

**U.S. Wheat and Barley Scab Initiative
 FY00 Final Performance Report (approx. May 00 – April 01)
 July 30, 2001**

Cover Page

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Grant Number:	59-0790-0-060
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2000 ARS Award Amount:	\$34,146

Project

Program Area	Project Title	Requested Amount
Biotechnology	Create molecular maps of wheat genes imparting resistance to scab infection and deoxynivalenol (DON) accumulation.	\$45,700.00
	Requested Total	\$45,700.00¹

Principal Investigator

Date

¹ Note: The Requested Total and the Award Amount are not equal.

Project 1: Create molecular maps of wheat genes imparting resistance to scab infection and deoxynivalenol (DON) accumulation.

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

Effective utilization of scab resistance resources relies on understanding inheritance of wheat resistance to scab and to DON accumulation in wheat grain. Because of complexity of wheat resistance to scab infection and DON, conclusions from classical research are controversial. Molecular mapping of QTL provides an efficient tool for solving the complicated problem. We constructed a well spaced molecular linkage map with AFLP and some microsatellite markers to characterize QTL for Type II scab resistance and low DON, and to dissect genetic effects of these QTL by testing the mapping population for scab resistance and DON accumulation under field and greenhouse conditions. The results will provide useful information on inheritance of the wheat resistance to the complicated disease and also speed up breeding process by providing breeders with selectable markers for breeding wheat cultivars with low DON and high levels of scab resistance.

2. What were the most significant accomplishments?

- a. Through AFLP mapping, we concluded that three QTL in Ning 7840 controlled Type II scab resistance. One QTL with a major effect located on chromosome 3BS by SSR markers and other two demonstrated minor effect on scab resistance.
- b. One major QTL for low DON as evaluated by spray inoculation under greenhouse conditions has been mapped on cv. Ning 7840, and DON levels in infected seeds of 133 F11 RILs from two field experiments have been analyzed for further mapping of low DON under field infection conditions.
- c. The AFLP map derived from Ning 7840/Clark population is being further saturated with PstI-AFLP, RGA and SSR markers.
- d. One AFLP marker has been converted into STS marker, 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.

Papers Published or Submitted

1. **Bai G-H**, Plattner, R., Desjardins, A. and Kolb, F. 2000. Resistance to Fusarium head blight and Deoxynivalenol accumulation in wheat. *Plant Breeding* 120:1-6
2. **Bai, G-H.**, Shaner, G., and Ohm, H. 2000. Inheritance of resistance to *Fusarium graminearum* in wheat. *Theor. and Appl. Genet.* 100: 1-8.
3. F. L. Kolb, **Bai, G-H.**, Muehlbauer, G. J., Anderson, J. A., Smith, K. P. and Fedak, G. **2001.** Molecular mapping of resistance genes for Fusarium head blight in wheat and barley. *Crop Science* 41:611-619
4. Desjardins A. E., **Bai G-H**, Plattner R. D., and Proctor R.H. 2000. Analysis of aberrant virulence of *Gibberella zae* following transformation-mediated complementation of a trichothecene-deficient (*Tri5*) mutant. *Microbiology* 146:2059-2068
5. **Bai G-H**, Desjardins A.E and Plattner R.D. 2001. Deoxynivalenol-nonproducing *Fusarium graminearum* causes initial infection, but does not cause disease spread in wheat spikes. *Mycopathologia* (Accepted).
6. Zhou W-C, Kolb, F. L., **Bai, G.-H.**, Shaner, G.E. and Domier, L. L. 2001. Microsatellite mapping and sub-arm physical mapping of a major scab resistance QTL in wheat. *Phytopathology* (Submitted)
7. **Bai G-H**, Kolb, F. , Shaner, G., and Domier, L.. 2001. Characterization of scab resistance QTL in wheat using an AFLP map. TAG (submitted).
8. **Bai, G-H**, Plattner, R., Shaner, G. and Kolb, F.. 2000. A QTL for deoxynivalenol tolerance in wheat. *Phytopathology*. 90(6):S4. (abstract)
9. Chen, L-F, **Bai, G-H.**, and Desjardins, A. E. 2000. Recent advances in wheat head scab research in China. National Agricultural Library Internet publication, USDA <http://www.nal.usda.gov/pgdic/WHS/whsindex.html>

Meeting Presentations

1. **Bai G-H**, Desjardins A.E and Plattner R.D. 2000. Deoxynivalenol-nonproducing *Fusarium graminearum* causes initial infection, but does not cause disease spread in wheat spikes. International Symposium on Wheat Improvement for Scab Resistance” Suzhou and Nanjing China, 5-11 May, 2000
2. **Bai G-H**, Plattner R., Shaner G. and Kolb F. 2000. A QTL for deoxynivalenol tolerance in wheat. American Phytopathological Society” Annual Meeting, New Orleans. LA, August 12-16, 2000.

3. **Bai G-H** 2000. Identification of QTL for scab resistance and low DON level in wheat. “Great Plains Cereals Biotechnology Consortium Research Symposium”. September 13-16, Kansas City MO.
4. **Bai G-H**, Plattner R., Shaner G. and Kolb F. 2000. Molecular mapping of a QTL for DON tolerance in wheat. 2000 National Fusarium Head Blight Forum. Dec. 10-12, 2000, Cincinnati, OH.
5. Guo P-G., Shaner G. and **Bai G-H**. 2000. Fine mapping of a QTL for wheat scab resistance using PstI-AFLP. 2000 National Fusarium Head Blight Forum. Dec. 10-12, 2000, Cincinnati, OH.
6. Zhang X., Guo P-G., Lu W-Z and **Bai G-H**. 2000. Creation of an AFLP map for identification of scab resistance genes from wheat cultivar Wangshuibai. 2000 National Fusarium Head Blight Forum. Dec. 10-12, 2000. Cincinnati, OH.
7. I Bi, F. Kolb, L. Boze, **G-H. Bai** and L. Domier. 2000. Development of STSs and SNPs linked to Fusarium head blight resistance of wheat using AFLPs and antifungal gene analogs. 2000 National Fusarium Head Blight Forum. Dec. 10-12, 2000. Cincinnati, OH.
8. Zhou W, Kolb F., **Bai G-H**, Shaner G. and Domier L.. 2000. SSR mapping and subarm physical location of a major scab resistance QTL in wheat. 2000 National Fusarium Head Blight Forum. Dec. 10-12, 2000. Cincinnati, OH

Invited Presentations

1. QTL for scab resistance and DON accumulation in wheat. Sept. 6, 2000. Invited seminar of Dept of Entomology and Plant Pathology, OSU.
2. Molecular Analysis of Quantitative Traits for scab resistance in Wheat. July 20-21. 2000. OSU Minisymposium: Model Organisms and Lessons Learned from DNA. Dept of Biochemistry and Molecular Biology. OSU.
3. Mapping QTL for scab resistance in wheat. May 13, 2000. Nanjing Agricultural University, Nanjing China.