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

Project Title: Targeting Host Defense Mechanism for Enhancing FHB Resistance in Wheat.

PROJECT 1 ABSTRACT

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The long-term goal of this collaborative project is to enhance *Fusarium* head blight (FHB) resistance in wheat. With previous support from the USWBSI we have utilized *Arabidopsis thaliana* to identify plant genes that are involved in plant defense and susceptibility to *F. graminearum*. In addition, we have identified a microbial elicitor and a plant-derived diterpenoid that enhance resistance against *F. graminearum*. We propose to utilize these activators and defense/susceptibility genes to enhance FHB resistance in wheat. Three strategies will be utilized: (i) The ectopic expression of defense regulatory genes, (ii) targeting non-host resistance mechanism, and (iii) reducing the level of host susceptibility factors.

The specific objectives are:

1. Characterize FHB resistance and mycotoxin accumulation in wheat plants expressing At*PAD4*, At*WRKY18* and in plants co-expressing At*NPR1* and At*PAD4*
2. Target non-host resistance mechanism for enhancing FHB resistance
3. Characterize FHB resistance and mycotoxin accumulation in lipoxygenases silenced and overexpressing transgenic wheat lines
4. Target expression of a Ca^{2+}-binding protein-encoding gene associated with diterpenoid signaling for promoting FHB resistance in wheat

Objectives 1, 2 and 3 are continuation of the currently funded USWBSI project. As part of objective 1 and 3, promising transgenic lines that have been identified will be evaluated for FHB resistance and toxin accumulation and resistance correlated with transgene expression. In addition, hybrids that contain At*NPR1* and At*PAD4* have been generated and will be used to evaluate the impact of co-expression of these genes on FHB resistance. Under objective 2, transgenic plants containing genes associated with non-host resistance are being developed as per the FY11 objectives. These will be evaluated in FY12 for FHB resistance. Objective 4 will study the impact of a Ca^{2+}-binding protein-encoding gene, which is involved in signaling mediated by a diterpenoid activator of SAR in enhancing FHB resistance in wheat.

Our ongoing and proposed projects are relevant to the GDER initiative of USWBSI, by promoting the development of effective FHB resistance through transgenic strategies. Our approach and the genes/mechanisms being targeted complement the activity of other USWBSI sponsored projects.