

**U.S. Wheat and Barley Scab Initiative  
Annual Progress Report  
September 15, 1999**

**Cover Page**

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<b>Year:</b>	<b>FY1999</b>

**Project**

<b>Program Area</b>	<b>Objective</b>	<b>Requested Amount</b>
Biotechnology	Create molecular maps of wheat genes imparting resistance to scab infection and deoxynivalenol (DON) accumulation.	\$15,000
	<b>Requested Total</b>	<b>\$15,000<sup>1</sup></b>

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Principle Investigator

Date

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<sup>1</sup> Note: The Requested Total and the Amount Granted 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?

Trichothecenes such as DON produced by the *Fusarium graminearum* have been shown to be important in the disease process and toxic to human and animals. We are trying to identify wheat germplasm with low DON level, to understand genetic control of low DON accumulation in wheat kernels, and reveal relationship between DON level in wheat kernels and plant resistance to scab. Molecular mapping approach is used to identify gene effects and number of genes involved in controlling DON accumulation in wheat kernels, and to determine the relationships between DON and visual scab symptoms and between different resistance components. The results are expected to provide plant breeders with selectable markers for improving wheat cultivars with low DON level and high resistance to scab. This should allow breeders to pyramid genes controlling different components of resistance to speed the process of developing highly resistant cultivars.

2. Please provide a comparison of the actual accomplishments with the objectives established.

- a. Identified high correlation between Type II scab resistance and DON level by evaluating 120 worldwide wheat collections for DON levels and Type II resistance in greenhouse.
- b. Constructed a wheat AFLP map by using 133 RILs from the cross between Ning 7840 and Clark.
- c. Evaluated wheat Type I, II, and VI resistance of the mapping population in greenhouse by spraying spores on wheat spike. The same set of RILs was also tested for field scab resistance in two locations of Illinois (Urbana and Peoria). Scab severity was measured from both field and greenhouse experiments. Seeds from inoculated spikes of each line are being evaluated for percent scabby seeds and DON levels. The data will be used to identify QTL controlling low DON levels and other resistance components.

3. What were the reasons established objectives were not met? If applicable.

Time required to complete the proposed project was predicted to be at least two years. Funding provided for this project was much less than needed and only provided for some technical support and not the chemicals and reagents used. Nevertheless, we made very significant progress toward the objectives.

4. What were the most significant accomplishments this past year?

An AFLP map has been constructed. Field and greenhouse scab evaluation of mapping population has been done as expected in proposal. DON evaluation is underway. Transfer of AFLP into STS markers is in progress. This is first attempt to construct high resolution AFLP map using

intervarietal mapping population segregating for scab resistance. This is first time to map wheat field scab resistance and low DON levels. Map wheat resistance as evaluated by spray inoculation in greenhouse is also a new strategy.

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. Bai, G.-H., Kolb, F., Shaner, G., and Domier, L. 1999. Amplified fragment length polymorphism markers linked to a major quantitative trait locus controlling scab resistance in wheat. *Phytopathology* 89: 343-348.
2. Bai, G.-H., Chen, L.-F. and Shaner, G. 1999. Breeding for resistance to head blight of wheat in China. In: *Wheat Fusarium Head Blight*. Kurt Leonard, (ed). APS Press. (In press).
3. Bai, G.-H., Shaner, G., and Ohm, H. 1999. Inheritance of wheat resistance to *Fusarium graminearum* in wheat. *Theory and Applied Genetics*. (Accepted).
4. Bai, G.-H., Plattner, R. and Desjardins, A., and Kolb, F. 1999 Deoxynivalenol Production by *Fusarium graminearum* on Wheat. *Plant Disease* (Submitted).
5. Chen, L.-F., G.-H. Bai, and A. E. Desjardins. 1999. Advances in wheat head scab research in China. USDA Internet Publication
6. Bai, G.-H., Kolb, F., Shaner, G., and Domier, L. 1999. Using AFLP map to identify scab resistance QTLs in wheat. Oct. 31-Nov. 4, 1999. ASA Annual Meeting, Salt Lake City, Utah.