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Project Title: Management of Fusarium Head Blight with Biological Control Agents.

PROJECT 1 ABSTRACT

(1 Page Limit)

A field-screening trial for the effectiveness of bacteria acting as biological control agents in managing Fusarium head blight (FHB) will be conducted. Treatments will compare several bacterial strains used as biological control agents (BCAs) applied at various stages of crop development to an untreated control and a fungicide (Folicur) standard. A variety of BCAs will be cultured and applied from investigators in Illinois, Nebraska, and New York as part of a uniform BCA trial. Strains of *Bacillus* isolated from South Dakota which have been studied in our lab for the last several years will also be used. Because it is difficult to guarantee FHB occurrence, the trial will be planted on sites with spring wheat residue and the site will be challenge inoculated with *Fusarium graminearum* conidia. Plots will be mist-irrigated to increase the likelihood of disease development. Foliar application of cells of the bacterial BCAs will be used in the field at flowering. Greenhouse trials using pots will also be conducted involving foliar spray application of selected BCAs at anthesis. Some greenhouse and field work will have application of one or more of our *Bacillus* isolates at a different time than the *Lysobacter* strain of Gary Yuen (U. of Nebraska) to see if a combination of the two BCAs applied separately at different stages of plant development will provide greater protection against FHB than either BCA alone. Extent of FHB development and DON levels in grain will be measured. In some greenhouse and field plot trials, Folicur and one or more selected *Bacillus* strains will be combined and sprayed together to assay whether the combination will have a better ability to control FHB and/or reduce DON levels than each applied alone. To assist efforts to enumerate the number of cells of BCAs applied to plant material, antibiotic markers for one or more *Bacillus* BCAs will be sought to allow more effective MPN counts of these bacteria in the field via use of antibiotics in the MPN media. Some media formulations will attempt to improve the ability of *Bacillus* cells to stick to plant material after spraying. 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) by these *Bacillus spp.* in a limited number of growth media. Effect of incubation time on antibiotic production and ability of the BCA inoculum to control FHB will be examined, to optimize a growth medium and incubation time for producing BCAs whose antagonism of FHB relies at least in part on antibiotic production. Bacterial BCAs may offer a more environmentally friendly control option for plant diseases than some chemical fungicides. By using bacterial BCAs isolated from wheat in a local environment, compatibility of the agent with the crop or success in establishing the agent on the crop should be more reliable. Results of this study will provide guidance in how best to use the agents in a commercial wheat production system and how effective the BCAs may be in field situations.