:1101-1111.

2. Bockus, W. W., Jedlicka, B. G., and Bowden, R. L. 2002. Reaction of selected winter wheat cultivars to Fusarium head blight, 2001. Biol. Cult. Tests Control Plant Dis. Vol. 17 (only published online at www.apsnet.org/online/BCtests/).

3. Davis, M. A., Bockus, W. W., Bowden, R. L., and Brown-Guedira, G. L. 2002. Reaction of selected winter wheat accessions to Fusarium head blight, 2001. Biol. Cult. Tests Control Plant Dis. Vol. 17 (only published online at www.apsnet.org/online/BCtests/).

4. Roozeboom, K., Bockus. W. W., Brooks, L, Knapp, M., Fritz, A., Evans, P., Long, J., Martin, T. J., Schlegel, A., Witt, M., Claassen, M., Gordon, W. B., Heer, W., Janssen, K., Martin, V., Parker, E., Lamond, R., and Bennett, R. 2002. 2002 Kansas Performance Tests with Winter Wheat Varieties. Kansas AES Report of Progress 896. 28 pp.

5. Bockus, W. W., Davis, M. A., and Garrett, K. A. 2002. Number of location-years needed to determine reaction of winter wheat cultivars to Fusarium head blight. Proceedings of the 2002 National Fusarium Head Blight Forum, p. 228.

6. Bockus, W. W. May 2002. Progress and prospects for obtaining resistance to Fusarium head blight. Talk and discussion leader for "Diseases besides rust" at the "KSU Wheat Retreat" in Kansas City which was for all KSU researchers working on wheat.

7. Bockus. W. W. 2002. Disease resistance in Kansas, winter wheats. Presentation to employees of Agripro Seeds.