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PROJECT 1 ABSTRACT
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Fusarium head blight (FHB) causes yield reductions and contamination of wheat and barley with trichothecene mycotoxins. With previous USWBSI funding, we screened an activation tagged *Arabidopsis* population for resistance to trichothecin (Tcin) and identified a novel non-specific lipid transfer protein (nsLTP) gene, *AtLTP4.4*, which provided resistance to Tcin when overexpressed in *Arabidopsis* and in yeast. To determine if expression of *AtLTP4.4* and a wheat nsLTP gene, *TaLTP3,* will confer resistance to FHB in transgenic wheat, we constructed new transformation vectors with the monocot codon optimized version of *AtLTP4.4*. We generated elite wheat lines with the *Ubi*:*AtLTP4.4* and *Ubi:TaLTP3* expression vectors. Preliminary results showed high level of expression of *Ubi*:*AtLTP4.4* and *Ubi:TaLTP3* in wheat. Transgenic wheat lines expressing *Ubi*:*AtLTP4.4* showed resistance to FHB in the greenhouse. Transgenic wheat lines expressing *Ubi:TaLTP3* are being evaluated in the greenhouse for resistance to FHB. Transgenic wheat plants expressing *Ubi*:*AtLTP4.4* and *Ubi:TaLTP3* will be ready for field testing during spring 2018. We generated transgenic barley lines with *Ubi*:*AtLTP4.4* and *Ubi:TaLTP3* and showed high level of expression of both genes in transgenic barley plants. The primary goal of this application is to determine if expression of *nsLTP* genes will provide resistance to FHB and reduce DON accumulation in elite wheat cultivars and in transgenic barley plants.

Our specific objectives are:

1) Develop elite wheat cultivars expressing *AtLTP4.4* and *TaLTP3* that show FHB resistance; and
2) Identify *AtLTP4.4* and *TaLTP3* expressing FHB resistant transgenic barley lines

This project addresses the following FY18-19 priorities of GDER: 1) Identify wheat or barley gene variants that improve FHB resistance; 2) Develop assays that can be used to rapidly validate candidate wheat and barley genes for resistance against FHB and/or reduced DON accumulation; 3) Develop effective FHB resistance and/or reduced DON accumulation through transgenic strategies. Stakeholders will benefit from this research through identification of elite wheat cultivars and barley lines that are resistant to FHB, identification of novel markers for breeding programs and important insights into the mode of action of trichothecene mycotoxins.