World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(RESEARCH ARTICLE)

Check for updates

Research on biometric studies on hybrid peach fruits

Florentina Dumitrescu, Dorel Hoza, Mirela Olga Boloacă and Ligia Ion *

Faculty of Horticulture, University of Agronomic Sciences and Veterinary Medicine Bucharest, 59 Mărăști, Romania.

World Journal of Advanced Research and Reviews, 2023, 19(02), 1344–1348

Publication history: Received on 09 July 2023; revised on 26 August 2023; accepted on 29 August 2023

Article DOI: https://doi.org/10.30574/wjarr.2023.19.2.1664

Abstract

The causal agent of Sharka disease is the *Plum pox virus* of the family Potyviridae, genus Potyvirus, which is well characterized molecularly and even used as a vector in biotechnology. Sharka is one of the most devastating diseases of fruit trees. In this work, results obtained from biometric studies for hybrid fruits compared to fruits of the parental forms obtained from the pollination process are presented. Three hybrid combinations were studied: *Prunus Lusitanica* Ulmi ♀ x Anemona ♂ - ULM, *Prunus Lusitanica* Ulmi ♀ x Liana ♂ - DDL, *Prunus Lusitanica* Ulmi ♀ x Filip ♂ - DDF.

Keywords: Hybrids; Combination; Apricots; Resistance

1. Introduction

Plum pox virus belongs to the genus Potyvirus in the family Potyviridae [1]. *Plum pox virus* causes the disease called Sharka, one of the most damaging viral diseases of stone fruit species, as it causes severe losses in affected varieties, also infecting wild and ornamental species of the genus *Prunus*, with a wide range of host plants, especially herbaceous. The virus spreads easily and uncontrolled over long distances through infested plant material and very efficiently by aphids.

Plum pox virus was first discovered in Bulgaria in 1917-1918 and was recognised as a viral disease by Atanasoff (1932), from where it spread to most countries of the continent [2]. Until 1992, no incident outside the Euro-Mediterranean area was reported. A report of *Plum pox virus* identification in India [3] has not yet been confirmed. *Plum pox virus* was detected in Chile in 1992 [4], United States of America in 1999 [5], China in 2004 [6] and Argentina in 2005 [7].

Plum pox virus (Sharka) is one of the most destructive diseases of stone fruit. The causal agent, *Plum pox virus* is very easily transmitted by aphids but also by hand grafting (nursery tree) and has a wide host range among *Prunus* species.

Under natural conditions, the disease affects species of the genus *Prunus: Prunus armenica, Prunus cerasifera, Prunus davidiana, Prunus domestica, Prunus mahaleb, Prunus marianna, Prunus mume, Prunus persica, Prunus salicina* and interspecific hybrids between these species as well as rootstocks. *Prunus avium*, *Prunus cerasus Prunus dulcis* can be infected occasionally or only by specific *Plum pox virus* strains [8]. Sharka is particularly damaging to stone fruit species and considerably reduces fruit yield and quality. Losses can reach up to 100% in some cases [9]. Infested plants may not show symptoms for several months or may be mistaken for symptoms of other diseases, so the virus may become established before the disease is first recognised. Symptoms of the virus may appear on leaves early in the growing season, including slight light green discoloration, chlorotic spots, bands or rings to yellowing and distortion, on shoots, bark, petals, fruit and even stones [10].

Identifying, breeding and introducing new genotypes with genetic resistance to diseases is one of the main ways to improve the quality and quantity of crop plants.

* Corresponding author: Ligia Ion

2. Material and methods

For the study purpose, Romanian and foreign varieties, with different characteristics that have been monitored during the research work conducted on the collection in the experimental field of the Faculty, as well as apricot varieties within the Variety Testing Centre in Ulmi locality, Dambovita county. The following hybrid combinations have been obtained:

- Crossing combination: *Prunus Lusitanica* Ulmi ♀ x Anemona ♂ - ULM;
- Crossing combination: *Prunus Lusitanica* Ulmi ♀ x Liana ♂- DDL;
- Crossing combination: *Prunus Lusitanica* Ulmi ♀ x Filip ♂ - DDF.

Description of hybrid fruits (phenotypic aspects) and observations for the following characters were made:

- Fruit size (height and diameter)
- Fruit weight
- Stone weight
- Percentage of stone weight relative to total weight of fruit
- Firmness
- Soluble dry substance

3. Results and discussion

3.1. Description of hybrid fruits derived from the crossing combination *Prunus Lusitanica* Ulmi ♀ x Anemona ♂

From this combination, 37 hybrid fruits, called ULM 1 - ULM 37 have been obtained. The fruit is medium in size, 76.94 g average weight, circular in shape (seen from the ventral side), symmetrical seen from the pistillar end which is weakly pointed. Prominence of suture is medium, depth of peduncular cavity deep and width large.

The ground colour of skin is yellow-orange, the hue of over colour skin is medium-red, marbled, with medium extension, pubescence present, thickness of skin thick. The colour of the flesh is light orange, with anthocyanin pigmentation under the skin, in the flesh and around the stone, with fibres. The soluble dry matter content is between 11,5 and 13.3%.

The stone is elliptical in shape, light brown in colour, the surface relief is formed of cavities and pits, with tendency to crack during harvesting absent or very weak, not adherent to the flesh. The fruit has an average stone content of 9,15 %

Tendency for the fruit to drop before harvest ia absent or very weak.

3.2. Description of hybrid fruits derived from the crossing combination *Prunus Lusitanica* Ulmi ♀ x Liana ♂

From this combination, 18 hybrid fruits, called DDL 1 – DDL 18 have been obtained. The fruit is medium in size, 70,39 g average weight, medium oblate in shape (seen from the ventral side), asymmetrical seen from the pistillar end which is weakly pointed. Prominence of suture is medium, depth of peduncular cavity deep and width large.

The ground colour of skin is yellow-orange, the hue of over colour skin is dark-red, marbled, with medium extension, pubescence present, thickness of skin thin. The colour of the flesh is yellow-orange, anthocyanin pigmentation under the skin, in the flesh and around the stone weak, with fibres. The soluble dry substance content is between 11,9% and 13,0%.

The stone is eliptical in shape, light brown in colour, the surface relief is formed of cavities and pits, with tendency to crack during harvesting absent or very weak, not adherent to the flesh. The fruit has an average stone content of 9,84 %

Tendency for the fruit to drop before harvest ia absent or very weak.

3.3. Description of hybrid fruits derived from the crossing combination *Prunus Lusitanica* Ulmi ♀ x Filip ♂

From this combination, 27 hybrid fruits, called DDF 1 – DDF 27 have been obtained. The fruit is medium in size, 73,06 g average weight, medium oblate in shape (seen from the ventral side), asymmetrical seen from the pistillar end which is pointed. Prominence of suture is medium, depth of peduncular cavity medium and width large.

The ground colour of skin is yellow-orange, the hue of over colour skin is medium-red, marbled, with small extension, pubescence present, thickness of skin thin. The colour of the flesh is yellow-orange, without anthocyanin pigmentation under the skin, in the flesh and around the stone, with fibres. The soluble dry substance content is between 12,31% and 13,20%.

The stone is slightly oblate in shape, dark brown in colour, the surface relief is formed of cavities and pits, with tendency to crack during harvesting absent or very weak, not adherent to the flesh. The fruit has an average stone content of 9,32 %

Tendency for the fruit to drop before harvest is absent or very weak.

Table 1 Results concerning the average values of the fruit size in the hybrid combinations of interest

No.	Hybrid combination	Fruit size		Weight (g)
		Height (cm)	Diameter (cm)	
1.	*Prunus Lusitanica* (L.) Ulmi ♀ x Anemona ♂ ULM	5.04	5.24	76.94
2.	*Prunus Lusitanica* (L.) Ulmi ♀ x Liana ♂ DDL	5.05	5.04	70.39
3.	*Prunus Lusitanica* (L.) Ulmi ♀ x Filip ♂ DDF	5.10	5.11	73.06

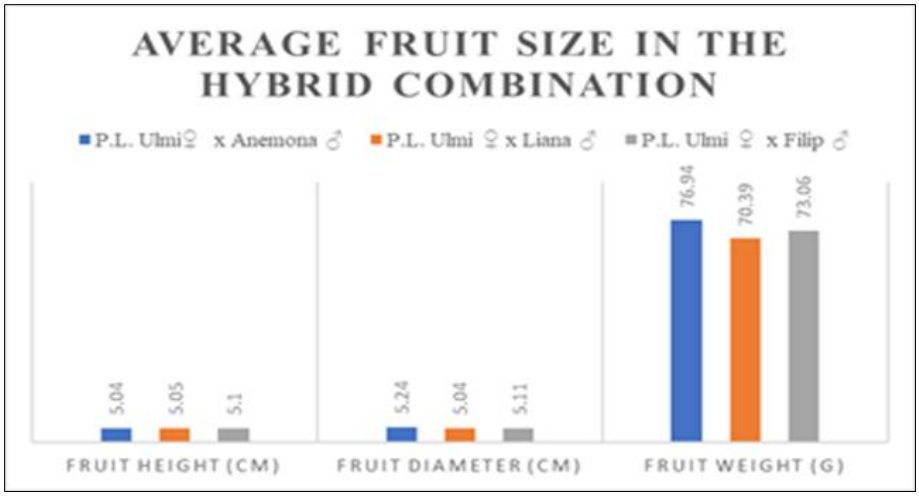

Figure 1 Average fruit size in the hybrid combinations

In terms of the average size of the hybrid fruits from the three combinations of interest, the figure above shows that the height ranges from 5,04 to 5,10 cm, with the highest in the *Prunus Lusitanica* Ulmi ♀ x Filip ♂ combination, measuring between 5,04 and 5,24 cm in the fruit diameter. The fruit weight from the combination varies a great deal, with the maximum value still held by *Prunus Lusitanica* Ulmi ♀ x Anemona ♂, 76,94 g, whereas the minimum is in the *Prunus Lusitanica* Ulmi ♀ x Liana ♂ combination, that is 70,39 g. The conclusion to be drawn is that these hybrid fruits fall within the medium sizes category.

Table 2 Results concerning the average values for the stone weight and the percentage of stone weight relative to total weight of fruit

No.	Hybrid combination	Stone weight (g)	Percentage of stone weight relative to total weight of fruit (%)
1.	*Prunus Lusitanica* (L.) Ulmi♀ x Anemona ♂ ULM	7.06	9.15
2.	*Prunus Lusitanica* (L.) Ulmi ♀ x Liana ♂ DDL	6.90	9.84
3.	*Prunus Lusitanica* (L.) Ulmi ♀ x Filip ♂ DDF	6.66	9.32

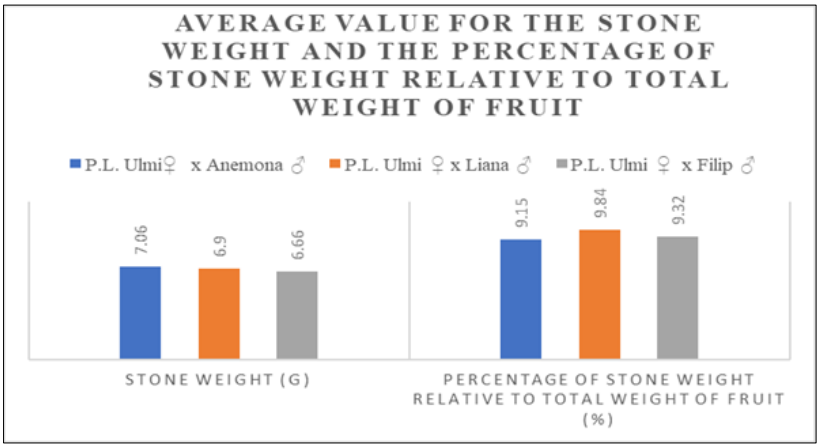

Figure 2 Results on the average values for the stone weight and the percentage of stone weight relative to total weight of fruit

As seen in the figure, the hybrid combinations *Prunus Lusitanica* Ulmi ♀ x Anemona ♂, *Prunus Lusitanica* Ulmi ♀ x Liana ♂ and *Prunus Lusitanica* Ulmi ♀ x Filip ♂ are noticed to have close values when it comes to the stone weight (6,66 – 7,06 g).

In regard to the percentage of stone weight relative to total weight of fruit, it is evident that the ratio is clearly favorable for the hybrid combinations *Prunus Lusitanica* Ulmi ♀ x Anemona ♂, with 9,15%, followed by *Prunus Lusitanica* Ulmi ♀ x Filip ♂, 9,32% and 9,84% for the combination *Prunus Lusitanica* Ulmi ♀ x Liana ♂.

Table 3 Results concerning the average values of the pulp firmness (kgf/cm^2) and the soluble dry substance (%)

No.	Hybrid combination	Pulp firmness (kgf/cm^2)	Soluble dry substance (g/100g)
1.	*Prunus Lusitanica* (L.) Ulmi♀ x Anemona ♂ ULM	3.27	12.21
2.	*Prunus Lusitanica* (L.) Ulmi ♀ x Liana ♂ DDL	3.36	12.51
3.	*Prunus Lusitanica* (L.) Ulmi ♀ x Filip ♂ DDF	2.77	12.31

As for the pulp firmness, the figure 3 shows that the highest value is held by *Prunus Lusitanica* Ulmi ♀ x Liana ♂ with 3,36 kgf/cm^2, whereas the lowest is for the combination *Prunus Lusitanica* Ulmi ♀ x Filip ♂, with 2,77 kgf/cm^2, *Prunus Lusitanica* Ulmi♀ x Anemona ♂ has the value of 3,27 kgf/cm^2.

Similar values are noticed for the soluble dry substance in the three hybrid combinations, namely 12,21 g/100g for *Prunus Lusitanica* Ulmi ♀ x Anemona ♂, 12.31 g/100g for *Prunus Lusitanica* Ulmi ♀ x Filip ♂ and 12.51 g/100g for the combination *Prunus Lusitanica* Ulmi ♀ x Liana ♂.

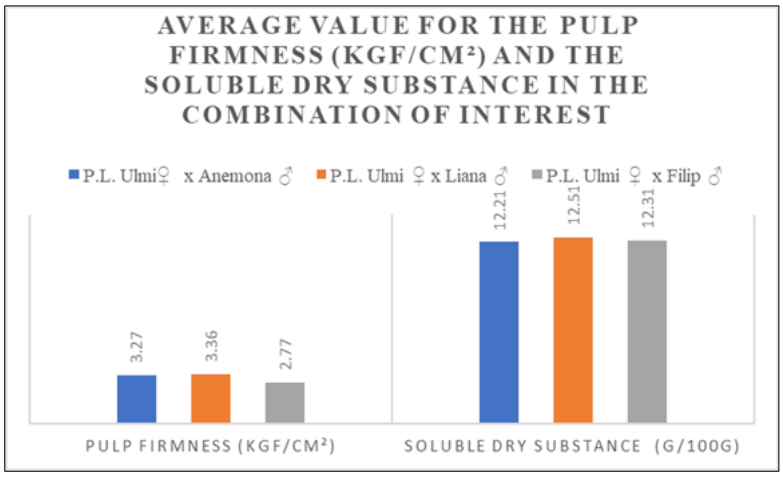

Figure 3 Average values for the pulp firmness (kgf/cm^2) and the soluble dry substance (%)

4. Conclusion

The conclusion to this article is that the hybrid fruits place themselves into the class of medium to large size. These fruits are larger compared to their parents, but this description can also come from the fact that there are fewer on the branch, selected during the pollination process and many of them have fallen amid the physiological drop process. The stones resulting from the fruit obtained from these hybrid combinations were stratified and subsequently sown in pots. Some of the plants obtained will undergo *Plum pox virus* inoculation to establish genetic resistance to this virus and the rest will be used for future observations needed in the breeding process.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

References

[1] Adams et al., 2012, Family Potyviridae In Virus Taxonomy, San Diego; Elsevier

[2] EPPO, 2011, EPPO Reporting Service. EPPO Reporting Service. Paris, France: EPPO

[3] Thakur et al., 1994, Plum pox virus on stone fruits from India – a new record. Plant Disease Research, 9 (1): 100-102

[4] Herrera G., 1994, Detection of sharka disease (plum pox virus) in an old stone collection at the Los Tilos experimental substation (INIA), Chile. Agric. Tech. (Chile), 187-191

[5] Levy L. et al., 2000, First report of plum pox virus (Sharka disease) in Prunus persica in the United States, Plant Disease, 84(2):202

[6] Navratil et al., 2005, First incidence of Plum pox virus on apricot trees in China, Plant Disease, 89(3):338

[7] Zotto et al., 2006, First report in Argentina of Plum pox virus causing Sharka disease in Prunus. Plant Disease, 90(4):523

[8] Damsteegt VD. Et al., 2007, Prunus host range of Plum pox virus (PPV) in the United States by aphid and graft inoculation. Plant Dis. 91

[9] Kegler and Hartmann, 1998, Present status of controlling conventional strains of plum pox virus. In: Plant Virus Disease Control, St. Paul Minessota: Phytopathological

[10] Garcia and Cambra, 2007, Plum pox virus ans sharka disease, Plant Viruses 1