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USING A BAYESIAN MODEL FOR ESTIMATING AIR BORNE INFECTION RISKS: FUSARIUM HEAD BLIGHT

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Among the most significant diseases affecting wheat worldwide, Fusarium head blight (FHB) has increased in concern to growers in many production regions. Apart from losses in- yield and reductions in baking and seed quality, the major impact associates with- FHB epidemics is the contamination of grain with mycotoxins. FHB has a worldwide distribution although the severity of the outbreaks is highly variable and influenced by local weather conditions. Disease development is enhanced when wetness conditions occur during the flowering and grain-filling stages of wheat. In Brazil, the main causal agent of the disease is *Gibberella zeae* (Schwein.) Petch., the teleomorphic phase member of the *Fusarium graminearum* species complex. The fungus infects others hosts besides wheat and can survive on crop residues. Under favorable weather conditions, ascospores and macroconidia are produced on infested residues and transported to wheat spikes by rain splash and turbulent air currents. Forecasting airborne inoculum density can be useful for disease management and new data, and statistical approaches can improve the accuracy of predictions. Currently, most methods for risk assessment rely upon deterministic weather-driven models based on regression techniques. In contrast, this work describes the use of a probabilistic approach to estimate wheat spikes exposure risk to FHB airborne inoculum. The data we utilized consist of daily counts of *Gibberella zeae* colony forming units in a semi-selective agar media and corresponding meteorological variables collected at hourly intervals. Models were fit to the data using a hierarchical auto-regressive Bayesian approach. Models were fit using MC-Stan software based on HMC U-Nuts, called from R via the RStan package.- Our program generated posterior predictions which allow us to assess prediction uncertainty in the density of *G. zeae* airborne inoculum. Model parametrization varied according to El Niño Southern Oscillation (ENSO) phases. Finally, a framework was developed for combining new information with existing models, in which prior probabilistic models are auto-updated based on new observations.

Keywords: *Triticum*; ENSO; forecasting; posterior estimation