Prediction model for deoxynivalenol in wheat grain based on weather conditions

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Environmental factors influence the growth, survival, dissemination and hence the incidence of Fusarium fungi and the disease severity. The knowledge of the quantitative and qualitative effects of environmental factors and growing practices on initial infection, disease development and mycotoxin production is important for prediction of disease severity, yield impact and grain contamination with mycotoxins. The objective of this study was to design a model for prediction of deoxynivalenol (DON) content in winter wheat grain based on weather conditions, preceding crop and soil cultivation. The grain samples from winter wheat field experiments conducted in 2002–2005 to determine the effect of preceding crop in combination with soil cultivation on Fusarium head blight infection were analysed for the DON content. Average daily weather data (temperature, rainfall, relative humidity) were collected using an automated meteorological station and analysed separately for April, May and a 5 days period prior to the beginning of flowering and 5 days after the beginning of flowering. The correlation coefficients of DON content to weather data were calculated for monthly data prior to heading and 5 days data prior to and after the beginning of anthesis. Highest positive correlation coefficients were found for sum of precipitation in April, average temperature in April, and sum of precipitation 5 days prior to anthesis. Significant negative correlation was found for average temperature in May and average relative humidity 5 days prior to anthesis. Using the data from this experiment, we trained neural networks for prediction of deoxynivalenol content on the basis of weather data and preceding crop. The most appropriate neural network model was then coupled with AgriClim model to simulate spatial and temporal variation of DON content in wheat samples for south Moravia and north-east Austria area.

Keywords:

prediction model; mycotoxin DON; winter wheat; weather conditions

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