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PROJECT 2 ABSTRACT

(1 Page Limit)

Scab is emerging as an important disease of wheat and barley. Losses of wheat to scab have averaged between $ 200-400 million per annum in the US. Our long-term goal is to identify and characterize signaling mechanisms that are important to plant defense and susceptibility to *F. graminearum*. Improved understanding of plant mechanisms contributing to defense and conversely those contributing to susceptibility to *F. graminearum*, the principal causal agent of scab in wheat and barley, will assist in developing strategies for combating this devastating disease. In addition, some of the genes that regulate these defense/susceptibility mechanisms could provide excellent targets for engineering scab resistance in wheat and barley or for the chemical control of scab. For example, the At*NPR1* gene, which is a key regulator of salicylic acid (SA) signaling in *Arabidopsis thaliana* defense against pathogens, when constitutively expressed in transgenic wheat, provides enhanced resistance to scab. Scab resistance in At*NPR1* expressing wheat plants correlated with their enhanced responsiveness to chemical activators of plant defense, suggesting that a NPR1 regulated defense-signaling mechanism(s) is primed to respond faster in the At*NPR1* expressing wheat. In addition, we have utilized Arabidopsis to demonstrate an important role for SA in promoting defense against *F. graminearum*, and the oxylipin, jasmonic acid (JA) in susceptibility to this fungus.

In this submission, we propose to extend some of our studies to wheat to determine the importance of SA in wheat defense against *F. graminearum* and JA as a susceptibility factor. In addition, we will continue our efforts to utilize Arabidopsis-*F. graminearum* interaction to characterize the role of potential plant regulatory genes/molecules in resistance/susceptibility to this fungus. The specific objectives that will be pursued are: **(1) Further characterization of SA's involvement in plant defense against *F. graminearum*.** Multiple approaches will be taken: (a) SA-deficient wheat plants will be generated to determine if SA is required for resistance to *F. graminearum*; (b) A regulatory *WRKY* gene that is a target of At*NPR1* will be characterized for its role in plant defense against *F. graminearum*. **(2) Further characterization of the involvement of JA as a susceptibility factor in plant interaction with *F. graminearum*.** A combination of genetic and biochemical approaches will be taken to determine if JA antagonizes SA signaling in Arabidopsis and wheat interaction with *F. graminearum*, thereby contributing to susceptibility to the fungus.

***Our proposed project is relevant to the HOST GENETICS AND GENOMICS initiative of the USWBSI, by promoting the characterization of host mechanisms of resistance/susceptibility and the identification of candidates for transgenic approaches to enhance host resistance to* Fusarium.**