

THE POLLEN SEASON OF THE MAIN ALLERGENS IN THE CZECH REPUBLIC WITHIN THE PERIOD 1991–2010

Hajkova L.¹, Koznarova V.², Sulovska S.², Richterova D.¹

¹ Czech Hydrometeorological Institute Prague, regional branch Usti nad Labem, Kockovska 18, 400 11 Usti nad Labem, Czech Republic, hajkova@chmi.cz., ²Czech University of Life Sciences Prague, Dept. of Agroecology and Biometeorology, Kamycka 129, 165 21 Praha 6 Suchbát, Czech Republic

Abstract. The Czech Hydrometeorological Institute operates phenological network with 45 wild plants observing programme (the programme includes among other species also the Common Hazel (*Corylus avellana* L.), the Common Alder (*Alnus glutinosa* (L.) Gaert.), the Silver Birch (*Betula pendula* Roth.), the Meadow Foxtail (*Alopecurus pratensis* L.) and the Cocks Foot (*Dactylis glomerata* L.). We have statistically evaluated the phenological stages closely connected with the pollen release into the air (the beginning of flowering - BBCH 61 and the end of flowering - BBCH 69) including maps creation. The processed period was within last twenty years 1991–2010. The maps were processed with using geographic information systems (Application Clidata–GIS, method Clidata–DEM). As the input data were used the mean dates of phenophase entrance from the twenty year period 1991–2010

The mean onset date of the beginning of flowering was from 24th February till the 24th March (the Common Hazel), from 6th March till 2nd April (the Common Alder), from 13th April till 7th May (the Silver Birch), from 5th May till 23rd May (the Meadow Foxtail) and from 16th May till 12th June (the Cocks Foot). The mean onset date of the end of flowering was from 18th March till the 15th April (the Common Hazel), from 27th March till 19th April (the Common Alder), from 28th April till 21st May (the Silver Birch), from 25th May till 6th June (the Meadow Foxtail) and from 7th May till 23th June (the Cocks Foot).

The phenological phases were much precipitated in the years 2000, 2007 and 2009, on the contrary the onsets were much delayed in the years 1991 and 1996. Part of selected species show an overall tendency to the earliest onset.

Key words

Phenology, Birch, Hazel, Alder, Meadow foxtail, Cocks foot, BBCH, Czech Republic, GIS

Introduction

Periodicity in the life of plants and animals is considered to be an indirect indicator for the periodicity in the climate. One of the preferred indicators is phenology, the science of natural recurring events, as their recorded dates provide a high-temporal resolution of ongoing changes (Menzel et al., 2006). Phenological observations can be an important biological indicator of the present environmental changes. Luknarova and Braslavská (1999) have studied flowering season of main allergens in Slovakia – hazel, alder and

birch during the period 1987–1998. Emberlin et al. (2007) studied the changes in the pollen seasons of the early flowering trees *Alnus* spp. and *Corylus* spp. in Worcester (UK) within the period 1996–2005. Weryszko-Chmielewska. and Rapijko (2007) analysed the pollen seasons in Lublin and Warszawa (Poland) in period 2001–2007.

Material and methods

The onsets of the selected phenological phases are monitored in the framework of the phenological station network by voluntary observers according to the methodological regulations for the activity of phenological stations (Methodological regulation no. 10 - Instructions for the activity of phenological stations – wild plants, 2009). For the depiction of maps, the method Clidata–DEM was used with a horizontal differentiation of 500 m and of regressive semi-diameter 40 km. The maps are processed from the observed data from the phenological stations; in the area above the boundaries of the present occurrence the map expresses potentially possible values. Technical rows for geographical coordinates of phenological stations were assessed for the calculation of complementing meteorological characteristics. The methodology for the calculation of technical rows using the software ProClimDB (Stepanek, 2009). And such prepared data were used for calculating meteorological characteristics according to the following procedure: pentad air temperature was calculated as the average air temperature for five consecutive days before the day of the onset of the selected phenophase in the given year. The sum of the air temperatures, the total of sunshine duration and the number of days with precipitation total of at least 1 mm during the selected phenophase intervals were calculated during the entire mentioned interval. The values were summarized in individual years and subsequently a 20year average was calculated.

We have also calculated the deviations of phenophase onsets from the long term average 1991–2010. Most of results (charts, tables) were executed in Excel.

Results and discussion

The results of average onset of selected phenological phases (the beginning of flowering (BBCH 61) and the end of flowering (BBCH 69) are described in the maps. The beginning of flowering of Meadow Foxtail shows six areas with five–days intervals. In the lowlands the

phenophase entrance is dated even though before 3rd May, then across the major part of the territory is the average phenophase onset between 4th May and 18th May and in the highest situated mountain are location with phenophase onset even after 24th May. The map of the end of flowering (BBCH 69) shows eight areas with five-days intervals. In the lowlands the phenophase entrance is dated before 26th May, then across the major part of the territory is the average phenophase onset between 27th May and 10th June and in the highest situated mountain are location with phenophase onset after 16th June. The flowering of the Meadow Foxtail takes in average 20 days with sum of air temperature at selected elevation zones between 282 and 338 DD, the duration of sunshine ranges between 130 and 161 hours and number of days with precipitation total of at least 6,3 and 7,4 days. The sum of air temperature has decreasing tendency with increasing elevation, on the contrary the number of days with precipitation total 1 mm and more has opposite tendency. The duration of sunshine has indifferent tendency. The results of other species will be presented at the conference.

Conclusions

In this paper were evaluated generative phenological phases (the beginning of flowering – BBCH 61; the end of flowering–BBCH 69) of the most allergology important species as the Common Hazel (*Corylus avellana* L.), the Common Alder (*Alnus glutinosa* (L.) Gaertn.), the Silver Birch (*Betula pendula* Roth.), the Meadow Foxtail (*Alopecurus pratensis* L.) and the Cocks Foot (*Dactylis glomerata* L.) from the CHMI phenological stations (wild plants) situated at elevations from 155 m (Doksany) to 1102 m (Modrava, Filipova Hut) within the period 1991–2010.

The flowering of these species showed a great variability within the twenty year period. The average time of flowering with selected allergens at elevation zones is subsequent: 22–23 days with standard deviation 2,3–5,3 days (*Corylus avellana* L.), 14–15 days with standard deviation 2,1–2,7 days (*Alnus glutinosa* (L.) Gaertn.), 17–21 days with standard deviation 1,8–4,2 days (*Betula pendula* Roth.), 20 days with standard deviation 1,0–2,7 days (*Alopecurus pratensis* L.) and 20–22 days with standard deviation 1,3–4,0 days (*Dactylis glomerata* L.).

The phenological phases were much precipitated in the years 2000, 2007 and 2009, on the contrary the onsets were much delayed in the years 1991 and 1996. Part of selected species show an overall tendency to the earliest onset of the low level of the statistics significance during the 20year processed period. Skvareninova (2009) has studied phenological phases of the Common Hazel and the Common Alder in Slovakia (Arboretum Borova Hora) within the years 1987–2008, the results also show earlier

phenophase onset, the average date of the beginning of flowering was on 6th March (*Corylus avellana* L.) and on 13th March (*Alnus glutinosa* (L.) Gaertn.).

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