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Project ID: 0405-DA-067 **FY03 ARS Agreement #: NA**

Research Area: **BIO** **Duration of Award: 1 Year**

Project Title: Development and Testing of FHB Resistant Transgenic Plants in Barley.

PROJECT 1 ABSTRACT
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Fusarium head blight (FHB), caused mainly by *Fusarium graminearum*, is a serious disease problem of barley in the Northern Plains area. The outbreak in the 1990's resulted in huge economic loss to growers. The fungus also produces the mycotoxin deoxynivalenol (DON) in infected grains which poses safety concerns for human and livestock. This project aims to provide additional genes for FHB resistance and low DON for breeding resistant barley cultivars. The objectives of this project are: (1) to produce transgenic barley expressing both anti-toxin and anti-fungal genes that may reduce FHB infection and DON level in the grain; (2) to test existing transgenic and backcross-derived lines for their reaction to FHB in the greenhouse and field; (3) to establish a new protocol for transforming barley using linear DNA constructs.

Two anti-toxin genes (*Tri101* and *Tri12*), and five anti-fungal genes (*tlp*, *chi*, *FvGlu*, *FvEndo*, *FvExo*) will be used to generate transgenic barley plants. *Tri101* encodes a 3-OH trichothecene acetyltransferase from *Fusarium sporotrichioides* that converts DON to a less toxic derivative while *Tri12* encodes a trichothecene efflux pump from *F. sporotrichioides* that is expected to transport the toxin (DON) out of the cell. Both these genes will be under control of the Lem2 promoter. The thaumatin-like protein (*tlp*) is a membrane permeabilizing protein while chitinase (*chi*) catalyzes the degradation of chitin, a cell wall component of most filamentous fungi. Both endochitinase (*FvEndo*) and exochitinase (*FvExo*) genes from *Fusarium venenatum* can attack the fungal cell wall. Glucanase (*FvGlu*), also isolated from *F. venenatum,* may prevent fungal infection and spread. A combination of anti-fungal and anti-toxin genes may provide transgenic plants that exhibit better resistance to fungal infection, reducing DON levels in barley and other small grains, and preventing significant economic loss. Existing transgenic lines and backcross lines lacking somaclonal variation will be tested in the greenhouse and field to determine the effects of single and combinations of genes on FHB resistance and DON levels. The malting cultivar Conlon will be used for generating transgenic plants.

This project fits in the biotechnology research area, specifically the first two priorities, to transform and test adapted barley cultivars with anti-*Fusarium* genes.