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

PROJECT 1 ABSTRACT

(1 Page Limit)

One of the fundamental impediments to effective biological control is the incomplete understanding of the ecological factors that both promote and impede effective biological control of Fusarium head blight and DON contamination. Our experimental system utilizes one promising biological control agent, the TrigoCor 1448 strain of *Bacillus subtilis*, which gives excellent and reliable biological control of FHB, and especially of DON, in controlled climate and greenhouse experiments, but has shown inconsistent efficacy in field tests against FHB. The emphasis of this proposal is on microbial ecology, particularly the temporal, spatial, and physical interactions between *B. subtilis* and *Fusarium graminearum* on wheat floral structures. Objectives of this research are to: 1) Continue to evaluate the temporal population dynamics of *Bacillus subtilis* and *Fusarium graminearum* on wheat spikes under varying environmental conditions; and 2) Determine the contribution of antifungal lipopeptides to biological control by *Bacillus subtilis*. We will utilize both traditional dilution plating onto agar media as well as real time PCR methods to monitor the population dynamics of *B. subtilis* and *F.graminearum* on wheat heads. DON in grain will be quantified by GC/MS at VirginiaTech and correlated with observed population dynamics. We will utilize LC and MS methodologies and growth inhibition assays to identify threshold inhibitory levels of the lipopeptides produced by *B. subtilis*. From this research we will determine if biocontrol in this system is positively associated with threshold populations of bacteria, and we will discover how environmental conditions alter these critical levels. Finally, we will determine which and at what threshold level of the major groups of lipopeptides produced by *B. subtilis* are necessary for biocontrol efficacy. Each of these findings informs the knowledge base to be exploited for enhanced biological control to be shared within the FHB research community and to be published in relevant scientific journals.