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**Project Title: Influence of Variable Pre-anthesis Rainfall Patterns on FHB and DON in Wheat.**

## PROJECT 4 ABSTRACT

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The effects of pre-anthesis rainfall patterns (frequency and duration) on the development of Fusarium head blight (FHB) and the accumulation of deoxynivalenol (DON) in harvested grain are not fully understood. This constitutes a major knowledge gap in the epidemiology of FHB and has led to uncertainty in the assessment of the risk of FHB/DON and interpretation of results from the FHB forecasting systems. For instance, producers and researchers alike have questioned the "low-risk" prediction of the FHB risk tool in some seasons when pre-anthesis rainfall is intermittent. Preliminary data suggest that certain intervals of dryness during a pre-anthesis wet period may be sufficient to reduce the forecasted FHB risk level without actually reducing the real risk of kernel damage and DON accumulation, especially where substantial infected residues are present. **The objective of this study is to investigate the specific effects of intermittent moisture during the 7-day pre-anthesis window on FHB and DON.** This will be accomplished through the use of mist-irrigation systems programmed to run on different schedules. Similar experiments will be conducted at three locations (North Carolina, Minnesota, and Ohio), two of these representing soft red winter wheat (SRWW) regions with distinct weather patterns, and the third representing a hard red spring wheat-producing region with in-season weather conditions considerably different from those at the SRWW locations. At each location and beginning 7 days prior to anthesis, four mist-irrigation regimens will be used to enhance inoculum production, infection, and FHB development: **A**) mist every day; **B**) two intermittent misting periods (1, 2, 6 and 7 only); one intermittent misting period (days 3, 4 and 5 only); and **D**) mist every other day (days 1, 3, 5, and 7). Susceptible cultivars will be used in all trials, grain spawn or naturally-infected host crop residue will be used as in-field sources of inoculum. Different planting dates and cultivar maturities will be used to increase the flowering window, and consequently, the chance of some plots receiving each of the mist treatments at the designated time relative to anthesis. FHB index, DON, FDK/VSK, spike spore density, and weather data will be collected for all plots. Linear mixed model analyses will be performed to quantify the effects of mist regimen, planting date/cultivar and their interaction on all measured responses and to develop equations to estimate the probability of infection (or the probability of disease index being above a threshold, *e.g.* 10%) and the probability of DON exceeding critical threshold levels (*e.g.* 2 ppm), given weather conditions and intermittency of pre-anthesis misting. This work directly addresses the FY12-13 FHB Management Research Priority #3 - "***Develop a full understanding of specific environmental and biological factors influencing infection and toxin accumulation***". **Results from this work will aid in the improvement and validation of FHB and DON prediction tools, Goal #3 of the FHB Management Action Plan (FY12-13 FHB MGMT Research Priority #2).**