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Project Title: Aggressiveness and Mycotoxin Potential of *Fusarium graminearum* in Field-grown Barley.

PROJECT 1 ABSTRACT

(1 Page Limit)

Despite efforts to reduce the impact of FHB on grain production in the U.S., DON levels in grain often remain high. In order to address this problem, we continue to investigate the genetic diversity, especially with regard to toxin producing potential, of populations of *Fusarium graminearum* currently found in the U.S. We are focusing on **three genetically distinct populations of *F. graminearum* in the Upper Midwest**, two of which were first identified by us in collections from 1999/2000 and are referred to as emergent populations. The three populations are also correlated with distinct DON chemotypes and in greenhouse experiments, with different levels of DON accumulation in plants. Further characterization of these emergent populations is important, not only because they have increased dramatically in frequency over a short period of time in some regions of the Upper Midwest, indicating that they are under strong positive selection, but also due to their higher toxigenic potential in greenhouse experiments (on wheat) when compared to the population of *F. graminearum* that is otherwise predominant in the Midwestern U.S. (Midwestern 15ADON population).

The project objective is to determine whether specific populations of *F. graminearum* are more aggressive and/or cause more toxin accumulation in barley grown in the field and to test the hypothesis of host genotype x pathogen chemotype/genotype interaction.

The goals of our project directly relate to **PBG FY09 Research Priority #1** Characterize genetic variation in the pathogen population with regard to aggressiveness toward plants and mycotoxin potential. By way of collaboration (**Integrated/Interdisciplinary Research**) we are partnering with two breeders, a barley breeder, Dr. Kevin Smith, University of Minnesota, (this proposal) and a wheat breeder Dr. James Anderson, University of Minnesota, (separate proposal, supported by PBG) and one field pathologist, Dr. Ruth Dill-Macky, University of Minnesota. Of particular interest will be whether experiments with field-grown plants will support our working hypothesis (formulated from population-level observations and results from greenhouse experiments) that the increase of the emergent populations in parts of North Dakota and Minnesota is explained by higher fitness of these populations due to higher toxigenic potentials.