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**Project Title: Enhancing Biocontrol of FHB/DON Through an Understanding of Microbial Ecology.**

### **PROJECT 1 ABSTRACT**

(1 Page Limit)

A research project is proposed which should begin to identify the biological and physical barriers to successful deployment of biological control against Fusarium head blight and DON contamination. Our experimental system utilizes one promising biological control agent, the TrigoCor 1448 strain of *Bacillus subtilis*, that gives excellent and consistent biological control of FHB and DON in controlled climate experiments, but, like other biocontrol agents tested, has shown inconsistent efficacy in field tests against FHB. The emphasis of this proposal is on microbial ecology and especially on the population dynamics of *B. subtilis* interacting with *Fusarium graminearum* on wheat floral structures. Objectives of this research are to 1) evaluate the population dynamics of *Bacillus subtilis* and *Fusarium graminearum* on wheat spikes from anthesis to grain maturity in controlled and field environments, and 2) evaluate the temporal dynamics of antifungal lipopeptide concentration on wheat spikes relative to biological control of FHB and level of DON in wheat grain. We will utilize both traditional dilution plating onto agar media as well as PCR methods to monitor the population dynamics of *B. subtilis* and *F.graminearum* on wheat heads. We will utilize LCMS methodologies to identify and quantify lipopeptides on wheat heads. DON in grain will be quantified by GC/MS at the University of Minnesota. From this research we will learn if biocontrol in this system is associated with threshold populations of bacteria or critical levels of lipopeptides at particular stages of flowering or grain development. We will learn whether populations of *Bacillus* on wheat spikes survive at constant levels, decline, or increase during intervals of constant dryness or intermittent wetting. Similarly we will learn whether lipopeptide concentrations decline or increase under different environments and in association with different levels of biocontrol. We will also learn whether biocontrol of FHB and DON is effective against *Fusarium* challenge during dough stages of grain development as it is at early post-flowering stages. Each of these findings is knowledge to be exploited for enhanced biological control and will be shared with the FHB research community and published in relevant scientific journals.