

**U.S. Wheat and Barley Scab Initiative
Annual Progress Report
September 18, 2000**

Cover Page

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Year:	FY2000
Grant Number:	59-0790-9-055
Grant Title:	Fusarium Head Blight Research
Amount Granted:	\$90,000.00

Project

Program Area	Objective	Requested Amount
Biotechnology	Enhance scab resistance in wheat and barley germplasm by plant transformation.	\$60,000.00
Biotechnology	Use mapping scab QTL in barley and development of scab QTL near-isogenic lines.	\$40,000.00
	Requested Total	\$100,000.00¹

Principal Investigator

Date

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

Project 1: Enhance scab resistance in wheat and barley germplasm by plant transformation.

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

Fusarium head blight (FHB or scab) is a disease that can devastate wheat and barley. To enhance scab resistance in wheat and barley, we are developing transgenic wheat and barley carrying antifungal protein genes.

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

The established objectives were to develop transgenic wheat and barley carrying antifungal protein genes, characterize the plants at the molecular level and test them for resistance to FHB.

We have met the objective of developing transgenic wheat and barley carrying antifungal protein genes. We developed wheat plants carrying transgenes that encode the following antifungal proteins: a wheat thionin, barley PR5, barley ribosome inactivating protein (RIP) and a barley glucanase. We have developed barley plants carrying transgenes that encode the following antifungal proteins: a barley ribosome inactivating protein (RIP) and a wheat thaumatin-like protein. We are meeting the objective of characterizing the transgenic plants at the molecular level. We have shown that the wheat thionin, barley PR5, barley RIP and barley glucanase transgenes are expressed in wheat. We are in the process of evaluating expression of the barley RIP in barley. We have advanced these plants to the T₂ generation and we plan to screen these plants for resistance to FHB this fall and winter.

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

All objectives have been met.

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

We developed transgenic wheat and barley plants carrying antifungal protein genes. We showed that these genes are expressed in the transgenic wheat plants. We have advanced the plants to the point where we will be evaluating them this fall and winter for FHB resistance.

Project 2: Mapping scab QTL in barley and development of scab QTL near-isogenic lines.

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

Fusarium head blight (FHB or scab) is a disease that can devastate barley. To enhance the breeding effort in barley, we are identifying and utilizing molecular markers associated with scab resistance.

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

The established objectives were: (1) to verify FHB and deoxynivalenol (DON) resistance QTL in Chevron-derived progeny populations coupled with a breeding effort to combine resistance with good agronomic and quality performance; (2) to evaluate marker-assisted selection (MAS) for Chevron-derived FHB resistance QTL; (3) to map FHB and DON resistance genes from a two-rowed source of resistance coupled with a breeding effort to combine resistance with good agronomic and quality performance and; (4) to use MAS in the Chevron/M69 population to select and develop near-isogenic lines (NILs) for FHB and DON resistance QTL.

Objective 1: Out of the 10 possible QTL associated with FHB resistance we verified 3 QTL.

Objective 2: We conducted MAS in two populations for 2 QTL associated with FHB resistance. We will evaluate the selected lines in the Summer of 2001.

Objective 3: We developed a molecular marker linkage map for the Fredrickson/Stander population.

Preliminary QTL analysis indicates that there is a major QTL for FHB resistance on chromosome 2.

Objective 4: We are developing NILs for the Chevron-derived FHB resistance QTL located on chromosome 2. To date, we have developed BC₃ material.

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

All objectives have been met.

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

We verified three FHB QTL from the Chevron/M69 population. We utilized MAS in two populations to identify plants carrying QTL associated with FHB. We developed a molecular marker linkage map for the Fredrickson/Stander population and conducted a preliminary QTL analysis. We developed BC₃ material for the Chevron-derived FHB resistance QTL located on chromosome 2.

Year: 2000

Progress Report

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Grant: 59-0790-9-055

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.

de la Peña, R.C., K. Smith, F. Capettini, G.J. Muehlbauer, M. Gallo-Meagher, R. Dill-Macky, D.A. Somers and D.C. Rasmusson. 1999. Quantitative trait loci associated with resistance to fusarium head blight and kernel discoloration in barley. *Theor. Appl. Genet.* 99:561-569.

Canci, P.C., K. Smith, R. Dill-Macky, G.J. Muehlbauer and D.C. Rasmusson. 1999. Genetic relationship between Fusarium head blight, kernel discoloration, and grain protein. 16th American Barley Researchers Workshop, p. 18.

Muehlbauer, G.J. and L. Smith. 1999. Developing transgenic barley carrying antifungal protein genes. Barley Workers Meeting, Idaho Falls, ID.