

**USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY05 Final Performance Report (approx. May 05 – April 06)
July 14, 2006**

Cover Page

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Fiscal Year:	2005
FY05 ARS Agreement ID:	NA
Agreement Title:	Development and Testing of Transgenic Barley for FHB Resistance.
FY05 ARS Award Amount:	\$ 52,000

USWBSI Individual Project(s)

USWBSI Research Area*	Project Title	ARS Adjusted Award Amount
BIO	Development and Testing of Transgenic Barley for FHB Resistance.	\$ 52,000
	Total Award Amount	\$ 52,000

Principal Investigator

Date

* BIO – Biotechnology
CBC – Chemical & Biological Control
EDM – Epidemiology & Disease Management
FSTU – Food Safety, Toxicology, & Utilization
GIE – Germplasm Introduction & Enhancement
VDUN – Variety Development & Uniform Nurseries

Project 1: *Development and Testing of Transgenic Barley for FHB Resistance.***1. What major problem or issue is being resolved and how are you resolving it?**

Fusarium head blight (FHB) in barley (*Hordeum vulgare* L.), caused mainly by *Fusarium graminearum*, is a major disease of devastating economic impact. The fungus also produces the mycotoxin deoxynivalenol (DON) in infected grains which poses safety concerns for human and livestock. Currently, there are no reports of barley genotypes that are highly resistant to Fusarium Head Blight (FHB). Resistance sources to FHB in barley is limited with only a few sources providing partial resistance. The development of barley that would express antitoxin and antifungal genes could provide breeders with sources of a combination resistance genes to be incorporated in the current breeding programs. Expression of single gene (antifungal or antitoxin) have provided some protection comparable to resistant checks but disease could still be overwhelming and DON levels could still be high. Our goal is to provide a combination of additional genes (through particle bombardment) for FHB resistance and low deoxynivalenol (DON) for breeding resistant barley cultivars. The specific objective in 2005 was to test new and existing homozygous transgenic as well as backcross-derived lines developed from previous and current USWBSI grants, for their reaction to FHB and DON level in the field.

2. List the most important accomplishment and its impact (how is it being used?).

Complete all three sections (repeat sections for each major accomplishment):

Accomplishment: Two homozygous T₂ lines each from 45 T₀ plants (40 transformation events) containing two pathogen response genes were developed through testing for gene presence and expression. These 90 lines were tested in replicated field plots for their reaction to FHB in the summer of 2005. While most lines had similar disease levels to the wild-type parent Conlon, three showed significantly less FHB. None of the lines had less DON than Conlon. Additional transgenic and backcross-derived transgenic lines expressing a rice chitinase and thaumatin-like protein also were tested in the field. None of them had reduced FHB or DON. All lines are being tested in the field again this year. Progeny from an additional 25 T₀ plants from 18 transformation events carrying single or pairs of pathogen response genes were tested for the presence and expression of the transgenes. Homozygous lines are being developed from these plants.

Impact: Gene combinations showing potential impact on FHB in barley were identified for further testing. If these combinations continue to reduce FHB in field trials, they are potentially useful lines for developing FHB resistant barley germplasm.

As a result of that accomplishment, what does your particular clientele, the scientific community, and agriculture as a whole have now that they didn't have before?: The first year's field data show that some antifungal gene combinations have little to no effect on FHB in barley. This knowledge can be used to help develop a more targeted strategy to select gene combinations to improve FHB resistance.

FY05 (approx. May 05 – April 06)

FY05 Final Performance Report

PI: Dahleen, Lynn

ARS Agreement #: NA

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.

Tobias, D.J., N. Hillen and L.S. Dahleen. Transgenic barley co-expressing antifungal and antitoxin genes. Proceedings of the 2005 National Fusarium Head Blight Forum. p. 107. 2005.