USDA-ARS / USWBSI
FY04 Final Performance Report
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Cover Page

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Year:	**FY2004** (approx. May 04 – April 05)
FY04 ARS Agreement ID:	**58-5430-2-323**
FY04 ARS Agreement Title:	**Development of Scab Resistant Wheat Cultivars for Kansas.**
FY04 ARS Award Amount:	**$ 24,365**

USWBSI Individual Project(s)

USWBSI Research Area*	Project Title	ARS Adjusted Award Amount
VDUN	Development of Scab Resistant Wheat Cultivars for Kansas.	$ 24,365
	Total ARS Award Amount	**$ 24,365**

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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: ***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 allow 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 KSU extension publication *Wheat Variety Disease and Insect Ratings* for the fall, 2000 issue and has been updated in each subsequent year. 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 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 later years) 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 only 12 and 15% scab, respectively compared with about 50% in highly susceptible cultivars. Similarly, the recently-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 a few 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. Several breeding "populations" are screened each year from which the breeders make selections of promising lines showing resistance. Also, there are approximately 40 advanced breeding lines (The Kansas Intrastate Nursery) screened each year. Among other things, this effort has resulted in a germplasm release in 2004 from Kansas State University with resistance to scab derived from *Triticum timopheevii* ssp. *armeniacum*.

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 you 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., Zhentian, L, Sumner, L. W., Mysore, K. S., Arakane, Y., Bockus, W., and Muthukrishnan, S. 2004. Apoplastic extracts from a transgenic wheat line exhibiting lesion-mimic phenotype have multiple pathogenesis-related proteins that are antifungal. Molec. Plant- Microbe Inter. 17:1306-1317

2 Bockus, W. W., Fritz, A. K., and Martin, T. J. 2004. Reaction of the 2003 Kansas Intrastate Nursery to Fusarium head blight, 2003. Biol. Cult. Tests Control Plant Dis. Vol. 19 (published online at www.apsnet.org/online/BCtests/).

3 Brown-Guedira, G. L., Bockus, W. W., Davis, M. A., Gill, B. S., VanSanford, D. A., and Murphy, J. P. 2004. Notice of release of KS04WGRC46 Fusarium head blight resistant hard red winter wheat germplasm. U.S. Dept. Agric., and Kansas Agric. Expt. Sta.

4 Davis, M. A., Bockus, W. W. and Brown-Guedira, G. L. 2004. Reaction of selected winter wheat cultivars to Fusarium head blight, 2003. Biol. Cult. Tests Control Plant Dis. Vol. 19 (published online at www.apsnet.org/online/BCtests/).

5 Roozeboon, K., Fritz, A., Stack, J., Whitworth, J., Evans, P., Long, J., Martin, T. J., Schlegel, A., Witt, M., Claassen, M., Gordon, W. B., Heer, W., Janssen, K., Maddox, L., Martin, V., Parker, E., Seabourn, B., Lamond, R., Shroyer, J., Bennett, R., and Bockus, W. W. 2004. 2004 Kansas Performance Tests with Winter Wheat Varieties. Kansas AES Report of Progress 930. 22 pp.