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Project Title: Control of DON Production in Grain with Non-Toxigenic Strains of *Fusarium*.

PROJECT 3 ABSTRACT

(1 Page Limit)

New strategies are needed to augment host genetic resistance and fungicides to provide greater control of Fusarium head blight (FHB) and deoxynivalenol (DON). We will test the concept that pre-application of non-toxigenic (Tox-) hypovirulent strains of *Fusarium graminearum* to wheat heads can inhibit floret infection by toxigenic (Tox+) virulent pathogen strains, resulting in reduced DON accumulation in the grain. This concept is based on the theory that Tox- strains can compete with Tox+ for niches and substrates on florets and potentially can induce host resistance mechanisms. We will test this concept in year 1 by infecting a susceptible spring wheat cultivar in the greenhouse with transgenic Tox- isolates and then challenging the plants with Tox+ transgenic and wildtype isolates. Numbers of infected spikelets and diseased kernels will be counted and trichothecene levels will be measured. Because each isolate can be distinguished by genetic markers, the proportion of kernels infected by Tox-, Tox+, or both isolates can be determined. In addition, a preliminary greenhouse test with a naturally-occuring Tox- strain, WG-9, will be conducted to determine if it has the potential to inhibit infection and DON production by a Tox+ strain. Also in year 1, the genetic profile for Tox- strain WG-9 will be compared with that of native Tox+ populations to identify differential sequences. These sequences will then be developed into probes to be used for distinguishing WG-9 from virulent isolates in co-inoculated wheat heads. Using these tools, the concept will be confirmed using WG-9 in a series of greenhouse and field experiments conducted in year 2. Also in year 2, WG-9 and transgenic Tox- isolates will be used in greenhouse experiments testing for inhibition of FHB and DON on a selection of spring wheat cultivars differing in FHB resistance and lineage. The experiments will determine whether the integration of Tox- isolates with host resistance can provide higher levels of disease and DON control than either strategy alone. In addition, the experiments will determine whether FHB and DON control by Tox- isolates can be expressed on all host cultivars or if it is specific to certain cultivars, the latter being a possibility if induced resistance is the primary mode of action. This project is a multi-PI effort that brings together expertise in *Fusarium* genetics, mycotoxin chemistry, and greenhouse/field biocontrol research methods. It represents the first example of results from the PBG research area are being translated into a potential management strategy that can be validated in the MGMT research area. This project addresses priority 3 in the PBG research area and priority 2 in the MGMT area, both of which speak to the development of new management strategies for FHB and DON. This study could lead to a novel biological control strategy that might have significant impact on DON production.