USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY05 Final Performance Report (approx. May 05 – April 06)
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Cover Page

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Fiscal Year:	**2005**
FY05 ARS Agreement ID:	**NA**
Agreement Title:	**Engineering Scab Resistance in Wheat by Combining Diverse Defense Mechanisms.**
FY05 ARS Award Amount:	**$ 60,000**

USWBSI Individual Project(s)

USWBSI Research Area*	Project Title	ARS Adjusted Award Amount
BIO	Engineering Scab Resistance in Wheat by Combining Diverse Defense Mechanisms.	$ 60,000
	Total Award Amount	**$ 60,000**

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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: *Engineering Scab Resistance in Wheat by Combining Diverse Defense Mechanisms.*

1. What major problem or issue is being resolved and how are you resolving it?
There is a shortage of cereal genes that are known to be effective in conferring resistance to Fusarium infection and DON accumulation. Our goal is to develop germplasm of hexaploid and durum wheat with improved resistance to Fusarium Head Blight by transformation–mediated combinations of anti-fungal genes. One such gene is the yeast gene that encodes the ribosomal protein L3, which is the target of DON toxicity. DON is a virulence factor for Fusarium spread in cereals, and thus making wheat resistant to its toxicity is expected to reduce Fusarium infection. In tobacco, it has been shown that over-expression of L3 makes seedlings resistant to DON in germination assays. Even more effective in tobacco was over-expression of an N-terminal fragment of the L3 protein in combination with the Pokeweed Antiviral Protein. We have introduced constructs containing coding regions of these genes under the control of the widely expressed maize *Ubiquitin1* promoter into hexaploid wheat. Another type of potentially anti-fungal gene is one that activates the reactive oxygen species defense responses of wheat. One such gene is from *Aspergillus* and encodes glucose oxidase, an enzyme whose product is hydrogen peroxide. Expression of this gene in wheat tissues could provide a barrier to initial infection as well as activate native pathogenesis-response genes. The glucose oxidase gene was placed under control of the barley *Lem1* promoter, which previous work in our lab had shown was well expressed only in the lemma, palea and rachis before anthesis. This construct was bombarded into embryogenic callus of wheat.

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: We generated 30 different transgenic wheat lines that expressed either the yeast ribosome protein L3 fragment or the pokeweed anti-viral protein or both.

Impact:
Seeds of the transgenic wheat lines were shipped to Nilgun Tumer at Rutgers University for germination tests for resistance to DON.

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?:

A new source of potentially Fusarium Head Blight resistance genes in hexaploid wheat

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.

Poster Presentations:

Blechl A. E. and Somleva, M.N., 2005. Accumulation of transgene-encoded defense-associated enzymes in tissue vulnerable to initial Fusarium infection. Proceedings of the 2005 National Fusarium Head Blight Forum, Dec. 11-13, 2005, in Milwaukee, WI, p 102 and at http://www.scabusa.org/forum.html#forum05.html

Somleva, M. N. and Blechl, A. E. 2005. Engineering of improved resistance to Fusarium Head Blight in wheat. XVII International Botanical Congress, July 17-23, 2005, in Vienna, Austria, P2619 on page 652 at http://www.ibc2005.ac.at/program/abstracts/IBC2005_Abstracts.pdf