USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY07 Final Performance Report (approx. May 07 – April 08)
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Cover Page

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Fiscal Year:	2007
USDA-ARS Agreement ID:	NA
USDA-ARS Agreement Title:	Wheat Transformants Containing DON Resistant Versions of Wheat L3 Ribosomal Protein.
FY07 ARS Award Amount:	$ 7,000

USWBSI Individual Project(s)

USWBSI Research Area*	Project Title	ARS Adjusted Award Amount
GET	Modification of the Ribosomal Target to Enhance Resistance to Trichothecene Mycotoxins.	$7,000
	Total Award Amount	**$ 7,000**

7/14/2008
Principal Investigator Date

* CBCC – Chemical, Biological & Cultural Control
EEDF – Etiology, Epidemiology & Disease Forecasting
FSTU – Food Safety, Toxicology, & Utilization of Mycotoxin-contaminated Grain
GET – Genetic Engineering & Transformation
HGR – Host Genetics Resources
HGG – Host Genetics & Genomics
IIR – Integrated/Interdisciplinary Research
PGG – Pathogen Genetics & Genomics
VDUN – Variety Development & Uniform Nurseries

Project 1: *Modification of the Ribosomal Target to Enhance Resistance to Trichothecene Mycotoxins.*

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

One of the most cost-effective ways to prevent losses due to Fusarium Head Blight (FHB) is host plant resistance. Although applications of traditional breeding have resulted in introgression of Type II resistances into wheat, these are only partial and can be overcome by large inocula of *Fusarium* spores. The deoxynivalenol (DON) toxin produced by *Fusarium* species acts as a virulence factor in increasing the success of fungal colonization and spread. The target of the toxin is the ribosomal protein L3.

Genetic transformation can be used to introduce new sources of resistance into wheat. In previous work with collaborators Nilgun Tumer and Di Rong (Rutgers University, New Brunswick, New Jersey), we have shown that transgenic wheat seedlings with high levels of a truncated form of the yeast L3 protein are protected against DON toxicity. More recently, Tumer and colleagues isolated genes encoding wheat L3 ribosomal proteins. They prepared DNA constructions fusing the highly expressed maize *Ubiquitin1* promoter and first intron to two different DON-resistant mutants of the wheat *RPL3A1* gene and to a truncated wheat *RPL3A1* gene that encodes the L3 protein fragment. Each coding region included V5 and 6xHis epitope tags so that the new proteins can be distinguished from native wheat L3. The work for the project that is the subject of this report was to introduce these three constructs into wheat using particle bombardment.

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:

Wheat transformants have been identified that contain the constructs for each DON-resistant mutant form of the wheat L3 gene or for the wheat L3 gene fragment. Inheritance to the T_1 generation has been confirmed for 9 transformants containing the W258C (cysteine for tryptophan at position 258) mutant form of the wheat gene, 12 transformants containing the W258K (lysine for tryptophan) mutant form of the wheat gene, and 4 transformants containing the truncated wheat gene encoding the L3 fragment. Some putative transformants still need to be characterized for inheritance.

Impact:

After securing interstate movement permits from APHIS, T_1 or T_2 seed from the transformants will be sent to Rutgers University where Tumer and colleagues will characterize expression of the L3 mutant and L3 fragment genes in various tissues. The resistance of transgene-expressing wheat seedlings to DON will be determined. If toxin resistance is demonstrated, selected lines will be greenhouse- and field-tested for DON accumulation levels and resistance to FHB. If this research is successful, these transgene loci will provide genetically marked sources of novel resistance to FHB.

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 scientific community will have a new and independent way of attaining resistance to FHB. This strategy utilizes over-expression of variant forms of natural wheat proteins and thus may be more acceptable to the public than introduction of completely alien proteins into wheat. As barriers to introduction of genetically engineered wheat into commercial production are overcome, wheat breeders can combine this type of resistance with Type I and Type II resistances from other sources to provide producers with wheat cultivars with robust multi-genic FHB resistance.

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.

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