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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 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 Arabidopsis constitutive overexpression of the At*PAD4* and At*WRKY18* genes enhances resistance to *F. graminearum*. In contrast, mutations in the corresponding genes results in increased susceptibility to the fungus, suggesting that these genes are important for plant resistance to the fungus. In striking contrast, mutations in a lipoxygenase gene, *LOX1*, which encodes a 9-LOX, resulted in heightened resistance to *F. graminearum*, indicating that a LOX1 product is a susceptibility factor. We propose to utilize these genes to genetically engineer FHB resistance in wheat.

The specific objectives are:
(1) Characterize FHB resistance and mycotoxin accumulation in At*PAD4* and At*WRKY18* expressing wheat. We will evaluate transgene expression, FHB severity and DON content in At*PAD4* and At*WRKY18* expressing transgenic *Ubi*:At*PAD4* and *Ubi*:At*WRKY18* wheat plants, respectively. These wheat plants express At*PAD4* and At*WRKY18* from the maize Ubi promoter. (2) Utilize RNAi to develop transgenic wheat with reduced expression of 9-LOX genes. RNAi constructs for silencing wheat WhLpx1 and WhLpx3 lipoxygenases will be generated and transformed into wheat for lowering expression of these lipoxygenases. It is anticipated that silencing of WhLpx1 and WhLpx3 will result in enhanced FHB resistance.

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.