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USING A BAYESIAN MODEL FOR ESTIMATING AIR BORNE INFECTION RISKS: WHEAT BLAST

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The effect of weather on plant diseases has been widely researched, and the ability to forecast meteorological events is able to offer valuable insights about the magnitude of an epidemic. In addition, better predictions of outbreaks that are more sensitive to fluctuations in weather can help in the establishment- of more suitable control practices. Wheat blast caused by *Magnaporthe oryzae* is a relative new disease that has been responsible for considerable damage on the wheat fields in several South American countries such as Brazil, Bolivia and Paraguay. Wheat blast outbreaks vary from year to year and location to location. The erratic occurrence of the disease can be attested, in some years, by comparing wheat fields varying on sowing dates. The erratic development of the disease is probably environmental in origin. The fungus *M. oryzae* produces light and dry hyaline conidia that may be removed by wind, from sporulating lesions, and transported over long distances. A study was carried out to examine the relationship of conidia density and weather factors. A spore sampler was prepared using microscopes slides coated with petroleum jelly, protected by a rain shelter, exposed to the air at 1.50 m height. The angle of the glass slides to wind was approximately 45º. The glass slides were replaced every 24 hours starting at 00:00 GMT from February 2, 2013 through June 7, 2014 in Passo Fundo, RS, Brazil. After being exposed, the slides were examined under light microscope and the number of conidia-like structures resembling those of *M. oryzae* were recorded. At the monitoring site, the weather variables such as temperature, relative humidity, wind, solar radiation, dew point temperature and rainfall were recorded at every hour. We used a hierarchical auto-regressive Bayesian model adjusted 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 *M. oryzae* airborne inoculum.The hierarchical Bayesian model built here for estimating *M. oryzae* like conidia in the air showed that daily atmospheric temperature range (C), mean relative humidity (%), accumulated solar radiation (MJ/m^2) and accumulated rain (mm) appeared to be the meteorological variables of prime importance. This information may help growers reduce economic and environmental risk through eliminating unnecessary fungicide applications.

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