PI: Sneller, Clay **PI's E-mail: sneller.5@osu.edu**

Project ID: FY09-SN-024 **FY08 ARS Agreement #: 59-0790-4-101**

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

Project Title: The Molecular Basis for the Low DON Accumulation Phenotype in Winter Wheat.

PROJECT 5 ABSTRACT

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Host resistance is a primary method to control Fusarium head blight and minimize accumulation of deoxynivalenol (DON) in grain. Breeders have selected for Type I and II resistance resulting in reduced DON. But these resistances are incomplete and alone are inadequate to assure low DON levels in the grain of our most resistant cultivars. There is a need to combine resistance to DON accumulation *per se* (RDA) with other types of resistance. Screening for true RDA is very difficult due to the confounding effects Type I and II resistance on DON in most populations.

We screened for RDA in a set of wheat lines where we obtained grain samples with a range of *Fusarium graminearum* infection from each genotype. We noted that some lines showed a significant increase in DON accumulation with increased *Fusarium graminearum* biomass (assayed with Q-PCR) while other showed no DON accumulation with increased *Fusarium graminearum* biomass. The presence of RDA is the logical explanation for lack of DON accumulation in these later lines. The two causes of RDA are 1) host inhibition of DON production and/or 2) host degradation of DON. We will test three hypotheses in this proposal:

1. Wheat lines with different levels of RDA have different effects on transcription of *Fusarium graminearum* genes.
2. Wheat lines with different levels of RDA have different effects on translational and post-translational control of DON production and/or degradation.
3. Variation in levels of Mg^{2+}, other minerals, proanthocyanidin, ferulic acid, polyphenol oxidase and catalase activity in wheat embryos or seeds.

The hypotheses address the 2nd and 3rd action plan goals of the Pathogen Biology and Genetics research area. We will spray inoculate two resistant and two susceptible lines in the greenhouse. For each line we will collect embryos/developing seeds at 2, 4, 8, and 16 days after inoculation. For each sample from each line we will assay the content of *Fusarium graminearum* biomass, DON, minerals, ferulic acid, proanthocyanadins, and polyphenoloxidase and catalase activity. We will conduct a micro-array analysis of the expression of fungal genes on one resistant/susceptible pair using embryos sampled at 2 and 4 days.

Acceptance or rejection of the three hypotheses will lead to understanding the causes of RDA and lead to efficient selection and breeding methods for this important trait.