

## 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 26<sup>th</sup> March and 12<sup>th</sup> April and fruit ripening between 13<sup>th</sup> July (Petrovača) and 18<sup>th</sup> 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 view 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 beneficial for human consumption [Botu et al. 2012].

Plum cultivation has a historical tradition, economical, social and cultural implication for the South East of Europe. The European plum (*Prunus domestica* L.) genetic variability in the South East of Europe is large, unique and particular evident in the characteristics of the fruit, plant and adaptability 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 Virus [Botu et al. 2012]. As an example, Elisa test that was conducted on cultivar 'Crvena durgulja', proved presence of Sharka (PPV), however 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 predominate in the assortment. 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. insititia* 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  $\pm 0.01$  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 30<sup>th</sup> March ('Trnovača') to 18<sup>th</sup> April ('Dupljanka'), and the end of flowering from 7<sup>th</sup> April ('Trnovača') to 24<sup>th</sup> 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      |
|              |           |          |              | <b>27.03 d</b>  | <b>31.03 d</b>  | <b>10.04 d</b> | <b>14a</b> | <b>13.07 d</b>  |
| 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      |
|              |           |          |              | <b>30.03 d</b>  | <b>03.04 d</b>  | <b>13.04 d</b> | <b>14a</b> | <b>25.07 d</b>  |
| 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      |
|              |           |          |              | <b>03.04 c</b>  | <b>06.04 c</b>  | <b>12.04 d</b> | <b>9c</b>  | <b>29.07 d</b>  |
| 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      |
|              |           |          |              | <b>01.04 cd</b> | <b>04.04 cd</b> | <b>10.04 d</b> | <b>10c</b> | <b>02.08 d</b>  |
| 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      |
|              |           |          |              | <b>29.03 d</b>  | <b>03.04 d</b>  | <b>11.04 d</b> | <b>13a</b> | <b>05.08 cd</b> |
| 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      |
|              |           |          |              | <b>01.04 c</b>  | <b>06.04 c</b>  | <b>13.04 d</b> | <b>12b</b> | <b>06.08 c</b>  |
| 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      |
|              |           |          |              | <b>30.03 d</b>  | <b>03.04 d</b>  | <b>13.04 d</b> | <b>14a</b> | <b>07.08 c</b>  |
| 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      |
|              |           |          |              | <b>31.03 d</b>  | <b>04.04 cd</b> | <b>13.04 d</b> | <b>13a</b> | <b>08.08 c</b>  |

| 1                | 2       | 3       | 4   | 5              | 6               | 7               | 8          | 9              |
|------------------|---------|---------|-----|----------------|-----------------|-----------------|------------|----------------|
| Šara             | 19°57'E | 42°40'N | 900 | 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     |
|                  |         |         |     | 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     |
|                  |         |         |     | <b>28.03 d</b> | <b>01.04 d</b>  | <b>11.04 d</b>  | <b>14a</b> | <b>12.08 c</b> |
| Metlaš           | 19°29'E | 42°51'N | 984 | 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     |
|                  |         |         |     | 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     |
|                  |         |         |     | <b>01.04 c</b> | <b>06.04 c</b>  | <b>12.04 d</b>  | <b>12b</b> | <b>13.08 c</b> |
| Crvena durgulja  | 19°48'E | 42°57'N | 870 | 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     |
|                  |         |         |     | 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     |
|                  |         |         |     | <b>30.03 d</b> | <b>03.04 d</b>  | <b>13.04 d</b>  | <b>14a</b> | <b>15.08 c</b> |
| Plavski piskavac | 19°55'E | 42°33'N | 940 | 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     |
|                  |         |         |     | 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     |
|                  |         |         |     | <b>07.04 b</b> | <b>11.04 b</b>  | <b>16.04 c</b>  | <b>9c</b>  | <b>21.08 b</b> |
| Turgulja         | 19°56'E | 42°37'N | 910 | 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     |
|                  |         |         |     | 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     |
|                  |         |         |     | <b>04.04 c</b> | <b>08.04 c</b>  | <b>13.04 d</b>  | <b>9c</b>  | <b>23.08 b</b> |
| Obični Piskavac  | 18°49'E | 42°26'N | 858 | 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     |
|                  |         |         |     | 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     |
|                  |         |         |     | <b>07.04 b</b> | <b>10.04 c</b>  | <b>17.04 c</b>  | <b>10c</b> | <b>23.08 b</b> |
| Komperuša        | 19°49'E | 42°43'N | 850 | 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     |
|                  |         |         |     | 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     |
|                  |         |         |     | <b>09.04 a</b> | <b>13.04 b</b>  | <b>18.04 c</b>  | <b>9c</b>  | <b>24.08 b</b> |
| Mudovalj         | 19°55'E | 42°33'N | 940 | 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     |
|                  |         |         |     | 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     |
|                  |         |         |     | <b>09.04 a</b> | <b>15.04 ab</b> | <b>21.04 ab</b> | <b>12b</b> | <b>02.09 b</b> |
| Dronga           | 19°55'E | 42°33'N | 940 | 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     |
|                  |         |         |     | 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     |
|                  |         |         |     | <b>09.04 a</b> | <b>15.04 ab</b> | <b>21.04 ab</b> | <b>12b</b> | <b>09.09 a</b> |

| 1          | 2       | 3       | 4                  | 5              | 6              | 7              | 8          | 9              |
|------------|---------|---------|--------------------|----------------|----------------|----------------|------------|----------------|
| 'Dupljanka | 19°59'E | 43°02'N | 1180               | 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     |
|            |         |         |                    | 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     |
|            |         |         |                    | <b>12.04 a</b> | <b>18.04 a</b> | <b>24.04 a</b> | <b>12b</b> | <b>11.09 a</b> |
| Jesenka    | 19°55'E | 42°33'N | 940                | 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     |
|            |         |         |                    | 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     |
|            |         |         |                    | <b>10.04 a</b> | <b>16.04 a</b> | <b>22.04 a</b> | <b>12b</b> | <b>11.09 a</b> |
| Trnovača   | 19°20'E | 42°38'N | 979                | 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     |
|            |         |         |                    | 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     |
|            |         |         |                    | <b>26.03 d</b> | <b>30.03 d</b> | <b>07.04 d</b> | <b>12b</b> | <b>18.09 a</b> |
|            |         |         | LSD <sub>005</sub> | 6.58           | 3.45           | 5.13           | 2.15       | 7.79           |
|            |         |         | LSD <sub>001</sub> | 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 13<sup>th</sup> July ('Petrovača') to 18<sup>th</sup> 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 <sup>1</sup>    | shape <sup>2</sup> | colour <sup>3</sup> | colour<br>* | colour<br>** | firmness<br>*** | ****     | 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    | <b>13.11 ±0.078e</b> | <b>1</b>           | <b>2</b>            | <b>2</b>    | <b>5</b>     | <b>3</b>        | <b>5</b> | <b>2</b>   | <b>1.19 ±0.032c</b> |
| 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    | <b>16.09 ±0.223e</b> | <b>1</b>           | <b>4</b>            | <b>2</b>    | <b>3</b>     | <b>5</b>        | <b>3</b> | <b>2</b>   | <b>1.43 ±0.075c</b> |
| 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    | <b>11.88 ±0.084e</b> | <b>1</b>           | <b>3</b>            | <b>2</b>    | <b>8</b>     | <b>3</b>        | <b>5</b> | <b>2</b>   | <b>0.53 ±0.007d</b> |
| 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    | <b>14.78 ±0.778e</b> | <b>1</b>           | <b>6</b>            | <b>4</b>    | <b>2</b>     | <b>2</b>        | <b>5</b> | <b>2</b>   | <b>0.90 ±0.075d</b> |
| 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    | <b>19.30 ±0.041e</b> | <b>1</b>           | <b>4</b>            | <b>3</b>    | <b>3</b>     | <b>3</b>        | <b>5</b> | <b>1.2</b> | <b>0.66 ±0.004d</b> |
| 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    | <b>35.60 ±0.299c</b> | <b>2</b>           | <b>2</b>            | <b>3</b>    | <b>3</b>     | <b>2</b>        | <b>5</b> | <b>2</b>   | <b>1.87 ±0.035b</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    | <b>13.90 ±0.300e</b> | <b>1</b>           | <b>2</b>            | <b>3</b>    | <b>0</b>     | <b>3</b>        | <b>3</b> | <b>2</b>   | <b>0.99 ±0.025d</b> |
| 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    | <b>12.77 ±0.221e</b> | <b>1</b>           | <b>3</b>            | <b>2</b>    | <b>7</b>     | <b>3</b>        | <b>7</b> | <b>2</b>   | <b>0.50 ±0.009d</b> |

|                  | 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 | <b>19.02 ±0.057e</b>  | <b>1</b> | <b>2</b> | <b>2</b> | <b>4</b> | <b>3</b> | <b>5</b> | <b>2</b> | <b>0.82 ±0.019d</b> |
| 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 | <b>18.33 ±0.071e</b>  | <b>1</b> | <b>2</b> | <b>3</b> | <b>3</b> | <b>3</b> | <b>7</b> | <b>2</b> | <b>0.70 ±0.009d</b> |
| 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 | <b>53.88 ±0.654a</b>  | <b>3</b> | <b>3</b> | <b>3</b> | <b>3</b> | <b>5</b> | <b>5</b> | <b>2</b> | <b>2.20 ±0.711a</b> |
| 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         |
|                  | average | <b>6.65 ±0.235f</b>   | <b>1</b> | <b>2</b> | <b>4</b> | <b>7</b> | <b>4</b> | <b>5</b> | <b>2</b> | <b>0.52 ±0.015d</b> |
| 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 | <b>20.91 ±0.221d</b>  | <b>1</b> | <b>2</b> | <b>2</b> | <b>9</b> | <b>3</b> | <b>5</b> | <b>2</b> | <b>1.59 ±0.013c</b> |
| 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 | <b>13.62 ±0.042e</b>  | <b>1</b> | <b>2</b> | <b>2</b> | <b>6</b> | <b>3</b> | <b>5</b> | <b>2</b> | <b>0.74 ±0.004d</b> |
| Komperuš a       | 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 | <b>16.88 ±0.106e</b>  | <b>1</b> | <b>2</b> | <b>2</b> | <b>7</b> | <b>3</b> | <b>5</b> | <b>2</b> | <b>1.19 ±0.033c</b> |
| 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 | <b>18.55 ±0.125e</b>  | <b>1</b> | <b>2</b> | <b>3</b> | <b>3</b> | <b>2</b> | <b>5</b> | <b>2</b> | <b>1.19 ±0.086c</b> |
| 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 | <b>20.15 ±0.233de</b> | <b>1</b> | <b>2</b> | <b>2</b> | <b>5</b> | <b>3</b> | <b>5</b> | <b>2</b> | <b>0.99 ±0.15d</b>  |



|                     | 1       | 2                    | 3        | 4        | 5        | 6        | 7        | 8        | 9        | 10                  |
|---------------------|---------|----------------------|----------|----------|----------|----------|----------|----------|----------|---------------------|
| Dupljanka           | 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         |
|                     | 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 | <b>22.66 ±0.22d</b>  | <b>1</b> | <b>4</b> | <b>4</b> | <b>3</b> | <b>6</b> | <b>5</b> | <b>2</b> | <b>1.88 ±0.440b</b> |
| Jesenka             | 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         |
|                     | 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 | <b>23.81 ±0.251d</b> | <b>1</b> | <b>2</b> | <b>2</b> | <b>9</b> | <b>3</b> | <b>5</b> | <b>2</b> | <b>1.81 ±0.023b</b> |
| Trnovača            | 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         |
|                     | 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 | <b>7.23 ±0.01f</b>   | <b>1</b> | <b>2</b> | <b>1</b> | <b>7</b> | <b>2</b> | <b>7</b> | <b>2</b> | <b>0.16 ±0.003e</b> |
| LSD <sub>0.05</sub> | 4.82    |                      |          |          |          |          |          |          |          | 0.26                |
| LSD <sub>0.01</sub> | 6.39    |                      |          |          |          |          |          |          |          | 0.36                |

IBPGR and UPOV Descriptor List for Plum:

<sup>1</sup> **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

<sup>2</sup> **fruit shape:** 2 = rounded, 3 = elliptical, 4 = ovate, 6 = oblong;

<sup>3</sup> **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 = mahogany, 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]. Although 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 acidity).

Table 3. Morphological and quantitative characteristics of one-year old seedlings for autochthonous brandy cultivars of plum on Myrobalan seedling (*Prunus cerasifera* Ehrh.) – 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           | <b>86.2c</b>       | <b>7.8c</b>   | <b>1</b>   | <b>2</b>     | <b>55e</b>          | <b>150.4d</b>        | <b>2</b> |
| 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           | <b>114.4a</b>      | <b>10.2ab</b> | <b>2</b>   | <b>2</b>     | <b>92a</b>          | <b>198.0a</b>        | <b>2</b> |
| 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           | <b>73.2c</b>       | <b>7.2c</b>   | <b>4</b>   | <b>1</b>     | <b>68d</b>          | <b>195.4a</b>        | <b>1</b> |

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

|                    | 1       | 2              | 3             | 4        | 5        | 6           | 7             | 8        |
|--------------------|---------|----------------|---------------|----------|----------|-------------|---------------|----------|
| Turgulja           | 2010    | 93.2           | 9.0           | 3        | 1        | 79          | 163.2         | 1        |
|                    | 2011    | 92.5           | 8.5           | 3        | 1        | 76          | 158.6         | 1        |
|                    | 2012    | 89.5           | 7.8           | 3        | 1        | 74          | 153.0         | 1        |
|                    | 2013    | 90.4           | 6.7           | 3        | 1        | 79          | 147.6         | 1        |
|                    | average | <b>91.4bc</b>  | <b>8.0bc</b>  | <b>3</b> | <b>1</b> | <b>77bc</b> | <b>155.6d</b> | <b>1</b> |
| Obični<br>Piskavac | 2010    | 118.5          | 10.8          | 2        | 1        | 88          | 203.2         | 1        |
|                    | 2011    | 114.5          | 10.0          | 2        | 1        | 82          | 199.5         | 1        |
|                    | 2012    | 111.5          | 9.0           | 2        | 1        | 84          | 195.0         | 1        |
|                    | 2013    | 109.1          | 8.2           | 2        | 1        | 86          | 191.1         | 1        |
|                    | average | <b>113.4a</b>  | <b>9.5b</b>   | <b>2</b> | <b>1</b> | <b>85b</b>  | <b>197.2a</b> | <b>1</b> |
| Komperuša          | 2010    | 125.5          | 11.5          | 2        | 1        | 78          | 195.5         | 1        |
|                    | 2011    | 122.0          | 11.0          | 2        | 1        | 85          | 190.0         | 1        |
|                    | 2012    | 117.5          | 10.6          | 2        | 1        | 91          | 175.5         | 1        |
|                    | 2013    | 113.0          | 10.1          | 2        | 1        | 98          | 159.0         | 1        |
|                    | average | <b>119.5a</b>  | <b>10.8a</b>  | <b>2</b> | <b>1</b> | <b>88ab</b> | <b>180.0b</b> | <b>1</b> |
| Mudovalj           | 2010    | 109.5          | 9.2           | 2        | 2        | 80          | 202.5         | 2        |
|                    | 2011    | 109.0          | 9.2           | 2        | 2        | 76          | 201.5         | 2        |
|                    | 2012    | 111.0          | 9.5           | 2        | 2        | 72          | 209.0         | 2        |
|                    | 2013    | 104.9          | 8.5           | 2        | 2        | 72          | 187.0         | 2        |
|                    | average | <b>108.6b</b>  | <b>9.1b</b>   | <b>2</b> | <b>2</b> | <b>75c</b>  | <b>200.0a</b> | <b>2</b> |
| Dronga             | 2010    | 124.1          | 11.0          | 2        | 2        | 78          | 204.2         | 2        |
|                    | 2011    | 118.5          | 10.6          | 2        | 2        | 87          | 194.3         | 2        |
|                    | 2012    | 116.5          | 9.5           | 2        | 2        | 92          | 192.0         | 2        |
|                    | 2013    | 116.9          | 8.9           | 2        | 2        | 95          | 191.5         | 2        |
|                    | average | <b>119.0a</b>  | <b>10.0ab</b> | <b>2</b> | <b>2</b> | <b>88ab</b> | <b>195.5a</b> | <b>2</b> |
| Dupljanka          | 2010    | 127.5          | 11.5          | 2        | 1        | 89          | 199.5         | 1        |
|                    | 2011    | 125.0          | 11.0          | 2        | 1        | 86          | 198.0         | 1        |
|                    | 2012    | 125.5          | 11.0          | 2        | 1        | 82          | 198.2         | 1        |
|                    | 2013    | 124.8          | 10.5          | 2        | 1        | 87          | 197.4         | 1        |
|                    | average | <b>125.7a</b>  | <b>11.0a</b>  | <b>2</b> | <b>1</b> | <b>86b</b>  | <b>198.2a</b> | <b>1</b> |
| Jesenka            | 2010    | 104.2          | 9.4           | 2        | 1        | 73          | 177.2         | 1        |
|                    | 2011    | 102.3          | 9.0           | 2        | 1        | 77          | 174.0         | 1        |
|                    | 2012    | 100.5          | 8.8           | 2        | 1        | 70          | 170.2         | 1        |
|                    | 2013    | 100.2          | 8.0           | 2        | 1        | 72          | 172.6         | 1        |
|                    | average | <b>101.8ab</b> | <b>8.8b</b>   | <b>2</b> | <b>1</b> | <b>73c</b>  | <b>173.5c</b> | <b>1</b> |
| Trnovača           | 2010    | 57.8           | 6.8           | 3        | 1        | 42          | 132.8         | 1        |
|                    | 2011    | 57.2           | 6.8           | 3        | 1        | 45          | 132.0         | 1        |
|                    | 2012    | 56.8           | 6.2           | 3        | 1        | 49          | 131.5         | 1        |
|                    | 2013    | 57.8           | 6.2           | 3        | 1        | 56          | 132.5         | 1        |
|                    | average | <b>57.4d</b>   | <b>6.5c</b>   | <b>3</b> | <b>1</b> | <b>48e</b>  | <b>132.2e</b> | <b>1</b> |
|                    | 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 | <b>9.67c</b>      | <b>21.1c</b>  | <b>26.46d</b> | <b>41.45d</b> | <b>70.84d</b> | <b>100</b> |
| 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 | <b>9.99d</b>      | <b>20.21b</b> | <b>24.76c</b> | <b>36.07b</b> | <b>65.2b</b>  | <b>100</b> |
| 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 | <b>9.47c</b>      | <b>19.28a</b> | <b>24.76c</b> | <b>38.01c</b> | <b>65.8b</b>  | <b>100</b> |
| 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 | <b>8.82ab</b>     | <b>20.47c</b> | <b>25.69d</b> | <b>39.19c</b> | <b>71.56d</b> | <b>100</b> |
| 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 | <b>8.93b</b>      | <b>18.35a</b> | <b>21.5a</b>  | <b>33.54a</b> | <b>58.24a</b> | <b>100</b> |
| 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 | <b>8.53a</b>      | <b>19.39b</b> | <b>26.3d</b>  | <b>39.88d</b> | <b>70.10c</b> | <b>100</b> |
| 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 | <b>9.52c</b>      | <b>19.71b</b> | <b>25.56d</b> | <b>41.37d</b> | <b>73.78d</b> | <b>100</b> |
| 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 | <b>9.20bc</b>     | <b>19.10a</b> | <b>23.05a</b> | <b>36.53b</b> | <b>64.17b</b> | <b>100</b> |

|                  | 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 | <b>8.29a</b>  | <b>18.34a</b> | <b>23.54a</b> | <b>36.29b</b> | <b>64.18b</b> | <b>100</b> |
| 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 | <b>9.11b</b>  | <b>20.90c</b> | <b>26.50d</b> | <b>40.96d</b> | <b>71.66d</b> | <b>100</b> |
| 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 | <b>9.19b</b>  | <b>18.55a</b> | <b>23.83c</b> | <b>36.32b</b> | <b>63.93b</b> | <b>100</b> |
| 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 | <b>8.89b</b>  | <b>18.44a</b> | <b>22.56a</b> | <b>35.09a</b> | <b>62.00a</b> | <b>100</b> |
| 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 | <b>9.85d</b>  | <b>20.14b</b> | <b>25.60d</b> | <b>37.71c</b> | <b>65.05b</b> | <b>100</b> |
| 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 | <b>10.02d</b> | <b>21.83d</b> | <b>27.60d</b> | <b>41.74d</b> | <b>72.45d</b> | <b>100</b> |
| 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 | <b>8.73ab</b> | <b>19.22a</b> | <b>24.92b</b> | <b>37.22b</b> | <b>68.63c</b> | <b>100</b> |
| 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 | <b>9.12b</b>  | <b>19.63b</b> | <b>25.42c</b> | <b>38.71c</b> | <b>66.69c</b> | <b>100</b> |
| 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 | <b>9.56c</b>  | <b>19.99b</b> | <b>25.18c</b> | <b>37.23b</b> | <b>66.65c</b> | <b>100</b> |

|           | 1       | 2            | 3             | 4             | 5             | 6             | 7          |
|-----------|---------|--------------|---------------|---------------|---------------|---------------|------------|
| Dupljanka | 2010    | 9.73         | 19.49         | 24.46         | 36.69         | 64.38         | 100        |
|           | 2011    | 8.72         | 18.48         | 24.56         | 37.17         | 65.13         | 100        |
|           | 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 | <b>9.32c</b> | <b>18.92a</b> | <b>24.08b</b> | <b>37.14b</b> | <b>64.57b</b> | <b>100</b> |
| Jesenka   | 2010    | 9.29         | 19.61         | 25.64         | 37.92         | 67.55         | 100        |
|           | 2011    | 8.98         | 19.67         | 25.97         | 38.28         | 67.37         | 100        |
|           | 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 | <b>9.55c</b> | <b>19.30a</b> | <b>25.30c</b> | <b>37.65c</b> | <b>67.50c</b> | <b>100</b> |
| Trnovača  | 2010    | 9.15         | 19.37         | 25.37         | 37.52         | 65.17         | 100        |
|           | 2011    | 10.08        | 18.74         | 25.42         | 38.01         | 64.48         | 100        |
|           | 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 | <b>9.40c</b> | <b>19.26a</b> | <b>24.96b</b> | <b>37.42b</b> | <b>64.97b</b> | <b>100</b> |
|           | 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  $0.16 \pm 0.003$  g ('Trnovača') to  $2.20 \pm 0.711$  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 stem 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 bud 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 phenological 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 18<sup>th</sup>



April ('Dupljanka'), and the end of flowering from 7<sup>th</sup> April ('Trnovača') to 24<sup>th</sup> April ('Dupljanka'). Flowering lasted 9 days 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 13<sup>th</sup> July ('Petrovača') to 18<sup>th</sup> 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'.

## REFERENCES

- Buljko, M. (1977). Some characteristics of the Japanese variety Florentia (*Prunus triflora*) grown in ecological conditions of Herzegovina. *Acta Hort.*, 74, 137–142.
- Botu, M., Tomić, L., Cvetković, M., Gjamovski, V., Jemrić, T., Lazović, B., Ognjanov, V., Pintea, M., Sevo, R., Acnim, G., Bozović, Dj., Carka, F., Čiček, D., Fruk, G., Jaćimović, V., Kiprijanovski, M., Juraveli, A., Hjalmarsson, I. (2012). *Balkan plum pomology. Review of the monograph.* ISBN 978-91-637-0272-3.
- Durić, G., Micić, N., Lučić, P. (1998). Growth and bearing potential of plum cultivars Stanley and Pozegaca on the two stock/interstock combinations and on Myrobalan. *Acta Hort.*, 478, 225–228.

- Esmenjaud, D., Direlewanger, E. (2007). Genome mapping and molecular breeding in plants. In: Fruits and nuts – plum, Kole, C. (ed.). Springer, Netherland, 119–136.
- Eremeev, G.N. (1964). Opredelenie zasuhoustojčivosti plodovih i drugih drevesnih rastenij. Fiziol. Rast., 106, 722–727.
- Funt, R.C. (1998). Plums: A guide to selection and use. Ohio State University Extension Fact Sheet.
- Gunes, M. (2003). Some local plum varieties grown in Tokat province Pakistan J. Appl. Sci., 3, 291–295.
- Jarebica, S.D., Muratović, S.A. (1977). Some properties of growth and productivity of plum cultivars in Bosnia. Acta Hort., 74, 125–127.
- Jelačić, T., Dermić, E., Halapija-Kazija, D., Vujević, P., Savić, Z., Bisko, A., Cvetković, B. (2008). Analysis of autochthonous plum cultivars (*Prunus domestica* L.) in Croatia for the presence of *Plum Pox Virus*. J. Plant Pathol., 90, 3–7.
- Jovančević, R. (1977). Biological and economic properties of some outstanding prune cultivars grown in the River Valley. Acta Hort., 74, 129–136.
- Joshi, K.V., Sandhu, K.D. (2000). Influence of ethanol concentration, addition of spices extract, and level of sweetness on physico-chemical characteristics and sensory quality of apple vermouth. Braz. Arch. Biol. Technol., 43, 537–545.
- Milošević, T. (2000). Bearing potential of standard and selected Požegača. Acta Hort., 536, 369–373.
- Milošević, N., Milošević, T. (2012). Phenotypic diversity of autochthonous European (*Prunus domestica* L.) and Damson (*Prunus insititia* L.) plum accessions based on multivariate analysis. Hort. Sci. (Prague), 39(1), 8–20.
- Mratinić, E. (2000). The selection of the autochthonous plum cultivars suitable for growing. In: 1st International scientific symposium: production, processing and marketing of plums and plum products. Kostunici, Serbia Proceed., 1, 193–196.
- Mratinić, E. (2012). Influence of agro and pomotechnical treatments to yield and fruit quality of Crvena Ranka plum. In: 14 st. Serbian congress of fruit and grapevine producers with international participation. Vrnjačka Banja, Serbia Proceed., 4, 179.
- Ogašanović, D., Ranković, M., Plazinić, R., Papić, V. (1994) Performance of newly-bred plum cultivars and current breeding tendencies. ActHort. 359, 75–81.
- Paunović, A.S. (1988). Plum cultivars and their improvements in Yugoslavia. Fruit Variet. J., 42, 143–151.
- Paunović, S., Stanković, D., Madžarević, P., Milošević, P., Kojović, T., Popović, D. (1985). The plum cultivars in Yugoslavia. Exploration, collecting, conservation and exchange of hexaploid species of *Prunus domestica* L. and *Prunus insititia* L. in Yugoslavia. Faculty of Agronomy, Cacak, Serbia, pp. 1–212
- Paunović, S.A., Paunović, A.S. (1994). Investigations of plum and prune cultivars (*Prunus domestica* L. and *Prunus insititia* L.) in situ in SFR Yugoslavia. Acta Hort., 359, 49–54.
- Petrović, R., Miletić, R., Mitrović, M. (2002). Some biological characteristics of introduced plum cultivars. Acta Hort., 577, 239–243.
- Rodrigues, P.S., Lindsey, G.G., Fernandes, B.M.P. (2009). Biotechnological approaches for plant viruses resistance: From general to the modern RNA silencing pathway. Braz. Arch. Biol. Technol., 52, 795–808.
- Slavik, B. (1974). Method of studying plant water relation. Springer-Verlag Heidelberg, Berlin, 452 p.
- SAS Institute, (1990). SAS/STAT user's guide, version 8 edition. Vol. 2. Cary, NC: SAS Institute.

- Šebek, G. (2004) Water attaining capability of the leaves in wild apples (*Malus sylvestris* L.) and autochthonous apple cultivars as indicator of their resistance to drought. Slovenski sadjarski kongres z mednarodno udeležbo. Krško, 1, 255–261.
- Usenik, V., Štampar, F., Fajt, N. (2007). Pomological and phonological characteristics of some plum cultivars. Acta Hort., 734, 53–59.
- Vachun, Z. (1995). Rootstocks for apricot – the current situation and main problems. Acta Hort., 384, 459–465.
- Zanetto, A., Maggioni, L., Tobutt, R.K., Dosba, F. (2002). Prunus genetic resources in Europe: Achievement and perspectives of a networking activity. Genet. Resour. Crop Ev., 49, 331–337.

## FENOLOGICZNE I POMOLOGICZNE CECHY AUTOCHTONICZNYCH ODMIAN ŚLIWKI W PÓLNOCNYM 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  $6,65 \pm 0,235$  do  $53,88 \pm 0,654$  g a masa pestki od  $0,16 \pm 0,003$  do  $2,20 \pm 0,11$  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 śliwovicę, 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* Ehrh.) 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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