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ARS Agreement #: *N/A*
Research Category: PBG
Duration of Award: 1 Year
Project Title: Expression of Fungal DON Transporters in Wheat for FHB Resistance

PROJECT 1 ABSTRACT
(1 Page Limit)

Overall project goals: Our goal is to create transgenic wheat expressing pathogen-derived genes for DON transporters in order to determine whether they may increase FHB resistance or lower DON levels during infection by *Fusarium*. We also aim to further characterize the specificity of *Fusarium* transporters when expressed in yeast.

Project objectives and expected outcomes.

1) **Characterize the spectrum of resistance to xenobiotics (e.g. mycotoxins, fungicides) conferred by the *Fusarium graminearum* genes *Abc1* and *Tri12* when expressed in yeast.** We anticipate that *Abc1*, a multidrug resistance gene homolog will confer resistance to a broad spectrum of fungicides in addition to trichothecene toxins. However, based on preliminary experiments, *Tri12* appears to make yeast strains more sensitive to DON toxicity. Tri12 is a predicted drug resistance, proton antiporter so DON sensitivity could be explained by a pH gradient favoring DON import rather than export. We will test this hypothesis by buffering cultures to different pH to determine if pH can shift the reaction of Tri12-expressing yeast cells from DON sensitivity to DON-resistance.

2) **Express the genes *Abc1* and *Tri12* in wheat and test lines for resistance to FHB and for DON levels compared to those of non-transformed parental lines.** We will test whether expression of *Abc1* in wheat reduces FHB symptoms and DON levels. Since preliminary experiments in yeast indicate that Tri12 may confer DON sensitivity, the gene expressed in wheat may actually make plants more sensitive to DON. If this is the case, we will test whether greater sensitivity to DON in wheat may be beneficial to the plant by causing a more rapid necrotic response, thereby limiting infection.

Plans to accomplish project goals within the proposed period:
As yeast strains already are constructed for Objective 1, screening for xenobiotic sensitivities can be accomplished rapidly within the first months of the project. For objective 2 we will synthesize *Abc1* and *Tri12* genes, clone into plant transformation vectors, confirm sequences and deliver to the Plant Transformation Center at KSU in the first months of the project. Transformant lines will be tested in the greenhouse and field for FHB and DON levels in 2021.

Statement of mutual interest. Novel approaches for FHB resistance and reduced DON contamination in small grains are of strong interest to both stakeholders and USDA. We consider this a proof-of-concept project whereby, if successful, transporters with different features may be engineered to fine-tune their impact on plant resistance.