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PROJECT 1 ABSTRACT

(1 Page Limit)

Elucidating methodologies for controlling plant diseases with a minimal input of pesticides has become increasingly important as agricultural consumers express a greater preference for foods produced in this manner. While pesticide use faces the additional concern of the potential or already realized development of pathogen resistance, other plant disease control measures including biological control, cultural control, and the use of resistant varieties also have shortfallings that frequently keep each individual control methodology from consistently reducing plant disease. Because it has become a national research priority to develop new pest management technologies that reduce our use of chemical pesticides, microorganisms naturally present in agricultural ecosystems are being studied as environmentally compatible alternatives for controlling disease or as supplements to reduced levels of traditional chemicals. The overall goal of our USDA-ARS and Ohio State University research team is to develop strategies and microorganisms to play a key role in the integrated management of FHB. In previous work, we have discovered microbial strains that reduce FHB in greenhouse and field work and demonstrated enhanced reduction of FHB using a number of strategies including formulation of biocontrol agents with UV protectants, and mixing fungicide tolerant variants of our biocontrol agents with fungicides. In more recent work, we have discovered chemical inducers of acquired disease resistance that are effective in reducing FHB development and choline metabolizing strains (CMS) that reduce FHB alone or in combination with previously discovered strains. The benefit of UV protectants or the amenability of CMS to mixing with fungicide is not known. While these factors are all clearly beneficial in reducing FHB, determining the relative importance of these factors when simultaneously tested and identifying synergies, if any, when multiplexing these factors is crucial to elucidating which of these factors should be included in any recommended IPM program against FHB and which factors are most critical for inclusion in a final FHB biocontrol product. The first two objectives for our proposed research, therefore, are to develop a UV protectant formulation and isolate a fungicide tolerant variant of strain OH 221.3, our most effective CMS antagonist. Our third objective will then be to test simultaneously in the field control factors of biocontrol agents, UV protectants, fungicide, and chemical inducers of FHB resistance on moderately resistant and susceptible wheat cultivars in Peoria, IL and Wooster, OH. A fractional (partial) factorial design will be employed that allows full factorial comparisons to be conducted using a more manageable number of plots. Identification of the most important of these multiplexed factors in single tests will provide key information on how to most effectively employ these biocontrol strains and other strategies in the integrated management of Fusarium head blight.