FY16 USWBSI PROJECT ABSTRACT

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Research Category: **GDER** **Duration of Award: 1 Year**

Project Title: Novel Genes for FHB Resistance.

PROJECT 1 ABSTRACT

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To identify novel plant genes for resistance to trichothecenes, we screened an activation tagged Arabidopsis population and identified two novel lipid transfer protein (LTP) genes, designated as *AtLTP4.4* and *AtLTP4.5*, which were overexpressed in the resistant line *AtTRRF1*. Overexpression of *AtLTP4.4* provided greater resistance to Tcin than *AtLTP4.5* in *Arabidopsis* and in yeast relative to wild type or vector transformed lines, suggesting a conserved protection mechanism. We showed that overexpression of the cysteine-rich *AtLTP4.4* increased the total cellular glutathione (GSH) content in yeast and in *Arabidopsis* and significantly attenuated reactive oxygen species (ROS) levels due to trichothecene exposure. These results demonstrated that trichothecenes cause ROS accumulation and overexpression of *AtLTP4.4* protects against trichothecene-induced oxidative stress by increasing the GSH-based antioxidant defense. To determine if expression of the *AtLTP4.4* will confer resistance to trichothecenes in transgenic wheat, we constructed monocot codon optimized version of *AtLTP4.4* with HA and His tags and generated transgenic Bobwhite, Rollag, Forefront and RB07 lines with the *Ubi*:*AtLTP4.4* expression vector. We are now in an excellent position to determine if expression of this gene confers resistance to FHB and reduces DON accumulation in elite wheat cultivars.

The primary goal of this application is to determine if expression of *AtLTP4.4* will provide resistance to FHB and reduce DON accumulation in elite wheat cultivars and in transgenic barley. Our specific objectives are:

1. Determine if transgenic wheat lines expressing *AtLTP4.4* show reduced DON accumulation and improved resistance to FHB.
2. Determine if overexpression of *AtLTP4.4* will reduce DON accumulation in transgenic barley.

Knowledge gained from the proposed studies may lead to the development of FHB resistant wheat and barley plants. Furthermore, the novel approaches outlined in this proposal will continue to provide important insights into the mode of action of trichothecene mycotoxins. These studies fit very well with both FY16-17 research priorities of GDER: 2) Identify candidate genes for resistance against FHB and/ or reduced DON accumulation; 3) Develop effective FHB resistance and/or reduced DON accumulation through transgenic strategies.