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Flower microphenology of Hungarian sour cherry cultivars in Iran climatical conditions

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Summary: Determination of flower microphenology for selecting the suitable pollinizer for sour cherry cultivars is of significant importance. In order to study the flower microphenology of Hungarian sour cherry (*Botermo,Erdi jubileum* and *Sigany*) cultivars in Mashhad climatic conditions, an experiment was conducted in1998, 1999, 2005 and 2006, using a completely randomized design with ten replications. The phenological stages were determined from before opening up to browning phase of stigma. Duration of pollen shedding, stigma receptivity and climatic factors were measured. The relative time of flowering between cultivars varied from year to year. The data indicate, the thermal variation strongly contributes to significant differences in duration of stigma viability, although there wasn't a significant difference between cultivars in anther dehiscence period. Phenological stages of flowers are highly affected by meteorological factors in various years.

Key words: microphenology,sour cherry,stigma viability, Érdi bőtermő, Érdi jubileum, Cigány.

Introduction

In sour cherry (*Prunus ceracus* L.) more than 30% fruit set is re required for high yields (*Nyéki*, 1989). Consequently, knowledge of flowering characteristics could play an important role from the viewpoint of assuring the successive pollination and synchronous activity of reproductive organs.

Duration of stigma viability is influenced by temperature. in sour cherry *Nyéki* (1974) observed that stigma viability was 2–3 days under sunny and warm weather conditions (average daily temperature 15–22 °C).Duration of viability was longe (4–6 days) under cool and overcast weather conditions (average daily temperature was 4–12 °C). *Wocior* (1976) carried out accurate experiments on various sour cherry varieties. According to his observations, all sour cherry varieties showed an average duration of pollen shedding of 3 days. When it rained no pollen shed was observed was serious effect of brown rot blossom blight was observed (*Holb*, 2003). A decline in the receptivity of the stigmatic and stylar tissue could be responsible for reducing set as pollination is delayed (*Frank & Dennis*,1986).

Microphenology belongs to the observation methods of flowering phenology; it is concerned with the functioning ability of sexual organs in relation to the meteorological factors. By this method, it is possible to establish the best time of the stigma activity, the dehiscence of anther and pollen shed (*Nyéki*, 1980; *Iffju & Nyéki*, 1977).

Factors that have influence on phenology of flowering are as follow: genotype, climate (temperature, light, photoperiod), soil, water and biological environment (viruses, pathogens, pests, symbionts) (*Gepts*, 1987).

Materials and methods

The experiments were carried out for a period of 4 years in 1998, 1999, 2005 and 2006 on Hungarian sour cherry cultivars cultivated in Khorasan, Iran. The flowering microphenological observations were carried out on the following varieties: Érdi bőtermő, Cigány meggy and Érdi jubileum.

Changes in stigma color and secretions and also course of anther dehiscence were registered, examining 20 free standing flower of each variety between 7 and 17 o'clock. Stigma is able to function before anther dehiscence, thus, the period of stigma viability that was important in respect of natural pollination has only been examined. This period extended from the beginning of flower opening to the beginning of stigma browning.

Duration of anther dehiscence means the period between dehiscence of the first and the last anther within the same flower. Anther dehiscence was followed every hour with observation of changes in the stages of stigma.

Results and discussion

Stigma receptivity

Secretory activity of stigmas, nearly in all flowers, started a few minutes after flower opening and culminates between 7 and 10 o'clock each day. in all three cultivars during dry and warm temperatures of day, secretion decreased to minimum content. Results showed that, duration of stigma viability in

Table 1 Sexual organs viability of sour cherry cultivars (1998, 1999–2005, 2006).

Cultivars	Years	Duration of flower opening to discoloring time of stigma (hour)	Stigma viability (hour)	Anther dehiscence period	
				First anther	Dehiscence period
	1998	25.35e	51.50g	4.70g	24.10e
Érdi bőtermő	1999	29.62c	105.7b	25.30d	14.50g
	2005	44.08b	95.00d	22.10e	27.20d
	2006	26.60d	101.10c	17.90f	43.80b
	1998	24.90e	52.90g	3.40g	24.80e
Cigány	1999	45.20a	101.60c	42.20a	56.10a
	2005	43.58b	72.00f	31.10c	31.40c
	2006	23.6f	77.20e	4.10g	21.50f
	1998	23.70f	40.60h	5.40g	19.80f
Érdi jubileum	1999	28.75c	122.50a	24.80d	20.40f
	2005	43.58b	73.60f	32.80b	32.30c
	2006	27.25d	70.40f	5.20g	28.90d

Means with the same letter are not significantly different at 5% level.

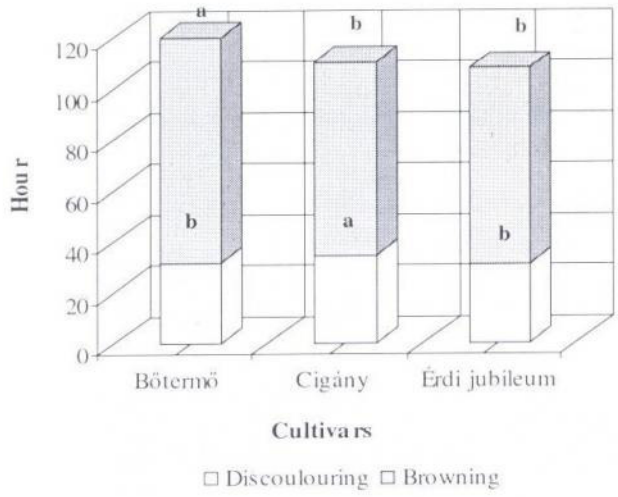

Figure 1. Duration between flower anthesis and discolouring of stigma of sour cherry cultivars (1998–1999, 2005–2006)

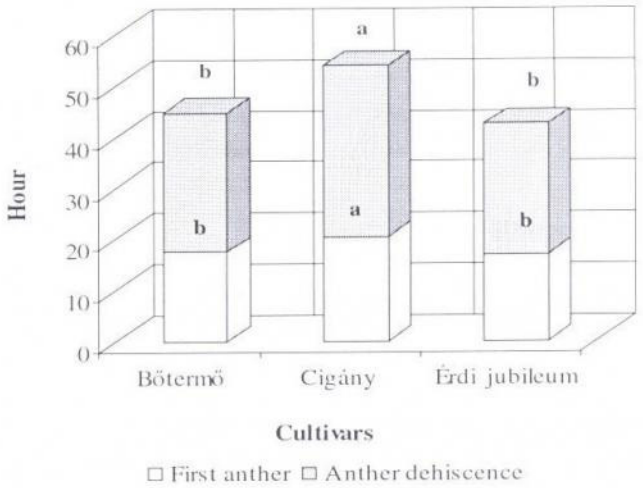

Figure 4. Duration between anthesis of flower and dehiscence of anthers (1998–1999, 2005–2006)

the case of Érdi bőtermő is much longer than Cigány and Érdi jubileum cultivars,. Average duration of stigma viability is shown in *Table 1* and *Figure 1*.

Approximately high differences between daily minimum and maximum temperatures under mashhad climatic conditions, could result in different responses. Low and constant temperatures resulted in longer duration of botermo stigma viability in 2006 in comparison with the year of 2005 (*Figures 2* and *3*). Totally there is a negative relationship between temperature and reproductive organs activity. It is concluded that seasonal variations and different meteorological conditions had more considerable effects on duration of stigma viability and of anther dehiscence than specific traits had.

Anther dehiscence pattern

Culmination of pollen shedding in all cultivars is nearly simultaneous with high temperatures during a day (*Figures 2* and *3*). Anther dehiscence reached its maximum between 11 and 13 o'clock at a temperature of 15–20 °C. proportion of dehisced anthers per hour exceeded 10% in respect of all sour cherry varieties during this period. In 2006 on the 8th of April when it was rainy and cool only a few amount of Érdi bőtermő anthers dehisced, and dehiscence became more intensive on 8th, due to considerable rise in temperature. Average of 4 year experiment for anther dehiscence is shown in *Figure 4*.

Conclusion

Analyzing the data of four years (1998, 1999, 2005, 2006), it can be revealed that temperature had a considerable effect on the functioning of reproductive organs of sour cherry varieties. If the weather is cloudy and cool (about 10 °C) the stigma is viable longer and higher temperature is resulted in shorter viability of stigma. Anther dehiscence, also, gets more intensive line with rising temperature. Totally duration of dehiscence was shorter than stigma viability and the overlap of the two periods was appropriate in all varieties.

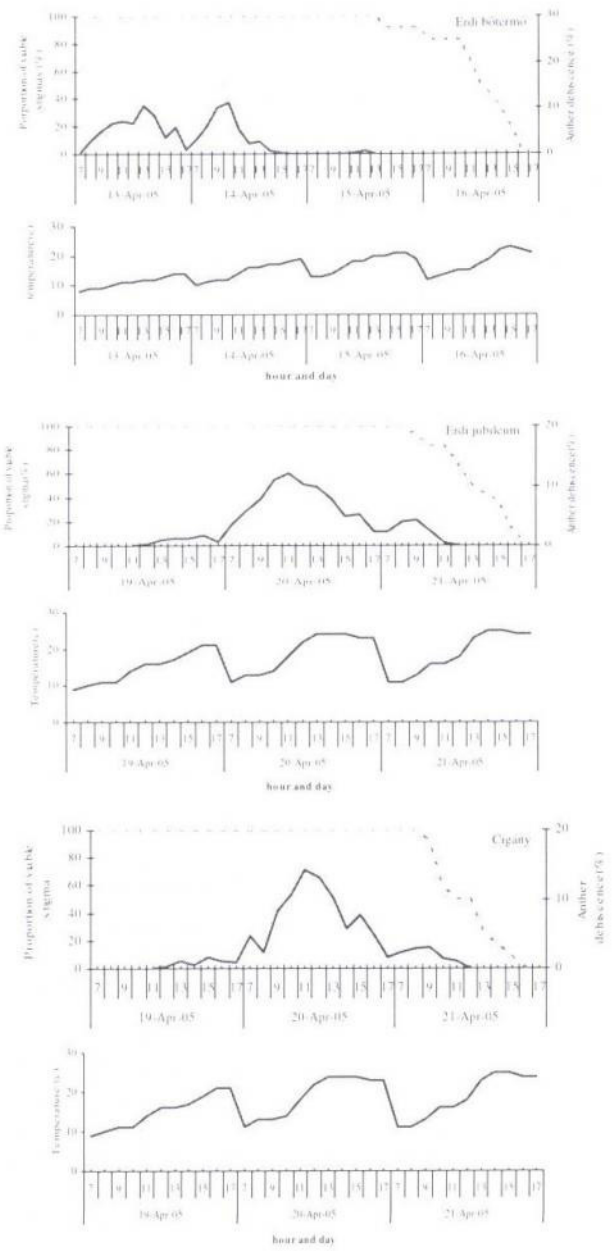

Figure 2. Stigma viability and anther dehiscence of sour cherry varieties (*Mashhad*, 2005)

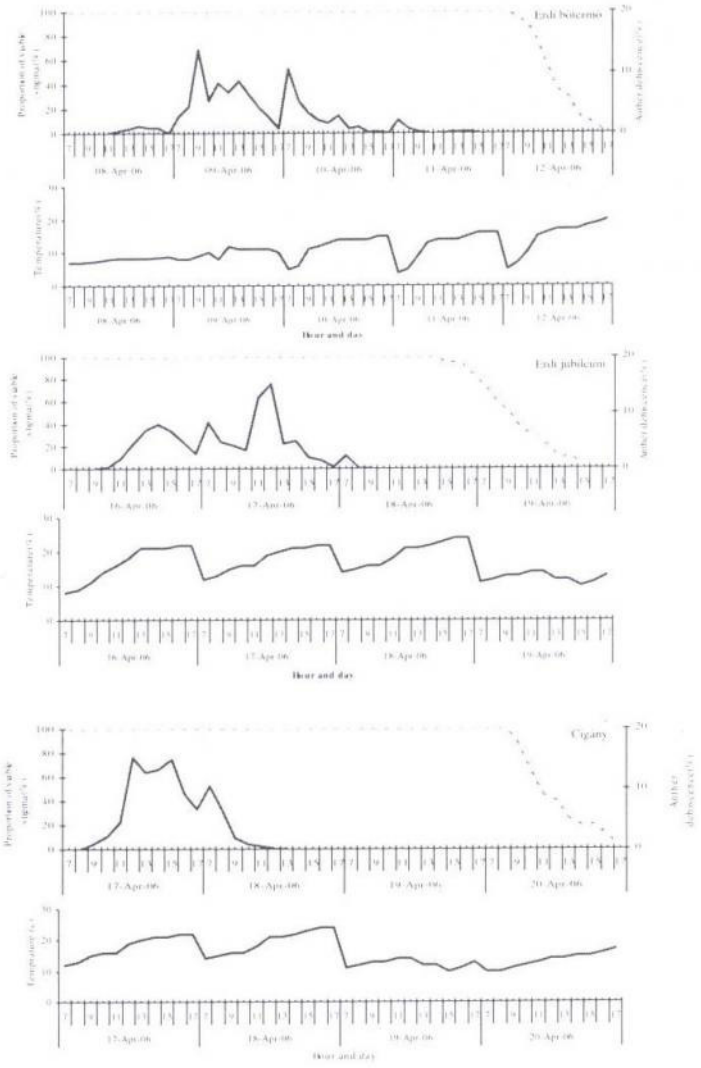

Figure 3. Stigma viability and anther dehiscence of sour cherry varieties (*Mashhad*, 2006)

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