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Project Title: Rapid Function Identification of Genes Contributing to FHB Resistance and Susceptibility.

PROJECT 1 ABSTRACT

(1 Page Limit)

A virus-induced gene silencing (VIGS) system utilizing barley stripe mosaic virus has been established for the identification of genes contributing to Fusarium head blight resistance in wheat. The efficacy of this system has been validated in tests in which the wheat line Ning 7840, which has type II resistance to FHB, was first infected with control or experimental VIGS constructs, and then challenged by *Fusarium graminearum*. It was observed that viral constructs that target no wheat genes or the wheat phytoene desaturase gene, which is assumed to not be involved in FHB resistance, had no effect of Ning 7840's type II resistance. However infection with three different constructs that target wheat chitinase all result in loss of type II resistance.

Here we propose to further optimize the VIGS-FHB assay and to continue to screen wheat genes that have been identified as candidates for contributing to FHB based on the rapid induction of their expression during the FHB resistance response.

Objectives:

1. Optimize the FHB-VIGS assay by:
 - a. Assess alternative methods of inoculating wheat with BSMV for improve targeting of genes expressed in the head.
 - b. Develop an assay to detect conversion of susceptibility to resistance.
 - c. Develop BSMV-VIGS protocols for other wheat genotypes relevant to FHB research.
 - d. Incorporate GFP expressing *F. graminearum* to facilitate assessment of infection type.
2. Screen 30 wheat genes that have been identified as candidates for contributing to FHB resistance.

Relevance of this project to the goals of the U.S. Wheat and Barley Scab Initiative:

The research plan described here will directly serve the following goals of the Host Genetics and Genomics research program of the USWBSI:

1. Identify genes encoding effective anti-*Fusarium* proteins.
2. Characterize molecular mechanisms of host-pathogen interactions as it relates to the host to identify potential resistance genes. Identify potential candidate genes involved in FHB resistance, and characterize the function of a specific candidate gene.
3. Determine signaling pathways that could be used to enhance host resistance or that are affected by *Fusarium* during infection.