Snooping into the invisible trajectory of airborne fungal inoculum

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The rationalization of chemical control against fungal diseases of crops, based on epidemic risk prediction, is a mean to make agriculture friendlier for the environment and human health. Numerous fungal pathogens are disseminated via the atmosphere in the form of spores. A major key to predicting epidemic risk in a given area is to forecast the abundance of airborne inoculum. This implies discovering the localization of inoculum sources and the pathway of spores in the atmosphere. This is highly challenging for fungi with large hosts range whose sources cannot be readily identified when compared to relative ease identifying those of host-specific fungi.

Botrytis cinerea and *Sclerotinia sclerotiorum* are widespread polyphagous Ascomycetes that cause high economic losses. We aim to set up decision support systems for white and grey mould diseases. In a first step we characterized viable airborne inoculum of these two fungi. We integrated quantitative data, genetic characteristics, climatic parameters and air masses trajectories, and used generalized linear models to assess if the inoculum has a local or distant origin, or both.

Viable inoculum of both fungi was present almost all the time in the air, even when no susceptible crop was located in the vicinity of the sampling sites. The abundance of this inoculum was significantly correlated with several local climatic parameters. For *B. cinerea*, the variation in abundance and genetic characteristics tended to be linked to the origin of the air masses. Moreover, the model providing the best prediction was obtained when local climatic parameters as well as climatic parameters along the air mass trajectories and their origin were taken into account. For *S. sclerotiorum*, potential long distance exchanges of airborne inoculum were probable. The results suggest that aerial interconnectivity may be appropriate to assess exchanges of isolates between regions.

For both fungi, sources of spores seemed to be local without excluding arrival of spores from distant locations. Our approach is likely to be applicable to all polyphagous fungi with aerial dissemination.