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Weather risk models for prediction of septoria tritici blotch

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Background
Disease risk models based on climatic data as well as disease monitoring and control thresholds for decision on fungicide use are traditionally used as important IPM elements. The need to control Zymoseptoria tritici varies significantly between localities and years. The severity of septoria tritici blotch (STB) is mainly driven by precipitation, periods with leaf wetness and high relative humidity during the growing season.

Aim
One aim of the C-IPM project - SPOT IT is to use historical weather data to evaluate performance of STB prediction models in each country, along with practical testing of the models in field trials. At the end of the project we hope to have some validated disease models that will give reliable output in all partner countries. The modeling engine used in the project is the Norwegian open-source platform VIP-S, which will provide a trans-national facility for model testing and validation.

Method
Different climate based scenario models have been investigated based on historical weather data from 5 years in 5 different countries. The prediction values gives an idea of the differences in risk of attack of STB, quantified as a number of treatments needed per season - applying a protection period of 10 days following a treatment. This testing of different thresholds gives clear hints on the sensitivity of the models and the dynamics resulting from the choice of different parameters.

Conclusions
The risk for Septoria tritici blotch varies significantly within the northern zone. Number of needed treatments varies between sites and seasons and need adjustment to the actual start and length of the season. The tested humidity model using weather data from 2012-17 and 20 hours above 85% RH recommend treatments between 0.9 and 2.9 treatments per season for control of STB, CPO using 4 days precipitation recommend treatments between 1.5 and 3.3 treatments per season (Table 2 and 3).

Validation of models

Figure 1. Visualization of the risk for STB based on hourly values using hours with RH, leaf wetness and rain as driving parameters.

Table 1. Tested weather models in winter wheat for control of STB using historical climate data.

Crop Protection Online (CPO) uses days with precipitation. 4 days with more than 1 mm of rain for susceptible cultivars between GS 32 and 71 or 5 days with more than 1 mm for more resistant cultivars in the period GS 37 to 71. The humidity model is a dynamic model counting continuous “humidity hours” with either hours >85% RH, leaf wetness (>30 min) or rain (>0.2 mm). Risk for disease spread and infection is regarded as high if 20 hours have been counted in a run. The counting runs from GS 32 to 71.

Table 2. Testing of different humidity and rainy days models and their sensitivity to releasing treatment using historical climate data from 5 countries in the Nordic and Baltic countries. No. of treatments for specific criteria (average of 2012-15 per region).

Table 3. Testing of different humidity and rainy days models and there sensitivity to releasing treatment using historical climate data from different years and localities. 5 countries in the Nordic and Baltic countries. No of treatments for specific criteria per year per country.

Figure 2. No. of treatments from two models using different years and climate stations in Denmark. Below: Historical trial responses from fungicide treatments in winter wheat carried out in Denmark.