

**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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<b>Year:</b>	<b>FY2002 (approx. May 02 – April 03)</b>
<b>Grant Number:</b>	<b>59-0790-9-050</b>
<b>Grant Title:</b>	<b>Fusarium Head Blight Research</b>
<b>FY02 ARS Award Amount:</b>	<b>\$ 77,526</b>

**Project**

<b>Program Area</b>	<b>Project Title</b>	<b>USWBSI Recommended Amount</b>
VDUN	Development of Scab Resistance Soft Red Winter Wheat Varieties.	\$79,464
	<b>Total Amount Recommended</b>	<b>\$79,464</b>

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Principal Investigator

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Date

### **Project 1: Development of Scab Resistance 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 2002 Northern Uniform Winter Wheat Scab Nursery (NUWWSN). These lines were made available to other breeders by entering them into the nursery. Three of the Illinois lines were among the most scab resistant lines in the nursery, and these three lines were in the most resistant group for all seven measures of scab resistance. University of Illinois entries have performed well in the NUWWSN for three consecutive years.
- In 2002 about 550 breeding lines and varieties were evaluated in replicated rows in the misted, inoculated scab evaluation field nursery. This included five cooperative nurseries with breeding lines from numerous breeding programs, a germplasm evaluation experiment with 48 entries, 45 entries from the Illinois Variety Trial, and approximately 200 doubled haploid lines. In addition, about 1900 entries from single plots were evaluated in the field inoculated nursery. Scab resistant lines were evaluated for many additional traits including grain yield, milling and baking quality, standability, and resistance to other diseases.
- Two scab resistant by susceptible populations, both using ‘Ning7840’ as the source of resistance, were developed to examine the effect of the 3BS QTL in different genetic backgrounds. Scab resistance and simple sequence repeat (SSR) markers linked to the resistance QTL were analyzed. Markers linked to the major QTL on chromosome 3BS in a previously mapped population (‘Ning7840’ / ‘Clark’) were closely associated with scab resistance in both validation populations.
- Two sets of substitution lines were developed by crossing individual monosomic lines of Chinese Spring (recipient) with scab resistant cultivar Sumai 3 (donor) and then using the monosomics as the recurrent male parent for four backcrosses. These substitution lines were used to evaluate spread within the head (Type II resistance) and deoxynivalenol accumulation within kernels with the objective of using the substitution lines to evaluate the effect of individual Sumai 3 chromosomes on the two different types of resistance. Significant differences in Type II scab resistance and deoxynivalenol (DON) levels among different Chinese Spring (Sumai 3) substitution lines were detected. Positive chromosome substitution effects on Type II scab resistance were found on chromosomes 2B, 3B, 6B, and 7A from Sumai 3. Chromosomes 3B and 7A also reduced DON accumulation within the kernels.

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 Publications:**

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 microsatellites and AFLP markers. *Genome* 45:719-727.

Zhou, W-C., F.L. Kolb, G-H Bai, L.L. Domier and J-B Yao. 2002. Effect of individual Sumai 3 chromosomes on resistance to scab spread within spikes and deoxynivalenol accumulation within kernels in wheat. *Hereditas* 137: 81-89.

Zhou, W-C., F.L. Kolb, G-H Bai, L.L. Domier, L.K. Boze, and N.J. Smith. 2003. Validation of a major QTL for scab resistance with SSR markers and use of marker-assisted selection in wheat. *Plant Breeding* 122:40-46.

**Abstracts:**

Zhou, W-C., F.L. Kolb, G-H Bai, J.B. Yao, and L.L. Domier. 2002. Effect of Sumai 3 chromosomes on scab resistance and deoxynivalenol accumulation within wheat spikes. Abstract 2002 ASA Meeting, Nov. 10-14, 2002.

Zhou, W-C., F.L. Kolb, G-H Bai, G.E. Shaner, and L.L. Domier. 2002. Molecular mapping of Fusarium head blight resistance QTL in wheat with microsatellite and AFLP markers. *Plant, Animal and Microbe Genomes X*, Jan. 12-16, 2002. San Diego, CA.

Zhou, W-C., F.L. Kolb, L.K. Boze, N.J. Smith, G-H Bai, L.L. Domier, and J-B Yao, 2002. Effect of Sumai 3 chromosomes on Type II and Type V scab resistance in wheat. In *Proceedings of the 2002 National Fusarium Head Blight Forum*, Erlanger, KY, Dec. 7-9, 2002.

**Presentation:**

Kolb, F. L., February 24, 2003. Progress in Developing Scab Resistant Wheat Varieties. Illinois Wheat Association Forum, Mount Vernon, Illinois.