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PROJECT 2 ABSTRACT

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Fusarium Head Blight (FHB) continues to be a concern in many wheat and barley production regions of the world. Through collaborative research funded by the USWBSI, Web-based risk assessment models were developed and deployed in 2004 to provide timely predictions of FHB risk in 24 states. In keeping with the MGMT RAC research priority of developing the next generation of FHB and DON forecasting systems, the epidemiology group initiated the development of mechanistic risk assessment models in 2007. This provides the conceptual framework necessary to address additional sources of variation and further improve model accuracy. Current objectives of the cooperative epidemiology group are to (1) improve the accuracy of empirical models for FHB by adding variables describing the impact of variety resistance and local sources of inoculum on the risk of disease epidemics in winter wheat; and (2) continue the development of mechanistic models of FHB epidemics and DON accumulation by incorporating model components that describe: the probability of infection and DON accumulation when inoculum is not limiting; and the contribution of wheat spikes with different levels of severity to the total DON level. To achieve these objectives, two experiments will be conducted in Nebraska according to standard protocols, using three locally adapted varieties with similar maturity and different levels of resistance to FHB. For the first experiment, a split-split plot design will be used, with 3 replicate blocks. Planting date will serve as the whole plot; wheat variety as the sub plot; and inoculation timing (no inoculation, inoculation at early flowering, and inoculation at mid flowering) as the sub-sub plot. Sub-sub plots will be spray-inoculated with a spore suspension of *Fusarium graminearum* either at early anthesis (Feekes GS 10.5.1), mid anthesis (GS 10.5.5) or left un-inoculated. In the second experiment, the three varieties will be randomly assigned to three blocks and corn residue will be placed between the rows at GS 6. Plots will be mist-irrigated intermittently between GS 9 and GS 10.5.5 to enhance infection and FHB development. Also in experiment 2, spikes in specific disease categories and clusters within plots will be tagged, harvested, and analyzed for DON. We will quantify the effects of IND variability, variety susceptibility, and weather on the IND/DON relationship at the individual spike and plot levels. Models will be developed to estimate the probability of infection and DON exceeding critical threshold levels, given weather conditions at the time of infection and variety susceptibility.