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Original Paper

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Phenological observations and the diseases and pests occurence in *Prunus* L. taxa on studied localities

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The autochtonous taxa of the genus *Prunus* L.: *Prunus* × *fruticans*, *Prunus* × *fechtneri* and *Prunus* × *dominii* was chosen for this research: the phenological observations and occurrence pest and diseases. We recorded, that two of the studied taxa P. × *fruticans* and *P.* × *dominii* started growth phases the first and *P.* × *fechtneri* the last. The longest vegetation period from first phenophase to dormancy (224 days) for P.× fechtneri in 2012 was observed. The shortest vegetation period (209 days) from first phenophases to phenophases flowering for *P.* × *fruticans* in 2013 was observed. We recorded the occurrence of insect *Cydia funebrana*, parasitic lichen *Xanthoria parietina* and fungal disease *Botrytis cinerea*. The highest incidence of *Cydia funebrana* was recorded on taxa *P.* × *fechtneri* from the locality Bádice and *Prunus* × *dominii* from the locality Dolné Lefantovce. On the shoots of the taxa L2, L3 and P1 the presence of parasitic lichen *Xantoria parietina* and in the plum *P.* × *fechtneri* B fungal disease *Botrytis cinerea* was observed. Only for the taxa *Prunus* × *fruticans* L1 no lichen was recorded. The taxa *Prunus* × *fruticans* L1, P1 and *Prunus* × *dominii* L2, L3 no fungal disease was show.

Keywords: phenological observations, phenophases, *Prunus* taxa, disease, pests

1. Introduction

The occurence of the species of the genus *Prunus* L. is largely concentrated in the northern part of hemispere. The most of the species come from semiarid climate habitats. Cultivated species of this genus are adapted to the various ecological conditions on the territory of plantation (Dönmez, Yildirimli, 2000). Many species of the genus *Prunus* L. belong to the economically important species, with the considerable morphological variations (Bortiri, 2006). Phenological observations provide ecologically valuable information about the average duration of the vegetation period of woody species in the local climate and determine the difference in dates to indicate the beginnings of important events. Phenology as a science is not limited to descriptive phenological dating, but it also seeks to explain the influence that causes these phenological events (Larcher, 1988). Expressed timing of lifecycle of plants became excellent bioindicator of their sensitivity, depending on the point of view of climate change, particularly the ambient temperature (Ahas et al., 2000), or the availability of water (Peñuelas et al., 2004). Many phenological phases, such as flowering and development of the leaves, the time of occurence of insects or the arrival of migratory birds have shifted, depending on the continued climate change (Parmesan and Yohe, 2003; Root et al., 2003). Changing environmental conditions and significant damage factors, due to climate change, require constant crop breeding mainly aimed at creating varietes with higher tolerance to biotic and abiotic factors (Drobná, 2005).

The aim of the paper was obtain phenological data of three hybridogenous taxa of the genus *Prunus* L.: *Prunus* × *fruticans*, *Prunus* × *fechtneri* and *Prunus* × *dominii* in natural conditions of Danube Lowland during years of 2011 till 2013 and those on occurence of some negative biological influence on the processes of their vegetative development.

2. Material and methods

2.1 Biological material

Phaenological expression and disease of the following spontaneaus hybrids of blackthorn (*Prunus spinosa* L., s. s.) were studied:

- *Prunus* × *fruticans* Weihe (*P. insititia.* × *P. spinosa* s.s.),
- *Prunus* × *fechtneri* (Domin) Baranec (*P. domestica* × *P. spinosa* s. s.),
- *Prunus* × *schurii* Baranec, nom. ined. (*P. dasyphylla* Schur × *P.* × *fruticans* Weihe),
- *Prunus* × *dominii* Baranec, nom. ined. (*P. spinosa* s. s. × *P.* × *fruticans* Weihe).

Taxonomical status of studied taxa is stated in according of Baranec (1990) and Bertová (1992).

2.2 Location of observations

Localities of observation were Dolné Lefantovce, Bádice and Podhorany. This area lies in the north – west foothills

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of Tribeč mts. on the alluvial cones of the left side of the river Nitra.

For our research we chosen these taxa from those locations:

- *Prunus* × *fruticans* – Dolné Lefantovce (L1) and Podhorany (P1),
- *Prunus* × *dominii* – Dolné Lefantovce (L2) a (L3),
- *Prunus* × *fechtneri* – Bádice (B1).

Studied area is situated between the Danube plain and the western part of the mountains Tribeč. Orographic entirety is one of the southern part of core areas of the Western Carpathians. It wedged into the Pannonian plain, the impact of which is particularly evident in the southern part of the mountains (Zobor). The mountain range has very varied geological structure. The Tribeč central ridge is geologically whole monotonous, consist predominantly of granitoid rocks (Košťál, 1996).

2.3 Phenological data

The phenological observations were carried out in regular intervals during the all vegetation periods, from March to beginning of November in 2011, 2012 and 2013. For the onset of phenophase there was considered a day, when more than 50 % of brachyblasts on the observed taxa achieved the given phenophase. Recording of phenophases with use of BBCH key (Meier, 1994).

2.4 The occurrence of pests and diseases

We recorded the pest *Cydia funebrana* on the pheromone traps, during the vegetation period in the year 2013. For keeping the minimum distance between traps there was placed one trap per one ha. The application deadline was fifth April 2013. The traps were was placed in a 2/3 of the height of the crown. The term of installation traps was before the beginning of the flight of the first generation of the pest. For the first and second generation we used three pheromone evaporators. We recorded the capture of butterflies once a week. The economic threshold by trap for butterflies can not be accurately determined. It is recomended to treat the plants, when the average daily capture is higher than the 15–25 males of the first generation and 10–15 males of the second generation. Vanek et al. (1996) states, that for the economic threshold can be considered whan 2–5 caterpilars occcur per plant.

For identification of diseases there were taken 40 branches with leaves. Symptoms were determined directly in the field using a photographic technique. Determination of zoonotic diseases was consulted with an expert.

The slides were examined by digital camera Lumix 16 × Optical Zoom, 20 × Inteligent Zoom, - Panasonic DMC-TZ 18.

3. Results and discussion

3.1 Phenological observations

We recorded the beginning of phenophase of leaf buds development for all the *Prunus* taxa in the third to fourth decade of March during the monitored years. Rybnikárová (2010) observed the sprouting of buds for the taxa *Prunus spinosa, Prunus* × *fruticans* in the third decade of the March, during the years 2008 and 2009 in locality Šindolka. According to our records, growth stage leaf development lasted about a week in the studied taxa. Leaf development was observed from the second week of April.The longest period for development of leaves, for the taxon *Prunus* × *fechtneri* lasted about 8 days in 2013. We recorded the development of branches in the second and third week of April. This phenophase persisted into the third week of May. By Matuškovič, Paulen (2005) the phenophase of vegetation growth occures due to spliting activity of meristems. This activity takes place on the tops of the branches, which gives in embryonic parts of branches, emergence a large number of new cells, which later increase their capacity and later give in differentiation. The autors point out, that the period of vegetative growth is depending on the physiological state of the plant and enviromental conditions. According to our observations, the development of the flower bases occurred in the third week of March (2011)

Table 1 Meteorological data for the years 2011–2013 from locality Nitra

		I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.	Year
2011	**temperature in °C**	-0.9	-0.6	5.9	12.7	15.8	19.8	19.7	20.9	17.7	9.9	3.0	2.2	10.5
	precipitation in mm	24.6	6.2	27.2	13.2	48.4	91.1	121.6	152.3	92.1	36.7	1.2	42.0	656.6
		I.	**II.**	**III.**	**IV.**	**V.**	**VI.**	**VII.**	**VIII.**	**IX.**	**X.**	**XI.**	**XII.**	**Year**
2012	**temperature in °C**	1.4	-2.5	7.4	11.2	17.3	20.9	22.8	21.5	17.0	10.5	7.5	-0.9	11.2
	precipitation in mm	61.1	23.5	2.8	36.1	19.6	70.1	61.4	7.3	32.7	76.1	34.6	44.4	469.7
		I.	**II.**	**III.**	**IV.**	**V.**	**VI.**	**VII.**	**VIII.**	**IX.**	**I.–IX.**			
2013	**temperature in °C**	-0.8	1.5	3.2	12.1	15.5	19.3	22.7	21.8	14.7	12.2			
	precipitation in mm	71.2	78.3	106.2	20.4	77.8	46.7	2.1	73.9	60.0	536.6			

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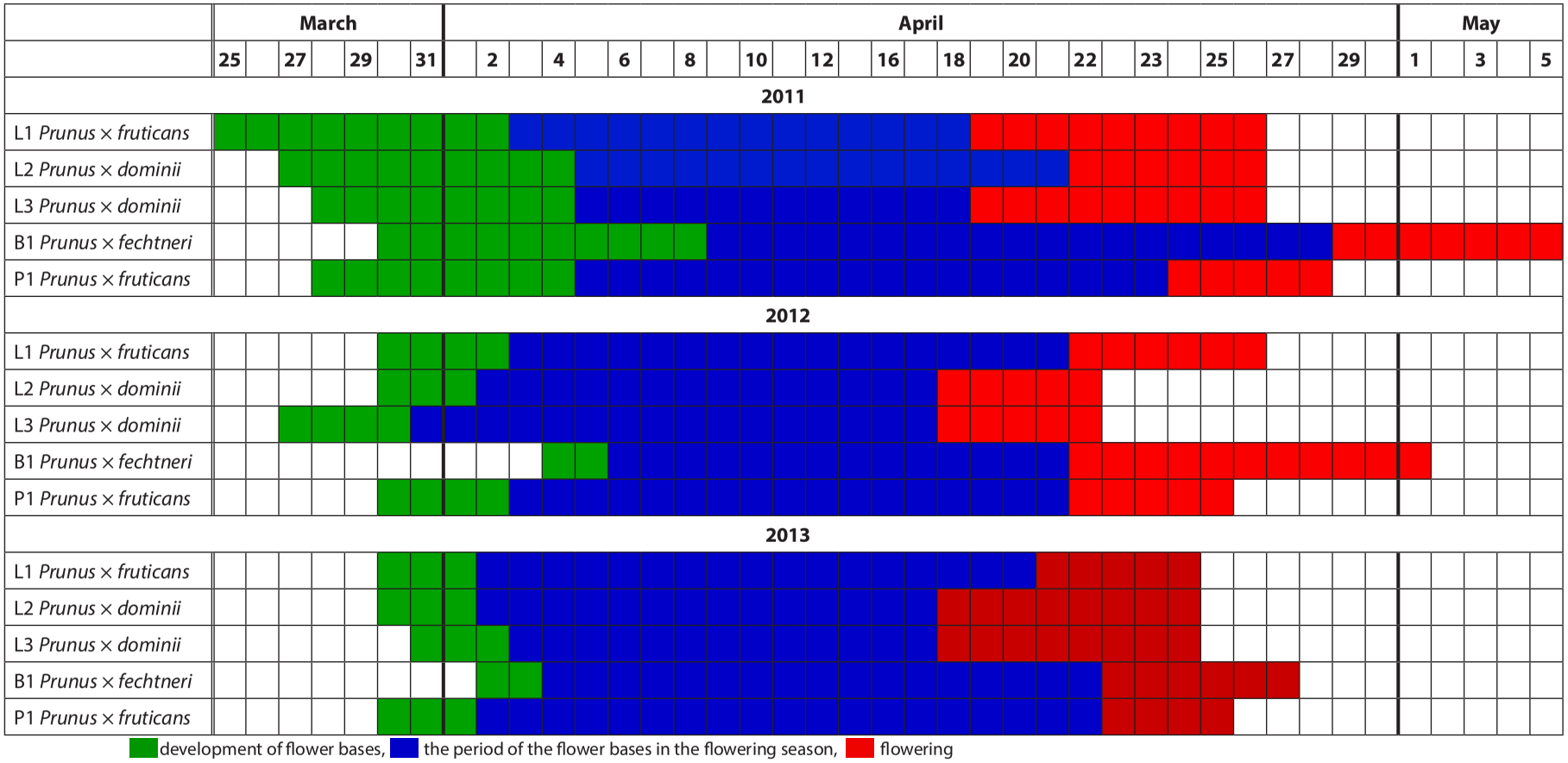
Table 2 Observation the phenophases of flowering the *Prunus* L. taxa during the years 2011–2013



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and the last week of March in 2012 and in 2013. This phenophase took place for the studied taxa, in average 25 days (2011) and 20 days in 2012 and 2013. Peiling, Qiang, Jiandong, Xuhui (2006) dealt with the influence of temperature on the process of flowering of *P. davidiana* and the *P. armeniaca*. By autors, that important period was affected by temperature about 30 days before flowering. The temperature for a certain period may affect annual changes in flowering. According to our observations, the all taxa of our research bloomed in the first week of April, during the all monitoring years. The first blossomed taxon *Prunus* × *dominii* L3 in 31 March and about three days later *Prunus* × *fruticans* L1, P1 in 2012. *Prunus* × *fechtneri* blossomed last. The whole phenophases of flowering, when all the flowers petals were fallen, lasted an average 23 days (2011–2013). The period of flowering the all three studied taxa was overlaped with each other and with the flowering period the other species of the genus *Prunus*, which creates conditions for a possible hybridization. A similar time of period the full flowering also mentions Rybnikárová (2010), who observed blooming flowers of *Prunus spinosa* and *Prunus* × *fruticans* from the 9th to the 21th April in 2008 on the locality Šindolka (Nitra). Neriman, Bahar (2009), observed cherry cultivars (*Prunus avium* L.) during the years 2003–2005 in Turkey. They found, that for observed cultivars occured phenophases of flowering to full flowering in the month of April by the end of March (2004).

We recorded, that development of fruit started in the second part of April. The fruits of studied taxa reached 90 % of the final size from 26th May to 6th June. We recorded the beginning of ripening fruits on 15th of September (2011), on 4th of September (2012) and on 24th of August (2013). We monitored advanced stage of maturation about the third week of September during the studied years. Fruits of studied taxa reached consume maturity in about the last week of September and the first week of October. This phenophase lasted in average 32 days during the observed years. Rybnikárová (2010) observed the beginning development of fruits from 28th of April in 2008 and from 29th of April in 2009 on the locality Šindolka (Nitra). According to our research, aging process of shoots and fall of leaves came approximately in the second part of October. The autumn changes and fall of leaves is a physiological process influenced not only by external factors, but it also depends on the previous processes, which are going in the leaves from its creation (Chalupa, 1969). Our results showed, thattaxon *Prunus* × *fechtneri* completed this phenophase last with more than 97 % of leaves fallen. This phenophase started about seven days later in 2011 and by ten days earlier in 2013. The average duration of this phenophase was 18 days. 17 days in 2011, 16 days in 2012 and 19 days in 2013. According to Larcher (1988), phenological dates occuring in the second part of

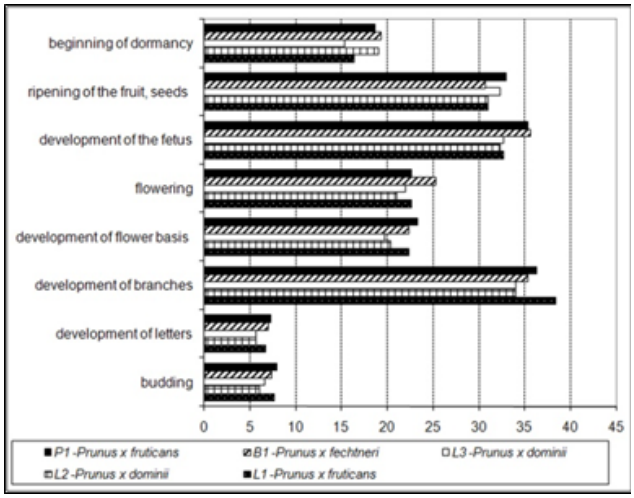

Figure 1 Average duration of phenophases during the monitored years 2011–2013

the year, such a time of maturity fruits, coloration leaves, fall of leaves and collection of time, may be affected by any enviromental conditions, which slow down or speed up the process of maturity or aging. Furthemore, the author notes, that the temperature has again the biggest imporatnce, but in this case, affects accelerating of the synthetic activity. Therefore, here is not as important threshold temperatute, rather than the amount of heat, that is time interval with average daily temperature (degrees – days) exceding specific thresholds. The other important factors affecting a time of leaf fall, are the supply of nutrients and water and mainly the impact of diural photoperiod. Different types of plants are preparing for coloring and fall of leaves, as soon as the days begin to shorten. Only later, when the temperature falls below the thresholdsin the range of 5–10 °C, they are reaching the final stages of phenological calendar.

3.2 Occurrence of pest and diseases on the observed taxa

We recorded the occurence of pest *Cydia funebrana* in the all observed taxa in 2013. Peak of the first generation, which we recorded for taxa L1 represented 10 individuals, for P1 11 pieces, for L2 11 individuals, for L3 13 individuals and a maximum for *P.* × *fechtneri* B 14 adults in pheromone traps, was taken into accounting on May 16 at 12 °C. In the second generation, the first peak of adult flight was observed July 7 at 24.2 °C. We recorded the biggest number of pests for the taxa *P.* × *fechtneri* B 17 individuals and *P.* × *dominii* L3 14 individuals. Another flight date with the second generation, with the highest incidence of *Cydia funebrana* was for *P.* × *fechtneri* B represented 32 individuals on July 28 at 28.7 °C.

Žgančíková (2013) states occurrence the carnation leaf of *Cydia funebrana*, *Grapholita lobarzewskii* a *Cydia molesta* for *P.* × *fruticans* on the locations Križovany,

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Table 4 Monitoring of Cydia funebrana occurence in 2013

Taxa							Taxa						
Date	**temperature in °C**	L1	L2	L3	B	P1	**Date**	**temperature in °C**	L1	L2	L3	B	P1
6. 4.	3.30	0	0	0	0	0	**2. 5.**	18.4	1	0	2	3	2
8. 4.	5.40	0	0	0	0	0	**7. 5.**	18.6	2	4	2	6	3
11. 4.	12.20	2	1	2	3	1	**11. 5.**	14.9	6	7	10	7	5
14. 4.	11.60	0	1	2	1	0	**14. 5.**	14.6	5	8	10	8	7
16. 4.	12.10	1	0	1	2	3	**16. 5.**	20.0	10	11	13	14	11
19. 4.	17.00	3	5	4	1	5	**21. 5.**	14.4	10	7	11	8	8
22. 4.	16.10	2	0	2	3	6	**25. 5.**	11.4	9	10	8	5	7
28. 4.	18.00	6	4	1	3	1	**30. 5.**	11.5	2	4	5	5	3
Taxa							**Taxa**						
Date	**temperature in °C**	L1	L2	L3	B	P1	**Date**	**temperature in °C**	L1	L2	L3	B	P1
3. 6.	11.80	3	2	3	5	3	1. 7.	15.8	3	1	1	5	2
8. 6.	19.50	9	12	15	17	10	7. 7.	24.2	17	11	14	17	5
15. 6.	21.80	4	8	8	11	6	12. 7.	19.0	4	12	12	10	2
19. 6.	27.60	16	16	19	19	17	19. 7.	25.0	3	4	4	9	0
23. 6.	23.10	5	3	5	10	4	22. 7.	21.9	0	5	2	4	7
27. 6.	14.60	0	1	0	2	1	28. 7.	28.7	19	21	28	32	20
30. 6.	15.20	10	11	12	11	8	30. 7.	21.6	5	2	1	1	0

Lošonec and Horné Orešany in 2012. Author recorded the largest number of occurrence *Cydia funebrana* 66 individuals, from June 26 to July 17 in 2012.

We also recorded occurrence of lichen *Xanthoria parietina* in *Prunus* × *fruticans* P1, *Prunus* × *dominii* L2 and L3 on the branches. The highest occurrence of this lichen was recorded in the taxon *Prunus* × *fechtneri* on the 55 % of branches. In *Prunus* × *dominii* L2 occurred lichen *Xanthoria parietina* on 27.5 % and L3 35 % branches. In *Prunus* × *fruticans* L1 we did not reccorded lichen occurence and in the taxon P1 only it was found 5 % branches. Žgančíková and Bilíková, et al. (2011) described insignificant occurrence of lichen on a few taxa of the genus *Prunus*.

Our results did not show the occurrence of fungal diseases on the fruits of the studied taxa of genus *Prunus*. But our results show fungal diseases *Botrytis cinerea* only in the taxon *Prunus* × *fechtneri* B on the branches, from the locality Bádice. Žgančíková and Bilíková et al. (2011) states that in taxon *Prunus* × *fruticans* observed on the fruits disease *Clasterosporium carpophilum* on the locality Jelenec. In *Prunus* × *dominii* there was found rotting of fruits in the locality Jelenec. Furthemore, the authors describe that were reported symtoms of the disease caused on the fungus *Clasteroporium carpophilum* in the taxa *Prunus* × *dominii*, *Prunus* × *fruticans* and *Prunus* × *fechtneri* from the locality Vráble. For the taxon *Prunus* × *fruticans* there was 87 % incidence of this fungal disease.

4. Conclusions

Phenological observations showed, that taxa *Prunus* × *dominii* and *Prunus* × *fruticans* entered in the first principal growth stages first. Taxon *Prunus* × *fechtneri*, with about week difference, entered in monitored growth phases last. For the taxa of the genus *Prunus* there was average lenght period of bud development to dormancy 207,4 days in 2011, 210,8 days in 2012 and 171,8 days in 2013. The all taxa we recorded the incidence of pest *Cydia funebrana*. Flight maxima of *Cydia funebrana* were for: the first generation 16th of May and the second generation 28th of July. Codling of plum *Cydia funebrana* had two generations in 2013. We also observed the occurrence of lichen *Xanthoria parietina* in the taxa *Prunus* × *fruticans* P1, *Prunus* × *dominii* L2 and L3 on the branches and fungal disease *Botrytis cinerea* in the taxon *Prunus* × *fechtneri*. Occurrence of diseases and pests causes a reduction of reproductive potential.

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