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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. We have successfully demonstrated that overexpression of a truncated form of yeast ribosomal protein L3 (L3 $\Delta$ ) in transgenic tobacco plants confers resistance to deoxynivalenol (DON). The goal of this project is to translate the success we had in tobacco to wheat and to generate wheat lines resistant to FHB. In collaboration with Dr. Ann Blechl, we have introduced the yeast L3 genes into wheat and identified transgenic lines containing the maize *Ubiquitin1* promoter and the yeast L3 $\Delta$ , barley *Lem1* promoter and the yeast L3 $\Delta$  and the *Lem1* promoter and the full-length yeast L3. We have identified two to five stable transformants per construct and obtained homozygous seed from these lines. Here, we propose to analyze the transgenic wheat lines for inheritance of the transgenes, expression level and stability of expression, effects on plant growth, development, ribosome synthesis and evaluate their resistance to FHB. Our specific objectives are to 1) Characterize expression of the DON resistant L3 genes in transgenic wheat plants and determine if they will confer resistance to FHB; 2) Analyze expression of PAP and L3 $\Delta$  in co-transformed wheat lines and determine if combination of these genes confers better resistance to FHB; 3) Isolate DON resistant alleles of the wheat L3 genes for transformation into wheat. We have used the genetically and biochemically malleable yeast system to isolate trichothecene resistant forms of L3, demonstrated that these genes confer resistance to DON in transgenic tobacco plants, we have transformed these genes into wheat and obtained homozygous seed from transgenic wheat lines that express the modified L3 genes. We are now in a unique position to determine if resistance to FHB may be attained through modification of the L3 genes in transgenic wheat plants and if resistance to DON will lead to resistance to FHB. 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.