

The beginning of selected phenological phases hazel (*Corylus avellana* L.) during the period 2001 to 2011 in Slovakia

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Abstract. This paper evaluated results of beginning of three generative phases and one vegetative hazel (*Corylus avellana* L.) phase in Slovakia between 2001 and 2011. Observations were carried out in 48 forest phenology stations at altitudes from 111 to 940 m a. s. l. Observations were carried out in accordance with applicable methodology of Slovak Hydrometeorological Institute. During the period 2001 to 2011 beginning of flowering is from 20 February to 30 March in Slovakia. The full flowering phenological phase started from 1 March to 6 April and first leaves phenological phase started from 14 to 27 April. Phenological phase beginning of ripening started from 29 August to 5 September. We were observed high variability of beginning in all phenological stages. Spring phenological phases started earlier. The phenological phase first leaves has the most significant trend, it started about 5.1 days earlier. Autumn phenological phase was postponed to later dates.

Key words

phenology, phenological observation, phenological phase, climatic change, phenological station, *Corylus avellana*

Introduction

Common hazel (*Corylus avellana* L.) is widespread bush in Slovakia. The bark is smooth to the touch and silver-grey in colour. The male flowers are hanging catkins which appear in winter before the leaves and release vast quantities of pollen for wind pollination. The female flower is a tiny attractive red flower which appears at the end of an appendage that looks like a bud but will develop into the fruit. Leaves are 5-12 cm long and round with a pointed tip and double toothed edge, rough to the touch and slightly hairy. The nuts are edible and develop in clusters in a green leafy cup before browning with age in the autumn. Flowers appear before the leaves in the spring. The plant produces many stems.

Material and methods

The phenological observations of Common hazel have been processed only for the period of years 2001-2011. Observations were carried out in 48 forest phenology stations at altitudes from 111 to 940 m a. s. l. Observations were carried out in accordance with applicable methodology of Slovak Hydrometeorological Institute (SHMI). (Braslavská-Kamenský 1996). We evaluated four phenological phases: beginning of flowering (BF), flowering (F), first leaves (FL) and beginning of fruit ripe (BFR). We used the revised data from the climate and meteorological information SHMI database system (Koak). Phenological data were used without prior homogenization

and missing data were not added.

Maps of phenological phases arrivals: beginning of flowering, flowering and first leaves in Slovakia were made using linear regression with altitude. Map of beginning of fruit ripe was created by objective spatial analysis in GIS ArcView.

Results and discussion

The survey of beginnings of particular observed phenological stages for the 11 years lasting period including their extreme values are given in Table 1.

Phenological phases	Ø	min	max
BF	20.2.-30.3.	14.1.2007	26.4.2006
F	1.3.-6.4.	20.1.2007	1.5.2001
FL	14.4.-27.4.	2.3.2008	20.5.2004, 2008
BFR	29.8.-5.9.	30.7.2004	29.10.2001

Table 1. The survey of Common hazel phenological stages beginnings in Slovakia during the period of years 2001-2011

Common hazel is a plant species with beginning of flowering in early spring period and has a big amplitude (104 days during the 11-year period). The onset of beginning of flowering in the period 2001 - 2011 runs at an average from the second half of February until the first decade of April in individual stations.

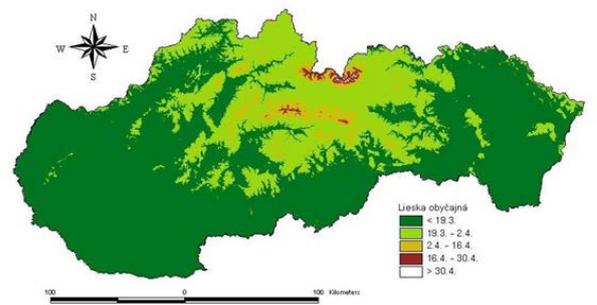


Figure 1. Map of beginning of flowering of Common hazel during the period 2001-2011.

The phenological phase beginning of flowering of Common hazel started in the Podunajská and Východoslovenská plains. The last onset of this phenological phase is in the mountainous areas of northern Slovakia: Orava, Liptov, Spis and Kysuce (figure 1).

Phenological phase flowering has a relatively large amplitude variability, 102 days for the reference 11-year period between the earliest and the latest start date of flowering. The onset of flowering during the period 2001 – 2011 was progress from the second decade of February until mid-April.

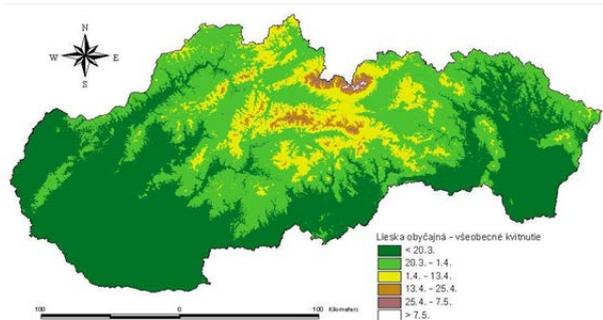


Figure 2. Map of flowering of Common hazel during the period 2001-2011.

The flowering of Common hazel started in the Podunajska plain. The last start of this phenological phase is in the mountainous areas of northern Slovakia: Orava, Liptov, Spis and Kysuce (figure 2).

Variability between the earliest and the latest start date listing of phenological phases first leaves of the 79 days for the period 2001 to 2011. Onset first leaves in the period 2001 - 2011 was progress from early April to the end of the first May decade.

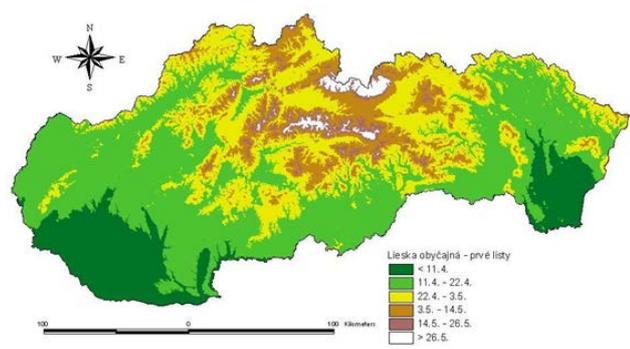


Figure 3. Map of first leaves of Common hazel during the period 2001-2011.

The first leaves of Common hazel begin in the Podunajska plain. The last start of this phenological phase is in the mountainous areas of northern Slovakia: Orava, Liptov, Spis and Kysuce (figure 3).

Variability between the earliest and the latest start date phenological phases beginning of fruit ripe is 91 days for the period 2001 to 2011. The onset this phenophase in the period 2001 - 2011 was progress from the first decade of August until mid-October. It is interesting that phenological phase beginning of fruit ripe Common hazel begins in the mountainous areas of northern Slovakia. The last start of this phenological phase is in Cerova, Ondavska and Laborecka highlands (figure 4). This could have been caused due to the subjective observers error. Observers could determine the onset of this phenological phase late or very soon.

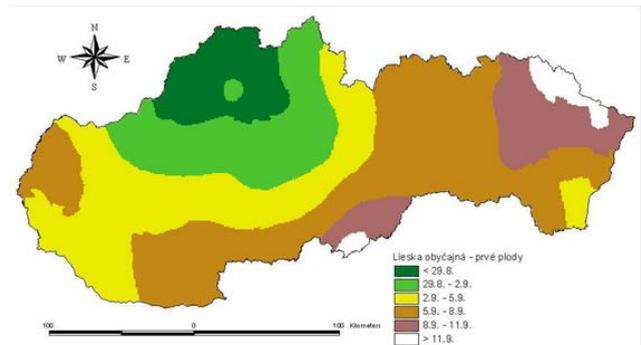


Figure 4. Map of beginning of fruit ripe of Common hazel during the period 2001-2011.

Conclusions

By statistical analysis we found a relatively high variability of onset in all observed phenological stages.

The results of Common hazel (*Corylus avellana* L.) phenological observations have shown several evaluation differences. They indicate warming and conditions changes of relating area in relationship to the current global climate change.

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