Scientific Papers. Series B, Horticulture. Vol. LXV, No. 1, 2021
Print ISSN 2285-5653, CD-ROM ISSN 2285-5661, Online ISSN 2286-1580, ISSN-L 2285-5653

RESEARCH ON THE BEHAVIOR IN THE POLLINATION PROCESS OF SOME NATIVE APRICOT VARIETIES

Mona TUFARU[1], Dorel HOZA[1], Adrian CHIRA[1], Adrian George PETICILĂ[1], Stelica CRISTEA[2], Ligia ION[1]

[1]University of Agronomic Sciences and Veterinary Medicine of Bucharest, Faculty of Horticulture, 59 Mărăști Blvd, District 1, Bucharest, Romania
[2]University of Agronomic Sciences and Veterinary Medicine of Bucharest, Faculty of Agriculture, 59 Mărăști Blvd, District 1, Bucharest, Romania

Corresponding author email: ionnagyligia@yahoo.fr

Abstract

Sharka virus disease is extremely difficult to control and cause severe economic loss. A long-term solution is to propose new hybrid combinations where, as parents, local genotypes better adapted to the climatic conditions of the culture area are involved. This paper aims to study the behavior in the process of pollination of native apricot varieties, 'Amiral', 'Dacia', 'Siret' in different hybrids combinations. The highest number of pollinations flowers was performed on the combination 'Dacia ♀ x Rareș ♂' with 243 flowers, then in descending order follows the combination 'Excelsior♀ x SEO ♂' with 210 flowers, 'Siret ♀ x Amiral ♂' 198 flowers, 'Bucovina ♀ x Harcot ♂' 178 flowers. At the end, a steady fall is recorded again in all combinations, but a fall rate of 100% was observed in the combination of 'Bucovina ♀ x Harcot ♂'. The lowest rate of fall of the remaining studied fruits was noticed in the combination 'Dacia ♀ x Amiral ♂' of 67.98%.

Key words*: apricot, genotypes, hybrids, combination.*

INTRODUCTION

Plum pox virus that causes the disease called Sharka brings devastating damage in the culture of stone fruits worldwide. It is thought to be a pathogen agent of phytosanitary quarantine, listed in OEPP documents (Damsteegt et al., 2001).

Quality in fruits is a critical component of the research programs as related to the fruit-bearing trees in the stone fruit group in the *Prunus* genus (peach, apricot, plum, cherry) where the criteria of 'resistant to disease and pest' carries a peculiar significance within the program of plant/pathogens interaction. Along this line, Sharka (pox virus) is a severe issue for Europe, since the fruit production and quality are fully ravaged (Krska et al., 2002). Sharka has recently traced in Asia, South America and North America (Kobber, 2000). As a consequence, creating varieties with a genetically resistance to this disease is a major objective to improve the *Prunus* genus (Dosba et al., 1994).

Apart from its economic interest, *Prunus*/Sharka pathosystem is likely to bring a meaningful contribution to the understanding of the plant/pathogen interaction mechanism. On the other hand, the 'perennial' and 'stone' features of the host plant (fruit-bearing trees) may have a vast impact upon the plant/pathogen interaction and evolution, which is why this particular genus of plants is less studied than the herbaceous plants (such as *Nicotiana ebontamiana*, *Arabidopsis thabana*, *Pisum sativum*). (Desvignes et al., 1999)

Thorough research studies on this virus worldwide have been assisted with substantial financial support so as not to create other infection areas and with identification of measures most efficient to eradicate it.

While important progress has been made for decoding the molecular and epidemiological aspects of the virus, which enabled a control upon the virus spreading, further investigation is conducted to scale down the effect of this virus upon the stone species, since there is still uncertainty in terms of epidemiology and the relation with the vector-borne virus (Kegler et al., 2000).

The paper herein examines different methods to eradicate the PPV impact upon the *Prunus*

genus cutivated species by using parents from certain apricot varieties resistant to PPV, rootstocks with strong resistance, regulation of the population of vectors, use of the biocontrol chemicals, virus visualization via high-resolution electron microscopy, as well as the improvement of the detection molecular techniques (Kölber, 2001).

MATERIALS AND METHODS

For the purpose of the study, Romanian and foreign apricot varieties have been used, of different traits to be monitored during the research on the collection in the experimental field of the Faculty, along with apricot varieties at the Variety Testing Centre in the Ulmi locality, Dambovita county.

1. 'Dacia' - registered in 1989, an early ripening variety. It is a high-vigor tree, of an increased yielding potential.

The fruit is round in shape, slightly flattened on top and a large peduncle, heavier than 50 g. The pulp is light orange in color, non-adherent to the stone, average firmness, light orange skin covered in crimson red on the sunlit side, the stone is large and round, with a sweet core.

It is a self-fertile variety.

2. 'Amiral' - a high-vigor tree, self-fertile.

It has a high resistance to PPV. The fruit is in an oval shape, with the orange skin in a carmin red hue, a fine and aromatic pulp of a medium succulence, while the core has a bitter taste.

The ripening time interval ranges from June 26 to July 5.

3. 'Rareș' - a Romanian variety, obtained at SCDP Băneasa, registered in 2002, resistant to diseases and freezing temperature, a large fruit of 60-65 g, in the shape of an elongated sphere with the seam line very visible, a yellow-orange skin in color, splashed with crimson red, a light yellow-orange succulent pulp, a sweet core.

It is a high-yielding variety, low vigor, early ripening, good resistance to PPV.

4. 'Bucovina' was created by USAMV Bucharest.

The fruit is large, in an egg-shaped form. Pubescence is absent. The background skin color is medium orange, while the coating color is red. The pulp is light orange in color, with an average firmness and non-adherence to the stone. Fruits reach consumption maturity in the second half of month of July.

5. 'Harcot' - an American origin variety, registered in 1991.

It is an early ripening variety, maturing between 10 and 15 of July, high vigor. The pulp is yellow-orange in color, succulent, non-adherent to the stone, dry substance 11.5-14.5%, average to large fruit, 50-55 g, yellow-orange skin with a red spot on the sunlit side, a large stone of a bitter taste. It is a self-fertile variety.

6. 'Excelsior' - a Romanian variety, obtained at SCDP Băneasa in 1994.

It is a tree of a medium vigor, resistant to the variations in temperature and frost, large and very large fruit, spherical - ovoid shaped, slightly flattened on the side. The skin is finely pubescent, yellow-orange in color. Yellow pulp, fleshy, with a balanced taste. Ripening takes place towards the end of month of July.

7. 'SEO' - a tree of a weak vigor, early ripening, large fruit size, yellow-orange in color with reddish spots, resistant to disease and pests.

8. 'Siret' - Romanian variety, an average vigor tree, large size fruit that are yellow and orange in color, with reddish spots on the sunlit side.

Ripening occurs in the first half of the month of July. The work method lies in the controlled pollination among different varieties of Romanian origin in two distinct locations, adopting the following crossing combination schemes:

In the USAMV orchard, pollinations were conducted as in the below crossing combination scheme:

1. Crossing combination 'Dacia ♀x Rareș♂'
2. Crossing combination 'Dacia ♀ x Amiral ♂'
3. Crossing combination 'Siret ♀ x Amiral ♂'

At the Variety Testing Center in the Ulmi locality, Dambovita county, the following combinations of varieties were pollinated:

1. Crossing combination 'Bucovina ♀ x Harcot ♂'
2. Crossing combination 'Excelsior♀ x SEO ♂'.

RESULTS AND DISCUSSIONS

As seen in Chart 1, the largest number of pollinations flowers was performed for the

combination ‘Dacia ♀ x Rareş ♂’, with 243 flowers, and in a descending order, the combination ‘Excelsior ♀ x SEO ♂’ with 210 flowers, ‘Siret ♀ x Amiral ♂’ with 198 flowers and ‘Bucovina ♀ x Harcot ♂’ with 178 flowers in the year 2019. The lowest number of pollinations was done on the combination ‘Dacia ♀ x Amiral ♂’, with 153 flowers.

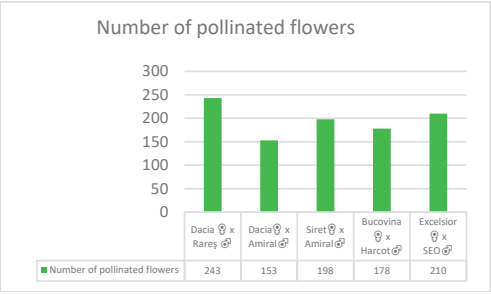

Figure 1. Number of pollinated flowers

According to the data in Figure 1 regarding the behavior in the pollination process for Romanian and foreign apricot varieties, following the already established crossing, a number of 243 flowers were pollinated in the hybrid combination ‘Dacia ♀ x Rares ♂’, with 183 pollinated flowers, with a percentage of 75.31 for fruits set. The lowest number of pollinated flowers was recorded for the combination ‘Dacia♀x Amiral ♂’, with 153 flowers and a fruits set percentage of 77.13%. As for the number of fruits obtained at the end of observation, the ‘Bucovina♀ x Harcot ♂’ combination was left with no fruit, ‘Excelsior ♀ x SEO ♂’ has 10 fruits left and, in an ascending order, are the combinations ‘Dacia♀ x Rareş ♂’ with 38 fruits and ‘Dacia ♀ x Amiral ♂’ with 49 fruits. The combination preserving the most fruits in the end (58) is ‘Siret ♀ x Amiral ♂’.

Table 1. Behavior of the studied combinations during the pollination process

No.	Hybrid combination	Number of pollinated flowers	Number of fruits set	Fruit set percentage (%)	Number of fruits resulted at the end of observations
1.	Dacia♀ x Rareş ♂	243	183	75.31	38
2.	Dacia♀x Amiral♂	153	118	77.13	49
3.	Siret ♀x Amiral♂	198	161	81.32	58
4.	Bucovina♀ x Harcot♂	178	111	62.36	0
5.	Excelsior ♀x SEO♂	210	95	45.24	10

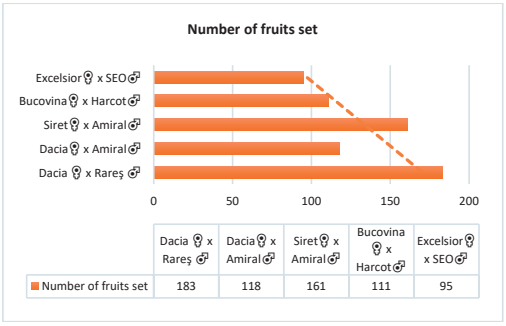

Figure 2. Number of fruits set per crossed combinations

As seen in Figure 2, the highest number of fruits set is in the hybrid combination ‘Dacia♀ x Rares ♂’, with 183 hybrid fruits. The fewest fruits set were derived from the combination ‘Excelsior ♀ x SEO ♂’, with 93 in number.
The highest fruits set percentage has been obtained in the combination ‘Siret ♀ x Amiral ♂’, with 81.32%, whereas the lowest fruits set percentage was recorded for the combination ‘Excelsior ♀ x SEO ♂’, 45.24%, despite having had a number of 210 flowers pollinated (Figure 3).

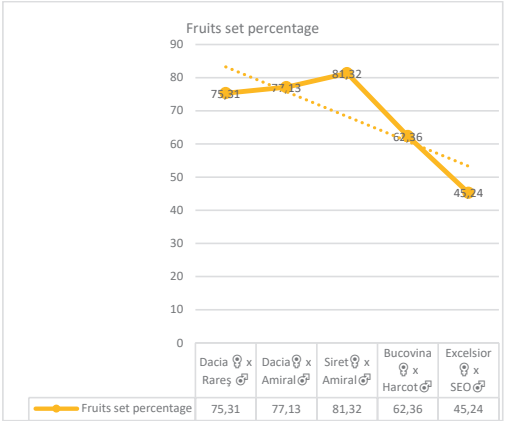

Figure 3. Hybrid fruits set percentage (%)

To have a better picture of the number of fruits set and of the decreasing rate of them in all five combinations, observations were made every 7, 14, 21 days and at the end of the process.
The highest number of fruits set at 7 days was calculated for the combination ‘Dacia ♀ x Rareş ♂’, while the lowest number of fruits set was in the combination ‘Excelsior ♀ x SEO ♂’.

Table 2. Number of hybrid fruits set monitored at the 7-day time interval

No.	Hybrid combination	Number of fruits set 11.04.	Number of fruits set 18.04	Number of fruits set 24.04.	Number of fruits set 01.05.
1.	Dacia♀ x Rareș ♂	163	92	78	38
2.	Dacia ♀x Amiral♂	108	74	65	49
3.	Siret♀ x Amiral♂	151	82	72	58
4.	Bucovina♀x Harcot ♂	98	75	44	0
5.	Excelsior ♀x SEO♂	87	68	25	10

The combination 'Siret ♀ x Amiral ♂' had a number of 151 hybrid fruits set, whereas the combination 'Dacia ♀ x Amiral ♂' the number was 108. During the following week (14 days), the most fruits are noticed to be still in the combination 'Dacia♀ x Rareș ♂'and the lowest number (68) was again detected in the combination 'Excelsior ♀ x SEO ♂'. In the descending order in the number of fruits set and left afterwards, we have 'Siret ♀ x Amiral ♂' with 82 fruits, 'Bucovina ♀ x Harcot ♂' 75 and 'Dacia ♀ x Amiral ♂' with 74 fruits. For the third observation week (21 days), the number of fruits set to be left is 78 in the hybrid combination 'Dacia♀ x Rareș ♂', while 'Siret ♀ x Amiral ♂' has 72. The lowest number of fruits left was recorded in the combination 'Excelsior ♀ x SEO ♂', i.e. 25. For 'Dacia ♀ x Amiral ♂', there are only 65 and 44 for the combination 'Bucovina ♀ x Harcot ♂'.

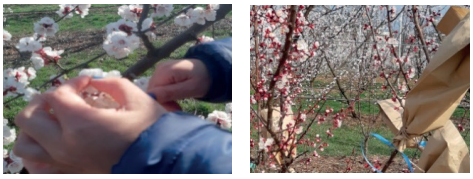

Figure 4. Pollination in the experimental field

CONCLUSIONS

At the final of the observations concerning the number of fruits set and left, it is noticed that there is no remaining fruit for the combination 'Bucovina ♀ x Harcot ♂'. In regards to this aspect, what can be considered is the incompatibility between the two parents, plus the torrential rains, strong winds and low temperatures that likely occurred in Ulmi locality at that time. The most fruits left in the study were in the combination 'Siret ♀ x Amiral ♂', 58, while the others are in a descending order - 'Dacia ♀ x Amiral ♂', with 49, 'Dacia ♀ x Rareș ♂', 38 and 'Excelsior ♀ x SEO ♂' with 10 fruits.

REFERENCES

Damsteegt, V.S., Stone, A.L., Luster, D.G., Gildow, F.E., Levy, L.,Welliver, R. (2001). Preliminary characterization of a North American isolate of Plum pox virus from naturally infected peach and plum orchards in Pennsylvania, USA. *Acta Hort. 550, 145–151.*8–16.

Desvignes J.C., Boye, R., Cornaggia, D., Grasseau, N. (1999). Virus diseases of fruit trees. *Editions Centre technique interprofessionnel des fruits et legumes,* Paris: 202.

Dosba F., Lansac M., Eyquard J.P. (1994). Plum pox resistance in *Prunus. EPPO Bull. 24:* 691–696.

Kegler, H., Fuchs, E., Gruntzig, M. and Schwarz, S. (2000). Screening of plum, peach and apricot cultivars for resistance to Plum pox potyvirus. *Acta Hort. 538:*397-405.

Kölber, M. (2001). Workshop on Plum pox. *Acta Hort. 550,* 249–255.

Krska, B., Salava, J., Pola´k, J., Komı´nek, P. (2002). Genetics of resistance to Plum pox virus in apricot. *Plant Prot. Sci. 38,* 180–182.