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ARS Agreement #: 59-0206-6-018

Research Category: GDER

Duration of Award: 1 Year

Project Title: Wheat Variants Deficient in a FHB Susceptibility Factor.

PROJECT 1 ABSTRACT

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- **Project Goals:** The long-term goal of this project is in line with the GDER Research Area's priority to *identify native wheat gene variants that improve FHB resistance and/or reduce DON accumulation*. Wheat genes that facilitate fungal growth, development and virulence provide excellent targets for controlling disease. With previous support from the USWBSI, the PI's lab has identified 9-lipoxygenases (9-LOXs) as susceptibility factors, which when knocked down by RNA-interference (RNAi) technology in the hexaploid wheat cv Bobwhite, enhance FHB resistance. Resistance in the *Lpx3*-RNAi lines was characterized by lack of spread of infection from the inoculated spikelet. The goals of the proposed work are to establish whether (i) the FHB resistance promoting effect of *Lpx3* knockdown is also effective in wheat backgrounds other than Bobwhite, (ii) one or more *Lpx3* homeolog(s) in wheat contribute towards susceptibility to *Fusarium graminearum*, and (iii) nonsense and/or missense *Lpx3* variants can provide a non-GMO strategy that in the future can be utilized by breeding programs to enhance FHB resistance in wheat. As a first step in this direction, several TILLING mutants that cover all three *Lpx3* homeologs on chromosomes 4A, 4B and 4D have been identified in the hexaploid and tetraploid wheat varieties Cadenza and Kronos, respectively. Mutations in these TILLING lines are predicted to yield prematurely truncated *Lpx3* protein, or strong missense alleles.
- **The specific objectives of the FY18-19 project are to:**

 1. Backcross *Lpx3* variant lines to clear background mutations.
 2. Characterize the response of homozygous *Lpx3* variants to *Fusarium graminearum*.
 3. Develop wheat lines with mutant combinations at more than one *Lpx3* homeologous loci.
- **Expected Outcomes:** The completion of this work will identify hexaploid and tetraploid wheat lines in which FHB resistance has been enhanced as a result of variations at the novel *Lpx3* locus. Our approach and the gene being targeted complement the activity of other USWBSI sponsored projects.
- **Plan to Accomplish Project Goals Within Period of Proposed Work:** To expedite the completion of this work within the 2-year period, work on hexaploid and tetraploid wheat will be split between two institutions, the University of North Texas and the University of Maryland.
- **Statement of Mutual Interest:** The non-GMO FHB resistant hexaploid and tetraploid wheat variants developed as a result of this work will provide novel genetic material that can be integrated into wheat breeding programs.