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PROJECT 1 ABSTRACT

(1 Page Limit)

Bacterial biological control agents (BCAs) may offer a more environmentally friendly control option for plant diseases than some chemical fungicides. The BCAs used in this study will include one or more *Bacillus* strains isolated from South Dakota wheat residue that have the ability to antagonize the fungus *Fusarium graminearum* which causes Fusarium Head Blight (FHB). Plate count enumeration of *Bacillus* BCAs applied to plant material will be conducted with recently developed culture conditions using high salt and high temperature, and antibiotic resistant spontaneous mutant strains to follow BCA population changes on wheat and barley heads and how these correlate to presence or absence of reduction in FHB and/or the fungal toxin deoxynivalenol (DON). Spray application of BCAs onto grain heads both before and at anthesis will be compared for efficacy of controlling FHB and DON levels, and for what effect this has on populations of applied BCAs. Extracts from grain heads inoculated with BCAs will be analyzed for evidence of antibiotics produced by the BCAs, to see if there is detectable *in situ* antibiotic production by BCAs. Also, PCR analysis of material washed from grain heads inoculated with *Bacillus* BCAs will look for evidence of lipopeptide antibiotic genes in larger amounts than in grain heads that have not been treated with BCAs. Effects of spray adjuvants on survival and activity of BCAs in the greenhouse and field will be conducted, to see what effect selected adjuvants have. Carbon source use by BCAs and *F. graminearum* will be examined, to find one or more carbon sources that enhance BCAs but not the pathogen. Further laboratory studies with pure cultures of the BCAs isolated from South Dakota wheat residue and foliage will examine the production of antibiotics (such as iturin and surfactin) by these *Bacillus spp.* in a limited number of growth media, with the identity of these lipopeptides verified by use of mass spectrometry.