



Operational application and validation of the disease risk forecast model PROCULTURE to optimize fungicides spray in the control of septoria leaf blotch disease in winter wheat in Luxembourg

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A large extend of land use in the Grand Duchy of Luxembourg is agriculture and the fungal disease septoria leaf blotch is one of the major diseases in winter wheat. Its spread on the individual plant is thereby highly dependent on rainfall events in combination with the plant's development. In order to obtain good harvests it is desirable to minimize the infection by spraying fungicides.

However, fungicide application is cost intensive, should be kept to a minimum due to ecological reasons and dependent on dry conditions; also the state of the infection is important as well as upcoming rainfall events that lead to further infections. The task is therefore to provide an optimum time frame for site-specific spraying in an operational setup for sites throughout Luxembourg and distribute these results to the farming community.

The model PROCULTURE has been developed in Belgium to simulate the evolution of septoria leaf blotch disease. It has been validated in Luxembourg for four years at four distinct representative sites. It is able to identify infection periods by the causal agent *Mycosphaerella graminicola* on the last five leaf layers by combining meteorological data with phenological data from the crop growth model component. The me-

eteorological forcing consists of hourly time-series since the time of sowing of air temperature, relative humidity and cumulative rainfall, retrieved from automatic weather stations and numerical weather prediction model outputs for the forecast periods. A PROCULTURE recalibration is routinely done using actual disease levels observed on site. Currently hind-cast analyses, validations and forecasts up to seven days are done once a week during the growth period.

On average, no spray of fungicides or only one application are required to control efficiently the septoria leaf blotch disease. Specific spatial patterns of infection can be identified and linked to topo-climatological conditions in Luxembourg. The PROCULTURE forecasts have been validated to be correct in about 85% of all cases.

To get a continuous spatial coverage of the country, it is planned to couple the PROCULTURE model offline to 12-hourly operational weather forecasts from an implementation of the Weather Research and Forecasting (WRF) model for Luxembourg at 1 km resolution. Via an internet map-server farmers will not only be able to enter their relevant crop information on a plot basis, but also retrieve the PROCULTURE forecast results which will make the overall system more efficient and flexible from the end-users perspective.