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Project Title: Optimizing Parameters for Efficacy of Biological Control Agents of FHB.

PROJECT 1 ABSTRACT

(1 Page Limit)

Project goals are to optimize growth media for *Bacillus* strains acting as biocontrol agents against FHB; understand parameters affecting production of lipopeptides and biofilm by these bacteria; and use this information when growing the bacteria for field plot applications. Application of these bacterial strains to wheat heads in field plots has often led to reduced development of FHB, and/or reduction in DON levels. Objectives include: 1) Studying utilization of carbon sources by the *Bacillus* strains and by *F. graminearum*, using Biolog microplate methodology, to look for one or more carbon sources that can be used by the bacteria but not the fungus. Such a carbon source would then be used to culture bacteria for application to grain heads, to see if this provides better control of FHB or DON than when the bacteria are cultured with carbon sources that the fungus can use as well. 2) Study production of lipopeptides by the bacteria in different broth media, using MALDI-TOF mass spectrometry, as well as by simple assays such as droplet collapse. 3) Studying production of biofilm material by the bacteria in different broth media, to see if one carbon source stimulates biofilm formation more than others. Enhanced biofilm formation by the bacteria could allow them to more readily stick to and colonize grain heads that they are sprayed onto at anthesis. 4) Assaying pure cultures of the bacteria for possession of genes encoding for surfactin and iturin, using appropriate primers in PCR. 5) The laboratory studies proposed above will then be used to guide field plot and greenhouse studies, by determining which carbon sources/broth media should be examined in these plant studies. Using viable plate count methodology, populations of biocontrol bacteria will be tracked over time after they are sprayed onto wheat and barley heads in Brookings, SD field plots, including plots used in the uniform trial of biocontrol agents. Grain heads that have been inoculated with biocontrol bacteria will be processed for assay of lipopeptides by MALDI-TOF, and for PCR analyses to see if genes encoding for surfactin and iturin can be detected on the grain heads. 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. Greenhouse studies in the second year of the study at University of Nebraska will examine whether application of these biocontrol agents in selected media with selected carbon sources will cause development of localized induced resistance in wheat plants. The work relates to the FHB Management program of the initiative; with relevance to research priority 1 (validate integrated management strategies for FHB and DON; in the field plot work where biocontrol agents are used with or compared to fungicide); and priority 3 (develop next generation of management tools for FHB/DON control).