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BIOMETRICAL ASPECTS OF SOME PEACH TREE (*PERSICA VULGARIS* L.) FRUIT VARIETIES GRAFTED ON DIFFERENT ROOTSTOCKS IN THE CONDITIONS OF LUGOJ NURSERY, TIMIȘ COUNTY

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Abstract

The aim of this research was to determine the behavior of some peach varieties from other countries when grafted on rootstocks currently used in our country, in order to find variants that are suitable for cultivating this species in Banat region conditions and in the context of climate changes that have been influencing the fruiting of peach trees in recent years. The fruit weight and the fruit size index were determined. The study was conducted during the year 2017 and 2018. In 2017, the fruit weight had values between 57.31 g in the 'Gold Dust' variety and 147.0 g in the 'Elbertina' variety and the size index had values between 44.0 in 'Gold Dust' variety and 63.45 in 'Desert Gold' variety. In 2018, the fruit weight had values between 85.32 g in the DS 62-193 genotype and 149. 83g in the Piroș Magdalena variety and the size index had values between 47.33 in 'Early Red' variety and 65.99 in 'Desert Gold' variety.

Key words*: peach tree, variety, rootstock, fruit weight, size index.*

INTRODUCTION

Finding the appropriate rootstock-variety combinations is very important to any orchard. A good rootstock x variety interaction leads to high fruit yield and increased fruit quality.

While the tree vigor, shoot growth and canopy density are strongly influenced by the rootstock, these rootstock effects are not separable from the effects of light environment with in the canopy (Hrotkó K., 2013)

Our research results showed how the interaction between rootstock and variety influenced the biometric aspects of the fruits. In the past years studies on this subject were made and the results showed how fruit aspects are influenced by the interaction between rootstock and variety. We mention other researchers that studied the influence of rootstock and variety on the quality of peach fruits: Fideghelli C. and A. Nicotra, 2002; Layne D.R. et al., 2002; Venig Aurora, 2007; Mathias, C. et al., 2008; Carmen Martinez-Ballesta, M. et al., 2010; Pal M. et al., 2017. The quality of the fruits expressed by their size, appearance and taste, is very important prerequisite for their sale. A review of the fruits should include mechanical, sensorial, chemical and microbiological control, as well as remarks for the variety (Stamatovska V. et al., 2017).

Bussi, C. et al., 2011, registered values of the peach fruit weight between 114.00 g and 134.00 g on different variety x rootstock combinations. According to Andreiaș A., 2011, the same cultivar can have different fruit weight when grafted on different rootstocks, for example the weight of the fruits of 'Redhaven' variety grafted on 5 different rootstocks ranged between 142.5 g and 151.6 g while the fruits of 'Springcrest' variety ranged from 71.0 g to 75.2 g.

Others recorded the average fruit weight of the varieties grafted on different rootstocks between 241.1 g and 296.0 g (Jimenez Sergio et al., 2011), 76 g-320 g for one cultivar and 70 g-296 g for another cultivar (Basile, B. et al., 2007).

Gavăț C. et al. (2016) considered that the average fruit weight was 75 g ('Springold') and 220 g ('Flacăra clon 1'), the fruits´ destination being for fresh consumption and processing.

According to Orazem Primoz et al., 2011, significant interaction between rootstock and

cultivar on fruit weight was evident and could have been affected by different crop load among rootstocks.

MATERIALS AND METHODS

The biological material consisted of 14 peach genotypes which were less common in our country, gathered from different Earth's regions and grafted at Lugoj nursery using rootstocks that are still commonly used in Romania, especially in the western part of the country, namely, the wax cherry and Oradea. The trees were planted in the experimental field in the autumn of 2015 and by the time the study was conducted the trees were in the first years of fruiting. The planting distances were 4 x 5 m, the trees were fan shaped and the growing technology used was the one that is currently used for peach trees. The experience was the multifactorial type, the factor *a* being represented by the genotype (variety) and the factor *b* by rootstocks. The data collected were calculated and interpreted statistically using the analysis of variance, respectively the Duncan test, and the control being chosen the average of the experience. The research methods regarding the biometric characteristics of the fruit in the studied varieties and genotypes, grafted on the two chosen rootstocks are according to literature.

Thus:

The fruit height (mm) was determined by measuring with the electronic caliper a number of 25 fruits from each variant, the measurement being made when the fruits reached the technological maturity.

The fruit diameter (mm) was determined by measuring with the electronic chisel a number of 25 fruits reached the technological maturity, of each variant. The measurement was made on all fruits on two diameters.

The fruit weight (g) was determined by weighing 25 fruits on a WPS - C2 model analytical balance, the results being expressed in grams with two decimals, for each analyzed variant.

The size index was calculated by the formula IM = D + d + H/3, as an arithmetic mean of the diameters and height of the fruit.

RESULTS AND DISCUSSIONS

The combined effect of genotype and rootstock on peach fruit weight character (2017)

The fruit weight (mass) represents one of the most variable size characters in one and the same variety, depending on the age of the tree, the climatic conditions and the applied agrotechnics. Drăgănescu E. (2006) classifies peach varieties according to their large diameter and average weight as follows: small fruits, diameter below 4.5 cm and average weight below 75.0 g; medium fruit, diameter between 4.5-6.5 cm and average weight between 65-80 g; large fruits, diameter between 6.5-8.5 cm and average weight between 120-200 g.

Chira L., V. Chereji, M. Roman (2008), classifies peaches according to their average weight as follows: small (under 100 g), medium (100-175 g), large (175-250 g), very large (over 250 g).

Table 1. The interaction betwen genotype and rootstock on peach fruits weight in 2017

Factor interaction	*Fruits weight* (g)	*Relative values* (%)	*Difference* (g)	*Significance*
a_1 x b_1 – 'Gold Dust' x Wax cherry	54.53ab	60.8	-35.12	000
a_2 x b_1 – Piroş Magdalena x Wax cherry	112.71ij	125.7	23.06	**
a_3 x b_1 – 'Desert Gold' x Wax cherry	140.90k	157.2	51.25	***
a_4 x b_1 – DS 62-193 x Wax cherry	60.00abc	66.9	-29.65	000
a_5 x b_1 – 'Elbertina' x Wax cherry	136.90k	152.7	47.25	***
a_6 x b_1 – 'Poli' x Wax cherry	73.73cde	82.2	-15.92	-
a_7 x b_1 – 'Tokinostate' x Wax cherry	51.00a	56.9	-38.65	000
a_8 x b_1 – GDRT x Wax cherry	72.00cde	80.3	-17.65	0
a_9 x b_1 – 'Maria Bianca' x Wax cherry	94.72fgh	105.7	5.07	-
a_{10} x b_1 – DR 32-15 x Wax cherry	105.30hij	117.5	15.65	-
a_{11} x b_1 – 'Maria Delicia' x Wax cherry	82.17	91.7	-7.48	-
a_{12} x b_1 – HB 19-9 x Wax cherry	108.17hij	120.7	18.52	*
a_{13} x b_1 – 'Early Red' x Wax cherry	52.00a	58.0	-37.65	000
a_{14} x b_1 – 'Tebana' x Wax cherry	111.02ij	123.8	21.37	*
Media / *Average* a x b_1	89.65	100.0	0.00	Mt / *Control*

Factor interaction	*Fruits weight* (g)	*Relative values* (%)	*Difference* (g)	*Significance*
a_1 x b_2 – 'Gold Dust' x Oradea	60.09abc	58.1	-43.41	000
a_2 x b_2 – Piroş Magdalena x Oradea	121.02j	116.9	17.52	*
a_3 x b_2 – 'Desert Gold' x Oradea	148.90kl	143.9	45.40	***
a_4 x b_2 – DS 62-193 x Oradea	68.85bcd	66.5	-34.65	000
a_5 x b_2 – 'Elbertina' x Oradea	157.10l	151.8	53.60	***
a_6 x b_2 – 'Poli' x Oradea	88.30efg	85.3	-15.20	-
a_7 x b_2 – 'Tokinostate' x Oradea	80.58def	77.9	-22.92	00
a_8 x b_2 – GDRT x Oradea	79.02def	76.3	-24.48	00
a_9 x b_2 – 'Maria Bianca' x Oradea	136.80k	132.2	33.30	***
a_{10} x b_2 – DR 32-15 x Oradea	113.06ij	109.2	9.56	-
a_{11} x b_2 – 'Maria Delicia' x Oradea	93.90fgh	90.7	-9.60	-
a_{12} x b_2 – HB 19-9 x Oradea	101.10ghi	97.7	-2.40	-
a_{13} x b_2 – 'Early Red' x Oradea	58.50abc	56.5	-45.00	000
a_{14} x b_2 – 'Tebana' x Oradea	141.80kl	137.0	38.30	***
Media / *Average* a x b_2	103.50	100.0	0.00	Mt / *Control*

DL $_{(p\ 5\%)}$ *LSD* $_{(p\ 5\%)}$ = 16.13 g DL $_{(p\ 1\%)}$ *LSD* $_{(p\ 1\%)}$ = 21.75 g DL $_{(p\ 0,1\%)}$ *LSD* $_{(p\ 0,1\%)}$ = 28.98 g

Regarding the genotype-rootstock interaction (Table 1) on the fruit weight character, it was found that the lowest value was registered for the combinations: 'Tokinostate' x Wax cherry, 'Early Red' x Wax cherry, 'Gold Dust' x Wax cherry, DS 62-193 x Wax cherry, 'Early Red' x Oradea, 'Gold Dust' x Oradea and DS 62-193 x Oradea all being very significantly negative compared to the average of the experience. The 'Gold Dust' and 'Early Red' varieties obtained low weight fruit regardless of the used rootstock.

At the opposite end, the highest values of fruit weight were recorded in the following combinations: 'Elbertina' x Oradea, 'Desert Gold' x Oradea, 'Tebana' x Oradea, 'Desert Gold' x Wax cherry, 'Elbertina' x Wax cherry and 'Maria Bianca' x Oradea, all these are very significantly positive compared to the average of the experience. 'Desert Gold' and 'Elbertina' varieties obtained the heaviest fruits regardless of the used rootstock.

The combined effect of genotype and rootstock on peach fruit weight character (2018)

In 2018 (Table 2), the genotype-rootstock interaction on fruit weight character led to the following low value combinations: 'Gold Dust' x Wax cherry, DS 62-193 x Wax cherry, 'Early Red' x Wax cherry, 'Tokinostate' x Wax cherry, HB 19-9 x Oradea, DS 62-193 x Oradea, DR 32-15 x Oradea and 'Early Red' x Oradea, all being very negative compared to the average of the experience. 'Early Red' variety and DS 62-193 genotype obtained low weight fruit regardless of the used rootstock.

Table 2. The interaction betwen genotype and rootstock on peach fruits weight in 2018

Factor interaction	*Fruit weight* (g)	*Relative values* (%)	*Difference* (g)	*Significance*
a_1 x b_1 – 'Gold Dust' x Wax cherry	63.13a	62.2	-38.33	000
a_2 x b_1 – Piroş Magdalena x Wax cherry	119.68fgh	11.0	18.22	***
a_3 x b_1 – 'Desert Gold' x Wax cherry	149.25m	147.1	47.79	***
a_4 x b_1 – DS 62-193 x Wax cherry	65.05a	64.1	-36.41	000
a_5 x b_1 – 'Elbertina' x Wax cherry	141.67klm	139.6	40.21	***
a_6 x b_1 – 'Poli' x Wax cherry	87.67b	86.4	-13.79	00
a_7 x b_1 – 'Tokinostate' x Wax cherry	68.62a	67.6	-32.84	000
a_8 x b_1 – GDRT x Wax cherry	87.95b	86.7	-13.51	00
a_9 x b_1 – 'Maria Bianca' x Wax cherry	111.28ef	10.7	9.82	*
a_{10} x b_1 – DR 32-15 x Wax cherry	120.77fgh	119.0	19.31	***
a_{11} x b_1 – 'Maria Delicia' x Wax cherry	93.91bc	92.6	-7.55	-
a_{12} x b_1 – HB 19-9 x Wax cherry	117.52fg	115.8	16.06	***
a_{13} x b_1 – 'Early Red' x Wax cherry	66.53a	65.6	34.93	000
a_{14} x b_1 – 'Tebana' x Wax cherry	127.42hij	125.6	25.96	***
Media / *Average* a x b_1	101.46	100.0	0.00	Mt / *Control*

Factor interaction	*Fruit weight* (g)	*Relative values* (%)	*Difference* (g)	*Significance*
a_1 x b_2 – 'Gold Dust' x Oradea	136.37jkl	96.3	-5.29	-
a_2 x b_2 – Piroş Magdalena x Oradea	179.97o	127.0	38.31	***
a_3 x b_2 – 'Desert Gold' x Oradea	150.00m	105.9	8.34	-
a_4 x b_2 – DS 62-193 x Oradea	105.58de	74.5	-36.07	000
a_5 x b_2 – 'Elbertina' x Oradea	130.67ij	92.2	-10.99	0
a_6 x b_2 – 'Poli' x Oradea	132.87ijk	93.8	-8.79	0
a_7 x b_2 – 'Tokinostate' x Oradea	183.67o	129.7	42.01	***
a_8 x b_2 – GDRT x Oradea	170.46n	120.3	28.81	***
a_9 x b_2 – 'Maria Bianca' x Oradea	168.46n	118.9	26.80	***
a_{10} x b_2 – DR 32-15 x Oradea	113.33ef	80.0	-28.32	000
a_{11} x b_2 – 'Maria Delicia' x Oradea	147.06m	103.8	5.41	-
a_{12} x b_2 – HB 19-9 x Oradea	98.50cd	69.5	-43.16	000
a_{13} x b_2 – 'Early Red' x Oradea	123.67ghi	87.3	-17.99	000
a_{14} x b_2 – 'Tebana' x Oradea	142.60lm	100.7	0.94	-
Media / *Average* a x b_2	141.66	100.0	0.00	Mt / *Control*

DL $_{(p\ 5\%)}$ *LSD* $_{(p\ 5\%)}$ = 8.68 g DL $_{(p\ 1\%)}$ *LSD* $_{(p\ 1\%)}$ = 11.70 g DL $_{(p\ 0,1\%)}$ *LSD* $_{(p\ 0,1\%)}$ = 15.58 g

At the opposite end, the highest values of fruit weight were recorded in the following combinations: 'Tokinostate' x Oradea, Pyros Magdalena x Oradea, GDRT x Oradea, 'Maria Bianca' x Oradea, 'Desert Gold' x Wax cherry, 'Elbertina' x Wax cherry, 'Tebana' x Wax cherry, DR 32-15 x Wax cherry, HB 19-9 x Wax cherry, Piroş Magdalena x Wax cherry, all of which are very significantly positive face to control. The only variety that recorded a large fruit weight regardless of rootstock was Piroş Magdalena, the other varieties recording small fruits on Wax cherry and large on Oradea or vice versa (exp. 'Tokinostate' and HB 19-9).

The use of the Oradea rootstock in the production of biological material has resulted in obtaining fruits with an average weight of over 100 grams for most peach genotypes experienced in 2018, but nevertheless the variability of the genotypes in terms of the analyzed morphological character is medium to low.

Results concerning the influence of variety (genotype) and rootstock on fruit index size (2017)

Regarding the classification by size classes that lead to a proper appreciation of the fruits, the researchers created several scales to classify the fruits by quality classes. Thus, Mitre V. (2008) classifies the fruits of the varieties according to their size into three groups, as follows:

- extra fruits- with a diameter over 56 mm;
- first class fruits - with a diameter between 51-55 mm;
- second class fruits - with a diameter of less than 50 mm.

For a proper classification of the fruits from our experience, the table 3 comes with an average of the diameter of the peaches obtained using the two rootstocks, in the pedoclimatic conditions of the Lugoj nursery where the experience was located.

According to this classification, from Table 3 it can be observed that the studied varieties and genotypes, regardless of the rootstock used, obtained fruits that fall into the first two quality groups, extra and first class.

Table 3. The medium values of peach fruit diameter in varieties studied grafted on two rootstocks studied

Variety/ genotype	*Fruit diameter (mm) in 2017 (average)*	
	wax cherry	Oradea
'Gold Dust'	44.33	49.67
Piroş Magdalena	56.00	61.33
'Desert Gold'	62.00	67.00
DS 62-193	54.67	61.33
'Elbertina'	59.33	68.00
'Poli'	49.67	54.33
'Tokinostate'	51.00	56.33
GDRT	47.33	52.00
'Maria Bianca'	53.33	56.67
DR 32-15	57.00	60.33
'Maria Delicia'	51.	55.0
HB 19-9	55.66	62.0
'Early Red'	45.33	50.66
'Tebana'	58.33	61.66

When using Wax cherry as rootstocks, it was found that 7 of the 14 studied varieties and genotypes were able to fit in the extra fruit group ('Desert Gold', 'Elbertina', 'Tebana', DR 32-15, Pyros Magdalena, HB 19-9 and DS 62-193), 4 of them obtained first- class fruits

('Poli', 'Tokinostate', 'Maria Bianca' and 'Maria Delicia'), and four, second-class fruits ('Gold Dust', GDRT, 'Early Red' and Tebana).

When using the Oradea rootstock, 10 of the studied varieties and genotypes recorded extra quality fruits - the same as in the case of the Wax cherry to which were added those that were in the first class, while only 3 varieties were classified as first class exceeding 51 mm ('Gold Dust', GDRT and 'Early Red').

Previous studies conducted on five of the 11 varieties we addressed in this research (Iordănescu O.A. et al., 2014, 2016; Costea V., 2016) have led to a classification under these classes, the 'Elberina' variety being the only one that has obtained fruits with an average diameter of 56.16 mm. In this context, the pedoclimatic conditions of the Lugoj town, Timiș County has positively impacted the quality of the obtained fruits, at least in terms of their external features.

Regarding the combined effect of the variety (genotype) and the rootstock (Table 4) on the fruit size index, 5 combinations / Wax cherry and 6 combinations / Oradea led to low values of the indicator, all being very significantly negative, while 5 combinations on both Wax cherry and Oradea led to high values of the size index, being very significantly positive face to control (Figure 1). 'Gold Dust' and 'Early Red' varieties put their mark on the combination variety-rootstocks, the values being similar regardless the used rootstock (low values).

Table 4. The interaction betwen genotype and rootstock on fruit index size in 2017

Factor interaction	*Fruit´s index size*	*Relative values* (%)	*Difference*	*Significance*
a_1 x b_1 – 'Gold Dust' x Wax cherry	41.88a	82.4	-8.94	000
a_2 x b_1 – Piroș Magdalena x Wax cherry	53.78h	105.8	2.96	***
a_3 x b_1 – 'Desert Gold' x Wax cherry	61.11m	120.2	10.29	***
a_4 x b_1 – DS 62-193 x Wax cherry	51.78g	101.9	0.96	-
a_5 x b_1 – 'Elbertina' x Wax cherry	56.99k	112.1	6.17	***
a_6 x b_1 – 'Poli' x Wax cherry	48.22de	94.9	-2.60	000
a_7 x b_1 – 'Tokinostate' x Wax cherry	47.11cd	92.7	-3.71	000
a_8 x b_1 – GDRT x Wax cherry	45.44b	89.4	-5.38	000
a_9 x b_1 – 'Maria Bianca' x Wax cherry	50.55f	99.5	-0.27	-
a_{10} x b_1 – DR 32-15 x Wax cherry	55.55ij	109.3	4.73	***
a_{11} x b_1 – 'Maria Delicia' x Wax cherry	49.22e	96.9	-1.60	0
a_{12} x b_1 – HB 19-9 x Wax cherry	52.10g	102.5	1.28	-
a_{13} x b_1 – 'Early Red' x Wax cherry	41.99a	82.6	-8.83	000
a_{14} x b_1 – 'Tebana' x Wax cherry	55.77ijk	109.7	4.95	***
Media / *Average* a x b_1	50.82	100.0	0.00	Mt / *Control*
a_1 x b_2 – 'Gold Dust' x Oradea	46.11bc	83.3	-9.24	000
a_2 x b_2 – Piroș Magdalena x Oradea	60.99m	110.2	5.64	***
a_3 x b_2 – 'Desert Gold' x Oradea	65.78o	118.8	10.43	***
a_4 x b_2 – DS 62-193 x Oradea	56.22jk	101.6	0.87	-
a_5 x b_2 – 'Elbertina' x Oradea	64.44n	116.4	9.09	***
a_6 x b_2 – 'Poli' x Oradea	51.77g	93.5	-3.58	000
a_7 x b_2 – 'Tokinostate' x Oradea	51.89g	93.7	-3.46	000
a_8 x b_2 – GDRT x Oradea	48.78e	88.1	-6.57	000
a_9 x b_2 – 'Maria Bianca' x Oradea	54.77hi	98.9	-0.58	-
a_{10} x b_2 – DR 32-15 x Oradea	58.77l	106.2	3.42	***
a_{11} x b_2 – 'Maria Delicia' x Oradea	52.33g	94.5	-3.02	000
a_{12} x b_2 – HB 19-9 x Oradea	56.33jk	101.8	0.98	-
a_{13} x b_2 – 'Early Red' x Oradea	46.66bc	84.3	-8.69	000
a_{14} x b_2 – 'Tebana' x Oradea	60.10m	108.6	4.75	***
Media / *Average* a x b_2	55.35	100.0	0.00	Mt / *Control*

DL $_{(p\ 5\%)}$ *LSD* $_{(p\ 5\%)}$ = 1.29 DL $_{(p\ 1\%)}$ *LSD* $_{(p\ 1\%)}$ = 1.74 DL $_{(p\ 0,1\%)}$ *LSD* $_{(p\ 0,1\%)}$ = 2.32

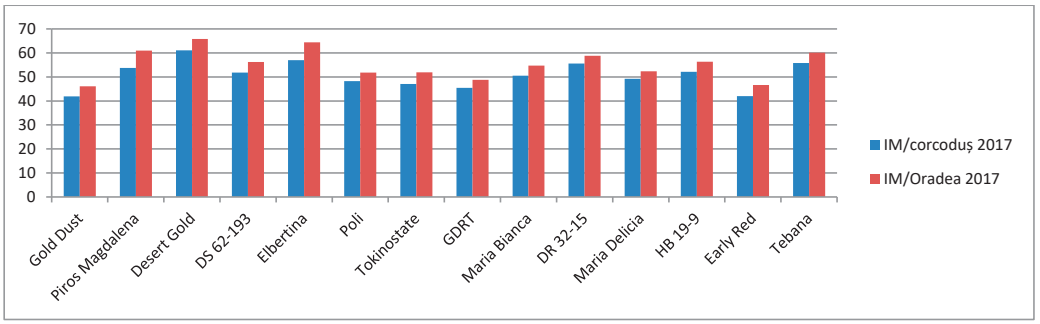

Figure 1. Fruit index size in 2017

Results concerning the influence of variety (genotype) and rootstock on fruit index size (2018)

In Table 5 are presented the medium values of peach fruit diameter, with a limit of variation between 56.66 mm in 'Gold Dust'/ wax cherry and 72.00 mm in 'Elbertina'/Oradea.

Table 5. The medium values of peach fruit diameter in the studied varieties grafted on two rootstocks

Variety/genotype	*Fruit diameter (mm) in 2018 (average)*	
	wax cherry	Oradea
'Gold Dust'	46.66	55.00
Piros Magdalena	57.67	66.33
'Desert Gold'	65.33	70.33
DS 62-193	57.33	66.33
'Elbertina'	64.00	72.00
'Poli'	53.00	60.00
'Tokinostate'	53.67	62.33
GDRT	50.67	57.33
'Maria Bianca'	55.67	61.00
DR 32-15	59.67	64.67
'Maria Delicia'	55.33	58.33
HB 19-9	57.66	66.0

The combined influence of the variety/rootstock combination on the value of the size index in 2018 led to very significantly negative values for 3 combinations/Wax cherry and 3 combinations/Oradea, the genetic imprint of the variety being observed, 'Gold Dust', 'Early Red' and GDRT recording the lowest values on both rootstocks.

The combinations that led to high values of the size index aimed the 'Desert Gold', 'Elbertina' and 'Tebana' varieties, all combinations being very significantly positive face to control.

The results obtained with the Duncan test (Table 6), for the year 2018, group the combinations variety - rootstock according to the size index value, as follows:

- small fruit varieties: 'Gold Dust' x Wax cherry, 'Early Red' x Wax cherry, GDRT x Wax cherry, 'Gold Dust' x Oradea, 'Early Red' x Oradea;
- small to medium fruit varieties: 'Tokinostate' x Wax cherry, 'Gold Dust' x Oradea, 'Poli' x Wax cherry, GDRT x Oradea;
- medium fruit varieties: 'Maria Bianca' x Wax cherry, 'Maria Delicia' x Wax cherry, DS 62-193 x Wax cherry, Piroș Magdalena x Wax cherry, HB 19-9 x Wax cherry, 'Tokinostate' x Oradea, 'Poli' x Oradea;
- supra-medium fruit varieties: 'Maria Delicia' x Oradea, 'Maria Bianca' x Oradea, DR 32-15 x Wax cherry, DS 62-193 x Oradea, 'Tebana' x Wax cherry, HB 19-9 x Oradea, 'Elbertina' x Wax cherry;
- large and very large fruit varieties: 'Desert Gold' x Wax cherry, Piroș Magdalena x Oradea, 'Tebana' x Oradea, 'Desert Gold' x Oradea, 'Elbertina' x Oradea.

In 2018, the values of the fruit index size (Figure 2) in the studied peach varieties and genotypes recorded higher values compared to the previous year, Oradea rootstock being the one that led to obtaining the highest values. Regarding the genetic imprint of the variety, 'Elbertina' variety slightly exceeded the value of 'Desert Gold' variety, followed by 'Tebana' and 'Piroș Magdalena' but also by the genotype DR 32-15 which exceeded the value of 60 mm.

From the graphs we can see an increase of the size index 2018 compared to 2017, maintaining the upward evolution of the variety/rootstock combination, Oradea proving to be a good alternative for the experimentation conditions.

Table 6. The interaction between genotype and rootstock on fruits size index in 2018

Factor interaction	*Fruit index size*	*Relative values* (%)	*Difference*	*Significance*
a_1 x b_1 – 'Gold Dust' x Wax cherry	44.55a	82.5	-9.48	000
a_2 x b_1 – Piroş Magdalena x Wax cherry	55.11fghi	102.0	1.08	-
a_3 x b_1 – 'Desert Gold' x Wax cherry	63.99n	118.4	9.96	***
a_4 x b_1 – DS 62-193 x Wax cherry	54.55fgh	101.0	0.52	-
a_5 x b_1 – 'Elbertina' x Wax cherry	61.77lmn	114.3	7.75	***
a_6 x b_1 – 'Poli' x Wax cherry	50.78cde	94.0	-3.25	0
a_7 x b_1 – 'Tokinostate' x Wax cherry	50.11cd	92.7	-3.92	00
a_8 x b_1 – GDRT x Wax cherry	48.00bc	88.8	-6.03	000
a_9 x b_1 – 'Maria Bianca' x Wax cherry	53.77efg	99.5	-0.26	-
a_{10} x b_1 – DR 32-15 x Wax cherry	58.89jkl	109.0	4.86	***
a_{11} x b_1 – 'Maria Delicia' x Wax cherry	53.99efg	99.9	-0.04	-
a_{12} x b_1 – HB 19-9 x Wax cherry	55.32fghi	102.4	1.29	-
a_{13} x b_1 – 'Early Red' x Wax cherry	45,11ab	83.5	-8.92	000
a_{14} x b_1 – 'Tebana' x Wax cherry	60.44klm	111.9	6.41	***
Average a x b_1	54.03	100.0	0.00	Mt / *Control*
a_1 x b_2 – 'Gold Dust' x Oradea	50.18cd	84.4	-9.28	000
a_2 x b_2 – Piroş Magdalena x Oradea	64.55n	108.6	5.09	***
a_3 x b_2 – 'Desert Gold' x Oradea	67.99o	114.3	8.53	***
a_4 x b_2 – DS 62-193 x Oradea	60.22klm	101.3	0.76	-
a_5 x b_2 – 'Elbertina' x Oradea	68.44o	115.1	8.98	***
a_6 x b_2 – 'Poli' x Oradea	56.89ghij	95.7	-2.57	-
a_7 x b_2 – 'Tokinostate' x Oradea	56.66ghij	95.3	-2.80	0
a_8 x b_2 – GDRT x Oradea	53.11def	89.3	-6.35	000
a_9 x b_2 – 'Maria Bianca' x Oradea	58.22ijk	97.9	-1.24	-
a_{10} x b_2 – DR 32-15 x Oradea	63.31mn	106.5	3.85	**
a_{11} x b_2 – 'Maria Delicia' x Oradea	57.88hijk	97.3	-1.58	-
a_{12} x b_2 – HB 19-9 x Oradea	60.66klm	102.0	1.20	-
a_{13} x b_2 – 'Early Red' x Oradea	49.55c	83.3	-9.91	000
a_{14} x b_2 – 'Tebana' x Oradea	64.77n	108.9	5.31	***
Average a x b_2	59.46	100.0	0.00	Mt / *Control*

DL $_{(p\ 5\%)}$ *LSD* $_{(p\ 5\%)}$ = 2.68 DL $_{(p\ 1\%)}$ *LSD* $_{(p\ 1\%)}$ = 3.61 DL $_{(p\ 0,1\%)}$ *LSD* $_{(p\ 0,1\%)}$ = 4.80

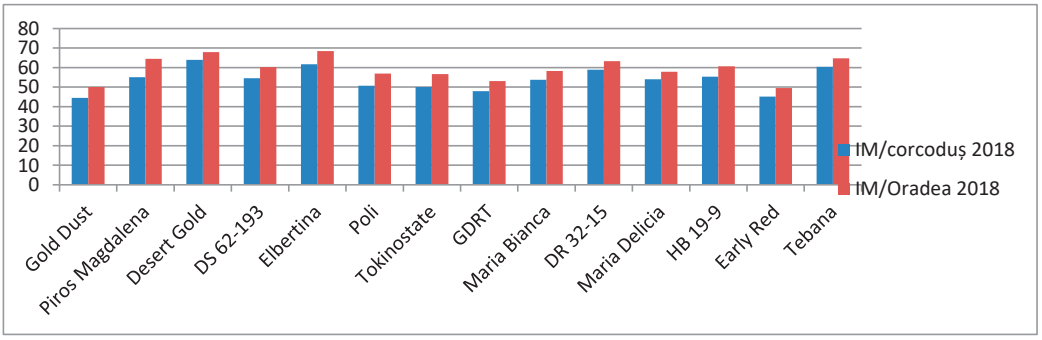

Figure 2. The fruit index size in 2018

CONCLUSIONS

Fruit weight is an important parameter, being closely correlated with the fruit size index. Following this parameter, based on the data obtained and depending on the variety (genotype) - rootstock combination, peach fruits can be grouped:

- low weight: 'Early Red' x Wax cherry, 'Early Red' x Oradea, 'Gold Dust' x Wax cherry, 'Gold Dust' x Oradea, DS 62-193 x Wax cherry, DS 62-193 x Oradea, 'Poli' x Wax cherry, 'Poli' x Oradea , GDRT x Wax cherry, GDRT x Oradea, 'Maria Delicia' x Wax cherry;
- with average weight: 'Maria Bianca' x Wax cherry, DR 32-15 x Wax cherry, DR 32-15 x Oradea, HB 19-9 x Oradea, HB 19-9 x Wax cherry, Piroș Magdalena x Wax cherry;
- heavy weight: 'Elbertina' x Wax cherry, 'Elbertina' x Oradea, 'Desert Gold' x Wax cherry, 'Desert Gold' x Oradea, 'Tebana' x Oradea, 'Maria Bianca' x Oradea, GDRT x Oradea, 'Piroș Magdalena' x Oradea, 'Tokinostate' x Oradea.

Based the size index, the fruits of the peach varieties (genotypes), depending on the variety - rootstock combination, can be grouped into:

- varieties with small fruits: 'Gold Dust' x Wax cherry, 'Gold Dust' x Wax cherry, 'Early Red' x Wax cherry, 'Early Red' x Oradea, GDRT x Wax cherry, GDRT x Oradea, 'Maria Delicia' x Wax cherry, 'Maria Bianca' x Wax cherry, Poly x Wax cherry;
- medium fruit varieties: 'Poli' x Oradea, DS 62-193 x Oradea, DS 62-193 x Wax cherry, HB 19-9 x Wax cherry, HB 19-9 x Oradea;
- varieties with large fruits 'Tebana' x Oradea, Piroș Magdalena x Oradea, 'Desert Gold' x Oradea, 'Elbertina' x Oradea.

REFERENCES

Cosmulescu Sina, A.A. Baciu (2003). Pomologie, Indrumător de lucrări practice. University of Craiova Typography.

Drăgănescu E. (2006). *Fructele Terrei - alimente, medicamente, cosmetice.* Timișoara, Mirton Publishing.

Mitre V. (2008). *Pomologie.* Cluj Napoca, Todesco Publishing.

Andreiaș, A. (2011). *Interactions between Rootstock and Scion Growth and Productivity of Peach*, IX International Symposium on Integrating Canopy, Rootstock and Environmental Physiology in Orchard: Acta Horticulturae, Volume: 903, Pages: 507-511.

Baciu A., Sina Cosmulescu, I. Botu, M. Gruia, Floriana Vișanu (2009). *Research on new generative rootstocks for peach trees* (*Prunus persica* L. Batsch.), Bulletin of University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, nr. 66(1), pg 115-119.

Basile, B., Solari, L.I., Dejong, T. M. (2007). *Intra-canopy variability of fruit growth rate in peach trees grafted on rootstocks with different vigour-control capacity,* Journal of Horticultural Science & Biotechnology, Volume: 82, Issue: 2, Pages: 243-256.

Bussi, C., Huguet, JG., Besset, J., Girard, T. (2011). *Rootstock effects on the growth and fruit yield of peach,* European Journal of Agronomy, Volume: 4, Issue: 3, Pages: 387-393.

Carmen Martinez-Ballesta, M., Alcaraz-Lopez, C., Muries, B., Mota-Cadenas, C., Carvajal, M. (2010). *Physiological aspects of rootstock-scion interactions*, Scientia Horticulturae, Volume: 127 Issue: 2, 112-118.

Costea (Murgu) Viorica Adriana, Olimpia Alina Iordănescu (2016). *The behaviour of some peach tree varieties belonging to the word collection concerning growing and fructification phenophases*, Journal of Horticulture, Forestry and Biotechnology, ISSN 2066-1797, vol. 20(1).

Fideghelli C., A. Nicotra (2002). *The italian national peach cultivar and rootstock trial*, Acta Horticulturae, nr 592, 331-334.

Gavăț C, Dumitru L. M., Dima V., Șeptar L., Moale C., Opriță V. A. (2016). *Study regarding the productivity of some peach varieties*, Scientific Papers. Series B, Horticulture. Vol. LX, Print ISSN 2285-5653, Online ISSN 2286-1580.

Hrotkó K (2013). *Development in fruit trees production systems,* AgroLife Scientific Journal - Volume 2, Number 1, ISSN 2285-5718; ISSN ONLINE 2286-0126.

Iordănescu Olimpia Alina, Adriana Costea (Murgu), Diana Todor Brădean , Daniela Olaru (2014). *The behavior of some peach cultivars belonging to the peach world collection concerning productivity and quality of fruits in pedoclimatic conditions of Timișoara area*, Horticulture in quality and culture of life, Lednice, Czech Republic, sep. 23-26.

Jimenez, S., Pinochet, J., Romero, J., Gogorcena, Y., Moreno, M.A., Espada, J.L. (2011). *Performance of peach and plum based rootstocks of different vigour on a late peach cultivar in replant and calcareous conditions*, Scientia Horticulturae, Volume 129, Issue 1, Pages 58-63.

Layne D.R., D.B. Cox, E.J. Hitzler (2002). *Peach systems trial: the influence of trening system, tree density, rooststock, irrigation and fertility on growth and yield of young trees in South Carolina",* Acta Horticulturae, nr.592, 367-375.

Mathias, C., Mayer, N.A., Mattiuz, B.H., Pereira, F.M. (2008). *Effect of rootstocks and tree spacing on 'Aurora-1' peach quality*, Revista Brasiliera de Fructicultura, Volume 30, Issue 1, Pages 165-170.

Orazem, P., Stampar, F., Hudina, M. (2011). *Fruit Quality of Redhaven and Royal Glory Peach Cultivars on Seven Different Rootstocks*, Journal of Agricultura Food, Volume 59, Issue 17, Pages 9394-9401.

Pal Monica Diana, I. Mitre, A. Asănică, A. Sestraș, A. Peticilă, V. Mitre (2017). *The Influence of Rootstock on the Growth and Fructification of Cherry Cultivars in a High Density Cultivation System*, Notulae Botanicae Horti Agrobotanici, Volume 45, Issue 2, 451-457.

Stamatovska V., Karakasova Lj., Nakov G., Kalevska T., Menkinoska M., Blazevska T. (2017). *Examination of the pomological characteristics and the presence of heavy metals in the peach cultivar ''Cresthaven'' from Republic of Macedonia*, Scientific Papers. Series B, Horticulture, Vol. LXI, Online ISSN 2286-1580.

Vening Aurora (2007). *Research on the new parent stocks selection for the peach species*, Lucrări ştiinţifice, Seria Horticultură, Anul L (50), Ed. Ion Ionescu de la Brad, Iași, 757-762.