Project Abstract

Project Title:	Explore RNAi to control FHB and mycotoxin contamination	
USWBSI Project ID:	FY24-PB-001	
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Project Summary

The proposed research addresses FY24 PBG research priority 4: develop novel RNAi based strategies targeting critical genes for fungal growth, pathogenesis, and/or mycotoxin biosynthesis to control FHB and mycotoxin contamination.

Delivery of RNAi using endophytes is cost-effective and sustainable. *Sarocladium zeae* is an endophyte isolated from corn and provides a biocontrol function towards *Fusarium* spp. in corn and wheat.

The goal of this project is to develop an endophytic fungal RNAi delivery platform to reduce FHB and mycotoxin contamination. We focused on collected preliminary data for proof of concept in the first two years. With the support from USWBSI, we made significant progress in the prior funding cycle.

Frist, we generated *S. zeae* RNAi strains targeting GFP, then we showed that the RNAi strains significantly reduced GFP expression of an *F. graminearum* GFP strain. Second, we created *S. zeae* RNAi strains targeting *F. graminearum TRI5* and showed the RNAi strains reduced *TRI5* gene expression and DON production in cultures. Taken together, our data suggest it is promising to implement an endophytic fungal RNAi delivery platform to reduce FHB and mycotoxins. Therefore, further investigations are needed to apply *S. zeae* RNAi strain on wheat and test their efficacy on FHB and mycotoxin reduction. Further, we will target additional *F. graminearum* genes and combine them to control FHB and mycotoxin contamination. We have two specific objectives:

1) Evaluate, optimize and improve *S. zeae* TRI5 RNAi strain treatment efficacy. We will compare seed and spray treatments with *S. zeae* RNAi strains and determine which method is more effective on FHB and mycotoxin reduction. We will examine sRNA production in wheat heads treated with *S. zeae* RNAi strains and *TRI5* expression following *F. graminarum* inoculation.

2) We will test additional *S. zeae* strains to identify some trains that can colonize and move from wheat roots to heads. Design and generate RNAi strains targeting multiple *F. graminearum* genes that are essential for its growth, pathogenesis, and mycotoxin biosynthesis, and determine the most effective gene silencing target.

The major outputs from the proposed research: characterize the most effective RNAi targets and application methods to reduce FHB and mycotoxins. This approach could provide the next generation of management and mitigation tools for FHB and mycotoxin reduction. In addition, the effective RNAi delivery methods and critical targets identified in this proposal will provide a general set of tools that can be used to control a wide variety of crop diseases and multiple toxins.