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EVALUATION OF SOME SCION/ROOTSTOCK COMBINATIONS REGARDING THE GROWTH OF SOME PLUM VARIETIES

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Abstract

This paper evaluated the growth of some varieties of plum in the central region of Oltenia, depending on the scion/rootstock combination. During the 2012-2014 period, within a plantation located in the proximity of Craiova City, three plum varieties were studied: 'Carpatin', 'Vâlcean', 'Tita', grafted on 4 rootstocks – 'Oteșani 8', 'Pixy', 'Miroval', 'Roșior văratic', and the trunk section area (TSA), the crown diameter, the crown volume, the height of trees and the degree of land occupancy were monitored. After the three years of research, depending on the given points, it was found out that 'Vâlcean' variety presented medium growth vigour, while the varieties 'Carpatin' and 'Tita' recorded low growth vigour. Among the studied rootstocks, it was noticed that the 'Miroval' rootstock produced higher growth vigour to all three plum varieties.

Cuvinte cheie: soi, altoi, portaltoi, vigoare
Key words: variety, scion, rootstock, vigour

1. Introduction

The plum being adapted to the most various conditions of climate and soil and having the technological conditions much diminished as compared to other fruit species, will continue to further populate the hillside areas where, during hundreds of years, were formed and survived some of the most valuable varieties of plum ('Grase românești', 'Tuleu gras', 'Vinete românești' etc.) (Chira and Hoza, 2007).

Botu and Achim (2004), studying the manner of behaviour of the scion/rootstock combination depending on the type of soil, found out that these had a major influence on the production of fruits, their quality, as well as their growth vigour.

The classification of plum varieties according to the growth vigour (based on the area of the trunk's section, the crown's volume, the crown's diameter and the height of trees) emphasised that most of the plum varieties in the Sub-Carpathian region of Oltenia fell under the group of average vigour (Botu, 2007).

It is obvious the influence of the variety, rootstock and the scion/rootstock combination on the production of fruits, the effect being very significantly positive (Cichi, 2013).

2. Material and methods

In a plum plantation established in the year 2000 in the proximity of Craiova City, during the 2012-2014 period, a series of researches regarding the growth of three varieties of plum ('Carpatin', 'Vâlcean', 'Tita'), grafted on four rootstocks ('Oteșani 8', 'Pixy', 'Miroval', 'Roșior văratic') were carried out.

The plantation was located on a reddish slightly pseudogleyed preluvosol, with slightly acid reaction (pH: 5.50-6.64) and humus content of 2.35% in the surface horizon.

The plantation distance was of 4m/4m, and the crown form is constituted by the improved vase. For the 12 scion/rootstock combinations resulted the following biometric measurements were performed: trunk circumference, trunk height, tree height and crown diameter both between the trees in the row and between the rows (inter-rows).

With the help of ANOVA statistics programmes the average values of the area of the trunk section, the crown diameter, the crown volume, the trees height and the degree of land occupancy were calculated.

3. Results and discussions

The variety '**Carpatin'** presents an average value of the trunk section area of 144 cm^2 (table 1). The maximum value was obtained for the 'Carpatin/Miroval' combination (175 cm^2), the minimum at the 'Carpatin/Oteşani 8' combination (112 cm^2). The other two combinations presented values close to the average, 148 cm^2 ('Carpatin/Pixy') and 141 cm^2 ('Carpatin/Roşior văratic'), respectively.

As compared to the 'Carpatin/Miroval' combination, considered the control group, there were negative and highly significant differences: -63 cm^2 ('Carpatin/Oteşani 8'), -34 cm^2 ('Carpatin/Roşior văratic'), -27 cm^2 ('Carpatin/Pixy') şi –31 cm^2, respectively (as compared to the average).

The average diameter of the crown was 337 cm, with the following recorded values: 308 cm ('Carpatin/Oteşani 8'), 331 cm ('Carpatin/Miroval'), 348 cm ('Carpatin/Roşior văratic') and 360 cm ('Carpatin/Pixy') (table 2).

The average height of the trees was 377 cm, the values recorded in the four combinations being close to the average, respectively: 373 cm ('Carpatin/Pixy'), 374 cm ('Carpatin/Oteşani 8' and 'Carpatin/Miroval') and 387 cm ('Carpatin/Roşior văratic').

The average volume of the crown was of 27 m^3, the greatest value being recorded in the 'Carpatin/Pixy' and 'Carpatin/Roşior văratic' combinations (30 m^3), and the lowest in the 'Carpatin/Oteşani 8' combination (23 m^3). The 'Carpatin/Miroval' combination registered a value of 26 m^3.

The average degree of land occupancy was of 55.7%, the values being as follows: 46.5% ('Carpatin/Oteşani 8'), 53.7% ('Carpatin/Miroval'), 59.4% ('Carpatin/Roşior văratic') and 63.5% ('Carpatin/Pixy').

The variety '**Vâlcean'** records an average value of the trunk section area of 225 cm^2 (table 3). The highest value is found when grafting on the rootstock 'Miroval' (330 cm^2), followed by the 'Vâlcean/Pixy' (258 cm^2), 'Vâlcean/Roşior văratic' (170 cm^2) and 'Vâlcean/Oteşani 8' (143 cm^2) combinations.

When it is considered the 'Vâlcean/Miroval' combination as control group, there are found out negative differences very significant, as it follows: -187 cm^2 ('Vâlcean/Oteşani 8'), -160 cm^2 ('Vâlcean/Roşior văratic'), -72 cm^2 ('Vâlcean/Pixy') and –105 cm^2 (as compared to the average).

The diameter of the crown records an average value of 349 cm, the individual values, depending on the scion/rootstock combination, being as follows: 297 cm ('Vâlcean/Oteşani 8'), 334 cm ('Vâlcean/Roşior văratic'), 364 cm ('Vâlcean/Pixy') and 399 cm ('Vâlcean/Miroval') (table 4).

The height of the trees presents the following values: 383 cm (when grafting on 'Oteşani 8'), 391 cm (when grafting on 'Roşior văratic') and 457 cm (when grafting on rootstocks 'Pixy' and 'Miroval'). The average value of the four combinations is of 422 cm.

The average volume of the crown is of 34 m^3, having values comprised between 21 m^3 ('Vâlcean/Oteşani 8'), 28 m^3 ('Vâlcean/Roşior văratic'), 40 m^3 ('Vâlcean/Pixy') and 47 m^3 ('Vâlcean/Miroval'). The degree of land occupancy is on average 59.7%, the highest value being recorded in the 'Vâlcean/Miroval' combination (78.1%), followed by the 'Vâlcean/Pixy' (65.0%), 'Vâlcean/Roşior văratic' (54.7%) and 'Vâlcean/Oteşani 8' (43.,2%) combinations.

The trunk section area in the variety '**Tita'** has the average value of 142 cm^2 (table 5), its variations being comprised between 105 cm^2 ('Tita/Oteşani 8') and 187 cm^2 ('Tita/Miroval'). The 'Tita/Pixy' combination has the area of the trunk section of 140 cm^2, and the 'Tita/Roşior văratic' combination 134 cm^2.

As compared to the control group 'Tita/Miroval', statistically are found out negative differences highly significant, with the following values: -82 cm^2 ('Tita/Oteşani 8'), -53 cm^2 ('Tita/Roșior văratic'), -47 cm^2 ('Tita/Pixy') and –45 cm^2 (average of biosystems).

The average value of the crown in these combinations is of 353 cm, having the following values: 308 cm ('Tita/Oteşani 8'), 352 cm ('Tita/Roşior văratic'), 359 cm ('Tita/Pixy') and 393 cm ('Tita/Miroval') (table 6).

The scion/rootstock combination present trees with the average height of 397 cm, the highest value being met in the 'Tita/Miroval' combination (443 cm), and the lowest in the 'Tita/Pixy' combination (376 cm).

When it is used the rootstock 'Roşior văratic', the height of the trees is of de 381 cm, and when it is used the rootstock 'Oteşani 8' the height is of 388 cm.

The crown of the trees, within the four combinations, is on average 34 m^3. The values registered on each combination are as follows: 25 m^3 ('Tita/Oteşani 8'), 31 m^3 ('Tita/Roşior văratic'), 32 m^3 ('Tita/Pixy') and 46 cm^2 ('Tita/Miroval').

The degree of land occupancy is on the average 61.1%, with the following values specific to each combination: 46.5% ('Tita/Oteşani 8'), 60.7% ('Tita/Roşior văratic'), 63.2% ('Tita/Pixy') and 75.7% ('Tita/Miroval').

After the three years of research, depending on the given points, it was found out that 'Vâlcean' variety presents medium growth vigour, while the varieties 'Carpatin' and 'Tita' recorded low growth vigour (table 7).

4. Conclusions

The rootstock had a great influence on the on the variety, therefore the highest growth vigour was noticed in the grafting on the 'Miroval' rootstock , followed by the rootstocks 'Pixy' and 'Roșior văratic', while the 'Oteșani 8' rootstock gave the lowest growth vigour.

As compared to the 'Miroval' rootstock, considered as control group, the trunk section area showed highly significant and negative differences in all the studied scion/rootstock combinations.

The average values of the trunk section area varied between 225 cm^2 in the 'Vâlcean' variety and 142 cm^2 in the 'Tita' variety.

The average value of the crown diameter varied between 353 cm ('Tita') and 337 cm ('Carpatin'), and within the scion/rootstock combination, the highest value was found in the 'Vâlcean/Miroval' combination (399 cm), and the lowest value in 'Vâlcean/Oteșani 8' one (297cm).

The average height of the trees ranged between 422 cm in the variety 'Vâlcean' and 377 cm in the variety 'Carpatin', and the crown volume had average values ranging between 34 m^3 in varieties 'Tita' and 'Vâlcean', and 27 m^3 in the 'Carpatin' variety, respectively.

The degree of land occupancy presented low average values in the variety 'Carpatin' (55.7%), in the variety 'Vâlcean' the obtained value being 59.7%, and in the 'Tita' variety of 61.1%;

As result of the low degree of land occupancy, we found out that we could decrease the planting distance, the studied varieties being also adapted for higher densities.

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Tables

Table 1. The trunk section area depending on scion/rootstock combination for 'Carpatin' plum variety (2012-2014)

No.	Scion / rootstock	TSA (cm^2)	Difference +/-	Significance
1.	Carpatin / Oteşani 8	112	-63	000
2.	Carpatin / Pixy	148	-27	000
3.	Carpatin / Miroval (Control)	175	-	Control
4.	Carpatin / Roșior văratic	141	-34	000
average		**144**	**-31**	**000**

5 % least significant difference (LSD) = 2.1 cm^2; 1 % LSD = 3.1 cm^2; 0.1 % LSD = 4.6 cm^2

Table 2. Characteristics of the growth depending on scion/rootstock combination for 'Carpatin' plum variety (2012-2014)

No.	Scion / rootstock	Biometrical measurements			
		The crown diameter (cm)	Height trees (cm)	The crown volume (m^3)	The degree of land occupancy (%)
1.	Carpatin / Oteşani 8	308	374	23	46,5
2.	Carpatin / Pixy	360	373	30	63,5
3.	Carpatin / Miroval (Control)	331	374	26	53,7
4.	Carpatin / Roșior văratic	348	387	30	59,4
Average		**337**	**377**	**27**	**55,7**

Table 3. The trunk section area depending on scion/rootstock combination for 'Vâlcean' plum variety (2012-2014)

No.	Scion / rootstock	TSA (cm^2)	Difference +/-	Significance
1.	Vâlcean / Oteşani 8	143	-187	000
2.	Vâlcean / Pixy	258	-72	000
3.	Vâlcean / Miroval (Control)	330	-	Mt
4.	Vâlcean / Roșior văratic	170	-160	000
Average		**225**	**-105**	**000**

5 % LSD = 5.8 cm^2; 1 % LSD = 8.4 cm^2; 0.1 % LSD = 12.6 cm^2

Table 4. Characteristics of the growth depending on scion/rootstock combination for 'Vâlcean' plum variety (2012-2014)

No.	Scion / rootstock	Biometrical measurements			
		The crown diameter (cm)	Height trees (cm)	The crown volume (m^3)	The degree of land occupancy (%)
1.	Vâlcean / Oteşani 8	297	383	21	43.2
2.	Vâlcean / Pixy	364	457	40	65.0
3.	Vâlcean / Miroval (Control)	399	457	47	78.1
4.	Vâlcean / Roșior văratic	334	391	28	54.7
Average		**349**	**422**	**34**	**59.7**

Table 5. The trunk section area depending on scion/rootstock combination for 'Tita' plum variety (2012-2014)

No.	Scion / rootstock	TSA (cm^2)	Difference +/-	Significance
1.	Tita / Oteşani 8	105	-82	000
2.	Tita / Pixy	140	-47	000
3.	Tita / Miroval (Control)	187	-	Mt
4.	Tita / Roșior văratic	134	-53	000
Average		**142**	**-45**	**000**

5 % LSD = 4.3 cm^2; 1 % LSD = 6.2 cm^2; 0.1 % LSD = 9.3 cm^2

Table 6. Characteristics of the growth manner depending on scion/rootstock combination for 'Tita' plum variety (2012-2014)

No.	Scion / rootstock	Biometrical measurements			
		The crown diameter (cm)	Height trees (cm)	The crown volume (m^3)	The degree of land occupancy (%)
1.	Tita / Oteşani 8	308	388	25	46.5
2.	Tita / Pixy	359	376	32	63.2
3.	Tita / Miroval (Control)	393	443	46	75.7
4.	Tita / Roșior văratic	352	381	31	60.7
Average		**353**	**397**	**34**	**61.1**

Table 7. Establishing the growth vigour of the varieties depending on the dimensional elements and granted points

No.	Variety	TSA (cm^2)	The degree of land occupancy (%)	The growth manner
1.	Carpatin	144	55.7	low
2.	Vâlcean	225	59.7	medium
3.	Tita	142	61.1	low