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STUDY REGARDING THE BLOSSOM PHENOPHASE OF CHERRY TREE CULTIVARS GROWN IN DOBROGEA

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Abstract

Cherries are among the first fruits that appear in late spring, their fresh consumption being a very important source of minerals, vitamins and sugars easily assimilated, of a great value for the human body. Period and duration of flowering is a genetic characteristic of cherry cultivar. The study on phenophase development of 31 cherry cultivars (Romanian and foreign origin), grown in the seaside area, demonstrates a strong variability in beginning, finish and duration of flowering. The beginning of the flowering took place in a long time, lasting 16 days, between April 10th ('Amara' and 'Catalina') and April 26th (NY 13272). Blossoming mass (optimal) occurred between April 19th to April 20th ('Catalina' and 'Amara') and May 4th to May 5th (NY 13272, 'Summit', 'Lambert', 'Sam', 'Izverna'). A group of 20 cultivars out of 31, bloomed in the same time, between May 2nd to May 5th, providing cross pollination. End of flowering (falling petals) are recorded between April 30th ('Catalina') and May 9th (NY 13272, H 15/25, 'Cristina', NY 7690, 'Sam', 'Izverna', 'Lambert', 'Summit'). In climatic conditions in Valu lui Traian flowering phenophase lasts 29 days and could be divided into two types: the early cultivars between 10th of April and 29th of April and late cultivars till 9th of May. Free cherry pollination was done extensively, but with significant variations depending on the cultivar, from 8.23% (NY 13272) to 83.3% ('Altenburger'). The only cultivars that can be considered partially self-compatible is NY 13272, 'Summit' and 'New Star', with more than 11% resulted fruits by self-pollination, the rest of them act as self-sterile cultivars.

Key words*: self-fertility, period and duration of flowering, pollination.*

INTRODUCTION

Cherry is a fruit tree species, which demand specific climate and soil. So, it requires average moisture conditions but doesn't like the water excess in the soil; also requires sufficient heat, but does not support very hot days and dryness, nor frosts either; it grows well in the hills region but does not go too high in the mountains (Constantinescu N., 1957).

Sweet cherry cultivars introduced in the new orchards, must be adapted to the climate and soil conditions specific for each cultural areas, with increased tolerance to stress factors (Parnia C. et al, 1985; Amzar Gh., 1990). Indicating the assortment for some geographical areas, but limited within the perimeters territorial administration perimeters, was the subject of some valuable works (Cociu V., 1971, 1988, 1990; 1981, 1999; Gozob T., 1986; Gozob T. and Micu C., 1987; Ivan I., 1981).

The study of cherry flowering allow to be drawn up a proper planning of artificial pollination and the knowledge of the period and duration of the flowering which helps for a proper selection of cultivars in the goal of new orchards establishment, knowing that the simultaneous flowering ensures optimal conditions for pollination.

Self-fertility presents a special importance for breeding and the technique of the artificial hybridization process is closely linked to pollination and productivity respectively. It is not conceivable that the future cultivars will not be self-fertile. However, Cociu V. (1971) believes that self-fertility is an involution process of cultivars, self-incompatibility being an evolutionary process in thus undertakes the pollination with stranger pollen, resulting

offspring with a broad genetic base and being an invaluable reservoir for creating genetic diversity. But in practice, self-fertile cultivars are preferred by growers.

Considering the eco-biological requests of cherry trees and the proper climatic conditions, Budan S. (1995) proposed eight areas of culture of this species in Romania, Dobrogea (eighth area) being evaluated as less favourable one.

Our researches were conducted in the centre of Dobrogea, which offers some cultural micro-zones and technical possibilities that allow the obtaining of a harvest at least at the level and the quality of the average favourably zones (zones IV and V).

MATERIALS AND METHODS

The study targeted 31 cherry cultivars and selections of Romanian origin (Research Institute for Fruit Growing Pitesti, Research Station for Fruit Growing Iaşi, Research Station for Fruit Growing Bistriţa), and foreign origin, grafted on the rootstock *Prunus mahaleb*: 'Amara', NY 13971, 'Simbol', 'Catalina', 'Bing', 'Ponoare', 'Scorospelka', 'Viscount', 'Altenburger', Ny 7690, 'Amar Galata', 'Van', 'Cerna', 'Rivan', 'Rainier', 'New Star', 'Boambe de Cotnari', 'Stella', 'Severin', 'Jubileu', 'Big Dönissen', 'Colina', H 15/25, NY 9295, 'Kristin', 'Izverna', 'Sam', 'Lambert', 'Summit', 'Hedelfinger' and NY 13272.

Experiments began at the beginning of 2008 by grafting the respective varieties in the nursery of the Research Station for Fruit Growing (R.S.F.G) Constanta and were continued in the orchard, until 2014, on 5 trees of each variety.

There were made observations on the ongoing phenological phases of growth and fructification and were determined compatibility coefficients by open and directed pollination after Fleckinger method.

The observations and determination had the final aim to identify the varieties with the best ability to adapt in area, e.g. normal course of phenological phases of growth and fruiting, age-appropriate production, good quality of the fruit, specific to each variety and to establish a conveyer of varieties from early to the late ripening ones.

RESULTS AND DISCUSSIONS

1. Flowering

Data on the period and duration of the flowering concerning all the 31 studied varieties are presented in Table 1.

The beginning of the flowering took place in a fairly long period, of 16 days, between April 10th and April 26th.

Table 1. Flowering period of sweet cherry varieties

Crt. no.	Variety	Begi-nning	Opti-mal	End	Duration (days)
1	Amara	10 IV	20 IV	26 IV	16
2	NY 13971	12 IV	26 IV	2 V	20
3	Simbol	14 IV	25 IV	1 V	17
4	Cătălina	10 IV	19 IV	24 IV	14
5	Bing	15 IV	24 IV	28 IV	13
6	Ponoare	15 IV	25 IV	29 IV	14
7	Scorospelka	15 IV	25 IV	29 IV	14
8	Viscount	16 IV	27 IV	2 V	16
9	Altenburger	16 IV	29 IV	5 V	19
10	NY7690	16 IV	29 IV	7 V	21
11	Amar Galata	16 IV	28 IV	2 V	16
12	Van	16 IV	26 IV	30 IV	14
13	Cerna	16 IV	26 IV	30 IV	14
14	Rivan	16 IV	28 IV	2 V	16
15	Rainier	16 IV	26 IV	30 IV	17
16	New Star	17 IV	29 IV	4 V	17
17	Boambe de Cotnari	17 IV	29 IV	2 V	15
18	Stella	17 IV	29 IV	2 V	15
19	Severin	17 IV	26 IV	30 IV	13
20	Jubileu	17 IV	26 IV	30 IV	13
21	Big Dönissen	18 IV	29 IV	3 V	15
22	Colina	21 IV	2 V	7 V	16
23	H 15/25	21 IV	3 V	7 V	16
24	NY 9295	21 IV	30 IV	4 V	13
25	Kristin	21 IV	2 V	7 V	16
26	Izverna	21 IV	2 V	5 V	14
27	Sam	22 IV	3 V	7 V	15
28	Lambert	22 IV	3 V	6 V	14
29	Summit	22 IV	3 V	6 V	14
30	Hedelfinger	23 IV	30 IV	4 V	11
31	NY 13272	26 IV	5 V	9 V	13
	Limite	10.IV-26.IV	19.IV-05V	24 IV-09 V	11-21

Earliness in flowering is a genetic attribute, specific to each variety. The earlier blooming varieties were 'Amara' and 'Catalina' (April 10th), followed by varieties NY 13971, 'Symbol', 'Bing', 'Ponoare' and 'Scorospelka' (15th of April). In some areas these varieties are vulnerable to spring low temperature (Figure 1). The later start of flowering occurs at variety NY 13272 (April 26th), followed by cultivars 'Hedelfinger', 'Summit', 'Sam', 'Lambert' and 'Izverna'. The late flowering varieties are recommended for breeding, as sources of genes for the late flowering and, of course, in production, being protected from the temperature decreases.

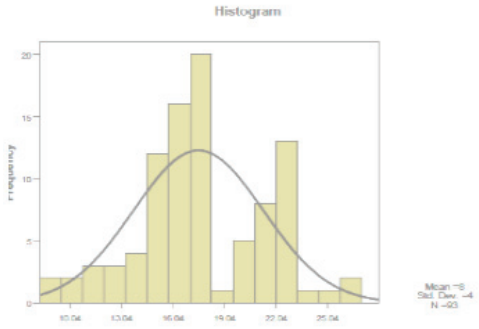

Figure 1. Beginning of flowering

Full bloom (optimal) took place between April 19th to 20th of April ('Catalina' and 'Amara') and 4th – 5th of May (NY 13272, 'Summit', 'Lambert', 'Sam', 'Izverna'). A group of 20 varieties, out of the 31 varieties studied, bloomed actually at the same time, on 2nd to 5th of May, which provides cross pollination (Figure 2).

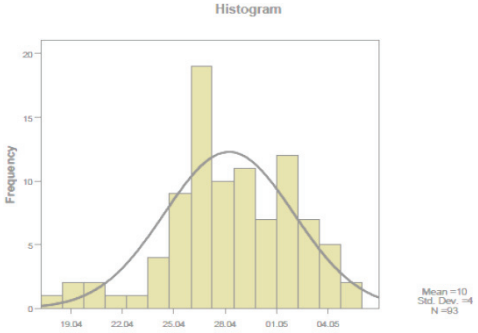

Figure 2. Full bloom

End of flowering (falling petals) occurred between April 24th ('Catalina') and 9th of May (NY13272, H 15/25, NY7690, 'Sam', 'Izverna', 'Lambert', 'Summit'), as shown in Figure 3.

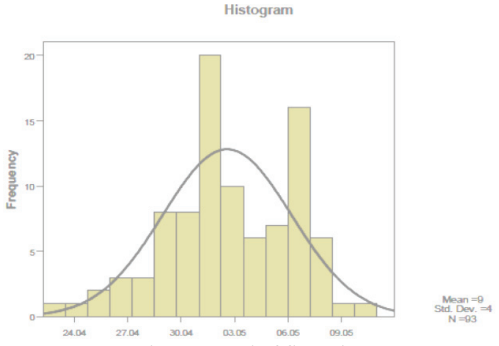

Figure 3. End of flowering

Some of these varieties have an important practical interest, short duration of flowering ensuring an earlier growth and maturation of the fruits.

It appears that in Valu lui Traian area, in case of all 31 varieties tested, the phenophase of the flowering lasts between 11 to 21 days (Table 1 and Figure 4) and could be divided into two: for the early varieties between 10th and 29th April and for the late varieties to 9th of May.

In both cases the simultaneous flowering of the majority varieties ensures cross pollination.

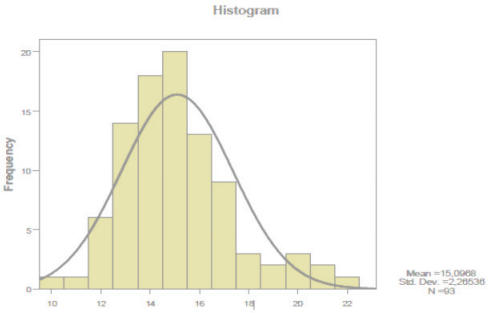

Figure 4. Duration of flowering

2. Pollination

a. Coefficient of fertility by free pollination

Depending on the existing flowers on trees, between 12 flowers – variety 'Viscount' and 53 flower-variety 'Severin' were counted and labelled (table2).

Table 2. Resulted fruits by free pollination

Crt.No.	Variety	No. counted flowers	Resulted fruits (%)
1	Altenburger	16	83.3
2	Kristin	15	82.2
3	Izverna	30	78.9
4	Summit	14	78.5
5	Rainier	36	78.7
6	Viscount	12	75.0
7	NY 9295	32	72.2
8	Stella	18	70.9
9	Sam	41	70.9
10	Scorospelka	28	63.0
11	H 15/25	27	62.9
12	Van	18	57.7
13	Severin	53	57.7
14	Simbol	31	57.1
15	Jubileu	52	51.1
16	Rivan	27	50.9
17	Cătălina	21	42.8
18	Cerna	43	42.2
19	Lambert	25	40.0
20	Big Dönissen	50	35.8
21	Amara	25	35.1
22	Colina	45	33.3
23	New Star	16	24.0
24	Ponoare	15	23.4
25	NY 7690	27	14.8
26	Ny 13272	18	8.23
	MEDIA	29.8	58.6
	LIMITE	12-52	8.23-83.3

In favourable climatic conditions, the cherry free pollination was done in large or even very large proportion, the percentage of fruits set at varieties 'Altenburger' and 'Kristin' exceeding 80% (Figure 5).

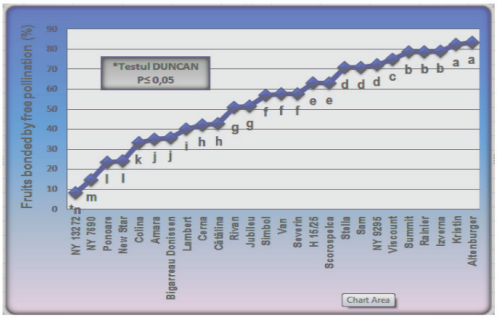

Figure 5. Fruits set by free pollination

The variation between varieties was significant, from 8.23% (NY 13272) to 83.3% ('Altenburger').

At varieties Izverna', 'Rainier', 'Summit', NY 9295, 'Viscount', 'Stella' and 'Sam the percentage of bonded fruits varies between 78.9 and 70.2%, and for the other seven varieties this percentage exceeds 50%. Only cultivars 'Ponoare', 'New Star', 'Big Dönissen', 'Amara', 'Colina' and 'Lambert' have a percentage of fertile flowers below 50%.

The percentage of only 8.23% for the variety NY 13272 can be attributed to the late flowering of this variety, when the most varieties flowering had finished and could not assure pollen .

b. Coefficient of fertility at self-pollination

Observations on self-compatibility (self-pollination) of 27 of sweet cherry varieties (Table 3), confirmed literature data, synthesized by Budan S and Grădinariu G. 2000), regarding the auto-sterility of the majority cherry varieties. In our case, the only varieties that can be considered partially auto compatible are NY 13272, 'Summit' and 'New Star', with more than11% resulted fruit.

We mention that being the first year of flowering, a small number of flower were bagged, between 10 flowers ('Bing') and 357 flowers ('Severin'), the average for the studied flower being of 90.

Table 3. Resulted fruits by self-pollination

Crt.No	Variety	No. bagged flowers	Resulted fruits (%)
1	NyY13272	42	11.9
2	Summit	50	11.7
3	New Star	44	11.3
4	Amara	82	8.5
5	Sam	96	7.2
6	Severin	357	5.8
7	Cerna	196	5.6
8	Viscount	100	4.0
9	Rainier	95	2.5
10	Simbol	45	2.2
11	H 15/25	52	1.9
12	Colina	27	0.0
13	Altenburger	45	0.0
14	NY 7690	29	0.0
15	NY 9295	135	0.0
16	Kristin	64	0.0
17	Amar Galata	86	0.0
18	Big Dönissen	42	0.0
19	Boambe de Cotnari	42	0.0
20	Bing	10	0.0
21	Cătălina	186	0.0
22	Van	181	0.0
23	Jubileu	206	0.0
24	Izverna	39	0.0
25	Ponoare	37	0.0
26	Scorospelka	138	0.0
27	Rivan	43	0.0

CONCLUSIONS

In terms of Valu lui Traian's area, the phenophase of flowering lasts 29 days. The phase starts earlier at: 'Amara', 'Catalina' (10th of April), NY 13971, 'Symbol', 'Bing', 'Ponoare' and 'Scorospelka' (15th of April). These varieties can be vulnerable to decreases of the spring temperature in some areas. The later start of flowering (April 26th) occurs at variety NY 13272, 'Hedelfinger', 'Summit', 'Sam', 'Lambert' and 'Izverna'. These varieties have produced fruits every year. They can also serve as sources of genes for late flowering cultivars in breeding programs of cherries varieties.

A group of 20 varieties, out of the 31 varieties studied, blooms in the same period, on 2nd to - 5th of May.

In favorable climatic conditions during flowering, free pollination of cherry occur out at a rate of minimum 20-40% ('Ponoare', 'New Star', 'Bigarreau', 'Dönissen', 'Amara', 'Colina', 'Lambert') and maximum 83.3-70.2% ('Altenburger', 'Kristin', 'Izverna', 'Rainier', 'Summit, NY 9295, 'Viscount', 'Stella' and 'Sam'). It is considered that a coefficient of free pollination of 30% of the total cherry flower/tree provides a normal crop.

The vast majority of cherry varieties known worldwide are self-incompatible, so will not set fruits by pollination with own pollen. This "*handicap*" of cherry varieties began to be overcome by breeding of self-compatible cultivars. The test of self-pollination, performed at Valu lui Traian, confirmed the self-incompatibility of the studied varieties. It might be considered partially self-compatible only varieties: NY 13272, 'Summit' and 'New Star', with more than 11% obtained fruits by pollinated with own pollen. Further research is needed in the coming years.

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