Inoculum-based plant disease forecasting

Małgorzata Jędryczka

Abstract

Biological life in the air is rarely studied in spite of its uniqueness and usefulness. Many human and plant diseases are initiated by airborne dispersal of spores, which vary in time and space. Inoculum-based disease forecasting is increasingly possible through advancements in biosensors, rapid isothermal DNA-based methods or immunological tests for automated, rapid on-site detection of airborne spores. Moreover, DNA-based methods can monitor pathogen populations for changes in genetic traits, such as avirulence genes. Air transmission of *Plenodomus* species pathogenic to oilseed rape has been monitored at several locations in Poland over the last 18 vegetative seasons and served as the basis for decision support in the protection of oilseed rape against stem canker. The System for Forecasting Disease Epidemics (SPEC) has been created and implemented countrywide, thanks to a collaboration with an agrochemical company. This system provides constantly updated information to the producers of oilseed rape. It is the largest in Europe and the third largest decision support system for plant protection worldwide, based on aerobiological methods. Additionally, microscopic and DNA-based inoculum detection has been expanded to *Ramularia collo-cygni*, a pathogen of barley, *Fusarium graminearum* in wheat and *Cercospora beticola* in sugar beet. In a recent parametric evaluation the impact of SPEC was highlighted as an example of the scientific activities of IPG PAS useful for society and the economy. Monitoring of the pathological aerobiome is in line with the latest policy agenda of the European Green Deal, so aerobiological tools will be further developed.

.