

Growing degree days between the phenological phases of forest trees and shrubs in the NW part of Croatia

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Phenological and meteorological data for the period 1961–1990 have been analysed at four stations in NW Croatia. For the phenological analysis, those forest trees and shrubs have been chosen that flower from February to June. Hazel (*Corylus avellana* L.) generally starts flowering at the end of February, sticky alder (*Alnus glutinosa* (L.) Gaertn.) mid-March, common lilac (*Syringa vulgaris* L.) at the end of April, followed immediately by horse-chestnut (*Aesculus hippocastanum* L.) and, at the beginning of May, by monogynous hawthorn (*Crataegus monogyna* Jacq.). Common elder (*Sambucus nigra* L.) and locust-tree (*Robinia pseudoacacia* L.) start flowering at the same time, in the second part of May, and large-leaved lime (*Tilia platyphyllos* Scop.) at the beginning of June, followed about ten days later by bast-small-leaved lime (*Tilia cordata* Mill.). The phenophases have also been analysed: the beginning of leaf-unfolding (BF), full flowering (FF), the first ripe fruits (RF), the colouring of leaves (CL) and leaf fall (FL). The vegetation period in the area observed gradually shortens going from south towards north and from east towards west. For these plants and their phenophases the growing degree days (GDD) have been defined for the 5°C temperature threshold at the Zagreb-Maksimir, Varaždin and Križevci meteorological stations. For the Zabok phenological station meteorological data from the nearest station, Novi Dvori, have been used. The growing degree days have been calculated from the first day in the year to the mean date of the first phenological phase of each particular plant. Then, the calculations continued from one phenological phase to the next. Precipitation amount and insolation duration were summed for the same period. This resulted with an estimate of the amount of warmth, humidity and light the observed plants needed to enter a particular phenophase, which has been shown as the mean values of GDD, precipitation amount and insolation. The plants in the western part of the area observed require the greatest amount of warmth and precipitation. Because of the close values of GDD values, precipitation amount and insolation duration, it is possible to group the Novi Dvori/Zabok and Zagreb-Maksimir stations and the Križevci and Varaždin stations. Over the NW Croatia hazel needs the least warmth to begin flowering (GDD from 15°C to 20°C on the average) while the locust-tree needs the most (from 415°C to 445°C). From flowering to fruit ripening, hazel and horse-chestnut need about 1820°C GDD while common elder needs about 1230°C and monogynous hawthorn 1480°C. The end of the vegetation period sets in first in the western part of the area observed so that the vegetation period is the shortest there.