

**U.S. Wheat and Barley Scab Initiative
 FY01 Final Performance Report (approx. May 01 – April 02)
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Cover Page

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FY01 ARS Award Amount:	\$ 66,195

Project

Program Area	Project Title	Requested Amount
Biotech	Development of Environment-Friendly Fusarium Head Blight (scab) Resistant Transgenic Plants in Barley and Durum Wheat	\$ 83,416
	Total Amount Requested	\$ 83,416

Muthusamy Manoharan
Principal Investigator

7/15/02
Date

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

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

An efficient regeneration system is essential for successful gene transfer into a crop plant. There are substantial genotypic differences in the regeneration response of barley and durum wheat. The regeneration and transformation protocol has been standardized for barley cv. Conlon. We have also established an efficient regeneration system in durum wheat cv. Monroe. Immature embryos were cultured on different concentrations of picloram (1.0, 1.5, 2.0, 2.5 and 3.0 mg/L). Although more than 90% of the embryos produced callus with 2.5 to 3.0mg/L picloram, the best quality of callus was obtained with 2.0 mg/L picloram. Green shoots appeared within two weeks of culture. Most of the green shoots developed roots in the same medium or after transfer to rooting medium. The number of plants regenerated per embryo with 2.0mg/L picloram was higher than other concentrations. We also optimized the concentration of bialaphos selection. Media with more than 5.0 mg/L bialaphos completely inhibited shoot regeneration. Subsequently, 5.0 mg/L bialaphos was used for our transformation experiments.

Several putative transgenic durum plants were obtained after bombardment with modified *TRII01* and *bar* for selection. Plants survived herbicide (FINALE 0.5%) treatment indicating *bar* was present. Further confirmation of these plants are in progress.

The anti-fungal genes chitinase and *tlp* were successfully inserted into barley through particle bombardment. Efforts are underway to obtain transgenic plants with anti-toxin genes such as modified *TRII01* (trichothecene acetyltransferase) and *TRII2* (ATP-binding cassette transporter). Previously developed transgenic barley lines with unmodified *TRII01* and *PDR5* (similar to *TRII2*) were evaluated in the field (T₂) and greenhouse (T₃) for FHB infection and DON level. Two of the best lines from each independent events that showed less or equal FHB infection compared to the Conlon (control) from the field tests were selected and tested in the greenhouse. We observed reduction in both FHB infection and DON level, indicating the usefulness of these genes for combating the scab.

2. What were the most significant accomplishments?

- A. Obtained transgenic barley cv. Conlon plants with the anti-fungal genes chitinase and thaumatin-like protein (*tlp*).
- B. Established an efficient regeneration system for durum wheat cv. Monroe
- C. Obtained putative transgenic durum plants with modified *TRII01* gene.
- D. Completed first field and greenhouse tests of *TRII01* (unmodified) and *PDR5* conlon.

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.

1. M. Manoharan, L.S. Dahleen, T. Hohn, S.P. McCormick, N.A. Alexander, P. Schwarz, and R.D. Horsley. 2002. Transformation of a commercial Barley cultivar with genes for resistance to Fusarium Head Blight. 10th IAPTC&B Congress: Plant Biotechnology 2002 & Beyond, June 23-28, 2002, Orlando, FL, pp. 39-A.
2. M. Manoharan, L.S. Dahleen, T. Hohn, S.P. McCormick, N.A. Alexander, P. Schwarz, and R.D. Horsley. 2001. Transformation of a commercial Barley cultivar with genes for resistance to Fusarium Head Blight. National Fusarium Head Blight Forum, Cincinnati, OH, pp. 21.