Floral bud development, blooming time and fertility relations of some Romanian apricot varieties in Hungary

INTERNATIONAL JOURNAL OF HORTICULTURAL SCIENCE

AGROINFORM
Publishing House, Hungary

Szalay L.[1], Papp J.[1], Szabó Z.[2] and Nyéki J.[2]

[1] *Department of Fruit Science, Szent István University, H-1118 Budapest Villányi út 35-43.*

[2] *University of Debrecen, Centre of Agricultural Science,*

Key words: *Prunus armeniaca L.*, microsporogenesis, blooming, self-fertility, open pollination

Summary: Due to the geographical situation of Hungary the introduction of late ripening apricot varieties holds great interest. In apricot production floral bud development during winter, blooming time, and the fertilisation properties are important factors. These characters were studied in six late ripening Romanian apricot varieties *(Callatis, Comandor, Litoral, Selena, Sirena, Sulmona)* in Szigetcsép representing the northern site of the lowland growing area. During the mild winter of 1997/98 the dynamics of floral bud development in the Romanian varieties was a few days slower during the whole examination period compared to Gönci magyar kajszi. Their meiotic divisions occurred between 1 and 5 February. Next winter the meiotic division started later at 28 February, due to the cold weather. In these conditions the dynamics of bud development was similar in all the varieties. Averaged over seven years blooming of the Romanian varieties started 1 – 3 days later than in Gönci magyar kajszi. All the Romanian varieties showed self-fertility to some extent, however, application of other pollen donor sources is necessary for the safety of production, with the exception of *Callatis*.

Introduction

Apricot varieties bred under similar environmental conditions in the neighbouring countries are promising candidates from the aspect of increasing the range of apricot varieties grown in Hungary. Due to the country's geographical situation, growers are getting more interested in late ripening varieties. To fulfil this demand, a research program has been initiated for the purpose of evaluating 11 late-ripening Romanian varieties at the Horticultural University in the beginning of 1990. These varieties were bred by *V. Cociu* whose aim was to develop a range of frost tolerant varieties for prolonged ripening time. All of these varieties were described as having a long dormancy, late blooming, and late ripening time (*Cociu* 1982, 1991), while there was no information available on the microsporogenesis and the extent of self-fertility of these varieties. The results of our research programme have already been published concerning on the frost tolerance, phenological properties and fruit quality of these varieties (*Pedryc & Szabó* 1995, *Szabó* et al. 1999).

Floral bud development during winter, blooming time, and the fertilisation properties are important factors in apricot production, especially when the growing area lies at the northern boundary of production. Based on the preliminary experiments, six Romanian varieties were selected for the purpose of carrying out a detailed experiment for evaluating their blooming and fertility properties. In the case of three varieties the experiment was completed with studying floral bud development during winter.

Materials and methods

The six Romanian varieties – *Callatis, Comandor, Litoral, Selena, Sirena, Sulmona* – and *Gönci magyar kajszi* as control were observed in the germplasm collection of Szigetcsép, 20 km South from Budapest representing the northern site of the lowland growing area.

Microsporogenesis: Development of floral primordia was examined through following microsporogenesis during two successive winters in *Callatis, Comandor, Litoral* and *Gönci magyar kajszi*. In the preliminary studies, *Callatis* and *Comandor* proved to be regularly yielding varieties with the best fruit quality. *Litoral* was chosen because of its frost sensitivity. During winter short shoots were collected weekly from the trees. Anthers were excised from the floral buds located in the middle part of the shoots, were stained with carmine-acetic-acid and examined under microscope.

The following six stages of microsporogenesis could be differentiated:

Archesporium stage (undifferentiated sporogenic tissues), premeiotic stage (pollen mother cells are sticking together), stage of pollen mother cells (pollen mother cells are separated), tetrads (pollen mother cells containing four microspores), uninucleate microspore stage (young microspores), and pollen stage (mature pollen grains).

Phenology of blooming: Beginning and the interval of blooming were recorded for all the six varieties.

Fertility studies: For evaluating the rate of self-fertility of each variety, shoots with about 20–30 floral buds were isolated with parchment bags before blooming has started. After blooming these bags were removed. The number of fruits from the isolated floral buds was counted before ripening to evaluate the rate of self-fertility. Parallel, for examine the fertility of open-flowering buds shoots of 50–60 cm long were taken into the evaluation. In the germplasm collection there was a large amount of pollen available from other apricot varieties producing ideal conditions for studying the open pollination of floral buds.

Results and discussions

Microsporogenesis: The dynamics of microsporogenesis is represented in *Table 1* by the date when a given developmental stage was reached by each variety.

Table 1 Dynamics of microsporogenesis in four apricot varieties (Szigetcsép, 1997–1999)

Variety	Premeiotic stage	Pollen mother cells	Tetrad	Microspore	Pollen
1997/98					
Callatis	12.29.	01.20.	02.02.	02.12.	02.20.
Comandor	12.20.	01.30.	02.05.	02.15.	02.25.
Litoral	12.28.	01.15.	02.01.	02.10.	02.20.
Gönci m. k.	12.21.	01.20.	01.29.	02.04.	02.27.
1998/99					
Callatis	01.08.	02.22.	02.28.	03.06.	03.22.
Comandor	01.08.	02.23.	02.28.	03.06.	03.23.
Litoral	01.05.	02.22.	02.28.	03.06.	03.22.
Gönci m. k.	01.05.	02.22.	02.28.	03.06.	03.20.

Floral bud development started at the end of December during the winter of 1997/98. The archeosporal tissues of *Commandor* started first to differentiate reaching the premeiotic stage by 20 December, while this process occurred nine days later in the latest variety *Callatis*. The meiotic division took place at the earliest in *Gönci magyar kajszi* in 29 January. The floral bud development of the Romanian varieties proceeded to meiotic division later, between 1 and 5 February. The nine-day difference in floral bud development found between the varieties in December decreased to six days by the beginning of blooming time.

During the winter of 1998/99 the differentiation of archeosporal tissues started later, at the beginning of January. The dynamics of bud development was similar in all the varieties. There was a maximum of 2–3 days difference between the varieties reaching a given developmental stage. In this year the floral bud development was slower due to the cold weather in January and February which resulted in approximately one-month delay in blooming time compared to the previous year.

There was a significant difference in floral bud development between the two winters, due basically to the differences in the weather conditions. There was however just a few days difference between the bud developmental dynamics of the varieties studied. During the mild winter of 1997/98 the dynamics of floral bud development in the Romanian varieties was a few days slower during the whole examination period compared to *Gönci magyar kajszi*. Thus it seems probable that the Romanian varieties, even the frost sensitive *Litoral*, are slower to react on the warming up periods during winter than the *Gönci magyar kajszi*.

This is an important character from the aspect of winterhardiness. The frost sensitivity of *Litoral* is not caused by the relatively quick floral bud development during winter.

Blooming time: There were large differences between the years both in the beginning and in the length of blooming time *(Table 2)*. Blooming started the earliest in 1998, while the latest in 1996. The length of blooming varied between 5 and 23 days. In those years when blooming started later, it proceeded much quicker resulting in short blooming period. The Romanian varieties flowered at the same time or with a few days later than *Gönci magyar kajszi*. *Gönci magyar kajszi* belongs to the middle flowering varieties in Hungary.

Table 2 Blooming time of apricot varieties (Szigetcsép, 1993–99)

Variety	1993		1994		1995		1996		1997		1998		1999		Average	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	3	4
Callatis	04.13	8	03.19	16	03.31	18	04.21	7	04.04	15	03.06	21	04.02	11	03.31	14
Comandor	04.16	8	03.19	17	03.31	17	04.21	7	04.04	16	03.12	17	04.02	11	04.02	13
Litoral	04.13	7	03.19	16	03.30	15	04.22	5	03.31	15	03.06	23	04.01	11	03.31	13
Selena	04.16	8	03.20	16	03.30	17	04.21	7	04.04	16	03.12	17	04.02	11	04.02	13
Sirena	04.18	7	03.20	16	03.31	19	04.22	6	04.04	15	03.12	17	04.02	11	04.03	13
Sulmona	04.16	7	03.21	14	03.31	10	04.22	5	04.02	15	03.09	18	04.02	11	04.01	11
Gönci m k	04.11	8	03.19	15	03.29	16	04.20	7	04.01	12	03.11	18	03.31	12	03.31	13

1 Date of the beginning of blooming
2 Length of blooming time in days
3 Date of the beginning of blooming averaged over seven years
4 Length of blooming time in days averaged over seven years

Table 3 Fertility relations of the apricot varieties (Szigetcsép, 1993,1996)

Variety	Self-fertility (%)			Open flower fertility (%)			Difference* (%)
	1993	1996	Average	1993	1996	Average	
Callatis	25.0	16.8	20.9	44.5	41.3	42.9	22.0
Comandor	9.0	5.4	7.2	54.0	15.9	35.0	27.8
Litoral	6.7	1.5	4.1	41.2	20.8	31.0	26.9
Selena	13.1	1.4	7.2	31.4	21.7	26.6	19.4
Sirena	6.1	13.6	9.8	16.9	26.2	21.6	11.8
Sulmona	15.5	4.0	9.8	23.3	16.5	19.9	10.1

*Difference in the averages of open flowering fertility and self-fertility

For avoiding the spring frosts the later flowering is a favourable character.

The relative order of these varieties based on their blooming time differed from that published by *Cociu* (1982). Averaged over the seven-year examination *Callatis* and *Litoral* flowered at the same time as *Gönci magyar kajszi*, while flowering of Sulmona was 1 day, that of *Comandor* and *Selena* 2 days, *Sirena* 3 days later than the *Gönci magyar kajszi*. Under Hungarian growing conditions *Comandor, Selena*, and *Sirena* belong to the late flowering varieties. The blooming time of the six varieties shows good overlap, which can help their mutual fertilisation.

Fertility relations: Though the fertility of the varieties was examined in several years, the results of 1993 and 1996 could only be evaluated due to the frequent frost damages in the other years.

Self-fertility: Based on the results, it can be concluded that all the varieties show the ability of self-fertilisation to some extent *(Table 3)*. Of the varieties *Callatis* possessed the highest self-fertility, above 15% in both years. *Selena* and *Sulmona* gave good values in 1993, while *Sirena* in 1996.

Fertility in open pollination: Fertility was always larger in open pollination than for isolated flowers *(Table 3)*. In 1993 fertility of *Comandor* was especially large (54%), while this value for the other varieties varied between 16.9 and 44.5%. In 1996 the fertility of *Callatis* was the best (41.3%), while the lowest (15.9%) was for *Comador*.

References

Cociu, V. (1982): New apricot breeded in Romania. Acta Hort. 121: 211–216.

Cociu, V. (1991): Forty years of apricot breeding of Romania. Acta Hort. 293: 197–201.

Pedryc, A. & Szabó Z. (1995): Extension of the ripening season of apricots due to breeding and foreign varieties introduced in Hungary. Acta Hort. 384: 141–146.

Szabó Z., Nyéki J., Andrásfalvy A., Szalay L. & Pedryc A. (1999): Evaluation of some Rumanian apricot varieties in Hungary. Acta Hort. 488: 211–214.