Project Abstract

Project Title:	**Explore RNAi to control FHB and mycotoxin contamination**	
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The proposed research addresses FY22 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.

The goal of this project is to identify effective RNAi targets and develop an endophytic fungal RNAi delivery platform to reduce FHB and mycotoxin contamination.

Host-induced gene silencing (HIGS) has been demonstrated to be effective for plant protection in many transgenic plants. However, HIGS application has been limited in wheat due to the lack of public acceptance of genetically modified organisms. Spray-induced gene silencing (SIGS) provides an alternative method to control disease. However, the lack of secondary amplification of RNAi machinery in *Fusarium* limits its application. Therefore, it is critical to develop methods to sustainably produce dsRNA molecules and deliver them to crops to maintain the efficiency of RNAi.

Endophytes form intrinsic relationships with their hosts, and they inhabit inside of the hosts without causing any adverse effects. 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. We hypothesize that *Sarocladium zeae* can be developed to continuously produce and deliver RNAi molecules to combat FHB and mycotoxin contamination. We have three specific objectives.

1) Design and generate RNAi mutants targeting *F. graminearum* genes that are essential for its pathogenesis, and mycotoxin biosynthesis, and examine gene silencing effects.
2) Build, evaluate, and optimize the *S. zeae*-mediated RNAi delivery system. We will generate *S. zeae* RNAi strains, examine RNAi molecule production and the transferring of RNAi signals from *S. zeae* to plants and *F. graminearum*, and determine gene silencing efficacy.
3) Determine the RNAi effects on FHB severity and mycotoxin production by applying *S. zeae* RNAi strains targeting different genes.

The major outputs from the proposed research: characterize RNAi targets and identify novel tools for RNAi delivery 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.