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POMO-TECHNOLOGICAL PROPERTIES OF SELECTED CLONES OF 'OBLAČINSKA' SOUR CHERRY

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***Summary**: The paper looks at 7 clones of 'Oblačinska' sour cherry with favourable pomological and technological properties. Fruit weight, soluble solids, total sugars and total acids in fruits of the clones investigated ranged 2.3 g (K-61)–3.4 g (K-73), 17.0% (K-49 and K-50)–20.5% (K-73), 14.1% (K-70)–17.9% (K-49) and 2.00% (K-73)–2.24% (K-50), respectively. Sugar and acid ratio ranged between 6.5 (K-50) and 8.6 (K-61), which is a favourable property from the standpoint of technology of processing. All the clones selected deserve attention as they may add to the preservation of biodiversity and gene bank, and are suitable for commercial growing within an organised production framework.*

***Key words:** 'Oblačinska' sour cherry, clones, fruit, chemical composition.*

INTRODUCTION

'Oblačinska' sour cherry is a heterogeneous population involving a great number of different forms with bio-pomological and technological characters (Misić, 2002). Owing to its heterogeneity, numerous problems arise within the processes of reproduction and exploatation of 'Oblačinska' sour cherry. It is a low-vigorous cultivar with small crown habit. It is a self-fertile, heavy and regular cropper. It is propagated via shoots. Fruits are small, having outstanding quality characteristics of flesh and juice. For this reason, fruits are suitable for industrial processing into various products (Mratinić, 2002).

In Serbia, within sour cherry breeding programmes, Ogasanović et al. (1985), Nikolić et al. (2005, 2011), Milutinović et al. (1980) and Miletić et al. (2008) established high heterogeneity of sour cherry with clones of different characteristics. Authors examined the genetic divergence of 'Oblačinska' sour cherry by using hierarchical cluster analysis and Euclidean distances, and established differences among clones that were singled out, grouped and analysed.

Given the fact that lower-quality clones reduce overall production and quality of products, it is required to single out clones with fruits of high technological value. Singling out superior clones, their propagation and large-scale cultivation would improve their uniform production and add to the expansion of 'Oblačinska' sour cherry.

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This paper looks at clones of 'Oblačinska' sour cherry which due to their favourable pomological and technological properties have been singled out from the long-term selection.

MATERIAL AND METHODS

In this trial, trees of extremely high cropping and favourable health status were singled out among trees of *in situ* grown 'Oblačinska' sour cherry, cultivated in major sour cherry growing areas in eastern Serbia (Knjaževac, Zaječar, Negotin). Clones with high dry matter content (<17%) were particularly observed and their fruits subjected to laboratory analyses. The paper presents the average values recorded over the 2009–2012 selection period. Seven clones were included in the trial. The following pomological properties were observed: fruit weight, fruit length, stone weight, stone length, mesocarp content, stalk length and attachment force of the fruit. Chemical properties viz. total soluble solids, invert sugars, sucrose content, total sugars, total acids and sugar/acid ratio, were also assessed.

Morphometrical and chemical composition of fruits were determined by using standard pomological methods. Fruit and stone size was determined by technical 'Mettler' vernier scale. To establish dry matter content fruits were dried at a temperature of 1050C to constant weight.

Soluble solids, total sugars and total acids were assessed using optical refractometer, Bertrand's method and neutralisation with NaOH, respectively. The attachment force of the fruit along with mesocarp content and total sugar/acid ratio were also checked at harvesting.

The results obtained were statistically analysed using Fisher's model of analysis of variance - ANOVA.The significance of differences between clones at $P \leq 0.01$ and $P \leq 0.05$ was defined using LSD test. The results are given in tabular form.

RESULTS

Analysed clones had low to moderate vigour, which is typical of 'Oblačinska' sour cherry. During the trial period, cropping of selected clones was high and steady. As for phenological properties, clones showed differences, though not relevant ones, given the different growing localities (altitude, exposure, age of trees and technology of growing). Flowering was in the first half of April, 4–12, April, while ripening and harvesting were in the third decade of June (22–30, June). A more precise comparison will be available after collection and growing under the same conditions.

Fruit and stone weight as well as flesh content are the main features of all stone fruits, especially of those used for industrial processing such as 'Oblačinska' sour cherry. Over the study period, the highest fruit and stone weight (3.4 g and 0.33 g, respectively) was recorded in clone K-73, while the lowest fruit weight and stone weight (2.3 g and 0.20 g, respectively) were recorded in clones K-61 and K-49, respectively. Fruit length ranged from 13.6 mm (K-50 and K-59) to 15.0 mm (K-73) and stone length from 9.0 mm (K-49) to 9.5 mm (K-70 and K-73). Flesh content was within the range of 90.3% (K-50) and 93.5% (K-49). Analysis of variance showed no significant differences in stone length, while the other studied traits (fruit and stone weight, and fruit length) revealed significant differences.

All the selections had short stalks (up to 35 mm), which is a favourable feature as it facilitates harvesting. Stalk length varied from 21.6 mm (K-49) to 30.5 mm (K-73). Highly significant statistical differences among the clones were evidenced.

Very important feature of 'Oblačinska' sour cherry which has been given little attention though is attachment force of the fruit. As the fruit ripens it forms a corky tissue (separation layer), which closes the fruit, prevents leakage of juice and facilitates harvesting. The attachment force of the fruit varied from 175.0 g (K-49) to 333.5 g (K-73). Very significant differences were found among clones studied (Tab. 1).

Table 1. Size and mass of fruits, stones and stalks

Clones	Fruit length(mm)	Stoneintermediate(g)	Fruit mass(g)	Stone mass(%)	Mesocarpcontent(cm)	Stalklength(g)	SOP(g)
K-49	13,8±0,30	9,0±0,25	3,1±0,26	0,20±0,02	93,5±0.43	21,6±1,32	175,0±13,0
K-50	13,6±0,30	9,2±0,38	2,9±0,30	0,28±0,02	90,3±0.62	24,6±1,32	300,5±13,2
K-54	13,7±0,23	9,2±0,33	2,6±0,25	0,26±0,03	91,5±1.09	22,9±2,22	252,4±12,8
K-59	13,6±0,28	9,2±0,28	2,7±0,27	0,28±0,02	90,7±1.24	23,8±1,36	298,0±14,6
K-61	13,7±0,32	9,2±0,37	2,3±0,20	0,22±0,03	91,3±0.71	22,9±1,38	175,0±13,0
K-70	14,0±0,32	9,5±0,30	2,7±0,19	0,26±0,02	92,6±2.38	24,5±2,02	274,0±12,9
K-73	15,0±0,27	9,5±0,23	3,4±0,30	0,33±0,02	91,2±0.33	30,5±1,30	333,5±12,9
LSD	0,42	0,44	0,37	0,04	1,73	1,80	18,7
0,01	0,57	0,59	0,50	0,05	2,34	2,43	25,3

Selections singled out in this work also had high soluble solids and total acids content. Lower values of sugar/acid ratio are the indicative of higher total acids in mesocarp, which is a desirable feature in 'Oblačinska' sour cherry intended for processing into juice and other dessert products. Total dry matter and soluble solids content varied from 18.6% (K-54) to 22.0% (K-73) and 17.0% to 20.5%, respectively. As regards the properties above, clone K-73 was highly significantly different compared to the other clones, among which no significant differences were recorded. Total sugars, invert sugars and sucrose contents in fruits studied ranged from 14.1% (K-70)–17.9% (K-49), 12.5% (K-50) –13.8% (K-49) and 1.4% (K-70)–2.0% (K-50), respectively. The comparison of clones showed that clone K-49 stood out for its total sugars content, whereas no significant differences were evidenced in inverted sugars content. Highly significant differences in sucrose content were recorded among clones studied.

Total acids content was lowest in clone K-70 (1.76%) and highest in clone K-50 (2.24%). The investigation revealed highly significant differences amongtheclones studied. Sugar/acid ratio ranged from 6.5 (K-50) to 8.6 (K-61), which is an important factor for technology of fruit processing (Tab. 2).

Table 2. Chemical composition of fruits

Klon	Total dry matter (%)	Soluble solidscontent(%)	Inverted sugars(%)	Reducing sugars(%)	Total sugars (%)	Total acids (%)	Flavour index
K-49	19,2±2,84	17,0±1,28	13,8±0,52	1,8±0,14	17,9±1,39	2,13±0,15	8,4±0,24
K-50	18,7±1,34	17,0±1,25	12,5±1,30	2,0±0,18	14,6±1,39	2,24±0,19	6,5±0,37
K-54	18,6±1,32	17,5±1,30	12,6±1,32	1,5±0,13	14,2±1,27	2,14±0,18	7,4±0,17
K-59	19,4±1,29	18,0±1,39	13,2±1,27	1,5±0,14	14,7±1,34	2,06±0,13	7,1±0,20
K-61	19,5±1,30	18,5±1,30	13,6±1,27	1,9±0,14	15,6±1,27	2,10±0,20	8,6±0,27
K-70	20,1±1,00	18,5±0,71	12,6±1,28	1,4±0,18	14,1±1,26	2,06±0,16	8,0±1,34
K-73	22,0±1,28	20,5±0,71	12,9±1,39	1,7±0,15	14,7±1,34	2,00±0,11	7,3±0,45
LSD 0.05	1,88	1,79	1,92	0,20	1,91	0,21	0,83
0.01	2,53	2,42	2,59	0,27	2,58	0,28	1,13

DISCUSSION

Pomo-technological characters of the selected clones of 'Oblačinska' sour cherry assessed in this paper are comparable with those of selections singled out in other areas of Serbia. The results obtained are in agreement with the results of other authors. Milutinović et al. (1980) examined clones of 'Oblačinska' sour cherry in which fruit weight ranged 3.12–3.36 g, stone weight 0.38–0.46 g, flesh ratio 68.66–86.16% and stalk length 14.39–15.12 mm. In clones studied Ogasanović et al. (1985) obtained fruit weight varying from 2.8 to 3.1 g. In their examinations conducted in eastern Serbia, Miletić et al. (2002, 2005, 2008) singled out clones that, depending on selection targets, had fruit weight and fruit ratio ranging from 2.4 to 3.76 g and 88.9 to 92.0%, respectively. In their examination of fruit and stone weight, flesh ratio and stalk length in 'Oblačinska' sour cherry Nikolić et al. (1996, 2005a, 2005b, 2011) obtained the results viz. 2.62–3.59 g, 0.255–0.303 g, 89.74–92.4% and 2.36 to 4.46, respectively. Miletić et al. (2009) reported that the average fruit weight and flesh ratio in 'Oblačinska' sour cherry varied among years and fruit set intensity from 2.49 to 3.03 and 89.6 to 90.4%, respectively.

The results are comparable with results Ogasanović et al. (1985), Miletić et al. (2002, 2005, 2008) and Nikolić et al. (2005a, 2005b, 2011) which were in the studies of 'Oblačinska' sour cherry clones obtained the following results: total dry matter content 12–17%, soluble solids 10.5–19.7%, total sugars 7.45–12.8%, total acids 1.06–3.30%.

Properties and fruit quality of selections singled out depend on genetic traits but also on other factors. Clones singled out are of different age, vigour and cropping. They grow and produce fruit under comparatively different environmental conditions. In addition, the agrotechniques are not identical, which affects pomological and technological characteristics of fruits. Generally, certain features are little prone to change, regardless of growing conditions (flower colour, fruit colour, etc.). In contrast, there are numerous properties, the quantitative ones in particular, that change quickly and easily with alterations in environmental conditions (fruit size, vigour, etc.) (Misić, 2002). For these reasons, the clones described deserve attention, as they add to the preservation of biodiversity and gene bank, and are suitable for commercial growing within an organised production framework.

CONCLUSION

Fruit and stone length in the assessed clones of 'Oblačinska' sour cherry grown in eastern Serbia were 136 mm (K50 and K-59)–15.0 mm (K-73) and 9.0 mm (K-49)–9.5 mm (K-70 and K-73), respectively.

Fruit weight, stone weight and flesh ratio ranged from2.3 g (K-61)–3.4 g (K-73), 0.20 g (K-49)–0.33 g (K-73) and 90.3% (K-50)–93.5% (K-49), respectively. Stalk length varied from 21.6 mm (K-49) to 30.5 mm (K-73), whereas attachment force of the fruit ranged from 175.0 g (K-49, K-61) to 333.5 g (K-73).

Total dry matter and soluble solids content ranged from 18.6% (K-54) to 22.0% (K-73) and 17.0% (K-49 and K-50) to 20.5% (K-73). Total sugars content varied from 14.1% (K-70)–17.9% (K-49), invert sugars 12.5% (K-50)–13.8% (K-49) and sucrose 1.4% (K-70)–2.0% (K-50). Total acids and sugar/acid ratio were within the range 2.00% (K-73)–2.24% (K-50) and 6.5 (K-50)–8.6 (K-61), which is a favourable trait from the standpoint of processing technology.

For these reasons, clones singled out in this paper deserve as they add to the preservation of biodiversity and gene bank, and are suitable for commercial growing within an organised production framework.

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POMOLOŠKO-TEHNOLOŠKE OSOBINE SELEKCIONISANIH KLONOVA OBLAČINSKE VIŠNJE

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Izvod: U radu je izdvojeno i opisano 7 klonova Oblačinske višnje koji se karakterišu povoljnim pomološkim i tehnološkim osobinama. Plodovi ispitivanih klonova odlikovali su se masom od 2,3 g (K-61) do 3,4 g (K-73), sadržajem rastvorljivih suvih materija od 17,0% (K-49 i K-50) do 20,5% (K-73), sadržajem ukupnih šećera od 14,1% (K-70) do 17,9% (K-49) i sadržaj ukupnih kiselina od 2,00% (K-73) do 2,24% (K-50). Indeks slasti kretao se od 6,5 (K-50) do 8,6 (K-61), što predstavlja povoljnu osobina sa stanovišta tehnologije prerade. Svi odabrani klonovi zaslužuju pažnju kako u očuvanju biodiverziteta i formiranja banke gene, tako i za komercijalno gajenje u organizovanoj proizvodnji.

Ključne reči: Oblačinska višnja, klonovi, plod, hemijski sastav.

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