

PI: Jin-Rong Xu

PI's E-mail: jinrong@purdue.edu

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Project Title: Testing the Feasibility of Using the HIGS Approach to Reduce Head Blight.

PROJECT 2 ABSTRACT

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Fusarium graminearum is the causal agent of Fusarium head blight (FHB) in the US. Due to the lack of type I resistance and the complexity of resistance in identified sources, it is important to develop transgenic plants with improved resistance to FHB. Recently, host-induced gene silencing (HIGS) of fungal genes has been shown to interfere with gene expression or plant infection processes in three phytopathogenic fungi, including *F. verticillioides*. Proposed study aims to test the feasibility of applying HIGS to control FHB. In objective 1, we will determine whether synthetic siRNA oligos can be effectively taken up by *F. graminearum* and result in the silencing of specific fungal genes. For objective 2, we will use the VIGS (virus-induced gene silencing) approach to express silencing constructs of *F. graminearum* genes in wheat and examine their effects on fungal infection and DON production. In addition, we will determine whether treatments with combinations of siRNA oligos or co-expression of different BSMV VIGS constructs targeting at multiple genes have synergistic effects on reducing fungal growth, virulence, or DON production. Results from proposed experiments will be useful to determine the feasibility and conditions for using the HIGS approach to improve resistance against *F. graminearum* in wheat. If it is effective, HIGS can be attempted with many different *F. graminearum* genes. We expect that silencing multiple genes with combinations of siRNA oligos or co-expressing different VIGS constructs is better than silencing individual genes. It may be a reasonable strategy to express multiple HIGS RNAi constructs to simultaneously silence two or more fungal genes for developing transgenic wheat lines with improved FHB resistance.

This research is directly relevant to the USWBSI's goal on developing possible effective FHB control measures. It addresses priority 2 of PBP: 'Develop new strategies for reducing impact of FHB disease and mycotoxin contamination'. It also addresses research priority 2 of GDER: 'Identify candidate genes for resistance against FHB and/or reduced DON accumulation'.