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Project ID: FY20-SH-004

ARS Agreement #: *New (NCE for FY20 for 59-0206-7-006)*

Research Category: GDER

Duration of Award: 1 Year

Project Title: RNA-Interference Targeting of Fungal Genes for Enhancing FHB Resistance

PROJECT 1 ABSTRACT

(1 Page Limit)

Project Goals: The long-term goal of the PI's research is to develop strategies for controlling FHB and mycotoxin accumulation that complement existing control measures in wheat and barley. While breeding efforts target host genes to enhance resistance, host-induced gene silencing (HIGS) provides an *in planta* strategy to silence expression of fungal genes to control infection and toxin accumulation. The goal of the proposed work is to test the hypothesis that HIGS of *Fusarium graminearum* effector genes, which are required for virulence, will adversely impact pathogenicity and thus promote FHB resistance in wheat. The efficacy of this approach to promote resistance against *F. graminearum* has been validated in *Arabidopsis thaliana*. Two fungal virulence factor-encoding genes will be targeted for HIGS in wheat: (i) *FGLI*, which encodes a lipase that is required for spread of the infection, and (ii) *FgNahG*, which encodes a hydroxylase that metabolizes the plant defense signaling metabolite salicylic acid. The specific objectives of the project are to:

1. Determine the effect of HIGS-mediated knockdown of a *F. graminearum* lipase expression in promoting FHB resistance in wheat.
2. Prevent the ability of *F. graminearum* to suppress wheat defense signaling by HIGS-mediated silencing of fungal *FgNahG* expression.

Expected Outcome: The proposed work addresses GDER's priority to 'Utilize new technologies to develop effective FHB resistance and/or reduced DON accumulation', and PBG's priority of 'Identifying fungal genes, proteins or small molecules that may be used to develop FHB resistance or to reduce DON contamination in barley and wheat'. The proposed work will provide proof-of-concept that HIGS of virulence factor-encoding *F. graminearum* genes is an effective strategy for controlling FHB and mycotoxin accumulation in wheat.

Plan to Accomplish Project Goals within Period of Proposed Work: Multiple transgenic wheat lines that express the *FGLI*-RNAi and *FgNahG*-RNAi constructs, which will promote HIGS of *F. graminearum* *FGLI* and *FgNahG* genes, have been generated. The availability of these transgenic lines will facilitate the timely completion of the proposed work.

Statement of Mutual Interest: The successful completion of this work will provide a new strategy and target genes for enhancing FHB resistance and controlling mycotoxin accumulation in wheat, which in the future could also be extended to barley. FHB resistant wheat generated as a result of this work will provide germplasms that could be used for transferring resistance to elite cultivars. In addition, these germplasms will be of utility to pathologists studying the virulence function of *F. graminearum* genes.