U.S. Wheat and Barley Scab Initiative
FY01 Final Performance Report (approx. May 01 – April 02)
July 15, 2002

Cover Page

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Year:	**FY2001 (approx. May 01 – April 02)**
Grant Number:	**N/A**
Grant Title:	**Fusarium Head Blight Research**
FY01 ARS Award Amount:	**$ 48,673**

Project

Program Area	Project Title	Requested Amount
Biotech	Transformation of Barley with an altered thionin antifungal gene	$ 50,000
	Total Amount Requested	**$ 50,000**

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Principal Investigator Date

Project 1: Transformation of Barley with an altered thionin antifungal gene

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

Currently, there are no known barley lines with biochemical resistance to *Fusarium*. In order to save barley as a crop in affected growing regions, it may be necessary to introduce *Fusarium* resistance through genetic transformation. Many technical obstacles must be overcome before stable pathogen-resistant transgenic cereals can be introduced into the field. It is first necessary to learn the requirements for strong redirected expression of antifungal genes, such as *HTH.* Ultimately, it will be futile to cultivate *Fusarium*-resistant lines in which the resistance gene(s) is expressed constitutively. Antifungal proteins must be expressed in the most appropriate tissue and subcellular compartment to avoid placing a metabolic burden on the plant and to minimize pressures which select for resistant pathogen strains. To do this most effectively, it is also necessary to understand the process of *Fusarium* infection. The proposed research incorporates subcellular targeting research and research on *F. graminearum* infection. Results from these studies will be incorporated with ongoing research, which has produced a lemma-specific promoter and several other floret-specific candidate genes. The long-range goal is to produce an antifungal gene/targeting vector that can be used in both barley and wheat.

2. What were the most significant accomplishments?

- Barley was transformed with a revised construct of our previous Hth1 vector. The Hth2 vector allowed a high degree of expression to occur at the mRNA level. However, mature HTH protein still did not accumulate in the target tissues of the transformants. Detailed analysis showed that the mRNA was attached to membrane-bound polyribosomes and was translated to various degrees, but the resultant translation products appeared to have been destroyed.
- Highly specific high-titre antibodies were produced to the hordothionin mature peptide.

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.

- Abstract P-1012 and oral presentation (by J. Fu), Congress on In Vitro Biology, June 2001. Constitutive expression of an endogenous antifungal protein alpha-hordothionin in transgenic barley. J. Fu, P. Sathish, M.L. Federico, H.F. Kaeppler, R.W. Skadsen. InVitro 27:25-A.