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

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

## PROJECT 1 ABSTRACT

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Wheat and barley scab, also known as Fusarium head blight (FHB) is a devastating disease worldwide, caused mainly by *Fusarium graminearum*. The *Fusarium*-infected grain is contaminated with potent mycotoxins, especially deoxynivalenol (DON), which poses a great threat to human and animal health. DON belongs to the group of trichothecene toxins, which target ribosomal protein L3 at the peptidyltransferase site of eukaryotic ribosomes and inhibit protein synthesis. The goal of our work is to identify mutations in L3 that confer resistance to DON and determine if FHB resistance can be engineered in transgenic wheat plants by expressing DON resistant L3 genes. During FY06 we have successfully demonstrated that overexpression of a truncated form of yeast ribosomal protein L3 (L3Δ) in transgenic wheat plants leads to improved resistance to FHB over the untransformed Bobwhite plants. We further showed that transgenic lines accumulate lower levels of DON, providing evidence that DON resistance will lead to resistance to FHB and result in a reduction in DON levels. The goal of this project is to determine if transgenic wheat lines expressing the yeast L3Δ will be resistant to FHB in the field and to express DON resistant wheat L3Δ and full-length wheat *RPL3* genes in transgenic wheat plants to obtain a higher level of resistance to FHB and a greater reduction in DON accumulation. We have cloned the wheat *RPL3A1* and *RPL3B3* genes and have constructed wheat expression vectors with L3Δ versions of these genes. We have introduced point mutations into the wheat *RPL3A1*, which confer a high degree of resistance to DON. Here, we propose to generate transgenic wheat plants expressing the DON resistant forms of the wheat L3 genes to determine if their expression will lead to a higher level of resistance to FHB and a greater reduction in DON accumulation. Our specific objectives are to 1. Determine if resistance to DON will lead to resistance to FHB and a reduction in DON accumulation in transgenic wheat plants in the field. 2. Determine if overexpression of the wheat L3Δ genes will confer resistance to DON and FHB in transgenic wheat plants. 3. Determine if expression of the DON resistant full-length wheat *RPL3* genes will confer a high level of resistance to DON and FHB in wheat. We are now in a unique position to determine if resistance to DON will lead to resistance to FHB and a reduction in DON levels. Information gained from these studies could be used to combat wheat scab and improve *Fusarium* resistance of other cereals. This work addresses three objectives of the Genetic Engineering and Transformation Component of the Scab initiative: 1) Transform wheat, barley, and durum to demonstrate the effectiveness of anti-*Fusarium* transgenes to limit *Fusarium* infection, growth and spread; 2) Develop methods/systems for rapid screening (e.g., transient expression) of potentially useful antifungal genes in wheat, barley or durum; and 3) Develop strategies to enhance acceptance of *Fusarium* resistant transformants.