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Project Title: Different Roles of Two Beta-Tubulins in Fungicide Resistance and DON Production.

PROJECT 1 ABSTRACT

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Fusarium graminearum is the causal agent of Fusarium head blight (FHB) in the US. It also is a producer of mycotoxin DON, a potent inhibitor of eukaryotic protein synthesis. In comparison with other plant pathogenic fungi, *F. graminearum* is unique to have two beta-tubulin genes. Previous studies have indicated that *TUB1* and *TUB2* are differentially regulated by the Kin1 kinase in microtubule organizations and play different roles in resistance to benzimidazole fungicides. These two beta-tubulin genes may also differ in functions related to the formation of DON-producing swollen hyphal structures and toxisomes, which are dependent on microtubule reorganizations. The goal of this study is to characterize the functions of *TUB1* and *TUB2* in DON production and MBC resistance and determine the underlying mechanisms. In objective 1, we will determine the effects of MBC treatments on *TUB1* and *TUB2* localization and point mutations or deletion of *TUB1* and *TUB2* on DON production and virulence. For objective 2, we will characterize the formation of DON-producing swollen hyphal structures and toxisomes in the *tub1*, *tub2*, *kin1*, *TUB1*^{E198L}, and *TUB2*^{E198L} mutants and determine the fitness cost of *TUB1*^{E198L} mutation. Tub1 and Tub2 likely have distinct functions in DON production and efflux pump *via* microtubule cytoskeleton reorganizations. Overall, results from proposed experiments will be important to better understand the roles of these two beta-tubulin genes in hyphal growth, fungicide resistance, and DON production. In the long run, this project is beneficial to improve FHB control by clarifying whether sub-lethal benzimidazoles will increase DON production and determine the molecular mechanism responsible for increased DON production the *TUB1*^{E198L} mutant.

This research is directly relevant to the USWBSI's goal on developing possible effective FHB control measures. This project fits the research area of PBG on developing new strategies for reducing impact of FHB and mycotoxin contamination.