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Project Title: Epigenetic Regulation of DON Biosynthesis in *Fusarium graminearum*

PROJECT 1 ABSTRACT

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Fusarium head blight (FHB) caused by *Fusarium graminearum* is one of the most destructive diseases of wheat and barley. The trichothecene mycotoxin deoxynivalenol (DON) produced by this pathogen is an important virulence factor. The *TRI* genes responsible for DON biosynthesis are regulated by two transcription factors, Tri6 and Tri10. Recently, we found that both *TRI6* and *TRI5* produced antisense transcripts and small transcripts (named SD6-RNA and SU5-RNA in this study) from the promoter or terminator region. *TRI6* expression was regulated by *TRI10* and Sas2 was phosphorylated by PKA, which affects H3K14 acetylation and DON biosynthesis. These data suggest a possible role of epigenetic control by antisense and histone acetylation on DON biosynthesis.

The goal of this study is to further characterize the regulation of DON production by antisense transcripts of *TRI5* or *TRI6* and histone acetylation. Objective 1 aims to characterize the regulation of *TRI6* sense and antisense transcripts by *TRI10*. The effects of *TRI10* overexpression and deletion of SD6-RNA on *TRI* gene expression will be determined. Different molecular mechanisms may be involved in the regulation of *TRI6* sense and antisense transcripts by Tri10. In objective 2, we will further characterize the regulation of *TRI5* by Tri6 and Tri10. The effects of *TRI6* overexpression and deletion of SU5-RNA on DON biosynthesis will be determined. Objective 3 will characterize the relationship between PKA and Sas3 on H3 acetylation and DON biosynthesis. Phosphorylation of Sas3 by PKA may be involved in regulating the transcription of sense or antisense transcripts of *TRI5* and *TRI6*. It is possible that PKA phosphorylation of Sas3 are well conserved in filamentous fungi for regulating secondary metabolism.

Overall, results from proposed experiments will be helpful to better understand the epigenetic control of DON production in *F. graminearum*. Reducing or eliminating DON biosynthesis can be used as a novel approach to control FHB or avoid mycotoxin contamination. Proposed study fits the research area of PBG on characterizing plant-fungal interactions to identify genes that may be useful to reduce DON contamination in barley and wheat. It is a project based on recent progresses.