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ORCHARD EVALUATION OF CHERRY VARIETY-ROOTSTOCK ASSOCIATIONS IN THE SECOND YEAR AFTER PLANTING

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ABSTRACT

The cherry is a fruit tree with economic importance, due to its nutritional proprieties, technological and commercial, in Romania finding good conditions for growth and production. The study was conducted at Research Station for Fruit Growing Constanta (RSFG Constanta), in a cherry plot planted in 2020. The objective of the study was to evaluate the orchard, in the climatic conditions of the South-East Romania of some cultivar/rootstock combinations. Ten cherry cultivars, created in Romania, or newly introduced in our country were studied, grafted on two vegetative rootstocks: IPC5 and IPC7. In the two years of the study (2021-2022), observations were made on growth vigor, tree height and on the number of anticipated shoots for each combination studied cultivar/rootstock. In terms of growth vigor, the highest average trunk diameter was recorded for the Daria/IPC7 30.56 mm. The highest average length of shoots was noted in the cherry cultivars Cociuvas and Daria grafted on the rootstock IPC7, which were 129 cm and 118 cm, respectively.

INTRODUCTION

The cherry is an economically important fruit species, due to its nutritional, technological, and commercial properties, and in Romania it finds good growing and production conditions (Cociu 1990). The territory of our country is within the limits of the geographical area of formation of the species, which determines a wide spread and possibilities of exploitation of the soil and climatic conditions specific to steppe, forest, hill and even sub mountainous areas.

Cherries can be harnessed in various ways. Fruits are highly appreciated in the food industry, wood is used in the production of furniture, handicraft, leaves and tails are used for medical purposes. Cherry is also considered a special ornamental tree, due to its flowers (Chira & Asănica 2006). For a better marketing, the parameters that must be taken into account are: the firmness that is indispensable for the fruits to reach the markets abroad (Glenn G., Paovaianh B.,).

The share of cherry production made in Romania, in ensemble the one obtained in Europe according to EEC statistics is about 7% respectively 60.000 t/year, and the export of fresh fruit is fluctuating and limited (FAO date, 2003).
Cherries are the first fresh fruit of the spring and are appreciated by consumers for their high content of vitamins, mineral salts, easily assimilated sugars and pleasant, refreshing taste. They are considered a typical dessert fruit and are eaten as such

and are classified as a luxury fruit in most countries of the world, being sold at a high price. In our country, the ripening of cherries begins in the first decade of May and lasts until the second decade of July (Asănică 2013).

As the varieties approach the maturity of consumption, the size of the fruit and the soluble dry substance is increasing (Sarbu et. al 2009), and the colour of the fruit's establishment of the optimal time for harvesting (Petre 2006, Rudi 1991, Vulpe 1995). There are significant advances in cultivation technology, due to the introduction of rootstocks that induce tow vigoro to trees, auto fertile, productive and qualitative varieties (Christensen 1972).

The work has as objective the behaviour in the orchard of some variety/rootstock combinations in the climatic conditions of the south-east Romania. Introduction of new rootstocks vegetative for cherry and sour cherry for use as potential genitors. The work aims to enrich the existing germplasm found and to promote rootstocks in future cultures.

Also, the work aims at reorganizing the collections of rootstocks, existing at RSFG Constanta, which will be the basic of future amelioration projects, with purpose to orient the commercial fruit trees crops towards a high technological level.

MATERIALS AND METHODS

The experimental lot is located within the RSFG Constanta and was established in the spring of 2021. Ten cherry varieties grafted on two vegetative rootstocks (IPC5 and IPC7), were taken in study (Table 1). Seven fruit trees were planted from each variety/ rootstock combination, with 140 trees in the experience.

The planting distance used was 4 m x 3m, with the fruit trees being directed in the form of an ameliorated vessel. During the two years of the study (2021-2022), were collected data on the increase in trunk thickness (mm) by measuring the diameter with the calliper 50 cm from in point of grafting; date of the average height of trees (cm) measured from the point of grafting to the highest point of the tree.

Table 1

Variety/rootstock combinations studied, Valu lui Traian

No.	Variety	Rootstock	Provenance of planting material
1.	Andreiaș	IPC5/IPC7	ICDP Pitesti Mărăcineni
2.	Cociuvaș	IPC5/IPC7	
3.	Daria	IPC5/IPC7	
4.	Ludovan	IPC5/IPC7	
5.	Kordia	IPC5/IPC7	
6.	Regina	IPC5/IPC7	
7.	Severin	IPC5/IPC7	
8.	Gorgeous	IPC5/IPC7	
9.	Sweet heart	IPC5/IPC7	
10.	Tempting	IPC5/IPC7	

The vegetative rootstocks used for fruit tree grafting were created at RIFG Pitesti Maracineni and are characterize by:

IPC5 – Induces the grafted varieties medium vigor, slow entry on the fruit and the economic productions obtained from 7-8th year after planting. It has good compatibility when grafting with a wide range of cherry varieties. Shows resistance to root asphyxiation when planted on heavier soils, it is suitable for clay loam soils and hilly areas.

IPC7 – It induces to the grafted varieties a medium vigor precocity of bearing constant and high level of production being also recommended for the establishment of intensive cherry orchards. It has good compatibility when grafting with cherry varieties having no problems of late incompatibility in the orchard (Mazilu C., 2014).

RESULTS AND DISCUSSIONS

Climate data recorded in the years of study: The climate date was recorded using the IMT300 weather station. The minimum and maximum average temperatures during May-August during the two years of study are shown in Table 2.

During the study period at SCDP Constanta (2021-2022), the minimum air temperature was between 1.1°C and 2.42°C. The highest temperatures were recorded in the first decade of August, the values reaching 38.5°C. The largest amounts of water from precipitation were recorded in 2021 in June (124.2 mm). The water deficit was supplanted by irrigation applied during the growing season of the fruit trees.

Table 2

Average minimum and maximum temperatures recorded in May-August, 2021-2022, Valu lui Traian

Year	Moon	Temperature		Precipitation
		Low	High	
2021	May	1.1	29.19	87.8
2022		2.42	31.2	22.8
2021	June	10.07	33.35	124.2
2022		11	34.29	47.6
2021	July	12.09	37.69	30.4
2022		11.06	35.25	68.4
2021	August	12.07	38.5	17.6
2022		14.39	35.91	10.4

Date regarding the diameter and circumference of the trunk:

The vigoro of the fruit tree is rendered by measurements of the diameter am circumference of the trunk. On average the highest value of the trunk circumference was denoted to Cociuvas/IPC5 variety of 76.96 mm and the lower value to the Tentant/IPC5 combination of 48.20 mm. (Table 3 and 4).

The surface of the trunk section is indicator most important for to determining the growth vigoro of fruit-growing plants. It is determined by annual measurement of the diameter of the trunk (with the help of the caliper), or by measuring the circumference of the trunk with the help of the centimeter (tailoring meter). The surface of the trunk section is the most important indicator what establishes the

growth vigoro of fruit-growing plants and is determined with the help of formulas (Botu 1997).

$$\boldsymbol{Diametrer\ tr.} = \frac{\mathbf{D^1 + D^2}}{\mathbf{2}}$$

$$\boldsymbol{A.c.} = \boldsymbol{\pi\ x\ R^2}$$
$$\boldsymbol{Cc} = \mathbf{2}\ \boldsymbol{x\ \pi}\ \mathbf{x\ R}$$

$$\boldsymbol{x} = \frac{\mathbf{Value\ Cc}}{\mathbf{2}\ \boldsymbol{x\ \pi}}$$
$$\boldsymbol{SST}(\boldsymbol{cm^2}) = \boldsymbol{\pi\ x\ R^2}$$

Table 3

Mean trunk diameter data for grafted varieties on IPC 5 (mm), Valu lui Traian

No.	Variety	Roots -tock	Year 2021		Year 2022		Average Circumfe-rence
			Diameter	Circum-ference	Diameter	Circumfe-rence	
1.	Andreiaș	IPC 5	16.94	53.19	26.80	84.15	68.67
2.	Cociuvaș		23.93	75.14	25.09	78.78	76.96
3.	Daria		11.94	37.49	19.15	60.13	48.81
4.	Ludovan		17.77	55.79	26.43	82.99	69.39
5.	Kordia		11.36	35.67	20.87	65.53	50.06
6.	Regina		15.21	47.75	16.61	52.15	49.95
7.	Severin		13.21	41.47	25.22	79.19	60.33
8.	Gorgeous		11.61	36.45	23.47	73.69	55.07
9.	Sweetheart		14.24	44.71	20.27	63.64	54.17
10.	Tempting		11.09	34.09	19.85	62.32	48.20
	Variety average/IPC5		14.73	46,17	22.37	70.25	58.21

Table 4

Mean trunk diameter data for grafted varieties on IPC 7 (mm), Valu lui Traian

No.	Variety	Roots -tock	Year 2021		Year 2022		Average Circum-ference
			Diameter	Circum-ference	Diameter	Circum-ference	
1.	Andreiaș	IPC 7	13.33	41.85	17.33	54.42	48.13
2.	Cociuvaș		15.93	50.02	28.34	88.98	69.05
3.	Daria		17.19	53.97	30.56	95.95	74.96
4.	Ludovan		7.30	22.92	14.93	46.88	34.09
5.	Kordia		14.48	45.46	18.99	59.62	52.54
6.	Regina		17.99	56.48	18.21	57.17	56.82
7.	Severin		16.83	52.84	23.47	73.69	63.26

8.	Gorgeous		16.29	51.15	17.46	54.82	52.98
9.	Sweetheart		11.81	37.08	15.98	50.17	87.25
10.	Tempting		21.49	67.47	22.46	70.52	67.49
	Variety average/ IPC7		**15.26**	**47.92**	**20.77**	**65.22**	**60.65**

On average, the highest trunk toros circumference value was noted to Sweetheart/IPC 7 variety, 87.25 mm, and the lower value of Ludovan/IPC7 of 34.09 mm.

Date on the average height of fruit tree (cm):

The height of the fruit's trees in the second year after planting is shown in table 5 and 6**.** The varieties grafted on IPC 5 has average values between 115 cm (Regina variety) and 157 cm (Andreias variety) and those grafted on IPC 7 average values between of 100 cm (Ludovan variety) and 172 cm (Daria variety).

Table 5

Average height of cherry trees (cm) in year II after planting, 2022, Valu lui Traian

No.	Variety	Rootstock	Average tree height (cm)
1.	Andreiaș	IPC 5	157
2.	Cociuvaș		143
3.	Daria		125
4.	Ludovan		149
5.	Kordia		131
6.	Regina		115
7.	Severin		152
8.	Gorgeous		138
9.	Sweetheart		135
10.	Tempting		122
Variety average/IPC5			**136,7**

Table 6

Average height of cherry trees (cm) in year II after planting, 2022, Valu lui Traian

No.	Variety	Rootstock	Average tree height (cm)
1.	Andreiaș	IPC 7	115
2.	Cociuvaș		161
3.	Daria		172
4.	Ludovan		100
5.	Kordia		124
6.	Regina		120
7.	Severin		133
8.	Gorgeous		119
9.	Sweetheart		110
10.	Tempting		126
Variety average/IPC7			**128**

Date on the number of anticipated shoots:

The anticipated shoots have the role of hastening the formation of fruit tree crowns. On average, in all varieties studied, the number of anticipated shoots were between 2-4. At the IPC 5 rootstock, the average number of the anticipated shoots were 2.6 and at the rootstock IPC 7 the average number of anticipated shoots were 2.8.

Table 7

Number of anticipated shoots

No.	Variety	Roots-tock	Year 2022	Variety	Roots-tock	Year 2022
1.	Andreiaș	IPC 5	3	Andreiaș	IPC 7	2
2.	Cociuvaș		3	Cociuvaș		4
3.	Daria		2	Daria		4
4.	Ludovan		3	Ludovan		2
5.	Kordia		2	Kordia		3
6.	Regina		2	Regina		3
7.	Severin		4	Severin		3
8.	Gorgeous		3	Gorgeous		2
9.	Sweetheart		2	Sweetheart		2
10.	Tempting		2	Tempting		3
Variety average/IPC5			**2.6**			**2.8**

The height of the plants is an important indicator provided that it is not to be affected by intervention humans through cutting. The height is determined annually and expresses the height from the ground level to the highest point of the fruit tree. On this occasion you can establish the height of the trunk and the height of the crown. These elements are expressed in meters or centimeters (Botu, 1997).

DISCUSSIONS

The authors (Glenn G., Paovaiah B., 1989) noted that fruit firmness is important in the quality of cherries and the industry leaders have recently expressed great interest in cherries and the damage is caused by heavy rains.

As he said before (Parnia P., 2022) the cherry tree in Topoloveni area finds optimal conditions for growth and fruiting. In fact, the area was famous and is still for cherry production being located in the first pedoclimatic area of Romania for cherry.

CONCLUSIONS

The vegetative buds are small and medium-sized, cylindroconical or conical, with the tip away from the branch. The fructification buds are medium-sized, conical are spherical and each forms an inflorescence with 2-5 flowers (Copoiu N., as al 2005).

The cherry's root system develops differently depending on the physic-chemical properties of the soil on which it is grown as well as the rootstock used. Thus, in fertile soils the roots grow less in depth and branch out more and on the least fertile ones, they reach more and branch less. Most of the roots are distributed

between 20 and 55 cm, usually the extending horizontally exceeding 1.6-3 time the projection of the crown (Horez D., 2000).

For varieties with globular growth and poor vigoro of the spindle the shapes vessel crown will be used, for the varieties with dominant vigoro of the spindle, the pyramid crown forms will be used and form the varieties of small and medium vigoro the flattened crown forms, fusiform etc. (Gradinariu G., 2003).

It is successfully practiced the summer pruning after harvesting the fruits instead of the spring one because the wounds heal easier and faster and the stress borne by the plant is lowed (Hoza D., 2000)

Although the data are preliminary, at this stage, the greatest vigor of the fruit tree was noted in the Sweetheart/ IPC7 combination 87.25 mm.

The height of the fruit trees in the experiment is between 115 cm and 157 cm for on the IPC5 rootstock and between 100 cm and 172 cm for on the IPC7 rootstock. Rootstocks are for the first time studied in the climatic conditions of south-eastern Romania; biometric data are related to growth in the orchard.

The experience will continue in the following years by determining the morphological characteristics of the fruits, examining the production and also the quality of the fruit.

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