

**U.S. Wheat and Barley Scab Initiative
 FY01 Final Performance Report (approx. May 01 – April 02)
 July 15, 2002**

Cover Page

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Year:	FY2001 (approx. May 01 – April 02)
Grant Number:	59-0790-9-050
Grant Title:	Fusarium Head Blight Research
FY01 ARS Award Amount:	\$ 77,238

Project

Program Area	Project Title	Requested Amount
Variety/Uniform	Development of Scab Resistant Soft Red Winter Wheat Varieties	\$ 79,344
	Total Amount Requested	\$ 79,344

Principal Investigator

Date

Project 1: Development of Scab Resistant Soft Red Winter Wheat Varieties

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

The major issue is that producers need varieties with high levels of scab resistance. We have lines with very good levels of scab resistance; however, many lines with excellent scab resistance are poor for other traits such as grain yield, milling and baking quality, standability, or resistance to other diseases. This problem is not resolved, but we are using backcrosses, and three-way crosses to attempt to develop well-adapted lines. We are also continuing to select and evaluate as many lines as possible. In addition, as more lines with good scab resistance are identified we are using these parents in crosses, so that in many crosses both parents, or two parents out of three in a three-way cross, are scab resistant. We also believe that it is important to combine several types of resistance rather than rely solely on Type II resistance.

2. What were the most significant accomplishments?

- Five lines from the Illinois program were entered into the 2001 Northern Uniform Winter Wheat Scab Nursery. These lines were made available to other breeders by entering them into the Northern Uniform Winter Wheat Scab Nursery. Three of the Illinois lines were among the most scab resistant lines in the nursery.
- In 2001 about 550 breeding lines were evaluated in replicated rows in the misted, inoculated scab evaluation field nursery. In addition, about 700 entries from single plots, and about 800 headrows were also evaluated in the field nursery. Scab resistant lines were evaluated for many additional traits including grain yield, milling and baking quality, standability, and resistance to other diseases.
- A total of 1707 plants from four segregating populations were evaluated in the greenhouse, and 567 plants (33.2%) were selected (most with Type II resistance better than Ernie).
- About 228 single and 161 three-way crosses were made with one or more scab resistant parents in each cross. In addition, 36 crosses were made with the objective of combining scab resistance from 6 new sources with other sources of scab resistance and with adapted lines.
- Seed increases of 213 doubled haploid lines originating from 26 crosses were grown.
- Six microsatellites on chromosome 3BS, Xgwm389, Xgwm533, XBARC147, Xgwm493, XBARC102, and XBARC131 were integrated into an amplified fragment length polymorphism (AFLP) linkage group containing a major QTL for scab resistance in a mapping population of 133 recombinant inbred lines (RILs) derived from Ning7840/Clark. Xgwm533 and XBARC147 were the two microsatellite markers most tightly associated with the major scab resistance QTL. Interval analysis based on the integrated map of AFLP and microsatellite markers showed that the major QTL was located in a chromosome region of about eight cM in length around Xgwm533 and XBARC147. We are beginning to use these markers for marker-assisted selection in some populations.
- Mapping of six microsatellite markers on eight 3BS deletion lines showed that the major QTL was located distal to breakage point 3BS-8. Two microsatellites, Xgwm120 and Xgwm614, were significantly associated with QTL for scab resistance on chromosome 2BL and 2AS, respectively. Significant interaction between the major QTL on 3BS and QTL on 2BL was detected based on microsatellite markers linked to them.

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.

Refereed Publications:

Bai, G-H, R. Plattner, A. Desjarins, and F. L. Kolb. 2001. Resistance to Fusarium head blight and deoxynivalenol accumulation in wheat. *Plant Breeding* 120:1-6.

Kolb, F.L., G-H. Bai, G.J. Muehlbauer, J.A. Anderson, K.P. Smith, and G. Fedak. 2001. Host plant resistance genes for Fusarium head blight: Mapping and manipulation with molecular markers. *Crop Sci.* 41:611-619.

Zhou, W.C., F.L. Kolb, G-H. Bai, G. Shaner, and L.L. Domier. 2002. Genetic analysis of scab resistance QTL in wheat with microsatellite and AFLP markers. *Genome* 45:1-9.

Zhou, W. C., F.L. Kolb, G-H Bai, L.L. Domier, L.K. Boze, and N. J. Smith. 2002. Validation and marker-assisted selection of a major QTL for scab resistance with SSR markers in wheat. Submitted to *Plant Breeding*.

Proceedings Article:

Kolb, F. L., L. K. Boze, N. J. Smith, I. Vroh Bi and W. C. Zhou. 2001. NCR-184 - Management of head scab in small grains - Illinois Report. p.296-298. *In* S.M. Canty, J. Lewis, L. Siler and R. W. Ward (eds.). 2001 National Fusarium Head Blight Forum Proceedings, Erlanger, Kentucky, 8-10 Dec. 2001. Michigan State University, East Lansing, Michigan.

Abstracts:

Bai, G.-H, P. Guo, and F. L. Kolb. 2001. Genetic diversity and scab-resistance wheat cultivars based on molecular markers. P. 7. *In* S.M. Canty, J. Lewis, L. Siler and R. W. Ward (eds.). 2001 National Fusarium Head Blight Forum Proceedings, Erlanger, Kentucky, 8-10 Dec. 2001. Michigan State University, East Lansing, Michigan.

Bai, G-H, Guo P-G, and F.L. Kolb. 2001. Genetic relationship among scab resistant cultivars of wheat as revealed by molecular markers. ASA-CSSA-SSSA Annual meeting, Charlotte, NC, Oct. 21-25, 2001.

Zhou, W.C., F.L. Kolb, G-H Bai, L.L. Domier, L.K. Boze, and N.J. Smith. 2001. Validation and marker-assisted selection of a major QTL for scab resistance with SSR markers in wheat. P. 291. *In* S.M. Canty, J. Lewis, L. Siler and R. W. Ward (eds.). 2001 National Fusarium Head Blight Forum Proceedings, Erlanger, Kentucky, 8-10 Dec. 2001. Michigan State University, East Lansing, Michigan.

Newsletter Article:

Boze, L. K. and F. L. Kolb, 2001. Scab resistance of varieties in the University of Illinois scab evaluation nursery, 1999-2001. *Illinois Wheat Association Newsletter* Vol.7, No. 4 p. 8.