



Modelling of the spring phenological phases of the Silver birch *Betula pendula* and Bird cherry *Padus racemosa* in Baltic region

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The air temperature is the strongest driving factor of the plant development during spring time in moderate climate conditions. However other factors such as the air temperature during the dormancy period and light conditions can play a role as well. The full potential of the recent and historical phenological observation data can be utilised by modelling tools.

We have calibrated seven phenological models described in scientific literature to calculate the likely dates leaf unfolding and start of flowering of the Silver birch *Betula pendula* and bird cherry *Padus racemosa* (Kalvāns et al., accepted). Phenological observations are derived from voluntary observation network for period 1960-2009 in Latvia. The number of used observations for each phase range from 149 to 172. Air temperature data measured in meteorological stations closest to the corresponding phenological observation sites are obtained from Latvian Environment, Geology and Meteorology Centre. We used 33 random data subsamples for model calibration to produce a range of model coefficients enabling the estimation of the phenological model uncertainty. It is found that the best reproduction of the observational data are obtained using a simple linear degree day model considering daily minimum and maximum temperature and more complex sigmoidal model honouring the need for low temperatures for dormancy release (UniChill, Chuine, 2000). The median calibration base temperature in the degree day model for the silver birch leaf unfolding is 5.6°C and for start of the flowering 6.7°C; for the bird cherry the corresponding base temperatures are 3.2°C and 3.4°C.

The calibrated models and air temperature archive data derived from the Danish Meteorological Institute is used to simulate the respective phase onset in the Estonia, Latvia and Lithuania in 2009. Significant regional differences between modelled phase onset times are observed. There is a wide regional variation of the model uncertainty as well, indicated by the confidence intervals calculated from the 33 model calibrations: in some regions all the coefficient sets give similar phase onset times (within two to three day interval) while on other cases the spread can be more than a week.

In the spring 2014 field campaign is planned to obtain considerable data set for leaf unfolding and start of flowering of the bird cherry in Estonia, Latvia and Lithuania. The data will be used to evaluate performance of phenological models driven by short, medium and long term air temperature forecasts. The research is supported by the European Union through the European Social Fund Mobilias grant No MJD309.

References

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