

Numerical Modelling of Wind Dispersal Seeds of Bromeliad *Tillandsia recurvata* L. (L.) Attached to Electric Power Lines

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Abstract : In some cities in the State of Parana - Brazil and in other countries atmospheric bromeliads (*Tillandsia* spp - Bromeliaceae) are considered weeds in trees, electric power lines, satellite dishes and other artificial supports. In this study, a numerical model was developed to simulate the seed dispersal of the *Tillandsia recurvata* species by wind with the objective of evaluating seeds displacement in the city of Ponta Grossa - PR, Brazil, since it is considered that the region is already infested. The model simulates the dispersal of each individual seed integrating parameters from the atmospheric boundary layer (ABL) and the local wind, simulated by the Weather Research Forecasting (WRF) mesoscale atmospheric model for the 2012 to 2015 period. The dispersal model also incorporates the approximate number of bromeliads and source height data collected from most infested electric power lines. The seeds terminal velocity, which is an important input data but was not available in the literature, was measured by an experiment with fifty-one seeds of *Tillandsia recurvata*. Wind is the main dispersal agent acting on plumed seeds whereas atmospheric turbulence is a determinant factor to transport the seeds to distances beyond 200 meters as well as to introduce random variability in the seed dispersal process. Such variability was added to the model through the application of an Inverse Fast Fourier Transform to wind velocity components energy spectra based on boundary-layer meteorology theory and estimated from micrometeorological parameters produced by the WRF model. Seasonal and annual wind means were obtained from the surface wind data simulated by WRF for Ponta Grossa. The mean wind direction is assumed to be the most probable direction of bromeliad seed trajectory. Moreover, the atmospheric turbulence effect and dispersal distances were analyzed in order to identify likely regions of infestation around Ponta Grossa urban area. It is important to mention that this model could be applied to any species and local as long as seed's biological data and meteorological data for the region of interest are available.

Keywords : atmospheric turbulence, bromeliad, numerical model, seed dispersal, terminal velocity, wind

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