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BIOPOMOLOGICAL PROPERTIES OF INTRODUCED OLIVE VARIETIES IN THE SOUTH OF MONTENEGRO

BIOPOMOLOŠKE KARAKTERISTIKE INTRODUKOVANIH SORTI MASLINE NA JUGU CRNE GORE

Abstract

Biopomological properties of ten olive varieties ('Leccino', 'Ascolana tenera', 'Coratina', 'Roggianella', 'Tonda Iblea', 'Cassanese', 'Frangivento', 'Oliva mela', 'Conservolia' and 'Manzanillo') were conducted during four year period (2000-2003).

Investigations showed statistical differences among the varieties for the majority of parameters observed. Due to productivity data the best results were observed in 'Manzanilla' and 'Leccino' varieties, as being with the most regular yield and a medium vigour. The oil content in dry matter above 40% was in 'Tonda Iblea', 'Frangivento' and 'Coratina'.

Key words: Olive, introduced varieties, blossoming, ripening, yield, oil content

Izvod

Biopomološke karakteristike deset sorti masline ('Leccino', 'Ascolana tenera', 'Coratina', 'Roggianella', 'Tonda Iblea', 'Cassanese', 'Frangivento', 'Oliva mela', 'Conservolia' and 'Manzanillo') praćene su tokom četvorogodišnjeg perioda (2000-2003).

Ispitivanja su pokazala da postoje značajne statističke razlike među sortama za većinu posmatranih parametara. Sorte 'Manzanilla' i 'Leccino' su u odnosu na ostale imale relativno stabilan rod i bile srednje bujnosti. Sadržaj ulja u na suvu materiju ploda bio je iznad 40% u sorti 'Tonda Iblea', 'Frangivento' i 'Coratina'.

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Ključne riječi: Maslina, introdukovane sorte, cvetanje, zrenje, prinos, sadržaj ulja

INTRODUCTION

Olive growing of Montenegro is characterized by majority of old olive orchards planted at the bottom of mountains along the coastal region. Olive assortment is autochthonous with predominant olive variety 'Zutica'. Autochthonous varieties are well adapted at the climate and generally are planted on poor lands, without irrigation and without or with minimum of agricultural measures. Due to the situation, additional problem in our olive growing is vigour of autochthonous varieties. That causes difficulty to do regular protection of fruit and adequate harvesting which is done by picking fruits from ground, after natural falling. Moreover, the tree productivity is relatively low and, with all above mentioned, directs us to the problem that should be solved (Miranovic & Lazovic, 1999; Lazovic, 2000).

To alleviate these problems and to give to the farmers possibility to plant the orchards with less vigorous varieties, with bigger fruits and with high oil content, it was necessary to investigate foreign varieties (Rio & Caballero, 1994; Ferrara & Lamparelli, 1996; Iannotta et al., 1996; Tous et al., 2000). Introduced varieties grown in the intensive plantations have 4-5 times higher productivity comparing to traditional varieties (Lavee, 1990). Moreover, that is the possibility to enrich domestic olive assortment and to influence the intensifying olive growing in Montenegro.

The aim of this study was to investigate vegetative and reproductive characteristics of ten introduced olive cultivars in agro ecological conditions of the South of Montenegrin coastal side. On the base of the expressed vegetative and productive properties, the most interesting cultivars will be recommended for intensive planting and further research.

MATERIAL AND METHODS

During 1996–1997, ten Mediterranean olive cultivars from Spain (Manzanilla), Italy ('Leccino', 'Ascolana tenera', 'Frangivento', 'Roggianella', 'Tonda Iblea', 'Cassanese', 'Coratina', 'Oliva Mela') and Greece ('Conservolia'), were introduced and planted on the field of Centre for Subtropical Cultures in Bar, with density 5x5m. Plants were 3-4 years old at the beginning of investigation. During the observing period regular agricultural maintenance was applied, and irrigation in the most dry period of the summer.

Biopomological properties were followed during four years period (2000-2003) on three plants per variety. The following characters were measured and observed: flowering: beginning, full blossom, end of blossom and blossoming rankness (1-5); maturation: beginning (5% of changed colour), full ripening (75% mature fruits), number of days need for fruit to ripe (from the end of anthesis to the full ripening) were calculated; productivity (cumulated yield and yield efficiency were calculated); fruit properties (in 100 fruits per sample): fresh weight, shape, pulp/stone ratio, number of fruits in 1 kg, and oil content by extracted on Soxhtlet method (% dry weight basis).

Obtained data were elaborated by statistical variation method. Separation of means were conducted using Tuckey test (0.05%).

RESULTS AND DISCUSSION

Blossoming, ripening, productivity and fruit properties in ten introduced olive varieties are shown in tables 1, 2 and 3, respectively.

Average beginning of flowering started in all investigated varieties in relatively short period from 14-17.05., and was finished in the same manner, from 20.-23.05. However, the earliest blossoming was observed in varieties 'Coratina', from 14.-20.05. and 'Conservolia', from 14.-21.05. The latest flowering was observed in varieties 'Cassanese' and 'Leccino', from 16. and 17.-23.05. respectively. According to the number of days the flowering lasted from 7 ('Leccino' and 'Coratina') to 10 days ('Ascolana tenera'). Intensity of flowering was average (3) except in varieties 'Frangivento' and 'Coratina' that had good (4).

Regarding of initiating of maturation all varieties can be divided in two groups, varieties that started maturation in September, from 12.09. ('Oliva mela') to 23.09. ('Frangivento'), and varieties that started maturation from 1. to 29.10. ('Manzanilla' and 'Coratina' respectively). Full maturation in average started the earliest in varieties 'Oliva mela', 'Leccino' and 'Conservolia' (7.-9.10.), and the latest in 'Ascolana tenera' and 'Roggianella' (2.11. and 4.11. respectively) and in 'Coratina' which fruits mature very late that we could not observed regularly the phase.

Generally observed in conditions of South of Montenegrin Sea-side the shortest period needed for fruits from set up to full maturation was in variety 'Oliva mela' (135 days) and the longest in varieties 'Roggianella' (166 days), and 'Coratina' respectively (162 days to the beginning of maturation).

The highest cumulative yield for the period observed was in varieties 'Manzanilla' and 'Leccino' (28,20 and 21,40 kg/tree respectively). The most irregular bearing was in 'Oliva mela' variety.

Table 1. Characteristics of blossom time of introduced olive cultivars (2000-2003)
Tab. 1. Karakteristike cvjetanja introdukovanoh sorti masline (2000-2003)

Cultivar Sorta	*Blossoming* Cvjetanje			*Bloss. rankn.* Stepen cvjet.	*Av. blos.lasting (days)* Prosj. Traj.cvj (dana)	Ripening Zrenje		*No. of days- end of blos. to full ripen.* Br. dana od kr. cvj. do pun. zr.
	Begin. Počet.	*Full* Puno	*End* Kraj			*Begin* Početak	*Full ripen.* Puno zrenje	
Leccino	17.05.	20.05.	23.05.	3 a	7 a	16.09.	8.10.	138 ab
Cassanese	16.05.	19.05.	23.05.	3 a	8 a	18.09.	16.10.	146 bc
Tonda Iblea	14.05.	17.05.	22.05.	3 a	9 a	7.10.	26.10.	157 de
Roggianella	14.05.	18.05.	22.05.	3 a	9 a	17.10.	4.11.	166 e
A.Tenera	14.05.	18.05.	23.05.	3 a	10 a	13.10.	2.11.	163 de
Conservolia	14.05.	17.05.	21.05.	3 a	8 a	25.09.	9.10.	141 ab
Oliva Mela	15.05.	19.05.	22.05.	3 a	8 a	12.09.	7.10.	135 a
Frangivento	15.05.	18.05.	23.05.	4 a	9 a	23.09.	15.10.	145 bc
Manzanilla	15.05.	18.05.	23.05.	3 a	9 a	1.10.	25.10.	155 cd
Coratina	14.05.	17.05.	20.05.	4 a	7 a	29.10.	-	162*
0.05%				1.73	2.59			10.69

* No. Of days from the end of bloss. to the beginn. of ripening

The tree vigour observed through the trunk diameter was the highest in 'Ascolana tenera' (121,1 cm^2) variety, that according to the yield had the lowest productivity also with 'Tonda Iblea' variety (0,05 kg/ cm^2). The best productivity was in varieties 'Manzanilla' and 'Leccino' (0,53 kg/ cm^2 and 0,45 kg/ cm^2 respectively).

Fruit characteristics – The biggest fruits were in varieties 'Ascolana tenera' and 'Conservolia' (6.95 g and 6.82 g respectively), and the smallest in 'Roggianella' variety (2.43 g). The biggest stone was in varieties 'Tonda Iblea' and 'Conservolia' (0.62 and 0.61 g respectively), and the smallest in 'Roggianella' variety (0.37 g).

According to that the percentage part of flesh in the whole fruit was in range from 82.0 and 82.7% respectively ('Leccino', 'Frangivento' and 'Coratina') to 91.1 and 91.8% respectively ('Conservolia' and 'Ascolana tenera').

Regarding the fruit form, in the majority of investigated varieties it was steroidal (<1.25), while ellipsoid (1.25-1.45) was in varieties 'Cassanese', 'Leccino' and 'Coratina'.

The oil content expressed on dry matter bases was the highest in 'Tonda Iblea' (45.37%), 'Frangivento' (42.15%) and 'Coratina' (41.03%), and the lowest in 'Cassanese' variety (30.27%).

Table 2. Average yield and productivity effectiveness of introduced olive cultivars (2000-2003)

Tab. 2. Prosječni prinos i efikasnost rodnosti u introdukovanih sorti masline (2000-2003)

Cultivar *Sorta*	Cumulat. yield (kg) (2000-2003) *Kumulativni prinos*	Average yield (kg/tree) (2000-2003) *Prosječni prinos (kg/st)*	Trunk cross section (cm^2) (2003) *Promjer debla*	Productivity (kg/cm^2)* (2000-2003) *Produktivnost*
Leccino	21.40	5.35 ab	47.79	0.45
Cassanese	4.70	1.20 c	40.66	0.12
Tonda Iblea	2.00	0.70 c	43.04	0.05
Roggianella	5.60	1.40 c	26.08	0.21
Ascolana Tenera	6.40	1.60 c	121.1	0.05
Conservolia	4.70	1.20 c	46.82	0.10
Oliva mela	2.50	0.80 c	30.27	0.08
Frangivento	10.30	2.60 bc	75.67	0.14
Manzanilla	28.20	7.05 a	53.12	0.53
Coratina	10.0	3.30 bc	56.63	0.18
0.05%		2.87		

*Cumulated yield per tree/trunk cross section (kg/cm^2)

Investigations showed statistical differences among the varieties for the majority of parameters observed. Due to productivity data the best results were observed in 'Manzanilla' and 'Leccino' varieties, as being with the most regular yield and a medium vigour. The oil content in dry matter above 40% was in three varieties 'Tonda Iblea', 'Frangivento' and 'Coratina'. Instead of a conclusion it can be noted that such results demand longer period of investigations for definite opinion about the adaptability of introduced varieties in conditions of South of Montenegro Coast.

Table 3. Characteristics of fruit of introduced olive cultivars and oil content (2000-2003)

Tab. 3. Farakteristike ploda introdukovanih sorti masline i sadržaj ulja (2000-2003)

Cultivar Sorta	*Fruit weight (g)* Masa ploda	*Stone weight (g)* Masa koštice	*Flesh weight (g)* Masa mesa	*Flesh in the fruit (%)* Udio mesa u plodu	*Fruit shape (l/w ratio)* Forma ploda (d/š)	*Oil content (dry wt basis)* Sad. ulja (na suvu mat.)
Leccino	2.55 c	0.46 bc	2.09 d	82.0 e	1.31 b	32.51 ab
Cassanese	3.54 bc	0.45 bc	3.09 cd	87.3 bcd	1.29 b	30.27 b
Tonda Iblea	5.73 a	0.62 a	5.11 b	89.2 ab	1.23 bc	45.37 a
Roggianella	2.43 c	0.37 c	2.06 d	84.8 cde	1.18 c	32.58 ab
A. Tenera	6.95 a	0.57 ab	6.38 a	91.8 a	1.23 bc	33.40 ab
Conservolia	6.82 a	0.61 a	6.21 ab	91.1 ab	1.17 c	39.11 ab
Oliva mela	3.19 bc	0.39 c	2.80 cd	87.8 bc	1.06 d	37.39 ab
Frangivento	2.50 c	0.44 c	2.06 d	82.5 de	1.22 c	42.15 ab
Manzanilla	3.97 b	0.45 bc	3.52 c	88.7 abc	1.16 c	38.48 ab
Coratina	2.66 c	0.46 bc	2.20 d	82.7 e	1.41 a	41.03 ab
0,05%	1.25	0.13	1.16	4.11	0.78	14.41

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Sažetak

U radu su prezentirani rezultati ispitivanja deset introdukovanih sorti masline ('Leccino', 'Ascolana tenera', 'Coratina', 'Roggianella', 'Tonda Iblea', 'Cassanese', 'Frangivento', 'Oliva mela', 'Conservolia' i 'Manzanillo'). Biopomološke karakteristike praćene su tokom četvorogodišnjeg perioda (2000-2003) u uslovima juga Crne Gore.

Dobijeni rezultati su pokazali:

- Da je najveći prinos bio u sorti 'Manzanilla' (7,05. kg/st) i 'Leccino' (5,35 kg/st).
- Najveći plod bio je u sorti 'Ascolana tenera' (prosječna masa ploda 6,95 g) i 'Conservolia' (6,82 g) dok je najmanji bio u 'Roggianella' (2,43 g), 'Frangivento' (2,50 g) i 'Leccino' (2,55 g).
- Sadržaj ulja, izražen kao % na suvu materiju, bio je najveći u 'Tonda Iblea' (45.37%), 'Frangivento' (42,15 %) i 'Coratina' (41.03 %), a najmanji u 'Cassanese' (30,27 %).
- Sorte krupnog ploda, kakve nedostaju našem sortimentu, nijesu se isticale prema rodnosti.

Nameće se zaključak da je za ovakve rezultate potreban duži period ispitivanja kako bi se sa sigurnošću moglo dati mišljenje o adaptivnosti ispitivanih sorti na uslove juga crnogorskog primorja.