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POMOLOGICAL AND TECHNOLOGICAL CHARACTERISTICS OF COLLECTED SELECTIONS OF CHERRY PLUM *PRUNUS CERASIFERA* ERHR.

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A plantation collection containing 32 genotypes selected from spontaneous populations of cherry plum *Prunus cerasifera* Erhr. was set up in the region of the Eastern Serbian town of Svrljig. The fruit trees budded from *Prunus cerasifera* seedlings and were planted at 5x4 m spacing on a mild slope of south-western aspect. This study shows the most important characteristics of the 19 selections in the collection, and the average results recorded in the 2000-2003 period. The most significant characteristics of the trees, their productivity, and fruit and stone characteristics are presented. The averge coarseness of fruits, i.e. their lenght, width and thickness, measured 25.0x 24.4x25.0 mm, while stone coarseness was 14.4x10.3x3.6 mm.The average fruit weight was 12.1 g (24.3-4.8 g), and stone weight 0.85 g (2.2-0.3 g). Depending on fruit and stone weight, the mesocarp content was 93% (96.3-90.3%). Taking into consideration the possibility of fruit exploitation for the production of biologically high-quality food, the mesocarp chemical composition was thoroughly examined. The fruits were found to have increased contents of total acids, achieving an average of 3.09% (3.44-2.60%), which was the initial objective of this selection. Total solids content was 13.5% (16.2-10.3%), total soluble solids 12.5% (14.5-9.5%) and total sugars 6.00% (11.45-3.14%). Considering these characteristics, the selections that were

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singled out deserve more attention in terms of preserving their biodiversiry, forming a gene bank and commercial cultivation.

Key words: Cherry plum, selections, genotype

INTRODUCTION

Cherry plum is a species with a number of desirable characteristics. It has a wide distribution range, pronounced vitality, stability of yield and moderate cultivation requirements. Its fruits are being used for generative rootstock in nursary production. They also provide good nourishment when consumed fresh, and may be used for the production of brandies, fruit juices and other processed foodstuffs. Across many Mediterranean countries, i.e. in Southern and Central Europe and mid-Asia, cherry plum is widespread as a wild species, but it also has cultivated and highly profitable forms. Breeding programmes in countries of the former USSR have resulted in a number of large-fruit cherry plum cultivars and hybrids (JANES and PAE, 2002).

Despite its favourable characteristics, cherry plum has a second rate status in Serbia, compared with other continental fruit species. Such situation has called for a selection, collection, and comparative research of cherry plum forms that have favourable properties. GAVRILOVIĆ and STANČEVIĆ (1960) had selected a cherry plum named "Kablarka". STAČEVIĆ *et al*. (1988) described 12 selected cherry plum ecotypes in Serbia, while MILUTINOVIĆ *et al*. (1997) made similar reports of 16 genotypes in the region of Mt. Avala. GEORGIJEV *et al*. (1985) and RISTEVSKI (2001) conducted comparative examination of a number of introduced cherry plum cultivars and local selected types under identical conditions in Macedonia.

PEJKIĆ *et al*. (1991) initiated a cherry plum selection programme in the livestock-raising parts of Serbia, and the work was later continued by MILETIĆ (1995). The goal was to study the cherry plum population and select forms that are suitable to the fruit-juice industry. As a result of these efforts, a collection stand was set up and was used for further investigation of the pomological and technological characteristics under identical conditions, which is also the subject of this research.

MATERIALS AND METHODS

The collection stand was set up in the area of Svrljig in 1995, and it included 32 genotypes selected from a spontaneous cherry plum population in Eastern Serbia. The fruit trees were grafted onto cherry plum seedlings and planted at 5x4 m spacing on a slight slope of south-western aspect. The soil was a moderate-fertile degraded eutric cambisol. Tillage and pruning were practiced to form an improved pyramidal crown. Each selection was represented by five to seven seedlings.

Fruits for the planned investigation were harvested at full maturity. Fruit and stone coarseness were measured by a high-precision calliper square, and

weight on a Mettler technical balance. Total solids were determined by drying out the fruits at 105 °C to constant weight, and total soluble solids by refrectometry. Total sugars were determined by Bertrand's method, total acids by neutralization with NaOH, and mesocarp pH with a pH meter. The article presents the most important pomological and technological characteristics of the 19 most outstanding selections. The data was obtained from three vegetation seasons and statistically processed by the analysis of variance and LSD test.

RESULTS

Fruit and stone coarseness of the chosen cherry plum selections are shown in Table 1.

Table 1. Fruit and stone coarseness

Selection No.	Fruit			Stone		
	Length mm	Width mm	Thickness Mm	Length mm	Width mm	Thickness mm
6	28.1	25.1	26.5	18.2	9.6	6.3
7	29.3	30.0	31.6	14.3	17.0	7.4
8	25.8	26.6	27.6	14.6	9.8	6.8
9	27.9	27.6	27.8	15.6	10.6	8.0
11	20.4	20.5	20.5	11.6	8.4	6.0
12	21.6	25.6	25.6	16.4	16.3	8.2
13	23.1	21.8	22.3	13.3	9.5	5.0
14	24.6	22.7	23.7	15.4	10.2	7.1
15	32.0	29.5	30.7	15.2	10.2	6.5
16	22.5	20.1	20.6	14.8	9.3	6.2
17	25.0	24.3	25.0	13.6	9.6	6.9
18	26.1	26.6	25.8	14.8	11.0	6.6
19	20.9	20.0	20.1	14.6	8.5	5.9
20	28.3	27.4	28.7	14.7	10.4	6.8
21	21.6	20.9	20.9	13.8	8.5	6.7
22	27.1	26.5	27.7	13.0	9.6	6.4
23	23.1	23.2	23.5	12.7	8.1	5.7
24	24.1	22.1	22.6	14.0	9.1	6.2
25	23.6	23.3	23.4	15.2	10.4	7.1
Mx	25.0	24.4	25.0	14.5	10.3	6.6
LSD 0.05	1.60	1.53	1.37	1.48	1.68	1.19
0.01	2.12	2.03	1.82	1.96	2.23	1.57

Fruit coarseness was medium or large, and the shape round. The average fruit coarseness (length, width, thickness) for all selections was 25.0x24.4x25.0 mm. The average fruit length was 32.0-20.4 mm, width 30.0-20.0 mm and thickness 31.6-20.1 mm. Selections 15, 1, 20 and 9 were found exceptional regarding fruit coarseness. The stones were elongated and flat-shaped, with the average coarseness of 14.5x10.3x6.6 mm. Stone length was 18.2-11.6, width 17.0-8.1 mm and thickness 8.2-5.0 mm. Larger stones were found in selections 6, 7, as well as 12 and 9, while small stones, which is a desirable trait, were found in selections 11,

23, 13 and 22. The analysis of variance and LSD test confirmed highly significant differences between most of these selections. In other words, the investigated cherry plum selections expressed their individual characteristics when grown under identical conditions.

Fruit and stone weight and mesocarp content make some of the foremost parameters in considerations of any fruit species, especially fruits such as cherry plum, which is used for industrial processing. According to data presented in Table 2, the average fruit weight of the selected cherry plums was 14.5 g. The highest weights were 18.2 and 16.4 g (measured in selections 6 and 12, respectively), and the lowest 13.0 and 12.7 g (measured in selections 22 and 23, respectively). Furthermore, stone weight was 0.85 g on the average, ranging from 0.3 g (selections 23 and 19) to 2.2 g (selection 24). The proportion of mesocarp was at the highest in selections 8 (96.3%) and 23 (95.8%), and lowest in selections 7, 14 (90.8%) and 25 (90.3%). Characteristically, mesocarp content in all selections was above 90.0%, which is their especially advantageous trait. Nevertheless, the analysis of variance and LSD test detected highly significant differences between most selections.

Table 2. Fruit and stone mass

Selection no.	Fruit mass g	Stone mass g	Portion of flesh %	Fruit Color
6	18.2	0.8	92.7	Light red
7	14.3	1.7	90.8	Yellow
8	14.6	0.4	96.3	Red-yellow
9	15.0	0.7	94.0	Dark blue
11	11.6	1.5	91.4	Purple yellow
12	16.4	0.9	91.3	Red
13	13.3	1.4	93.0	Yellow
14	15.4	0.7	90.8	Yellow
15	15.2	0.8	95.5	Red
16	14.8	0.4	92.7	Yellow
17	13.6	0.6	92.8	Light red
18	14.8	0.8	93.9	Yellow
19	14.6	0.3	93.7	Dark red
20	14.7	0.8	94.4	Yellow
21	13.8	0.4	92.5	Yellow
22	13.0	0.7	94.7	Yellow
23	12.7	0.3	95.8	Dark red
24	14.0	2.2	91.0	Yellow
25	15.2	0.7	90.3	Yellow
Mx	14.5	0.85	93.0	
Lsd 0.05	1.21	0.14	1.46	
0.01	1.61	0.19	1.94	

Dominating in the population are light yellow-skinned selections. The fruits of the other selections are light or dark red, or red. Selection 9 was found to have a distinctly dark blue colour, which is rare in the population.

As cherry plum fruits are primarily used as raw material for the foodstuffs industry, their chemical composition is an important indicator of the quality of the chosen selections, Table 3.

Table 3. Chemical contents of plum

Selection no.	Total solids (%)	Total solube solids (%)	Total sugars (%)	Total acids (%)	pH	Sugars:acid ratio
6	14.4	13.5	4.53	3.12	3.51	1.45
7	16.2	15.0	3.91	3.44	3.61	1.13
8	12.7	11.5	5.65	2.93	3.42	1.93
9	11.5	10.5	8.84	3.00	3.37	2.95
11	14.3	13.5	6.10	3.04	3.73	2.00
12	11.7	10.0	7.82	3.22	3.62	2.43
13	10.3	9.5	11.45	2.60	3.06	4.40
14	13.8	12.0	5.41	3.24	3.45	1.67
15	13.0	11.5	3.14	3.32	3.58	0.94
16	13.6	12.0	6.16	3.02	3.38	2.04
17	13.6	13.0	4.27	3.02	3.34	1.41
18	15.9	14.5	4.70	3.19	3.20	1.47
19	15.3	14.0	5.05	3.20	3.45	1.58
20	10.8	14.5	5.74	2.95	3.65	1.94
21	14.1	12.5	4.04	3.32	3.73	1.22
22	14.7	13.5	4.58	3.14	3.29	1.46
23	15.0	12.5	6.61	3.25	3.54	2.03
24	10.8	10.0	9.53	2.69	3.30	3.54
25	14.9	14.0	6.49	3.08	3.35	2.11
Mx	13.5	12.5	6.00	3.09	3.45	1.94
LSD 0.05	1.51	1.68	0.14	0.13	0.07	0.07
0.01	2.00	2.23	0.19	0.17	0.09	0.09

The selections are characterized by a high contents of solids, 13.5% on the average, and total soluble solids as high as 12.5%. The highest solids content was recorded in selections 7 (16.2%) and 18 (15.9%), and lowest in selection 13 (10.3%). The situation was similar as regards total soluble solids. The highest values of 15.0% and 14.5%, and lowest of 9.5% were found in the same selections, respectively. Total sugar content was highest in selections 13 (11.45%) and 24 (9.53%), and lowest in selection 15 (3.14%).

The selections were characterized by high total acid contents, 3.09% on the average. Selection 7 had an outstanding percentage of total acids (3.44%), followed by selections 21 and 15 (3.23%). On the other hand, the lowest total acid content was found in selection 13 (2.60%). Consequently, fruit pH was high, 3.45 on the average, ranging from 3.75 (selections 21 and 11) to 3.06 (selection 13). The total sugars/acids ratio was as low as 1.94 on the average. It was the highest in selection 13 (4.4), and lowest in selection 15 (0.94).

Nearly all selections had a low sugar/acid ratio, meaning that they are mostly sour in taste and primarily suitable for the production of fruit juices. The

selections showed significant differences ragarding their chemical composition, i.e. the contents of individual components. Depending on their intended uses (method of processing), some of them may be singled out for their favourable solids contents or total sugars, and especially for total acids. A confirmation for this comes from the statistically processed data. Highly significant and significant differences were determined between most selections for all mentioned aspects of chemical compositions.

DISCUSSION

Due to their unrepressed generative reproduction, the cherry plum population includes forms with different characteristics. Some of them have fruits notable for their high-quality fruits. STANČEVIĆ *et al*. (1988) had selected 12 types of cherry plum with large and very large fruits, weighing 17.2-6.4 g, and with mesocarp content measuring 97.2-92.7%, total soluble solids 16.5-11.5%, and total acids 1.54-0.48%. MILUTINOVIĆ *et al*. (1997) found a high variability in the cherry plum population. The fruit weight of 16 selected genotypes ranged 19.88-8.76 g, mesocarp content 96.11-92.2% and soluble solids content 17.22-12.87%.

Especially invaluable to our work was the data reported by GEORGIJEVA *et al*. (1985) and RISTEVSKI (2001). The cherry plum cultivars introducted into Macedonia had very large fruits and high weight. They were found to have favourable chemical composition, which makes them suitable for consumption as fresh fruits. Some of them were characterized by high total acid contents. The cultivar Iskušenija contained 3.20% total acids, which corresponds to those found in the selections in this investigation, which aimed at selecting forms with increased solids and total acid contents. The selections that were isolated and collected expressed the same or even better characteristics in the collection stand than in their natural habitats.

An exceptional genetic variability is due to the centuries-long adaptation of the cherry plum population to the agro-ecological conditions existing in their local habitats. According to MIŠIĆ (1983), and NENADOVIĆ-MRATINIĆ and KOJIĆ (1988), the region of Serbia may in this respect be designated as a secondary centre of divergence of *P. cerasifera* Ehrh..

All these results show that cherry plum deserves a much closer attention and pomological treatment. It is especially important in arid regions with extensive agriculture, where the more noble fruit species and cultivars of contiental fruits fail to provide stable and high-quality production. Cherry plum grows, yields and reaches its comparatively early maturation (in July) under extensive agricultural conditions, i.e. without any special cultivation or tillage. Organized stands and moderate agricultural practices secure high yields and desirable fruit quality, while production costs are lower. Besides, cherry plum requires no chemical protection from parasites and pests, so that its final products can be declared as having biological high-quality and safety, which is a global trend in food production today. Its wide uses (ČOLIĆ *et al*., 2001), the existing selections and favourable agro-eco-

logical conditions provide a basis for an organized and intensive commercial production.

The properties of our selections showed considerable differences, and the results of statistical data processing confirmed them. It is therefore difficult to single out those with the most advantageous characteristics as they have a number of top qualities. Depending on the objective and purpose of cultivation (type of processing), it is nevertheless possible to make a most appropriate choice. This especially refers to the mesocarp chemical content. Besides, data obtained from this stand indicates possibilities for plantation growing and fruit production. The chosen selections, by all their properties, deserve a closer attention in terms of preservation of biodiversity, gene bank formation and commercial cultivation.

CONCLUSION

Based on our investigation of several cherry plum selections chosen from a collection stand, it is possible to make the following conclusions:

The fruits were found to be round-shaped, medium large or large, and their average coarseness being 25.0x24.4x25.0 mm, while the average stone coarseness was 14.5x10.3x6.6. The average fruit weight was 14.5 g (18.2-12.7), stone weight 0.85 g (2.2-0.3), and mesocarp content 93.0% (96.3-90.3%). The fruits were mostly yellow in colour, but also red or red-yellow. Mesocarp had a good soluble solids content of 12.5% (15.0-9.50%), as well as 6.00% (11.45-3.14%) total sugars, and a high total acids content of 3.09% (3.32-2.60%). The fruits of the chosen selections were found to be appropriate for different types of processing. Based on their intended purposes it would be possible to choose selections with most adequate characteristics.

Regarding all traits, the chosen selections deserve more attention both in terms of preservation of biodiversity, formation of a gene bank and organization of commercial production.

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POMOLOŠKO-TEHNOLOŠKE OSOBINE KOLEKCIONISANIH SELEKCIJA DŽANARIKE (*PRUNUS CERASIFERA* ERHR.)

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I z v o d

Kolekcioni zasad je formiran 1995. godine u okolini Svrljiga od 32 genotipa odabranih iz spontane populacije džanarike u istočnoj Srbiji. Voćke su okalemljene na sejancu džanarike, zasađene na rastojanju 5x4 m na blagoj padini jugozapadne ekspozicije. U radu su prikazane najvažnije karakteristike za 19 kolekcionisanih selekcija i prosečni rezultati za period od 2000-2003. godine. Opisane su važnije karakteristike stabla, produktivnost i osobine plodova i koštice. Tako je prosečna krupnoća (dužina, širina, debljina) za plodove svih selekcija bila 25.0x24.4x25.0 mm, a koštica 14.5x10.3x6.6 mm. Prosečna masa plodova je 12.1 g (24.3-4.8 g), a koštica 0.85 g (2.2-0.3 g). U zavisnosti od mase ploda i koštice sadržaj mezokarpa je 93.0% (96.3-90.3). S obzirom na mogućnost korišćenja plodova u proizvodnji biološki visokovredne hrane, detaljno je obrađen hemijski sastav mezokarpa. Plodovi se pored ostalog odlikuju i povećanim sadržajem ukupnih kiselina, prosečno 3.09% (3.44-2.60%) što je bio i cilj selekcije. Sadržaj ukupno suvih materija je 13,5% (16.2-10.3%), ukupno rastvorljivih suvih materija 125% (14.5-9.5%) i ukupnih šećera 6.00% (11.45-3.14%). Izdvojene selekcije po svim osobinama zaslužuju veću pažnju kako u cilju očuvanja biodiverziteta, formiranju banke gena tako i za komercijalno gajenje u organizovanoj proizvodnji.

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