U.S. Wheat and Barley Scab Initiative
FY01 Final Performance Report (approx. May 01 – April 02)
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Cover Page

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Grant Number:	**59-0790-0-060**
Grant Title:	**Fusarium Head Blight Research**
FY01 ARS Award Amount:	**$ 29,204**

Project

Program Area	Project Title	Requested Amount
Biotech	Molecular Breeding - A Promising Tool to Improve Wheat Resistance to Scab	$ 35,910
	Total Amount Requested	**$ 35,910**

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Principal Investigator Date

Project 1: Molecular Breeding - A Promising Tool to Improve Wheat Resistance to Scab

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

Effective utilization of available resources to improve scab resistance in wheat relies on availability of effective selection methods and understanding of the genetic relationship among wheat resistant germplasm. Because of complexity of wheat resistance to scab infection, it is difficult to solve the problem through classical method. Molecular marker provides an efficient tool for solving the complicated problem. We analyzed a world collection of scab resistant germplasm with AFLP and microsatellite markers to characterize genetic relationship among these cultivars. To facilitate application of markers from 3BS QTL in breeding programs, we developed breeder-friendly STS markers from closely linked AFLP markers. In addition, a high-throughput marker-assisted selection protocol was developed for marker-assisted selection and several markers for 3BS QTL were validated in different populations and breeding generations. The results will provide breeders with useful information for selecting parents and selectable markers for breeding wheat cultivars with high levels of scab resistance.

2. What were the most significant accomplishments?

a. Through genomewide DNA fingerprinting of a worldwide scab resistant germplasm collection, we found that Chinese and Japanese resistance sources are closely related, while scab resistance sources from American and European countries are different from these Chinese resources. We also found that most Chinese resistant lines derived from Sumai 3 or Ning 7840 contain 3BS major QTL.

b. One AFLP marker has been successfully converted into a co-dominant STS marker. This STS marker showed a high R^2 value in Ning7840/Clark mapping population, and demonstrated a good correlation with 3BS QTL in array of resistant cultivars. This marker is ready to be released to breeding programs. Another dominant STS marker has been identified, and the PCR condition is been optimized and further validation of the marker is underway.

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. Guo P-G, **Bai G-H** and Shaner G.E. 2002. AFLP and STS tagging of a major QTL for scab resistance in wheat. Theor. & Appl. Genet. (Accepted with minor revision)
2. **Bai G-H**, Guo P-G and Kolb FL. 2002. Genetic relationships among scab-resistant cultivars of wheat based on molecular Markers. Crop Science. (Accepted with minor revision)
3. Zhou W-C, Kolb FL., **Bai G.-H**., Shaner GE. and Domier L. L. 2002. Genetic analysis of scab resistance QTL in wheat with microsatellite and AFLP markers. Genome. (In press)
4. **Bai G-H**, Desjardins AE and Plattner RD. 2001. Deoxynivalenol-nonproducing *Fusarium graminearum* causes initial infection, but does not cause disease spread in wheat spikes. Mycopathologia 153:91-98
5. **Bai G-H**, Plattner R., Desjardins A. and Kolb F. 2001. Resistance to Fusarium head blight and deoxynivalenol accumulation in wheat. Plant Breeding 120:1-6
6. Lu WZ, et al (eds). 2001 "Research on Wheat Scab" (in Chinese). China Scientific Press, Beijing China.
7. W-C. Zhou, 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. Plant Breeding (Submitted)

Meeting Presentations

1. **Bai G-H**, Guo P-G., and Kolb FL. 2002. Genetic diversity in scab-resistant wheat cultivars based on molecular markers. Genome X. Jan 12-17, San Diego. CA
2. Guo P-G, and **Bai G-H** . 2002. A STS marker for scab resistance QTL in wheat derived from PstI-AFLP. . Genome X. Jan 12-17, San Diego. CA
3. Bernardo A, and **Bai G-H.** 2001. Developing ESTs for scab resistance in wheat using suppression subtraction hybridization and bulk segregant analysis. . 2001 National Fusarium Head Blight Forum. Dec. 8-10, 2000, Cincinnati, OH.
4. **Bai G-H**, Guo P-G, Kolb F.L. 2001. Genetic relationship among scab-resistant cultivars of wheat as revealed by molecular markers. 2001 ASA-CSSA-SSSA Annual meeting, Charlotte, NC Oct 21-25, 2001.