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

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Fiscal Year:	**2005**
FY05 ARS Agreement ID:	**58-5430-2-323**
Agreement Title:	**Development of Scab Resistant Wheat Cultivars for Kansas.**
FY05 ARS Award Amount:	**$ 26,821**

USWBSI Individual Project(s)

USWBSI Research Area*	Project Title	ARS Adjusted Award Amount
VDUN	Development of Scab Resistant Wheat Cultivars for Kansas.	$ 26,821
	Total Award Amount	**$ 26,821**

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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. Additionally, 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 the important wheat-growing area of 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. Such a solution requires expertise to test cultivars and breeding lines for reaction to scab and involvement from the Kansas wheat breeding and genetics programs.

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:

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 accurate and efficient greenhouse and field screening nurseries that are providing useful ratings for current cultivars in Kansas, advanced breeding lines, and allow participation in the Regional Scab Nursery. Respectively, these nurseries allow dissemination of information to growers on the reaction of current commercial cultivars, selection by breeders for scab resistance in their breeding lines, and identification of additional sources of resistance from other breeding efforts in the region that can be incorporated into Kansas breeding lines. Kansas has also taken the lead in organizing a Tri-state Scab Screening Nursery for the hard red winter wheat breeding programs of Kansas, Nebraska, and South Dakota. The long-term goal of the research is to develop, deploy, and advertise winter wheat cultivars adapted for Kansas with improved levels of resistance to scab.

Impact:

Two commercial cultivars in Kansas (Hondo and Heyne) were identified in 2000 (and confirmed in later years) as having good levels of scab 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 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) that are tested each year.

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?:

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 subsequent years. 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 publication (*Kansas Performance Tests with Winter Wheat Varieties*). The involvement of breeders and the wheat geneticist has resulted in significant progress to improve the level of resistance to scab in future commercial wheat cultivars. Additionally, this research 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 the grant. Please reference each item using an accepted journal format. If you need more space, continue the list on the next page.

1. Davis, M. A.and Bockus, W. W. 2005. Reaction of selected winter wheat cultivars to Fusarium head blight, 2004. Biol. Cult. Tests Control Plant Dis. Report 20:FC029, DOI:10.1094/BC20, The American Phytopathological Society, St. Paul, MN.

2. Bockus, W. W., and Davis, M. A. 2005. Reaction of selected winter wheat accessions to Fusarium head blight, 2004. Biol. Cult. Tests Control Plant Dis. Report 20:FC026, DOI:10.1094/BC20, The American Phytopathological Society, St. Paul, MN.

3. Bockus, W. W., Fritz, A. K., and Martin, T. J. 2005. Reaction of the 2004 Kansas Intrastate Nursery to Fusarium head blight, 2004. Biol. Cult. Tests Control Plant Dis. Report 20:FC025, DOI:10.1094/BC20, The American Phytopathological Society, St. Paul, MN.

4. Roozeboon, K., Fritz, A., Stack, J., Whitworth, J., Evans, P., Long, J., Martin, T. J., Schlegel, A., Spangler, M., Claassen, M., Gordon, W. B., Heer, W., Kimball, J., Maddux, L., Parker, E., Seabourn, B., Knapp, M., Bennett, R., Bockus, B., and Shroyer, J. 2005. 2005 Performance Tests with Winter Wheat Varieties. Pages 4-28 in: 2005 Kansas Wheat Seed Book. Kansas AES Report of Progress 947. 42 pp.

5. Bockus, W. W. 2005. Kansas. Report for the Western Education/Extension Research Activities Coordinating Committee on cereal diseases (WERA-97). (http://plantsciences.montana.edu/wera97/Default.htm)