

Self pollination in peach

Szabó Z. & Nyéki J.

DATE, College of Agriculture, H-5540 Szarvas, Szabadság u. 1-3.
Hungary

INTERNATIONAL
JOURNAL OF
HORTICULTURAL
SCIENCE

AGROINFORM
Publishing House, Hungary



Key words: peach, self pollination

Summary: The peach is though considered to be a self fertile fruit species, also some self sterile and male sterile varieties have been registered. The latter type seems to be frequently met in Asian varieties, whereas in the USA and Europe, *J. H. Hale* and *Flaminia* are grown. The purpose of the present study was the assessment of fertility relations of peaches and nectarines grown in Hungary. The authors studied, since 1974, more than 100 different peach and nectarine varieties as for fertility relations, especially their autogamous or geitonogamous fruit set on isolated, i.e. bagged flowers at bud stage, then set free after blooming finished. Isolated flowers of some varieties were also self pollinated, artificially. According to the results the varieties have been assigned to four alternative groups. Self sterile varieties in the proper sense have not been found, but partial self sterility (less than 10% fruit set), self fertility (10 to 20% fruit set) and high self fertility (more than 20% fruit set on selfed flowers) was generally met. The majority of the varieties belonged to the last two groups, nevertheless, the rate of fruit set displayed seasonal variation, the maximum was in one case 89.9%. The purposeful self (hand)pollination of the isolated flowers increased fruit set, substantially. Varieties rated as partially self-sterile are *J. H. Hale* and *Fuzador* (the former being partially male sterile too). Although in some years and some varieties, fruit set legged below 10% but according to the means the majority of nectarines are assigned to the self fertile category whereas most peach varieties, either for fresh consumption or industrial types, were highly self fertile.

Introduction

Self fertility of peaches has been treated by several authors (*Branscheidt* 1933, *Detjen* 1945, *Maligà* 1961, *Ryabov & Kancerova* 1970, *Fogle* 1977, *Tudor* 1981 and *Perfileva* 1982). They stated that the majority of varieties is self fertile, but there are some male steriles too. *Ryabov & Kancerova* (1970) distinguished four groups of the varieties according to their fertility: (1) self sterile varieties, e.g. *Laureat*, *Uspeh* (0% fruit set), (2) male steriles, (3) partially self fertiles (fruit set up to 10%), (4) self fertiles (more than 10%). No correlation between the colour (pink) and shape (bell) of the flowers was detected. *Quarta et al.* (1992) studying dwarf peaches found two self sterile genotypes.

Bellini & Scaramuzzi (1976) claimed that poor self fertility means less than 20% fruit set, medium between 20 and 50% and high with more than 50% fruit set with self pollination. They screened about 200 peach varieties. 11 of them (5.5%) did not set fruit because of male sterility. More than 92% of varieties set more than 10% fruit, and 72.5% more than 20%.

The majority of varieties grown in Hungary set fruit well by self pollination, but especially at cool spring weather, the fruit set is poor. The present study aimed to rate the self fertility of the new peach varieties.

Material and methods

Since 1974, more than 100 peach varieties have been studied as for their fertility relations at different growing

sites in Hungary. This time mainly results of the period between 1996 and 1999, in a private orchard at Szatymaz are presented.

In the collection of peaches varieties have been planted in 1992 as grafts on GF 677 rootstocks and trained to open crowns. 30 fresh-market, 4 processing type peach varieties and 26 nectarines were involved.

Each variety was tested on 8 branches according to the fruits ripened. The grouping of varieties has been attempted on the base of the criteria of *Nyéki* (1989): partially self fertile with less than 10% fruit set, self fertile between 10 and 20% fruit set, and highly self fertile above 20% fruit set.

Results and discussion

Earlier studies (*Nyéki et al.* 1980, *Nyéki* 1990, *Nyéki & Szabó* 1996) proved that most varieties are self fertile but the rate of fruit set is variable, i.e. subject to seasonal variation. The fruit set by self pollination was generally less than by open pollination, but the seasonal variability was higher. In some years and some varieties set no fruit at all. The great mean of 13 years of all varieties was between 1.5 and 54.4%. The maximum was 89.9%.

Studies performed in Hungary (*Nyéki et al.* 1980, *Nyéki & Szabó* 1996, *Nyéki et al.* 1998) did not reveal any self sterile variety. As partially self fertile varieties only two were considered (*J. H. Hale*, *Fuzador*).

According to the studies of 1996-1999, maximum fruit set of 60 peach varieties has been compiled in *Table 1*. The

Table 1 Maximal fruit set and self fertility in peach varieties (*Szatymaz*, 1996-1999)

Varieties	Self- fertility Fruit set %	Open pollination Fruit set %
Fresh market types		
Aurelia	24.3	60.8
Biscoe	50.8	76.4
Cresthaven	23.7	49.1
Elegant Lady	24.4	73.9
Early Redhaven	26.9	61.0
Flavorcrest	25.1	72.9
Genadix 4	13.9	69.4
Gloria Red	15.1	57.2
Harbinger	10.6	35.5
July Lady	25.3	36.2
Lacika féle	32.0	28.3
Lisbeth	20.9	70.4
Loring	22.6	45.5
Maria Bianca	16.7	78.8
Maria Luisa	15.0	53.8
Maycrest	23.8	71.4
Michigani	30.0	79.8
Mireille	25.7	59.4
Óvári féle	23.3	84.3
Piros Mariska	38.8	50.4
Primerose	25.1	34.8
Redhaven Bianca	15.3	61.8
Industrial varieties		
Babygold 5	24.7	49.2
Babygold 6	26.3	58.3
Babygold 7	47.7	82.6
Babygold 9	46.4	73.3
Nectarines		
Armking	24.6	63.2
Bóka féle	25.5	61.6
Cherokee	20.4	41.2
Domiziana	26.1	44.4
Fairlaine	21.4	44.0
Fantasia	23.8	60.6
Flamekist	24.0	55.4
Flavortop	21.3	42.7
Croce del Sud	25.7	41.5
Harblaze	22.7	65.6
Harko	21.1	44.0
Le Grand	25.3	57.3
Maria Aurelia	25.1	74.4
Maria Carla	15.2	56.2
Nataly	23.6	51.7
Nectagrand 1	26.2	68.5
Nectacross	24.6	51.0
Orion	25.7	42.6
Pegaso	17.1	58.1
Red June	19.3	61.5
Stark Delicious	23.4	56.7
Stark Redgold	23.1	61.3
Stark Sunglo	21.4	58.7
Venus	22.1	73.0
Weinberger	23.1	49.6
"11/6"	20.6	61.0

fruit set on selfed and open pollinated flowers show some genetically fixed self and interfertility. The groups of fertility are determined on the base of several years. In some years the fruit set of individual varieties did not attain 10%, but the majority of nectarines was self fertile, whereas peaches for processing were rather highly self fertile.

Considering the means of years and of varieties, it is generally true that nectarines are the less fertile when self pollinated. Fruit set of peaches, either for fresh consumption or for processing, are similarly self fertile (*Table 2.*). The extent of self fertility was tested in 4 varieties by isolation to different length of periods and also by hand pollination (*Table 3.*). Open pollinated flowers set always more fruits than the isolated ones relying on autogamy. Isolated and hand pollinated flowers (with pollen taken from other flowers of the same variety, i.e. geitonogamous combination) set sometimes more fruits than open pollinated ones.

Detjen (1945) also studied the self fertility in 37 peach varieties during 4 years. He also stated the superior fruit set in hand pollinated flowers than in isolated and untouched flowers, but the latter set fruits also sufficiently.

Table 2 Fruit set (%) after self pollination and open pollination (*Szatymaz*)

Group of varieties	Type of pollination	Number of varieties	1996	1997	1998	1999	Mean
For fresh consumption	selfing open p.	30	15.9 64.8	— 24.2	24.7 48.2	15.4 37.2	18.7 43.6
Processing clingstones	selfing open p.	4	22.7 71.4	— 26.2	39.6 55.8	14.9 29.1	25.7 45.6
Nectarines	selfing open p.	26	5.4 56.6	82.7 —	14.5 33.6	12.0 34.1	10.6 35.4
Mean	selfing open p.	60	9.9 61.5	— 21.0	21.7 42.3	13.9 35.4	15.2 40.1

Table 3 Fruit set (%) of peach flowers after different length of periods under isolation (*Szatymaz*, 1998)

Variety	Bagged throughout blooming	Bagged through the first half time	Bagged through the second half time	Hand pollinated once	Open pollinated
Cresthaven	23.7	16.6	31.9	—	49.1
Fantasia	4.6	34.2	12.9	24.4	31.9
Harko	21.1	17.4	23.4	25.9	23.7
Red June	15.9	9.2	28.0	42.4	33.9
Mean	16.3	19.4	24.1	30.9	34.6

Conclusions

Relevant literature and the present results agree in stating that peaches are mainly self fertile. The extent of self fertility is, however, variable according to varieties and to seasons too, being as low as less than 20 % which may be insufficient for a normal yield in the case of scarcity of flowers. There is, moreover, tight correlation between the extent of self fertility and the fruit set at open pollination.

At low density of flowers (e.g. after freeze injury) the rate of fruit set may become crucial, thus bee pollination and

association of varieties in one plantation are to be considered.

According to our experiences, the association of peach varieties in one plantation has various aspects. At optimal growing sites or where the fruit set is expected to be secured, varieties of high self fertility should not be mixed because the phenomenon of over-setting is threatening. Varieties should be planted in wide blocks.

The danger of freeze or any other adversity diminishing fruit set, the advantage of inter-fertility must be exploited by planting narrow, less than 4–6 rows- blocks each of the particular varieties.

References

- Bellini, E., Scaramuzzi, F. (1976):** Monographia delle principali cultivar di pesco. Vol. II. Consiglio Nazionale delle Ricerche, Firenze 562.
- Branscheidt, P. (1933):** Beitrag zur Frage der Sortenbeschreibung und der Fertilitätsverhältnisse beim Pfirsich. Gartenbauwiss. 8(1): 45–76
- Detjen, L. R. (1945):** Fruitfulness in peaches and its relationship to morphology and physiology of pollen grains. Bull. Del. Univ. Agr. Exp. Sta. 257: 1–24.
- Fogle, H. W. (1977):** Self pollination and its implications in peach improvement. Fruit Var. Journ. 31 (4): 74–75.
- Maliga P. (1961):** Tests of fertility and their application for the planning of plantations (Hungarian). Kert. Kut. Int. Évkönyve 4: 33–76.
- Nyéki J. (1990):** Blooming and fertilisation of stone fruits (Hungarian). Thesis of D. Sci., Hungarian Academy of Science, Budapest
- Nyéki J., Brózik S., Ifjú Z. (1980):** Results of fertility tests in peaches (Hungarian). Kertgazdaság 12(2): 37–50.
- Nyéki J., Szabó Z., Andrásfalvy A., Soltész M., Szél I. (1998):** Open pollination and autogamy of peach and nectarine varieties. Acta Horticulturae 465: 279–284..
- Perfileva, Z. N. (1982):** Self fertility of some new peach varieties (Russian). Byul. Gosud. Nikit. Botan. Sada 48: 54–57.
- Quarta, R., Dettori, M. T., Nati, D., Marinucci, R., Di Gaetano, R. (1992):** Flower morphology, gametogenesis and embryo development in size-controlled peach and nectarine genotypes. Acta Horticulturae 315: 151–161.
- Ryabov, I. N., Kancerova, V. P. (1970):** Self pollination in peach (Russian). Trudy Gos. Nikit. Botan. Sada 4: 155–159.
- Tudor, A. (1981):** Study of an assortment of peach varieties and breeding lines in Oltenia (Rumanian). Lucrarile Stiintifice 9: 229–239.