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THE PHENOLOGICAL AND POMOLOGICAL TRAITS OF AUTOCHTHONOUS PLUM CULTIVARS IN THE AREA OF NORTH MONTENEGRO

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Abstract. Plum is the major fruit species in the area of North Montenegro. A study conducted over a period of 4 years in North Montenegro region included in situ identification of autochthonous plum cultivars. Observation and recording of their phenological and pomological traits were performed using IBPGR and UPOV methodologies. Flowering started between 26th March and 12th April and fruit ripening between 13th July (Petrovača) and 18th September (Trnovača). Fruit weight ranged from 6.65 ±0.235 to 53.88 ±0.654 g and stone weight from 0.16 ±0.003 to 2.20 ±0.711 g. The cultivars were classified as being extremely small in terms of fruit size, except for cv. Crvena durgulja (bigger fruit size). Rounded fruit shape and light green ground color were dominant. Skin color ranged from amber to black. Yellow green was a dominant flesh color and medium flesh firmness predominated. The fruits of the above cultivars could be processed, particularly into plum brandy, or they could be used fresh or dried. The selected plum cultivars can be used both in breeding programmes and as cultivars for organic plum orchards. This study was made to assess the performance of autochthonous plum cultivars (in situ) and seedling. Selection process consisted of 3 stages: a) initial selection from the population and pomological characterization, b) morphological and quantitative characteristics of one-year old seedlings for autochthonous brandy varieties of plum on Myrobalan seedling (*Prunus cerasifera* Erhr.), and c) water attaining capability of leaves in autochthonous plum cultivars as an indicator of their resistance to drought.

Key words: plum, genetic bases, germplasm, *Prunus domestica* L., *Prunus insititia* L.

INTRODUCTION

Plum is ranked as the second most important fruit tree crop in the temperature climate after apple from the point of vue production. Its tasty and good looking fruits have been used extensively during history as fresh or dried fruits, but also processed as jam,

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marmelade, jelly and brandy. Plums contain health promoting compounds, minerals, vitamins, fibers, and low in calories and among the highest in antioxidant containing foods and for those reasons are benefical for human consuption [Botu et al. 2012].

Plum cultivation has a historical tradition, economical, social and cultural implication for the Sout East of Europe. The European plum (*Prunus domestica* L.) genetic variability in the South East of Europe is large, unique andparticularu evident in the characteristics of the fruit, plant and adaptabilitu to different ecological conditions. In Serbia and Romania 80% of the plums go into the production of slivovitz or tuica.

Fortunately, some of plum cultivars and biotypes exhibit tolerance to Plum Pox Potyvirus [Botu et al. 2012]. As an example, Elisa test that was conducted on cultivar 'Crvena durgulja', proved presence of Sharka (PPV), howewer it did not affect the fruits. Also, 'Crvena durgulja' showed as very resistant to other pests and diseases. The cultivar 'Crvena ranka' is slightly susceptible to Sharka. The cultivar 'Komperuša', Elisa test showed absence of Sharka (PPV). Also, 'Komperuša' showed as very resistant to other pests and diseases [Botu et al. 2012].

'Požegača' and number of cultivars used for brandy production predominante in the assortiment. The Montenegro plum production is characterized by extensive growing technology, low unstable yields, low-quality fruit, PPV-induced problems and a multitude of cultivars. The cultivars include Požegača (35%), foreign standard and introduction newly bred cultivars (15%) and autochthonous (local, primitive) cultivars (50%), and their fruit is typically used for brandy production. Autochthonous plum cultivars are a limiting factor in improving plum production in Montenegro. Nevertheless, they are used as an outstanding source of germplasm and as a genetic basis underlying breeding activities, principally the development of new cultivars, clonal selection [Ogašanović et al. 1994, Milošević 2000], the development of new plum, apricot and peach rootstocks [Paunović 1988, Durić et al. 1998], resistance to economically important diseases [Paunović and Paunović 1994, Rodrigues et al. 2009] or intensive cultivation [Mratinić 2000]. Similar investigations with focus on identical or similar objectives were also conducted in the other countries of the former Yugoslavia – Serbia [Milošević 2000], Bosnia and Herzegovina [Buljko 1977, Jarebica and Muratović 1977], Croatia [Jelačić et al. 2008] and Slovenia [Usenik et al. 2007]. In situ investigations of cultivars derived from *Prunus domestica* L. and *P. insititia* L. in Serbia were conducted by a number of researchers [Paunović et al. 1985, Paunović 1988, Paunović and Paunović 1994, Petrović et al. 2002] who defined important biological, pomological and technological traits of both fruit and tree. They reported that the selected cultivars could be used both as breeding programmes and as rootstocks, as well as in further disease-related systematic studies under field and laboratory conditions. The main objective of this study was to determine in situ basic biological and pomological traits of some autochthonous plum cultivars derived from *P. domestica* L. and *P. insititia* L. in the area of North Montenegro that could be used as a genetic basis and source of germplasm for future breeding studies and as cultivars for organic plum orchards.

MATERIALS AND METHODS

The investigations were conducted continuously in years 2010, 2011, 2012 and 2013. They involved in situ identification, marking and careful observation of autochthonous plum cultivars (accessions) in the area of North Montenegro.

The researched genotypes or cultivars were selected in Western Serbia [Paunović et al. 1985]. Majority of them, eighteen to be exact, derived from *P. domestica* L., while, cultivars 'Trnovača' and 'Turgulja' were derived from *P. institia* L. [Paunović et al. 1985]. The sampled trees were aged 35 ('Plavski piskavac') to 55 years ('Turgulja'). The trees of all the cultivars grew on their own roots.

The study focused on few segments. Very first one included recording of the phenological traits – first flowering, full flowering, end of flowering and harvest date. Phenological characteristics were determined as below: the beginning of flowering was recorded when at least 5% of the flowers bloomed; full flowering was accepted when at least 80% of the flowers bloomed, the end of flowering was determined when 90% of the flowers bloomed and corollas began to fall off, and harvest date was established when the fruits were sufficiently colored and soft to be eaten [Funt 1998]. The other segment comprised pomological, i.e. physical: fruit weight (g), stone weight (g) and fruit size (on a scale of 1–9) and sensorial traits of the fruit: fruit shape (1–6), ground color (1–5), skin color (0–9), flesh color (1–9), flesh firmness(1–9) and fruit usage (1–4). IBPGR and UPOV methodologies were used to describe the cultivars in phenological, pomological and sensorial terms [Zanetto et al. 2002]. Measurements included the weight of 25 fruits and as much stones per cultivar. Fruit and stone weights were determined using a Metler 1200 technical scale (range of measurement 0.01–120.00 g, precision ±0.01 g). The data were subjected to statistical analysis of variance (ANOVA) and means were separated by LSD test at $P < 0.05$ significant level [SAS Institute 1990].

One-year old seedlings from 20 autochthonous plum cultivars were planted in the nursery and raised seedlings were evaluated for nursery characteristics: plant height (cm), stem diameter (mm), bat take (%) seedling vigour, uniformity and branching. Uniformity was low (grade 1) when coefficient of variation was less than 15%, and high (grade 2) when it was from 15 to 25%.

The dynamics of leaf dehydration per measured interval was determined by method of Eremeev [1964]. The loss of water due to transpiration followed by measuring the weight of leaves [Slavik 1974]. The dynamics of leaf dehydration was measured in order to obtain initial resistance rate of autochthonous plum cultivars towards drought conditions. The dynamics of leaf dehydration depends on the thickness of leaf cuticle and leaf average size.

RESULTS AND DISCUSSION

The data showed that the onset of flowering was recorded in the last five days of March and in the first twelve days of April (tab. 1). The earliest onset of flowering was observed in cultivar 'Trnovača' (26.03) derived from *P. insititia* L., and the latest in cultivar 'Dupljanka' (12.04) derived from *P. domestica* L. Among the 20 cultivars examined, 8 (40%) started to flower at the end of March, and 12 (60%) during the middle of the first twelve-day period of April. The full flowering stage lasted from 30th March ('Trnovača') to 18th April ('Dupljanka'), and the end of flowering from 7th April ('Trnovača') to 24th April ('Dupljanka'). Flowering lasted 9 ('Turgulja', 'Plavski piskavac', 'Grkaja', 'Kapavac' and 'Komperuša') to 14 days ('Crvena durgulja', 'Mednica', 'Petrovača', 'Belošljiva' and 'Šara').

Table 1. Phenological characteristics of autochthonous plum cultivars in the region of North Montenegro – 2010, 2011, 2012, 2013 and average

Cultivar	Location			Flowering				Harvest
	longitude	latitude	altitude (m)	onse	full	end	duration	date
1	2	3	4	5	6	7	8	9
Petrovača	19°41'E	41°01'N	879	25.03.2010	29.03.2010	07.04.2010	13	10.07.2010
				26.03.2011	30.03.2011	11.04.2011	16	14.07.2011
				30.03.2012	02.04.2012	14.04.2012	15	17.07.2012
				27.03.2013	01.04.2013	08.04.2013	12	11.07.2013
				27.03 d	**31.03** d	**10.04** d	**14**a	**13.07** d
Mednica	19°59'E	42°70'N	670	27.03.2010	02.04.2010	11.04.2010	15	20.07.2010
				29.03.2011	03.04.2011	13.04.2011	15	22.07.2011
				02.04.2012	06.04.2012	16.04.2012	14	30.07.2012
				31.03.2013	01.04.2013	12.04.2013	12	28.07.2013
				30.03 d	**03.04** d	**13.04** d	**14**a	**25.07** d
Kapavac	19°29'E	42°50'N	974	01.04.2010	04.04.2010	10.04.2010	9	25.07.2010
				03.04.2011	06.04.2011	12.04.2011	9	27.07.2011
				06.04.2012	09.04.2012	15.04.2012	9	02.08.2012
				02.04.2013	05.04.2013	11.04.2013	9	31.07.2013
				03.04 c	**06.04** c	**12.04** d	**9**c	**29.07** d
Grkaja	19°59'E	42°70'N	670	28.03.2010	03.04.2010	08.04.2010	11	30.07.2010
				30.03.2011	04.04.2011	10.04.2011	11	03.08.2011
				02.04.2012	06.04.2012	14.04.2012	12	06.08.2012
				02.04.2013	03.04.2013	08.04.2013	6	01.08.2013
				01.04 cd	**04.04** cd	**10.04** d	**10**c	**02.08** d
Crvena ranka	19°43'E	42°59'N	601	27.03.2010	01.04.2010	08.04.2010	12	04.08.2010
				28.03.2011	03.04.2011	12.04.2011	15	04.08.2011
				01.04.2012	07.04.2012	15.04.2012	14	08.08.2012
				29.03.2013	01.04.2013	09.04.2013	11	04.08.2013
				29.03 d	**03.04** d	**11.04** d	**13**a	**05.08** cd
Mudara	19°43'E	42°59'N	601	29.03.2010	04.04.2010	11.04.2010	13	04.08.2010
				31.03.2011	06.04.2011	13.04.2011	13	06.08.2011
				04.04.2012	09.04.2012	15.04.2012	11	10.08.2012
				02.04.2013	05.04.2013	13.04.2013	11	04.08.2013
				01.04 c	**06.04** c	**13.04** d	**12**b	**06.08** c
Belošljiva	19°52'E	43°03'N	850	27.03.2010	02.04.2010	12.04.2010	16	05.08.2010
				29.03.2011	02.04.2011	12.04.2011	14	07.08.2011
				04.04.2012	06.04.2012	16.04.2012	12	11.08.2012
				30.03.2013	02.04.2013	12.04.2013	13	05.08.2013
				30.03 d	**03.04** d	**13.04** d	**14**a	**07.08** c
Crnošljiva	19°20'E	42°38'N	978	29.03.2010	03.04.2010	11.04.2010	13	06.08.2010
				30.03.2011	03.04.2011	13.04.2011	14	08.08.2011
				02.04.2012	07.04.2012	16.04.2012	14	12.08.2012
				01.04.2013	03.04.2013	12.04.2013	11	06.08.2013
				31.03 d	**04.04** cd	**13.04** d	**13**a	**08.08** c

1	2	3	4	5	6	7	8	9
				26.03.2010	30.03.2010	10.04.2010	15	10.08.2010
				28.03.2011	31.03.2011	10.04.2011	13	12.08.2011
Šara	19°57'E	42°40'N	900	31.03.2012	04.04.2012	14.04.2012	14	16.08.2012
				27.03.2013	01.04.2013	10.04.2013	14	10.08.2013
				28.03 d	**01.04** d	**11.04** d	**14**a	**12.08** c
				28.03.2010	03.04.2010	10.04.2010	13	10.08.2010
				30.03.2011	06.04.2011	12.04.2011	13	14.08.2011
Metlaš	19°29'E	42°51'N	984	03.04.2012	10.04.2012	16.04.2012	13	16.08.2012
				01.04.2013	05.04.2013	10.04.2013	9	12.08.2013
				01.04 c	**06.04** c	**12.04** d	**12**b	**13.08** c
				26.03.2010	01.04.2010	11.04.2010	16	13.08.2010
				28.03.2011	03.04.2011	14.04.2011	17	15.08.2011
Crvena durgulja	19°48'E	42°57'N	870	05.04.2012	07.04.2012	15.04.2012	10	19.08.2012
				31.03.2013	01.04.2013	12.04.2013	12	13.08.2013
				30.03 d	**03.04** d	**13.04** d	**14**a	**15.08** c
				05.04.2010	09.04.2010	12.04.2010	7	19.08.2010
				07.04.2011	11.04.2011	17.04.2011	10	21.08.2011
Plavski piskavac	19°55'E	42°33'N	940	10.04.2012	14.04.2012	20.04.2012	10	25.08.2012
				06.04.2013	10.04.2013	15.04.2013	9	19.08.2013
				07.04 b	**11.04** b	**16.04** c	**9**c	**21.08** b
				02.04.2010	06.04.2010	11.04.2010	9	21.08.2010
				04.04.2011	08.04.2011	13.04.2011	9	24.08.2011
Turgulja	19°56'E	42°37'N	910	08.04.2012	11.04.2012	16.04.2012	8	28.08.2012
				02.04.2013	07.04.2013	12.04.2013	10	19.08.2013
				04.04 c	**08.04** c	**13.04** d	**9**c	**23.08** b
				04.04.2010	08.04.2010	14.04.2010	10	20.08.2010
				07.04.2011	10.04.2011	17.04.2011	10	25.08.2011
Obični Piskavac	18°49'E	42°26'N	858	12.04.2012	14.04.2012	22.04.2012	10	27.08.2012
				05.04.2013	08.04.2013	15.04.2013	10	20.08.2013
				07.04 b	**10.04** c	**17.04** c	**10**c	**23.08** b
				07.04.2010	11.04.2010	16.04.2010	9	21.08.2010
				09.04.2011	13.04.2011	18.04.2011	9	26.08.2011
Komperuša	19°49'E	42°43'N	850	12.04.2012	16.04.2012	22.04.2012	10	29.08.2012
				08.04.2013	12.04.2013	16.04.2013	8	20.08.2013
				09.04 a	**13.04** b	**18.04** c	**9**c	**24.08** b
				06.04.2010	11.04.2010	19.04.2010	13	29.08.2010
				10.04.2011	16.04.2011	21.04.2011	11	30.08.2011
Mudovalj	19°55'E	42°33'N	940	13.04.2012	19.04.2012	25.04.2012	12	05.09.2012
				07.04.2013	14.04.2013	19.04.2013	12	02.09.2013
				09.04 a	**15.04** ab	**21.04** ab	**12**b	**02.09** b
				06.04.2010	12.04.2010	19.04.2010	13	06.09.2010
				08.04.2011	17.04.2011	22.04.2011	14	07.09.2011
Dronga	19°55'E	42°33'N	940	12.04.2012	18.04.2012	24.04.2012	12	13.09.2012
				10.04.2013	13.04.2013	19.04.2013	9	10.09.2013
				09.04 a	**15.04** ab	**21.04** ab	**12**b	**09.09** a

1	2	3	4	5	6	7	8	9
				10.04.2010	16.04.2010	22.04.2010	12	07.09.2010
				12.04.2011	18.04.2011	24.04.2011	12	10.09.2011
'Dupljanka	19°59'E	43°02'N	1180	15.04.2012	22.04.2012	27.04.2012	12	14.09.2012
				11.04.2013	16.04.2013	23.04.2013	12	13.09.2013
				12.04 a	**18.04** a	**24.04** a	**12**b	**11.09** a
				07.04.2010	13.04.2010	20.04.2010	13	08.09.2010
				11.04.2011	18.04.2011	22.04.2011	11	09.09.2011
Jesenka	19°55'E	42°33'N	940	14.04.2012	19.04.2012	26.04.2012	12	15.09.2012
				08.04.2013	14.04.2013	20.04.2013	12	12.09.2013
				10.04 a	**16.04** a	**22.04** a	**12**b	**11.09** a
				24.03.2010	26.03.2010	04.04.2010	11	13.09.2010
				26.03.2011	29.03.2011	05.04.2011	10	18.09.2011
Trnovača	19°20'E	42°38'N	979	29.03.2012	04.04.2012	12.04.2012	14	20.09.2012
				25.03.2013	30.03.2013	07.04.2013	13	21.09.2013
				26.03. d	**30.03** d	**07.04** d	**12**b	**18.09** a
			LSD_{005}	6.58	3.45	5.13	2.15	7.79
			LSD_{001}	7.84	4.54	6.11	2.95	8.32

The harvest period was longer than the flowering period [Gunes 2003], as it lasted from 13th July ('Petrovača') to 18th September ('Trnovača'). Local plum cultivars began to flower at the end of March or at the beginning of April under the environmental conditions of Serbia [Paunović 1988, Paunović and Paunović 1994, Milošević 2000, Mratinić 2000]. Similar data on the period and duration of flowering of autochthonous plum cultivars were reported by Jarebica and Muratović [1977] and confirmed by the results of this study. Somewhat later flowering under Slovenian conditions was reported by Usenik et al. [2007] and early flowering in the Tokat province (Turkey) by Gunes [2003], the reason being environmental, particularly climate effects [Buljko 1977]. In terms of fruit ripening, the results of this study were similar to the ones obtained by Paunović et al. [1985], Paunović [1988] and Mratinić [2000]. Measurable pomological characteristics of fruit and stone are given in Table 2. Fruit weight ranged from 6.65 ±0.235 g ('Plavski piskavac') to 53.88 ±0.654 g ('Crvena durgulja'). Jarebica and Muratović [1977] determined that the plum fruit weight ranged from 14.17 to 41.70 g. Jovančević [1977] reported minimum and maximum values of fruit weights of some local plum cultivars, being 5.03 and 23.86 g, respectively. In the study conducted by Petrović et al. [2002], fruit weight of eight local plum cultivars in Eastern Serbia and in the region of Čacak (Western Serbia) ranged from 15.20–26.40 g and from 6.68–36.50 g, respectively [Paunović et al. 1985]. According to Mratinić [2000], fruit weight of autochthonous plum cultivars in a broader region of south-western Serbia and Šumadija fell within a range of 6.20–28.00 g with 50% of the cultivars having the fruit weight of 15.00 g.

Table 2. Pomological and sensorial characteristics of autochthonous plum cultivars in the Region of North Montenegro – 2010, 2011, 2012, 2013 and average

Cultivar		Fruit			Ground	Skin	Flesh		Use	Stone
		weight (g)	size[1]	shape[2]	colour[3]	colour *	colour **	firmness ***	****	weight (g)
1		2	3	4	5	6	7	8	9	10
Petrovača	2010	13.24 ±0.082	1	2	2	5	3	5	2	1.29 ±0.044
	2011	13.13 ±0.089	1	2	2	5	3	5	2	1.22 ±0.038
	2012	12.99 ±0.069	1	2	2	5	3	5	2	1.10 ±0.022
	2013	13.08 ±0.072	1	2	2	5	3	5	2	1.15 ±0.024
	average	**13.11 ±0.078**e	**1**	**2**	**2**	**5**	**3**	**5**	**2**	**1.19 ±0.032**c
Mednica	2010	16.33 ±0.220	1	4	2	3	5	3	2	1.51 ±0.079
	2011	16.27 ±0.230	1	4	2	3	5	3	2	1.47 ±0.079
	2012	15.99 ±0.234	1	4	2	3	5	3	2	1.40 ±0.074
	2013	15.77 ±0.208	1	4	2	3	5	3	2	1.34 ±0.068
	average	**16.09 ±0.223**e	**1**	**4**	**2**	**3**	**5**	**3**	**2**	**1.43 ±0.075**c
Kapavac	2010	11.95 ±0.090	1	3	2	8	3	5	2	0.61 ±0.009
	2011	11.92 ±0.085	1	3	2	8	3	5	2	0.52 ±0.006
	2012	11.86 ±0.081	1	3	2	8	3	5	2	0.55 ±0.007
	2013	11.79 ±0.080	1	3	2	8	3	5	2	0.44 ±0.006
	average	**11.88 ±0.084**e	**1**	**3**	**2**	**8**	**3**	**5**	**2**	**0.53 ±0.007**d
Grkaja	2010	14.89 ±0.782	1	6	4	2	2	5	2	0.99 ±0.080
	2011	14.80 ±0.795	1	6	4	2	2	5	2	0.97 ±0.080
	2012	14.76 ±0.748	1	6	4	2	2	5	2	0.88 ±0.074
	2013	14.67 ±0.787	1	6	4	2	2	5	2	0.76 ±0.066
	average	**14.78 ±0.778**e	**1**	**6**	**4**	**2**	**2**	**5**	**2**	**0.90 ±0.075**d
Crvena ranka	2010	19.45 ±0.051	1	4	3	3	3	5	1.2	0.74 ±0.006
	2011	19.42 ±0.050	1	4	3	3	3	5	1.2	0.81 ±0.004
	2012	19.25 ±0.040	1	4	3	3	3	5	1.2	0.59 ±0.003
	2013	19.08 ±0.023	1	4	3	3	3	5	1.2	0.50 ±0.003
	average	**19.30 ±0.041**e	**1**	**4**	**3**	**3**	**3**	**5**	**1.2**	**0.66 ±0.004**d
Mudara	2010	35.84 ±0.311	2	2	3	3	2	5	2	1.91 ±0.041
	2011	35.60 ±0.310	2	2	3	3	2	5	2	1.90 ±0.035
	2012	35.60 ±0.298	2	2	3	3	2	5	2	1.85 ±0.033
	2013	35.36 ±0.277	2	2	3	3	2	5	2	1.7 ±0.031
	average	**35.60 ±0.299**c	**2**	**2**	**3**	**3**	**2**	**5**	**2**	**1.87 ±0.035**b
Belošljiva	2010	14.15 ±0.318	1	2	3	0	3	3	2	1.12 ±0.031
	2011	14.12 ±0.295	1	2	3	0	3	3	2	1.03 ±0.028
	2012	13.85 ±0.280	1	2	3	0	3	3	2	0.95 ±0.022
	2013	13.48 ±0.307	1	2	3	0	3	3	2	0.86 ±0.019
	average	**13.90 ±0.300**e	**1**	**2**	**3**	**0**	**3**	**3**	**2**	**0.99 ±0.025**d
Crnošljiva	2010	12.95 ±0.225	1	3	2	7	3	7	2	0.58 ±0.011
	2011	12.85 ±0.222	1	3	2	7	3	7	2	0.52 ±0.011
	2012	12.55 ±0.217	1	3	2	7	3	7	2	0.49 ±0.008
	2013	12.73 ±0.220	1	3	2	7	3	7	2	0.41 ±0.006
	average	**12.77 ±0.221**e	**1**	**3**	**2**	**7**	**3**	**7**	**2**	**0.50 ±0.009**d

1		2	3	4	5	6	7	8	9	10
Šara	2010	19.22 ±0.062	1	2	2	4	3	5	2	0.92 ±0.023
	2011	19.11 ±0.058	1	2	2	4	3	5	2	0.88 ±0.021
	2012	18.95 ±0.055	1	2	2	4	3	5	2	0.78 ±0.017
	2013	18.80 ±0.053	1	2	2	4	3	5	2	0.70 ±0.015
	average	**19.02 ±0.057**e	**1**	**2**	**2**	**4**	**3**	**5**	**2**	**0.82 ±0.019**d
Metlaš	2010	18.55 ±0.088	1	2	3	3	3	7	2	0.80 ±0.008
	2011	18.44 ±0.080	1	2	3	3	3	7	2	0.74 ±0.010
	2012	18.29 ±0.062	1	2	3	3	3	7	2	0.68 ±0.007
	2013	18.04 ±0.054	1	2	3	3	3	7	2	0.58 ±0.011
	average	**18.33 ±0.071**e	**1**	**2**	**3**	**3**	**3**	**7**	**2**	**0.70 ±0.009**d
Crvena durgulja	2010	53.99 ±0.662	3	3	3	3	5	5	2	2.35 ±0.722
	2011	53.90 ±0.659	3	3	3	3	5	5	2	2.25 ±0.710
	2012	53.84 ±0.650	3	3	3	3	5	5	2	2.18 ±0.705
	2013	53.79 ±0.645	3	3	3	3	5	5	2	2.02 ±0.707
	average	**53.88 ±0.654**a	**3**	**3**	**3**	**3**	**5**	**5**	**2**	**2.20 ±0.711**a
Plavski piskavac	2010	6.69 ±0.238	1	2	4	7	4	5	2	0.59 ±0.021
	2011	6.67 ±0.235	1	2	4	7	4	5	2	0.54 ±0.020
	2012	6.63 ±0.229	1	2	4	7	4	5	2	0.48 ±0.013
	2013	6.61 ±0.238	1	2	4	7	4	5	2	0.47 ±0.006
	averae	**6.65 ±0.235**f	**1**	**2**	**4**	**7**	**4**	**5**	**2**	**0.52 ±0.015**d
Turgulja	2010	22.85 ±0.325	1	2	2	9	3	5	2	1.66 ±0.016
	2011	20.15 ±0.266	1	2	2	9	3	5	2	1.61 ±0.014
	2012	20.84 ±0.220	1	2	2	9	3	5	2	1.57 ±0.012
	2013	19.80 ±0.073	1	2	2	9	3	5	2	1.52 ±0.010
	average	**20.91 ±0.221**d	**1**	**2**	**2**	**9**	**3**	**5**	**2**	**1.59 ±0.013**c
Obični Piskavac	2010	13.75 ±0.053	1	2	2	6	3	5	2	0.82 ±0.006
	2011	13.70 ±0.046	1	2	2	6	3	5	2	0.74 ±0.004
	2012	13.55 ±0.040	1	2	2	6	3	5	2	0.70 ±0.002
	2013	13.48 ±0.029	1	2	2	6	3	5	2	0.70 ±0.004
	average	**13.62 ±0.042**e	**1**	**2**	**2**	**6**	**3**	**5**	**2**	**0.74 ±0.004**d
Komperuša	2010	16.99 ±0.109	1	2	2	7	3	5	2	1.25 ±0.038
	2011	16.90 ±0.105	1	2	2	7	3	5	2	1.22 ±0.035
	2012	16.84 ±0.103	1	2	2	7	3	5	2	1.15 ±0.029
	2013	16.79 ±0.107	1	2	2	7	3	5	2	1.14 ±0.030
	average	**16.88 ±0.106**e	**1**	**2**	**2**	**7**	**3**	**5**	**2**	**1.19 ±0.033**c
Mudovalj	2010	18.62 ±0.132	1	2	3	3	2	5	2	1.26 ±0.092
	2011	18.58 ±0.129	1	2	3	3	2	5	2	1.22 ±0.087
	2012	18.51 ±0.128	1	2	3	3	2	5	2	1.17 ±0.082
	2013	18.49 ±0.111	1	2	3	3	2	5	2	1.11 ±0.083
	average	**18.55 ±0.125**e	**1**	**2**	**3**	**3**	**2**	**5**	**2**	**1.19 ±0.086**c
Dronga	2010	21.05 ±0.244	1	2	2	5	3	5	2	1.03 ±0.19
	2011	20.00 ±0.240	1	2	2	5	3	5	2	1.03 ±0.15
	2012	19.89 ±0.229	1	2	2	5	3	5	2	0.96 ±0.13
	2013	19.66 ±0.219	1	2	2	5	3	5	2	0.94 ±0.13
	average	**20.15 ±0.233**de	**1**	**2**	**2**	**5**	**3**	**5**	**2**	**0.99 ±0.15**d

1		2	3	4	5	6	7	8	9	10
	2010	22.72 ±0.25	1	4	4	3	6	5	2	1.93 ±0.495
	2011	22.68 ±0.23	1	4	4	3	6	5	2	1.87 ±0.425
Dupljanka	2012	22.62 ±0.20	1	4	4	3	6	5	2	1.82 ±0.445
	2013	22.62 ±0.20	1	4	4	3	6	5	2	1.90 ±0.395
	average	**22.66 ±0.22**d	**1**	**4**	**4**	**3**	**6**	**5**	**2**	**1.88 ±0.440**b
	2010	23.80 ±0.267	1	2	2	9	3	5	2	1.90 ±0.022
	2011	23.56 ±0.256	1	2	2	9	3	5	2	1.84 ±0.025
Jesenka	2012	23.83 ±0.250	1	2	2	9	3	5	2	1.78 ±0.023
	2013	24.05 ±0.231	1	2	2	9	3	5	2	1.72 ±0.022
	average	**23.81 ±0.251**d	**1**	**2**	**2**	**9**	**3**	**5**	**2**	**1.81 ±0.023**b
	2010	7.25 ±0.012	1	2	1	7	2	7	2	0.18 ±0.004
	2011	7.18 ±0.011	1	2	1	7	2	7	2	0.14 ±0.003
Trnovača	2012	7.25 ±0.015	1	2	1	7	2	7	2	0.14 ±0.003
	2013	7.24 ±0.022	1	2	1	7	2	7	2	0.18 ±0.002
	average	**7.23 ±0.01**f	**1**	**2**	**1**	**7**	**2**	**7**	**2**	**0.16 ±0.003**e
	$LSD_{0.05}$	4.82	–	–	–	–	–	–	–	0.26
	$LSD_{0.01}$	6.39								0.36

IBPGR and UPOV Descriptor List for Plum:
¹ fruit size: 1 = extremely small, 2 = very small; 3 = small, 4 = small/medium, 5 = medium, 6 = medium/large, 7 = large, 8 = very large, 9 = extremely large
² fruit shape: 2 = rounded, 3 = elliptical, 4 = ovate, 6 = oblong;
³ ground color: 1 = green, 2 = light green, 3 = light yellow, 4 = yellow, 5 = deep yellow
*** – skin color:** 0 = white yellow, 1 = pink, 2 = red, 3 = red violet, 4 = violet, 5 = dark violet, 6 = blue, 7 = mahagony, 8 = dark blue, 9 = black
**** – flesh color:** 1 = green, 2 = light green, 3 = yellow-green, 4 = light yellow, 5 = yellow, 6 = amber, 7 = light orange, 8 = orange, 9 = red
***** – flesh firmness:** 3 = soft, 5 = medium, 7 = firm;
****** – use:** 1 = fresh, 2 = processing, 4 = other (drying)

Similar data for autochthonous plum cultivars were reported by researchers from other countries. In Turkey, for example, Gunes [2003] reported the fruit weight of local plum cultivars in the Tokat province to range from 5.23–25.18 g and from 8.30–29.50 g in the Van province. The results obtained in this study confirmed those provided by the above authors in terms of the high degree of genotypic variability in fruit weight of autochthonous (local) plum cultivars. The cultivars selected in this study were classified as being extremely small in terms of fruit size, whereas the fruits of cultivar 'Crvena durgulja' were the only ones classified as being small [Paunović et al. 1985, Mratinić 2000, Zanetto et al. 2002]. 'Crvena durgulja' – fruits are elongated 49 mm long, 44.10 mm wide, 46.8 mm thick and weight 60.65 g on average [Botu et al. 2012].

The most dominant fruit shape was rounded in twelve cultivars, followed by ovate – in four cultivars, elliptical – in three cultivars and oblong – in one cultivar

(‘Grkaja’). Ground color in most of the cultivars was light green (10) and light yellow (6), being yellow in cv. ‘Trnovača’, cv. ‘Dupljanka’ and cv. ‘Grkaja’. Skin color ranged from white yellow (1) and red (1) and violet (1) and blue (1) and dark blue (1), and to dark violet (2), black (2), mahagoni (4) to red violet (7 cultivars). Flesh color was yellow green in most cultivars (12) and light yellow only in cv. ‘Plavski piskavac’ and amber only in cv. ‘Dupljanka’. As for flesh firmness, it was medium in 15 cultivars, firm in three and soft in two cultivars. The fruits of all the cultivars could be used for different types of processing, particularly for plum brandy production [Joshi and Sandhu 2000]. ‘Crvena ranka’ can be used fresh [Mratinić 2000]. ‘Crvena ranka’ fruits can be consumed immediately. Fruits are also used to produce an alcoholic drink that is called “Raki” in Albanian [Botu et al. 2012]. The autochthonous plum cultivar ‘Crvena ranka’ is cultivated in the Šumadija area (Serbia) since ancient times as a typical brandy cultivar [Mratinić 2012]. Althought it produces excellent quality brandy, it is less and extensively cultivated. The consequence of this type of production is irregular bearing, low yields and small atypical fruits of lower quality. Mratinić [2012] pointed out the study which aim was to determine the influence of necessary agro- and pomo-technical practices such as pruning and fertilizing to improve yields and fruit quality of this cultivar. In cultivar ‘Crvena ranka’, manure – agrozel combination achieved the highest yields, fruit weight (19.4 g) and fruit quality (17% soluble solid content, 13.25% total sugars and 1.05% total aciditivity).

Table 3. Morphological and quantitative characteristics of one-year old seedlings for autochthonous brandy cultivars of plum on Myrobalan seedling (*Prunus cerasifera* Erhr.) – 2010, 2011, 2012, 2013 and average

Cultivar		Plant height (cm)	Stem diameter (mm)	Branching	Uniformity	Bud take (%)	Grow of scions (cm)	Uniformity of scions
1		2	3	4	5	6	7	8
Petrovača	2010	88.7	8.0	1	2	64	156.2	2
	2011	86.0	7.8	1	2	54	151.6	2
	2012	85.9	7.7	1	2	52	150.2	2
	2013	84.2	7.7	1	2	50	143.6	2
	average	**86.2**c	**7.8**c	**1**	**2**	**55**e	**150.4**d	**2**
Mednica	2010	120.5	11.5	2	2	90	200.5	2
	2011	121.0	11	2	2	88	196.5	2
	2012	108.5	10.2	2	2	95	198.0	2
	2013	107.6	8.1	2	2	95	197.0	2
	average	**114.4**a	**10.2**ab	**2**	**2**	**92**a	**198.0**a	**2**
Kapavac	2010	74.0	7.4	4	1	70	192.8	1
	2011	71.5	7.0	4	1	65	190.2	1
	2012	73.2	7.1	4	1	75	192.0	1
	2013	74.1	7.3	4	1	62	206.6	1
	average	**73.2**c	**7.2**c	**4**	**1**	**68**d	**195.4**a	**1**

1		2	3	4	5	6	7	8
	2010	113.0	9.8	2	1	85	190.5	1
	2011	115.0	10.0	2	1	90	191.5	1
Grkaja	2012	104.4	9.0	2	1	89	188.5	1
	2013	114.4	9.2	2	1	88	183.1	1
	average	**111.7**a	**9.5**b	**2**	**1**	**88**ab	**188.4**b	**1**
	2010	112.8	10.8	2	1	87	197.4	2
	2011	112.0	10.2	2	1	85	194.5	2
Crvena ranka	2012	116.5	9.8	2	1	75	198.0	2
	2013	99.5	8.4	2	1	93	190.1	2
	average	**110.2**ab	**9.8**ab	**2**	**1**	**85**b	**195.0**a	**2**
	2010	131.5	12	1	2	91	160.5	2
	2011	133.5	11.8	1	2	95	165.0	2
Mudara	2012	129.0	11.4	1	2	98	150.0	2
	2013	120.8	10.4	1	2	96	144.5	2
	average	**128.7**a	**11.4**a	**1**	**2**	**95**a	**155.0**d	**2**
	2010	111.2	8.6	2	1	75	201.0	1
	2011	110.2	8.2	2	1	78	199.2	1
Belošljiva	2012	107.8	7.8	2	1	68	195.2	1
	2013	103.6	7.4	2	1	59	194.6	1
	average	**108.2**b	**8.0**bc	**2**	**1**	**70**c	**197.5**a	**1**
	2010	114.8	9.4	4	1	65	195.4	1
	2011	110.4	9.4	4	1	82	195.2	1
Crnošljiva	2012	104.5	9.0	4	1	78	198.4	1
	2013	109.1	9.0	4	1	83	185.0	1
	average	**109.7**b	**9.2**b	**4**	**1**	**77**bc	**193.5**a	**1**
	2010	126.4	11.5	1	1	80	153.0	2
	2011	121.0	10.5	1	1	72	155.5	2
Šara	2012	120.5	10.2	1	1	74	145.0	2
	2013	118.5	9.8	1	1	74	132.5	2
	average	**121.6**a	**10.5**a	**1**	**1**	**75**c	**146.5**d	**2**
	2010	89.5	8.5	3	1	84	162.0	1
	2011	86.0	7.5	3	1	60	153.5	1
Metlaš	2012	87.5	7.7	3	1	62	154.5	1
	2013	85.0	7.5	3	1	54	146.0	1
	average	**87.0**c	**7.8**c	**3**	**1**	**65**d	**154.0**d	**1**
	2010	136.8	12.8	1	1	97	208.5	1
	2011	132.5	12.4	1	1	98	206.5	1
Crvena durgulja	2012	128.5	11.7	1	1	99	202.8	1
	2013	129.8	11.1	1	1	98	202.2	1
	average	**131.9**a	**12.0**a	**1**	**1**	**98**a	**205.0**a	**1**
	2010	54.8	6.5	3	1	38	142.3	1
	2011	54.1	6.5	3	1	48	138.0	1
Plavski piskavac	2012	52.0	5.9	3	1	42	125.4	1
	2013	52.7	5.1	3	1	52	117.5	1
	average	**53.4**d	**6**c	**3**	**1**	**45**f	**130.8**e	**1**

1		2	3	4	5	6	7	8
	2010	93.2	9.0	3	1	79	163.2	1
	2011	92.5	8.5	3	1	76	158.6	1
Turgulja	2012	89.5	7.8	3	1	74	153.0	1
	2013	90.4	6.7	3	1	79	147.6	1
	average	**91.4**bc	**8.0**bc	**3**	**1**	**77**bc	**155.6**d	**1**
	2010	118.5	10.8	2	1	88	203.2	1
	2011	114.5	10.0	2	1	82	199.5	1
Obični Piskavac	2012	111.5	9.0	2	1	84	195.0	1
	2013	109.1	8.2	2	1	86	191.1	1
	average	**113.4**a	**9.5**b	**2**	**1**	**85**b	**197.2**a	**1**
	2010	125.5	11.5	2	1	78	195.5	1
	2011	122.0	11.0	2	1	85	190.0	1
Komperuša	2012	117.5	10.6	2	1	91	175.5	1
	2013	113.0	10.1	2	1	98	159.0	1
	average	**119.5**a	**10.8**a	**2**	**1**	**88**ab	**180.0**b	**1**
	2010	109.5	9.2	2	2	80	202.5	2
	2011	109.0	9.2	2	2	76	201.5	2
Mudovalj	2012	111.0	9.5	2	2	72	209.0	2
	2013	104.9	8.5	2	2	72	187.0	2
	average	**108.6**b	**9.1**b	**2**	**2**	**75**c	**200.0**a	**2**
	2010	124.1	11.0	2	2	78	204.2	2
	2011	118.5	10.6	2	2	87	194.3	2
Dronga	2012	116.5	9.5	2	2	92	192.0	2
	2013	116.9	8.9	2	2	95	191.5	2
	average	**119.0**a	**10.0**ab	**2**	**2**	**88**ab	**195.5**a	**2**
	2010	127.5	11.5	2	1	89	199.5	1
	2011	125.0	11.0	2	1	86	198.0	1
Dupljanka	2012	125.5	11.0	2	1	82	198.2	1
	2013	124.8	10.5	2	1	87	197.4	1
	average	**125.7**a	**11.0**a	**2**	**1**	**86**b	**198.2**a	**1**
	2010	104.2	9.4	2	1	73	177.2	1
	2011	102.3	9.0	2	1	77	174.0	1
Jesenka	2012	100.5	8.8	2	1	70	170.2	1
	2013	100.2	8.0	2	1	72	172.6	1
	average	**101.8**ab	**8.8**b	**2**	**1**	**73**c	**173.5**c	**1**
	2010	57.8	6.8	3	1	42	132.8	1
	2011	57.2	6.8	3	1	45	132.0	1
Trnovača	2012	56.8	6.2	3	1	49	131.5	1
	2013	57.8	6.2	3	1	56	132.5	1
	average	**57.4**d	**6.5**c	**3**	**1**	**48**e	**132.2**e	**1**
	LSD0.05	13.1	1.25	–	–	0.41	14.02	–
	LSD0.01	17.4	1.66			0.47	17.94	

Table 4. Dynamics of leaf dehydration per measured interval (%) – 2010, 2011, 2012, 2013 and average

Cultivar		Measured interval					
		1h	2h	4h	8h	16h	24h
1		2	3	4	5	6	7
Petrovača	2010	9.54	20.5	26.31	41.25	70.44	100
	2011	9.48	20.0	26.24	40.98	70.18	100
	2012	9.72	21.9	26.74	42.05	71.05	100
	2013	10.46	22.0	26.55	41.52	71.69	100
	average	**9.67**c	**21.1**c	**26.46**d	**41.45**d	**70.84**d	**100**
Mednica	2010	9.85	20.00	23.55	35.50	64.80	100
	2011	9.74	19.95	23.10	35.05	64.25	100
	2012	10.14	20.95	25.84	36.70	66.05	100
	2013	10.23	19.94	26.55	37.03	65.70	100
	average	**9.99**d	**20.21**b	**24.76**c	**36.07**b	**65.2**b	**100**
Kapavac	2010	9.28	19.00	22.95	37.14	64.5	100
	2011	9.15	18.72	22.54	36.95	63.5	100
	2012	9.61	19.85	25.60	38.50	66.9	100
	2013	9.84	19.55	27.95	39.45	68.3	100
	average	**9.47**c	**19.28**a	**24.76**c	**38.01**c	**65.8**b	**100**
Grkaja	2010	8.54	19.93	25.34	38.74	71.02	100
	2011	8.32	19.87	25.03	38.53	70.97	100
	2012	8.97	20.22	25.77	39.25	71.76	100
	2013	9.45	21.86	26.62	40.24	72.49	100
	average	**8.82**ab	**20.47**c	**25.69**d	**39.19**c	**71.56**d	**100**
Crvena ranka	2010	8.64	17.87	20.74	33.51	58.03	100
	2011	8.43	17.73	20.92	32.87	57.87	100
	2012	9.53	18.74	21.76	33.76	58.54	100
	2013	9.12	19.06	22.58	34.02	58.52	100
	average	**8.93**b	**18.35**a	**21.5**a	**33.54**a	**58.24**a	**100**
Mudara	2010	8.23	19.12	25.91	39.45	69.90	100
	2011	8.31	19.02	25.87	40.00	70.12	100
	2012	8.73	19.54	26.54	40.22	69.75	100
	2013	8.75	19.88	26.88	39.85	70.63	100
	average	**8.53**a	**19.39**b	**26.3**d	**39.88**d	**70.10**c	**100**
Belošljiva	2010	8.87	19.15	25.18	41.52	73.13	100
	2011	9.38	19.49	25.73	41.07	73.98	100
	2012	9.40	20.32	26.20	41.64	74.22	100
	2013	10.43	19.88	25.14	41.24	73.79	100
	average	**9.52**c	**19.71**b	**25.56**d	**41.37**d	**73.78**d	**100**
Crnošljiva	2010	9.23	18.81	23.20	36.11	63.80	100
	2011	8.55	18.46	22.72	37.10	64.49	100
	2012	9.20	19.22	23.49	36.65	63.48	100
	2013	9.81	19.90	22.79	36.26	64.91	100
	average	**9.20**bc	**19.10**a	**23.05**a	**36.53**b	**64.17**b	**100**

1		2	3	4	5	6	7
Šara	2010	8.17	17.71	22.81	36.39	64.24	100
	2011	8.10	17.82	23.06	35.71	64.62	100
	2012	8.70	18.51	23.87	36.15	64.17	100
	2013	8.19	19.31	24.43	36.91	63.68	100
	average	**8.29**a	**18.34**a	**23.54**a	**36.29**b	**64.18**b	**100**
Metlaš	2010	8.38	20.24	26.89	40.45	71.46	100
	2011	8.48	21.52	26.77	41.42	71.7	100
	2012	8.39	20.17	25.96	40.81	71.91	100
	2013	11.19	21.67	26.38	41.17	71.57	100
	average	**9.11**b	**20.90**c	**26.50**d	**40.96**d	**71.66**d	**100**
Crvena durgulja	2010	8.55	17.88	23.60	35.62	64.14	100
	2011	9.70	18.76	23.97	36.84	64.50	100
	2012	9.79	18.44	24.48	35.83	64.11	100
	2013	8.72	19.12	23.27	36.99	62.96	100
	average	**9.19**b	**18.55**a	**23.83**c	**36.32**b	**63.93**b	**100**
Plavski piskavac	2010	8.79	18.34	22.36	35.15	61.83	100
	2011	9.05	18.51	23.16	34.52	62.53	100
	2012	8.18	19.03	22.81	35.14	62.52	100
	2013	9.54	17.88	21.92	35.55	61.11	100
	average	**8.89**b	**18.44**a	**22.56**a	**35.09**a	**62.00**a	**100**
Turgulja	2010	10.25	19.56	25.11	37.9	64.34	100
	2011	9.25	20.03	26.0	37.02	65.55	100
	2012	9.18	20.16	25.94	37.65	64.39	100
	2013	10.72	20.81	25.36	38.27	65.91	100
	average	**9.85**d	**20.14**b	**25.60**d	**37.71**c	**65.05**b	**100**
Obični Piskavac	2010	9.93	21.92	27.3	42.2	72.84	100
	2011	10.62	21.43	26.94	41.72	72.11	100
	2012	9.62	22.35	27.79	42.15	72.42	100
	2013	9.91	21.61	28.37	40.89	72.42	100
	average	**10.02**d	**21.83**d	**27.60**d	**41.74**d	**72.45**d	**100**
Komperuša	2010	8.39	19.00	24.85	36.85	69.22	100
	2011	8.26	19.54	25.41	37.48	68.14	100
	2012	9.17	19.05	25.05	37.1	69.20	100
	2013	9.10	19.28	24.37	37.45	67.97	100
	average	**8.73**ab	**19.22**a	**24.92**b	**37.22**b	**68.63**c	**100**
Mudovalj	2010	9.40	19.43	25.49	39.12	67.16	100
	2011	9.03	19.58	24.76	38.08	66.08	100
	2012	8.65	19.19	25.8	39.03	66.35	100
	2013	9.40	20.32	25.63	38.62	67.17	100
	average	**9.12**b	**19.63**b	**25.42**c	**38.71**c	**66.69**c	**100**
Dronga	2010	9.14	20.25	24.79	36.66	66.83	100
	2011	9.01	19.59	24.96	37.87	66.89	100
	2012	9.61	20.20	24.59	36.66	65.99	100
	2013	10.48	19.93	26.39	37.73	66.88	100
	average	**9.56**c	**19.99**b	**25.18**c	**37.23**b	**66.65**c	**100**

1		2	3	4	5	6	7
	2010	9.73	19.49	24.46	36.69	64.38	100
	2011	8.72	18.48	24.56	37.17	65.13	100
Dupljanka	2012	9.97	18.51	23.82	37.1	63.92	100
	2013	8.86	19.2	23.48	37.6	64.85	100
	average	**9.32**c	**18.92**a	**24.08**b	**37.14**b	**64.57**b	**100**
	2010	9.29	19.61	25.64	37.92	67.55	100
	2011	8.98	19.67	25.97	38.28	67.37	100
Jesenka	2012	9.52	19.95	25.57	37.91	67.49	100
	2013	10.41	17.98	24.02	36.49	67.59	100
	average	**9.55**c	**19.30**a	**25.30**c	**37.65**c	**67.50**c	**100**
	2010	9.15	19.37	25.37	37.52	65.17	100
	2011	10.08	18.74	25.42	38.01	64.48	100
Trnovača	2012	8.64	19.36	25.45	37.46	64.79	100
	2013	9.73	19.58	23.60	36.70	65.43	100
	average	**9.40**c	**19.26**a	**24.96**b	**37.42**b	**64.97**b	**100**
	LSD0.05	0.15	0.21	0.32	0.42	0.75	
	LSD0.01	0.27	0.29	0.38	0.49	0.88	

Similar data for Serbian autochthonous plum cultivars in terms of pomological, physical and sensorial characteristics were reported by Paunović et al. [1985], Paunović [1988], Petrović et al. [2002], and Milošević and Milošević [2012], and data on local cultivars grown in the former Yugoslavia were given by Jovančević [1977], Jarebica and Muratović [1977], Usenik et al. [2007], Jelačić et al. [2008]. Stone weight ranged from 0.16 ±0.003 g (‘Trnovača’) to 2.20 ±0.711 g (‘Crvena durgulja’), which was in similar with the results obtained by Paunović et al. [1985], Paunović [1988], Paunović and Paunović [1994], Mratinić [2000] and Milošević and Milošević [2012]. Those obtained values, particularly those for fruit weight and fruit size, were lower than the ones reported for standard commercial cultivars, both foreign and domestic ones. The fact that substantial climate- and soil-dependent variations could occur in the above traits should be taken into account. Importantly, some cultivars are found to be promising in terms of fruit traits. Almost all the fruits can be processed, particularly into plum brandy, or used fresh (‘Crvena ranka’). More importantly, the autochthonous (primitive, local) cultivars or accessions observed in this study can be used as an outstanding genetic basis and source of germplasm in plum breeding aimed at developing new cultivars and rootstocks [Duric et al. 1998, Esmenjaud and Direlewanger 2007].

The results of this research show that the plant height, stem diameter, branching and uniformity of one-year old seedlings of autochthonous plum cultivars are genetic characteristics of autochthonous plum cultivars, from which rapid growth and uniformity of scions depend (tab. 3). The plant height of one-year old seedlings of researched autochthonous cultivars of plum was from 53.4 cm (cv. ‘Plavski piskavac’), to 131.9 cm (cv. ‘Crvena durgulja’). The stem diameter of researched one-year old seedlings of autochthonous cultivars of plum was from 6mm (cv. ‘Plavski piskavac’), to 12 mm (cv. ‘Crvena durgulja’). The most significant nursery characteristics which must be

estimated in selection of autochthonous plum cultivar are ability to propagate, growth-rate, uniformity and compatibility [Vachun 1995]. In most of autochthonous cultivars of plum height and steam diameter at the height of 10 cm above the ground were sufficient for successful grafting in August (tab. 3). The bud take data of researched one-year old seedlings of autochthonous cultivars of plum was from 48% (‘Trnovača’) to 98% (‘Crvena durgulja’). The cultivars ‘Crvena durgulja’ and ‘Mudara’, whose but take data was 98% and 95%, were also very interesting from the aspect of economic production of one-year old seedlings autochthonous plum cultivars.

Most of the germplasm resources have never been subjected to proper germplasm conservation research work. Many local types of genetic value have already disappeared or will be lost in the next few years without any possibility of recovery. Fortunately genetic resources in sparsely populated and less developed areas of Serbia and Montenegro have been less eroded. The main objective of this work was selection of old autochthonous cultivars with better bio-agronomic characteristics such as uniformity of growth, high productivity, reduction of vigor and adaptation to the pedoclimatic environment. However, since the results obtained in this study are only preliminary, reliable estimation will be possible only through a multi-disciplinary approach to examining selected cultivars grown in a collection orchard as well as through further findings to be attained under field and laboratory conditions over the next five to ten years.

Out of the studies autochthonous plum cultivars, the highest water attaining capability had the leaves of cultivar ‘Crvena ranka’ (tab. 4). Over the monitored time interval (8 hours upon sample taking), leaves taken from the annual twigs of the studied cultivars (one-year old seedlings) lost on average 33.54% of water. The lowest level of the stated capability was recorded with the leaves of cultivar ‘Obični piskavac’ (41.74%). Out of the studied water attaining capability of leaves in autochthonous apple cultivars [Šebek 2004], the highest water attaining capability had the leaves of cultivar ‘Pašinka’. Over the monitored time interval (8 hours upon sample taking), leaves taken from the annual twigs of the studied cultivars (in situ) lost on average 38.09% of water. The lowest level of stated capability was recorded with the leaves of cultivar ‘Arapka’ (40.64%). In terms of the selected wild apples [Šebek 2004], the highest level of water attaining capability was registered in the leaves of type 2 (32.44%). Leaves taken from the annual twigs out of the studied selected types (in situ) lost on average level (36.61%) showed the leaves of type 6.

CONCLUSIONS

The research was conducted on 20 different plum cultivars and that allow us to obtain important phonological and morphological traits.

1. The onset of flowering was recorded in the last five days of March and in the first twelve days of April. The earliest onset of flowering was observed in cv. ‘Trnovača’ (26.03) derived from *P. insititia* L., and the latest in cv. ‘Dupljanka’ (12.04) derived from *P. domestica* L. Among the twenty cultivars examined, eight (40%) started to flower at the end of March, and twelve (60%) during the middle of the first twelve-day period of April. The full flowering stage lasted from 30 March (‘Trnovača’) to 18th

April (‘Dupljanka’), and the end of flowering from 7th April (‘Trnovača’) to 24th April (‘Dupljanka’). Flowering lasted 9 dazs for cultivars ‘Turgulja’, ‘Plavski piskavac’, ‘Grkaja’, ‘Kapavac and Komperuša’) to 14 days (‘Crvena durgulja’, ‘Mednica’, ‘Petrovača’, ‘Belošljiva’ and ‘Šara’).

2. The harvest period was longer than the flowering period, as it lasted from 13th July (‘Petrovača’) to 18th September (‘Trnovača’).

3. The fruit weight ranged from 6.65 ±0.235 g (‘Plavski piskavac’) to 53.88 ±0.654 g (‘Crvena durgulja’). The most dominant fruit shape was rounded – in twelve cultivars, followed by ovate – in four cultivars, elliptical – in 3 cultivars and oblong – in one cultivar (‘Grkaja’).

4. Ground color in most of the cultivars was light green (10) and light yellow (6), being yellow in cv. ‘Trnovača’, cv. ‘Dupljanka’ and cv. ‘Grkaja’. Skin color ranged from white yellow (1), red (1), violet (1), blue (1), dark blue (1) to dark violet (2), black (2), mahagoni (4) to red violet (7 cultivars). Flesh color was yellow green in most cultivars (12) and light yellow only in cv. ‘Plavski piskavac’ and amber only in cv. ‘Dupljanka’.

5. As for flesh firmness, it was medium in 15 cultivars, firm in tree and soft in two cultivars.

6. Stone weight ranged from 0.16 ±0.003 g (‘Trnovača’) to 2.20 ±0,711g (‘Crvena durgulja’).

All the fruits could be processed, and cv. ‘Crvena ranka’ could be used fresh. The autochthonous plum cultivars or accessions observed in this study could serve as an outstanding genetic basis and a source of germplasm for plum breeding aimed at developing new cultivars and as cultivars for organic plum orchards.

The results of this research show that the plant height, stem diameter, branching and uniformity of one-year old seedlings are genetic characteristics of autochthonous plum cultivars, from which rapid growth and uniformity of scions depend. From the aspect of production of one-year old seedlings and evaluation of scions, the most interesting autochthonous plum cultivars are ‘Mednica’ and ‘Mudara’.

The highest water attaining capability had the leaves of cultivar ‘Crvena ranka’. The lowest level of the stated capability was recorded with the leaves of cultivar ‘Obični piskavac’.

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FENOLOGICZNE I POMOLOGICZNE CECHY AUTOCHTONICZNYCH ODMIAN ŚLIWKI W PÓŁNOCNYM REJONIE CZARNOGÓRY

Streszczenie. Śliwa jest głównym gatunkiem owoców w rejonie Czarnogóry. Prowadzone przez 4 lata badanie obejmowało identyfikację *in situ* autochtonicznych odmian śliwy. Obserwację i zapis ich cech fenologicznych i pomologicznych przeprowadzono przy użyciu metodologii IBPGR i UPOV. Kwitnienie rozpoczęło się między 26 marca a 12 kwietnia, a dojrzewanie między 13 lipca (Petrovača) a 18 września (Trnovača). Masa owocu wahała się od 6,65 ±0,235 do 53,88 ±0,654 g a masa pestki od 0,16 ±0,003 do 2,20 ±0,11 g. Odmiany sklasyfikowano jako skrajnie małe w kategoriach rozmiaru owoców, z wyjątkiem odmiany 'Crvena durgulja' (większe owoce). Dominował kulisty kształt owocu i jasnozielona barwa. Barwa skórki była różna, począwszy od bursztynowej, skończywszy na czarnej. Dominującą barwą miąższu była żółtozielona. Przeważała średnia jędrność miąższu. Owoce omawianej odmiany mogą być przetwarzane przede wszystkim na śliwowicę, lub mogą być używane świeże lub suszone. Wybrane odmiany śliwy można stosować w programach hodowlanych i jako odmiany w sadach organicznych. Niniejsze badanie przeprowadzono w celu oceny autochtonicznych odmian i sadzonek śliwy (*in situ*). Proces selekcji składał się z trzech etapów: a) wstępna selekcja na podstawie charakterystyki populacji i cech pomologicznych, b) morfologiczna i jakościowa charakterystyka jednorocznych sadzonek do autochtonicznych odmian brandy z sadzonki Myrobalan (*Prunus cerasifera* Erhr.) oraz c) zdolność zatrzymywania wody śliwek jako wskaźnik ich odporności na suszę.

Słowa kluczowe: śliwa, bazy genetyczne, plazma zarodkowa, *Prunus domestica* L., *Prunus insititia* L.

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