USDA-ARS / USWBSI
FY02 Final Performance Report (approx. May 02 – April 04 [NCE])
July 15, 2004

Cover Page

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Year:	**FY2002 (approx. May 02– April 03)**
FY02 Agreement Number:	**59-0790-1-073**
FY02 Agreement Title:	**Fusarium Head Blight Research**
FY02 ARS Award Amount:	**$ 65,366**

USWBSI Individual Project

Program Area	Project Title	USWBSI Recommended Amount
BIO	Development of Environment-Friendly Fusarium Head Blight Resistant Transgenic Plants in Barley and Durum Wheat.	$ 67,000
	Total Amount Recommended	**$ 67,000**

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Principal Investigator Date

Project 1: Development of Environment-Friendly Fusarium Head Blight Resistant Transgenic Plants in Barley and Durum Wheat.

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

Resistance to FHB in barley and durum is limited, with only a few sources of partial resistance available for cultivar development. The development of transgenic barley and durum expressing antifungal and antitoxin genes has the potential to provide breeders with additional sources of resistance to incorporate into breeding programs. Single gene insertions have provided some protection, comparable to resistant checks, but disease and DON levels are still too high to provide complete protection. Our objective is to insert multiple antifungal and antitoxin genes into barley and durum, develop homozygous lines expressing the genes, and test their effects on FHB and DON. Antitoxin genes being used include *Tri101* and *Tri12*, and antifungal genes include chitinase and thaumatin-like protein genes.

2. What were the most significant accomplishments?

Additional greenhouse tests showed that *Tri101* and *PDR5* transgenic barley lines had disease levels comparable to the resistant checks CI4196 and Zhedar 2, significantly less than nontransgenic Conlon. Field tests did not show any significant decreases in FHB in any of the transgenic lines. All *Tri101* and *PDR5* lines also have been crossed twice to Conlon and Lacey to develop lines without somaclonal variation, and lines that looked most like the wildtype parent have been selected for disease testing.

Transgenic barley plants with three independent insertion events of a rice chitinase and rice thaumatin-like protein (tlp) were evaluated and advanced to the T_2 to develop homozygous lines. All three events produced the tlp as measured using western blots, but only one event produced the chitinase protein. Testing for leaf and root disease reaction is underway. Homozygous lines from all three events will be screened for FHB reaction this fall.

A total of 39 barley plants containing *Tri101* + tlp were regenerated. Western results show that the tlp gene is expressed in the leaves of these plants and their progeny. All six transgenic plants containing *Tri101* + chitinase show no expression of the chitinase gene by western analysis. A single transgenic containing *Tri12* + chitinase has been recovered so far and is under evaluation.

Transgenic durum also has been recovered, with 44 plants containing *Tri101* + tlp. Western analysis indicates tlp is expressed in some of these plants and their progeny.

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.

Manoharan, M., Hohn, T.M., and Dahleen, L.S. Genetic transformation of barley with genes for scab resistance. In Annual Meeting Abstracts [CD-ROM]. ASA, CSSA, SSSA, Madison, WI. 2002.

Dahleen, L.S. and M. Manoharan. 2003. Transformation of barley with two antifungal genes. In Vitro Congress on In Vitro Biology Abstract Issue Poster P-2000. 39:36A.

Manoharan, M. and L.S. Dahleen. 2003. Regeneration and genetic transformation of durum wheat. In Vitro Congress on In Vitro Biology Abstract Issue Poster P-2001. 39:36A