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Project Title: Engineering Scab Resistance in Wheat with Plant Defense Signaling Genes.

PROJECT 1 ABSTRACT

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Fusarium head blight (FHB), also known as scab is a devastating disease of wheat and barley resulting in losses averaging \$ 200 million per annum in the US. *Fusarium graminearum* is the primary causative agent of FHB in the US. The best source of resistance against scab is a complex, quantitative trait derived from the cultivar Sumai-3. Biotechnology provides an alternative approach for enhancing scab resistance. We have utilized genes that regulate plant defense responses (e.g. *AtNPR1*) to successfully enhance scab resistance in hexaploid wheat. These genes offer the advantage that they can simultaneously modulate expression of multiple defense genes. Our studies in *Arabidopsis thaliana* have identified *AtPAD4* and *AtWRKY18* as additional candidate genes for enhancing scab resistance in wheat. *AtPAD4* offers the added advantage that it is also involved in plant defense against aphids, which are vectors of plant viruses.

The specific objectives of this proposal are to: (1) Evaluate Scab resistance in *AtPAD4* expressing wheat. We will evaluate transgene expression and scab resistance in *Ubi:AtPAD4* transformed transgenic plants. (2) Engineer *AtWRKY18* expression in wheat. The *AtWRKY18* cDNA will be cloned under the control of the maize *Ubi* promoter, and the resulting *Ubi:AtWRKY18* construct will be transformed into hexaploid wheat. We will evaluate transgene expression in the transgenic plants. In ensuing years, we will test scab resistance in promising lines.

Our objectives are relevant to the priorities of the GENE DISCOVERY AND ENGINEERING RESISTANCE (GDER) initiative of the USWBSI, to promote the development of effective FHB resistance through transgenic strategies. Based on our studies in Arabidopsis, we expect AtPAD4 and AtWRKY18 to enhance scab resistance in wheat.