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Project Title: Development of Prediction Models for Fusarium Head Blight and Deoxynivalenol.

PROJECT 3 ABSTRACT

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The overall goal of the modeling effort is to improve the predictive accuracy of models used to manage FHB and DON, thereby reducing the impact of FHB on growers and agricultural industries relying on wheat and barley. We have already made considerable progress toward reaching this goal; however, additional improvements are possible. The specific objectives for FY14-FY15 include: (1) Coordinate the collection of new observations from the IM-CP used in developing and testing future models; (2) Conduct quality checks on the new observations before including them in the expanded dataset; (3) Improve the prediction accuracy of models for FHB and DON by (i) including predictors from time periods not considered by the current models, and (ii) by using functional data analysis to identify signal locations within the expanded time series; (4) Evaluate the potential value of prediction models as part of the integrated management program for FHB and DON using Bayesian decision theory. Frequent contact with cooperators involved in the IM-CP will facilitate the collection of data from the 2014 and 2015 growing seasons. Additional weather-based predictors not previously considered will be created, based on our own current modeling efforts as well as those suggested by recent models presented by other research groups. Functional data analysis will be used to look for differences between epidemics and non-epidemics in a predictors' time series up to several months before anthesis. A functional analysis is analogous to ANOVA, except the independent variable consists of a time series represented by a curve, rather than a point value. This approach will identify periods within the time series most strongly associated with FHB epidemics. The results of the functional analysis will be transferred to logistic regression models, which are easy to apply on a large geographical scale via the Fusarium Head Blight Prediction Center (www.wheatscab.psu.edu). All models identified by this analysis will be further evaluated for utility using Bayesian decision theory. Decision theory helps assess the impact of information provided by a disease or DON prediction model over more naive decisions (e.g. always apply a fungicide or don't apply a fungicide). Additional improvements in model accuracy will enhance their utility as part of the integrated management of the disease/mycotoxin complex. The project addresses the second research priority of the FHB Management research area.