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Research Category: GDER **Duration of Award:** 1 Year

Project Title: Response of Wheat Constitutively Expressing Lignin Genes to Fusarium Head Blight

PROJECT 1 ABSTRACT

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The **overall project goal** is to identify Fusarium head blight (FHB) resistance in wheat plants through constitutive expression of genes involved in monolignol biosynthesis, a generalized defense response against pathogens. Monolignols are the subunits of the lignin polymer, which are secreted into cell walls to provide structural support, and this pathway also is induced upon pathogen attack. We have previously shown increased resistance to *Fusarium* grain pathogens and elevated phenolic cell wall metabolites in sorghum lines with alterations in monolignol biosynthesis. For the current research, we identified transgenic wheat lines constitutively expressing one of four genes, a Myb transcription factor (*SbMyb60*) that acts as a positive regulator, and for three enzymes in the pathway, caffeoyl CoA 3-O-methyltransferase (*SbCCoAOMT*), 4-coumarate-coenzyme A ligase, (*Sb4CL*), and p-coumarate 3-hydroxylase (*SbC3H*) using *Agrobacterium tumefacians*-mediated transformation. Results from screening lines expressing *SbCCoAOMT* or *Sb4CL*, suggest that they may have increased resistance to FHB. Further analyses will identify unique sources of resistance to FHB. The **project objectives** are:

1) Screen transgenic lines constitutively expressing genes (*SbMyb60, SbCCoAOMT, Sb4CL* and *SbC3H*) in the monolignol biosynthesis pathway for resistance following artificial inoculations under field conditions.
2) Determine FHB resistance in lines with two stacked transgenes in the CB037 background, or with a single transgene in a highly susceptible or moderately-resistant background, and constitutively expressing monolignol biosynthesis genes.

We have all the tools for successfully completing the proposed research in two years. We plan to utilize the field nursery at University of Minnesota for screening transgenic spring wheat for FHB responses. Our team is highly adept at performing crosses with wheat and conducting FHB greenhouse screens.

This research has **mutual interests with stakeholders**. We expect to identify transgenic lines with increased resistance or tolerance and/or reduced DON accumulation among those developed through stacking transgenes or introgressing transgenes into elite susceptible or moderately-resistant backgrounds. These potential resources are invaluable for development of wheat lines with increased resistance to FHB or DON accumulation.