

FRUIT CHARACTERISTICS OF DIFFERENT AUTOCHTHONOUS CHERRY GENOTYPES SELECTED FOR THE INTERACTION WITH THE PLUM POX VIRUS

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Abstract

The Plum pox virus (PPV), is the one that greatly affects stone fruit crops, considered one of the most destructive viruses worldwide, as a quarantine pathogen. Over time, numerous researches have been carried out because the virus affects particularly the productivity and quality of the fruits, but, unfortunately, no treatment has been discovered, and as a last measure taken for a short time, at the present moment, being to eradicate the infected trees and plant new virus-free trees. The highlighting and selection of valuable genes, of economic importance in cherry, through modern techniques, and their transmission to new cherry cultivars, the production of agro-productive and superior quality planting material and the launch on the market of the most valuable cultivars, is a major objective of all programs of cherry breeding both worldwide and in Romania. In this work, the plant material was made up of different F1 hybrid combinations from the specie Cerasus avium. The hybrids studied were obtained in Mihai Bravu locality, Giurgiu County.

Key words: genetic improvement, tolerance or resistance to pathogens, fruit parameters.

INTRODUCTION

In the improvement of horticultural plants, the history of the development of knowledge and achievements in the field were specific to the level of knowledge and the concrete possibilities of each era (Sestraš, 2004).

On a global level, there is an intense and continuous concern for the genetic improvement of cherry varieties as the main way to improve agricultural performance, the quality of the harvest, to increase the commercial value of the fruit and the only possibility of increasing disease resistance, with implications in reducing production costs and the level of pollution of the agroecosystem (Cepoiu, 2001). The main aim of the work was to study the behavior of some autochthonous varieties of cherry when grafted onto three rootstocks, in order to find variants that are resistant or tolerant to plum-pox, in the context of climate changes that have left their mark on the growth and cherry development.

The evaluation of the differences in growth and fruiting of combinations of cherry varieties

grafted on different rootstocks will allow the identification and evaluation of the agrobiological potential of the studied material, in relation to the ecological factors (Ion, 2007).

In the relationship between grafts and rootstocks, a series of factors intervene with immediate or delayed influence regarding the phenotypic reaction of the grafted plant. Compliance with the general principles for establishing cherry orchards as well as with current culture technologies does not ensure and cannot guarantee the maximum percentage absence of delayed incompatibility phenomena in the young orchard.

The grafting of cherry varieties from the species *Cerasus avium* L. on rootstocks other than frank, referring in particular to interspecific rootstocks, creates the premises for the appearance of these delayed incompatibility phenomena. The causes are generated on the one hand by genetic, biochemical, morpho-anatomical or physiological factors and on the other hand by external factors such as climate (temperature, water), soil, pathogens that, above a certain threshold of intensity in a

negative sense, trigger irreversible imbalances in the plant (Asănică, 2011). In some situations, for the appearance of symptoms of incompatibility, it is enough that only one of the factors is involved, but most of the time, the decline of the tree is caused by a combination of several factors in a greater or lesser weight.

The success of grafting depends to a large extent on placing the graft cambium and the rootstock as close as possible to make the weld as fast as possible. Environmental conditions during the grafting period are very important (Mazilu and Duțu, 2014).

The grafting of a variety belonging to one species can be done on a rootstock of the same species, on a rootstock belonging to another species, or on a hybrid rootstock between two or more species.

In practice in our country, cherry varieties are grafted on cherry rootstocks, sour cherry rootstocks, mahaleb rootstocks and interspecific rootstocks with vegetative propagation.

MATERIALS AND METHODS

The plant material consists of different F1 hybrid combinations from the specie *Cerasus avium* L. The hybrids studied were obtained at Mihai Bravu, Giurgiu County.

The plant material consisted of:

1. Pollen obtained from the varieties 'Boambe de Cotnari', 'Daria', 'Superb', 'Vlad Țepeș', 'Grădiștea 3', 'Copaciu 5', 'Cotenii' and 'Dărăști' as sources of resistance to PPV used as male parent.

2. The varieties used in hybridization, 'Timpurii de Comana', 'Samurcășești', 'Fălăstoaca', 'Budeni 1' and 'Câmpurelu', varieties used as female parent.

3. F1 hybrids considered valuable from the specie *Cerasus avium* L.

The pollen obtained from the varieties 'Daria', 'Superb' and 'Dărăști' as a source of resistance to PPV used as the male parent was harvested in the spring of 2022 in the SCDP Băneasa farm, but also from the bordering area of the Mihai Bravu locality, Giurgiu County.

For statistical data processing, we used the IBM SPSS Statistics 20 software. The variance of fruit firmness is calculated and plotted as a function of weight and soluble dry matter content.

RESULTS AND DISCUSSIONS

In order to have a broad picture of the quality of the fruit in the studied variety and hybrid, Table 1 shows the average values for a sample of 10 fruits from the 'Timpurii de Comana' x 'Daria' hybrid with an average weight of 7.53 g, in which the stone has an average weight of 0.44 g. For the 'Timpurii de Comana' variety, the average weight of the fruit was 7.35 g, and the weight of the stone in this variety was 0.54 g.

The average value of soluble dry matter for the hybrid combination was 14.21% and for the 'Timpurii de Comana' variety, the average value of soluble dry matter was 13.96%.

In summary, from Table 1 it can be seen that the 'Timpurii de Comana' x 'Daria' hybrid cross has larger fruits and smaller pits, compared to the mother variety studied 'Timpurii de Comana', but also the ratio of pulp to pit in favor of the pulp. It is therefore observed how the exogenous pollen partner in the pollination process positively influences the characteristics of the hybrid fruit, not being identical to the varieties used as parents.

The results in Table 1 clearly illustrate the average fruit weight of the 'Timpurii de Comana' x 'Daria' hybrid combination with a value of 7.53 g and the average fruit weight of the 'Timpurii de Comana' variety with a value of 7.35 g. Between the hybrid fruits and the fruits of the variety there are differences that are not visible, but the hybrid fruits from the hybrid combination 'Timpurii de Comana' x 'Daria' are larger than the fruits of the 'Timpurii de Comana' variety. Also the percentage of the average value of the weight of the seeds in the hybrid combination 'Timpurii de Comana' x 'Daria' which is 0.44 g and the variety 'Timpurii de Comana' 0.54 g, helps us to conclude that the smaller seeds from the hybrid combination actually mean a higher percentage of pulp, which is of most interest when we talk about what is consumed in a fruit, i.e. the pulp.

Also in Table 1, the results on the soluble dry matter of the hybrid combination 'Timpurii de Comana' x 'Daria', demonstrate that the hybrid 'Timpurii de Comana' x 'Daria' has a higher soluble dry matter content of 14.21% compared to the mother variety 'Timpurii de Comana' 13.96%. As soluble dry matter is associated

with sugar content, this would demonstrate that the hybrid is sweeter than the parent variety.

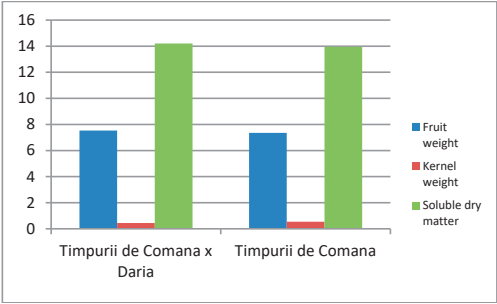


Figure 1. The average of the results regarding the internal characters of the fruits of the hybrid combination 'Timpurii de Comana' x 'Daria'

Table 2 shows the results regarding the firmness of the fruits of the hybrid combination 'Timpurii de Comana' x 'Daria', and we can see that the average of the results of the firmness of the hybrid fruits is 0.168 kgf/cm², instead the average of the firmness of the fruits of the mother variety is 0.157 kgf/cm².

In statistical interpretation, we can see that the differences are not significant, but they are significant which means that the hybrid is superior to the variety.

Table 1. Results regarding the internal characters of the hybrid fruits and the fruits of the variety from the hybrid combination 'Timpurii de Comana' x 'Daria'

No. crt.	Fruit weight of the hybrid combination Timpurii de Comana x Daria (g)	Fruit weight Timpurii de Comana variety (g)	Kernel weight of the hybrid combination Timpurii de Comana x Daria (g)	Kernel weight Timpurii de Comana variety (g)	Soluble dry matter in the hybrid combination Timpurii de Comana x Daria (%)	Soluble dry matter Timpurii de Comana variety (%)
1	8.10	8.73	0.42	0.52	14.25	13.20
2	6.45	7.67	0.48	0.49	13.15	14.45
3	7.78	7.12	0.45	0.57	13.55	13.50
4	7.89	7.25	0.43	0.53	13.70	12.90
5	8.74	6.91	0.55	0.65	14.72	13.80
6	6.36	7.45	0.39	0.49	14.93	14.15
7	7.02	7.59	0.36	0.56	14.10	14.40
8	8.67	7.22	0.38	0.43	13.80	14.75
9	6.20	6.92	0.48	0.58	14.80	14.55
10	8.16	6.62	0.52	0.55	15.15	13.92
Total	75.37	73.48	4.46	5.37	142.15	139.62
Average	7.53	7.35	0.44	0.54	14.21	13.96

Table 2. Results regarding the fruit firmness of the 'Timpurii de Comana' x 'Daria' hybrid combination

Fruit firmness		
Nr. crt.	The hybrid combination Timpurii de Comana x Daria	Maternal variety Timpurii de Comana
	kgf/cm ²	kgf/cm ²
1	0.17	0.17
2	0.16	0.16
3	0.17	0.15
4	0.17	0.16
5	0.16	0.16
6	0.15	0.17
7	0.18	0.16
8	0.18	0.16
9	0.17	0.12
10	0.17	0.16
Total	1.68	1.57
Average	0.168	0.157

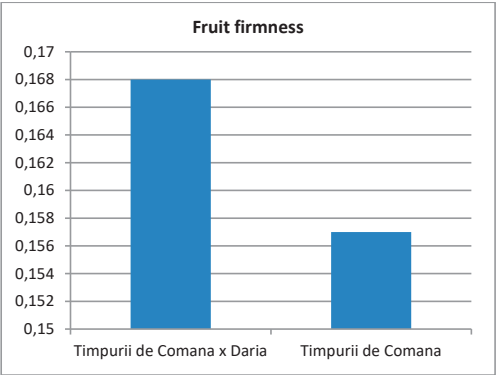


Figure 2. Average fruit firmness results for the hybrid combination 'Timpurii de Comana' x 'Daria'

According to Figure 3, the values obtained according to the Brix analyzes can be observed for the hybrid combination 'Timpurii de Comana' x 'Daria' with an average of 28.44% compared to the maternal variety with an average value of 27.87%.

The fruits of the 'Timpurii de Comana' x 'Daria' hybrid combination are significantly sweeter compared to the fruits of the native variety 'Timpurii de Comana', obtained on the same plant.

Of course, this does not reflect the intrinsic values of the hybrid until after the seeds have germinated and the actual hybrid plants will result, which will flower and bear fruit.

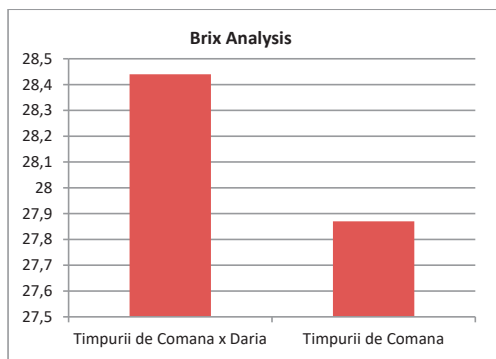


Figure 3. Average Brix analysis results for the hybrid combination 'Timpurii de Comana' x 'Daria'

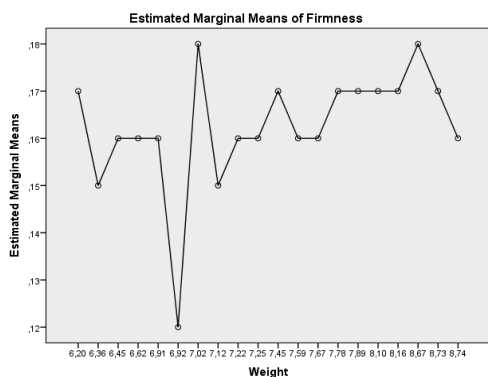


Figure 4. Variation of fruit firmness depending on weight

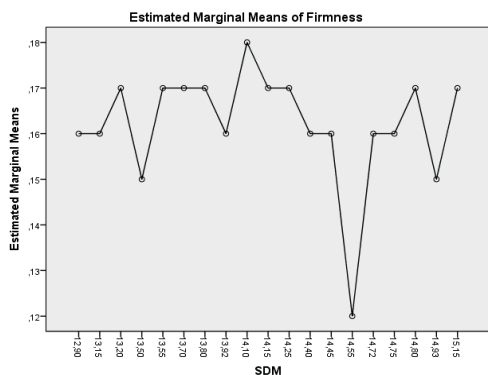


Figure 5. Variation of fruit firmness depending on soluble dry matter

As can be seen from Figure 6, at low values of soluble dry matter, the firmness of the fruits of the Timpurii de Comana variety is higher than that of the hybrid combination, on the other hand at medium and high values within the

specific range of SDM, the hybrid combination 'Timpurii de Comana' x 'Daria' presents a much higher firmness than 'Timpurii de Comana'.

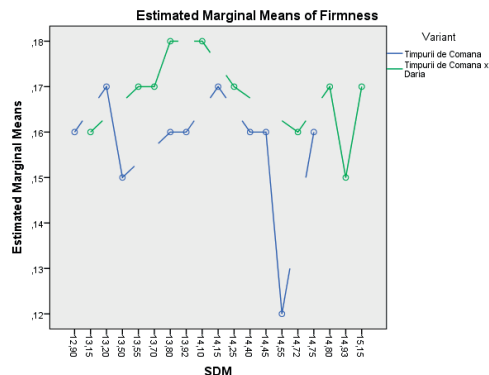


Figure 6. Comparative variation of fruit firmness according to soluble dry matter

CONCLUSIONS

The average fruit weight of the 'Timpurii de Comana' x 'Daria' hybrid combination was higher than the average fruit weight of the maternal parent ('Timpurii de Comana').

The same hierarchy was recorded in the case of the weight of soluble dry matter.

It can be seen that the 'Timpurii de Comana' x 'Daria' hybrid cross has larger fruits and smaller pits, compared to the studied mother variety 'Timpurii de Comana', but also the pulp/stone ratio in favor of the pulp. It is therefore observed how the exogenous pollen partner in the pollination process positively influences the characteristics of the hybrid fruit.

Also, the firmness of the fruits of the hybrid combination as well as the average Brix value were higher compared to the results recorded by the fruits from the 'Timpurii de Comana' variety.

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