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## **Traditional pear varieties in the west region of Republic of Macedonia**

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**Abstract:** In this article, we present the results of the examination of the morphological, phenological and chemical characteristics of fruits of 9 traditional pear varieties that are typical for the west region of Macedonia ('Carigradsko avche', 'Evropsko avche', 'Vodenka', 'Sherbetka', 'Sinec', 'Letna kajkushka', 'Trupnjak', 'Tiranka' and 'Zimska

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kajkushka'). According to the ripening time, the pears 'Carigradsko avche', 'Evropsko avche', 'Sherbetka', 'Sinec' and 'Letna kajkushka' are summer pear varieties, the pear 'Vodenka' is an autumn pear variety and the pears 'Trupnjak', 'Tiranka' and 'Zimska kajkushka' are winter pear varieties. Statistically significant differences among the examined pear varieties for all fruit characteristics are found. The biggest fruits are characteristic of the pears 'Vodenka', 'Tiranka' and 'Trupnjak'. All pear varieties, excluding the pears 'Evropsko avche', 'Vodenka' and 'Zimska kajkushka', have long fruit stalks. Medium to high quantity of seeds are found in the fruits of the pears 'Letna kajkushka', 'Zimska kajkushka' and 'Carigradsko avche'. The highest value of soluble dry matter is found in the pear 'Vodenka' and 'Zimska kajkushka'. The highest content of total sugar in the fruits (15 % or more) is detected in the varieties 'Zimska kajkushka', 'Evropsko avche', 'Tiranka' and 'Vodenka'. The best flavor and juiciest mesocarp is characteristic of the pear 'Vodenka'.

**Key words:** genetic resources; pear varieties; traditional.

## Introduction

In the past, a plenty of domestic pear varieties such as 'Carigradsko avche', 'Evropsko avche', 'Arapka', 'Ekshikuti', 'Ekshija', 'Ekserka', 'Zimorka', 'Vodenka', 'Karamanka', 'Kurtizaim', 'Letna kajkushka', 'Zimska kajkushka', 'Lerinka', 'Maslarka', 'Sari armut', 'Tatlija', 'Tiranka', 'Shalganka' etc., existed on the territory of the Republic of Macedonia (Avramovski *et al.* 2005). But by the introduction of new pear varieties or the replacement of local varieties with new varieties from abroad, the genetic diversity decreased significantly. The traditional pear varieties were neglected and destroyed. Namely, the traditional pear varieties became rare in Macedonia. Today, these varieties are commonly found in abandoned areas and hilly-mountainous regions in the country, where extensive agriculture is still used (Selamovska and Nikolić, 2012).

Realizing this situation, it was obvious that there is a need for studying traditional pear varieties, their determination and selection of quality varieties in relation to the researched characteristics, dissemination and conservation. The study was part of the scientific projects Study of Autochthonous Pear Varieties in the Republic of Macedonia (2009) and Research of Autochthonous Pear Varieties in the Republic of Macedonia (2011), supported by the Ministry of Agriculture, Forestry and Water Economy of Macedonia. The research analyses were done in collaboration with professionals from the Agency for Individual Agriculture Development from Tetovo, Gostivar, Kichevo and Debar.

### **Materials and methods**

For an appropriate selection of pear varieties for certain soil and climatic conditions to be done, it is necessary to know the phenological and fruit characteristics of the varieties, their response to different soil and climate conditions, their sensitivity and resistance to abiotic and biotic factors, their time of ripening, fruit yield etc. Starting from this, the aim of this study was the determination of: phenological characteristics (flowering and ripening time), fruit characteristics (fruit mass - g, dimensions of fruit -cm, fruit hardness - g/cm<sup>2</sup>, length of fruit stalk - cm, number of seeds in a fruit, fruit color and taste and content of stone cells) and chemical characteristics of the fruit (soluble dry matter - %, total sugar - % and total acids -%). This research was a part of the scientific-research projects "Study of Autochthonous Pear Varieties in the Republic of Macedonia" which were funded by the Ministry of Agriculture, Forestry and Water Economy of Macedonia, during two years. The first year, the pear varieties were determined and labeled. The second year the researches activities were done.

A description of the variety was made by an IBPGR descriptor. The fruits were classified by mass and diameter. According to fruit mass, pear varieties are classified by Mratinić as: very small (to 25 g), small (26-50 g), medium-small (51-100 g), medium (101-150 g), medium-large (151-200 g), large (201-300 g) and very large fruits (above 300 g) (Mratinić, 2000). According to fruit diameter (Rubcov classification), small fruits have diameter to 5 cm, medium-large fruits have diameter of 5.1–10 cm and large fruits have diameter of more than 10 cm. According to the number of seeds in the fruit, pear varieties have very low quantity (0.1–1), low (1.1–3), medium (3.1–5) to high quantity of seeds (5.1–10) (Nyeki and Soltesz, 1998). According to the length of the fruit stalk, pear varieties have short stalk (to 2 cm), medium-long (2.1–3.5 cm) and long stalk (more than 3.5 cm).

The fruit firmness was measured with a FT02 penetrometer and the fruit mass was weighed on the Mettler analytical laboratory scale. The extraction of seeds was done manually and then the number of filled (healthy) seeds per fruit was counted. The soluble dry matter were measured with Carl Zeiss Jena-DDR/713457 refractometer. Also, the total sugar were directly measured with the refractometer. The total acids were determined by a standard method of titration (NaOH). The received data were statistically processed using analysis of variance (ANOVA).

The object of this study was 9 traditional pear varieties ('Carigradsko avche', 'Evropsko avche', 'Vodenka', 'Sherbetka', 'Sinec', 'Letna kajkushka', 'Trupnjak', 'Tiranka' and 'Zimska kajkushka'), that are typical for west part of Macedonia i.e. the regions of Tetovo, Gostivar, Kichevo and Debar (Figure 1-9).

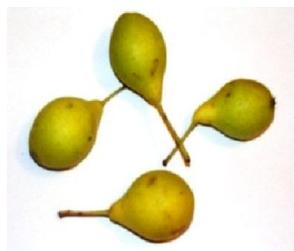


Fig. 1. Pear 'Carigradsko avche'



Fig. 2. Pear 'Evropsko avche'

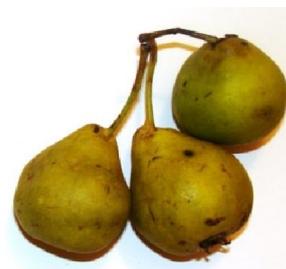


Fig. 3. Pear 'Sherbetka'



Fig. 4. Pear 'Sinec'

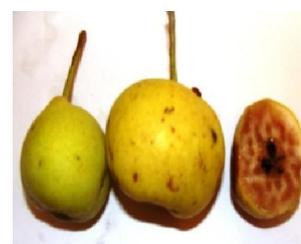


Fig. 5. Pear 'Letna kajkushka'



Fig. 6. Pear 'Vodenka'



Fig. 7. Pear 'Trupnjak'



Fig. 8. Pear 'Tiranka'



Fig. 9. Pear 'Zimska kajkushka'

The regions of Tetovo, Gostivar, Kichevo and Debar belong to hot continental climate-vegetation-soil region and are situated on altitude of 600-900 m. These regions present 24.4 % of the territory of Macedonia. An average year temperature in these regions is in the range of 9.6 °C – 11.8 °C (average 10.9 °C). The sum of average year temperatures is 3 975 °C. The number of summer days is 87. The average year falls is 700 mm and the average year drought index is 33.5 (Filipovski *et al.* 1996). In this climate-vegetation-soil region chromic luvisol on saprolite is present, but albicluvisol is the dominant soil type (WRB, Classification 2006).The soil

temperature on depth of 20 cm is in range of 11.1°C - 12.8°C, and on depth of 50 cm goes from 12.3 °C to 13.1 °C (Filipovski *et al.* 1996).

### Results and Discussion

The researched pear varieties are adapted on the local conditions and they are naturally resistant to different biotic and abiotic factors. Their characteristics are vitality and long-lasting (more than 100 years old). The obtained results of the research are presented in the Table 1, Table 2 and Table 3.

Table 1. Vigorous and phenological characteristics of researched traditional pear varieties in the west region of Macedonia

Variety	Vigorous trees	Flowering time	Ripening time
<b>Carigradsko avche'</b>	vigorous well-developed and branchy trees	the second decade of April	the first half of July
<b>Evropsko avche'</b>	middle	the second decade of April	the middle of July
<b>Sherbetka'</b>	vigorous well-developed and branchy trees	the first decade of April	the middle of August
<b>Sinec'</b>	vigorous well-developed and branchy trees	the middle of April	the end of August
<b>Letna kajkushka'</b>	middle	the middle of April	the end of August
<b>Vodenka'</b>	vigorous well-developed and branchy trees	the second decade of April	the end of September
<b>Tiranka'</b>	middle	the second decade of April	at the end of October and at the beginning of November
<b>Trupnjak'</b>	vigorous well-developed and branchy trees	the second decade of April	at the end of October and at the beginning of November
<b>Zimska kajkushka'</b>	middle	the third decade of April	at the end of October and at the beginning of November

Table 2. Morphological characteristics of researched traditional pear varieties in the west region of Macedonia

Variety	Fruit mass (g)	Fruit length (cm)	Fruit width (cm)	Length of fruit stalk (cm)	Number of seeds in fruit	Fruit firmness (g/cm <sup>2</sup> )
<b>Carigradsko avche'</b>	13.8	3.1	3.1	3.9	5.1	1276.7
<b>Evropsko avche'</b>	48.9	4.63	4.5	3.5	1.9	1352.3
<b>Sherbetka'</b>	60.6	5.3	4.9	4.1	0.5	1713.3
<b>Sinec'</b>	60.8	5.6	4.6	3.9	1.2	1470
<b>Letna kajkushka'</b>	23.7	3.1	3.7	4.4	3.7	1200
<b>Vodenka'</b>	152.3	7.4	6.5	2.8	2.7	1221.7
<b>Tiranka'</b>	214.1	7.9	7.8	4.2	2.1	1275
<b>Trupnjak'</b>	120.8	5.2	5.6	3.9	2	1620
<b>Zimska kajkushka'</b>	45.3	3.8	4.4	2.9	5	1301.3
<b>Average</b>	82.2	5.1	5	3.7	2.7	1381.1
<b>F</b>	315.3519	484.7367	486.3217	24.2226	41.80233	11.81709
<b>p-value</b>	2E-129	7.5E-152	5E-152	1.04E-27	1.26E-42	2.35E-14
<b>F critic</b>	1.973975	1.973975	1.973975	1.973975	1.973975	1.973975

According to the morphological characteristics, these pear varieties form different vigorous trees. The pears 'Tiranka', 'Zimska kajkushka', 'Evropsko avche' and 'Letna kajkushka' form middle vigorous trees, and the other varieties 'Carigradsko avche', 'Sherbetka', 'Sinec', 'Vodenka' and 'Trupnjak' form vigorous, well-developed and branchy trees (Table 1).

The researched pear varieties flower in April, from the first decade to the end of April, depending on their genotype. The variety 'Sherbetka' flowers at the earliest (in the first decade of April). Next are the pears 'Carigradsko avche', 'Evropsko avche', 'Trupnjak', 'Vodenka' and 'Tiranka' (in the second decade of April). The varieties 'Sinec' and 'Letna kajkushka' flower in the middle of April. The pear 'Zimska kajkushka' flowers at the latest (in the third decade of April) (Table 1).

Table 3. Chemical content of analyzed pear varieties

Variety	Soluble dry matter (%)	Total acids (%)	Total sugar (%)
Carigradsko avche'	16.2	0.39	14
Evropsko avche'	16.7	0.21	15
Sherbetka'	12.8	0.32	11.7
Sinec'	14.9	0.35	13.8
Letna kajkushka'	14.3	0.16	14
Vodenka'	18	0.25	15.8
Tiranka'	15.4	0.27	15.2
Trupnjak'	15.6	0.15	13
Zimska kajkushka'	18.3	0.23	16.9
Average	15.8	0.26	14.4
F	13224	2951.958	231.2213
p-value	0	4.2E-251	8.9E-114
F critic	1.973975	1.973975	1.973975

The pear 'Carigradsko avche' ripens the earliest (in the first half of July), followed by the pear 'Evropsko avche' (in the middle of July), the variety 'Sherbetka' (in the first half of August), the pears 'Sinec' and 'Letna kajkushka' (at the end of August), the variety 'Vodenka' (at the end of September). The fruits from the varieties 'Trupnjak', 'Tiranka' and 'Zimska kajkushka' ripen the last (at the end of October and at the beginning of November) and they are stored until March-April for complete ripening and consumption (Table 1).

The variety 'Tiranka' has the largest fruit. The medium-large fruit is characteristic for the pears 'Trupnjak' and 'Vodenka'. The varieties 'Sherbetka' and 'Sinec' form medium-small fruits. The small to very small fruits are produced by 'Evropsko avche', 'Zimska kajkushka', 'Carigradsko avche' and 'Letna kajkushka'. As presented in Table 2, the analysed pear varieties have long fruit stalks except the varieties 'Vodenka', 'Evropsko avche' and 'Zimska kajkushka' which have medium-long fruit stalks.

The lowest quantity of seeds was detected in the variety 'Sherbetka'. The pears 'Letna kajkushka', 'Zimska kajkushka' and 'Carigradsko avche' produce medium to high quantity of seeds in the fruits.

The color of fruit mesocarp is whitish ('Carigradsko avche', 'Sherbetka', 'Sinec', 'Trupnjak' and 'Tiranka'), yellowish-white ('Letna kajkushka' and 'Zimska kajkushka') to yellowish ('Evropsko avche' and 'Vodenka'). The low quantity of stone cells is present in the pears 'Carigradsko avche', 'Sherbetka' and 'Vodenka'. The highest value of stone cells is found in fruits from the varieties 'Sinec', 'Trupnjak' and 'Zimska kajkushka'. When the fruits of the analyzed pears ripen, the mesocarp rots.

The average content of soluble dry matter, total acids and total sugar in the analyzed pear varieties is 15.8 %, 0.26 % and 14.4 %, respectively. As presented in the Table 3, the highest content of soluble dry matter is detected in the pears 'Vodenka' and 'Zimska kajkushka'. The high values of total sugar, 15 % or more, are measured in the varieties 'Zimska kajkushka', 'Evropsko avche', 'Tiranka' and 'Vodenka'. The researched pear varieties have relatively high value of total acids.

The analyzed pear varieties are characterized as varieties with good and regular yield. The tree of the variety 'Tiranka' in the village Galate gives yield of one tone. The average yield the pears 'Carigradsko avche' and 'Vodenka' give is 200 – 300 kg/tree (Dimitrovski, 1974). According to Stančević (1983) and Niketić (1951), the varieties 'Zimska kajkushka' and 'Tiranka' are a super high-yield varieties (178.0 kg/ tree i.e. 192.5 kg/ tree or more than 30.000 kg/ha). These varieties exist in a purely natural environment, and at same time they are healthy organic food and they find suitable place in the organic agricultural production.

The researched regions belong to same climate-vegetation-soil region and they have similar climate. Because of this, there is no difference among the analyzed pear varieties from these regions in the flowering and ripening time.

According to Dimitrovski (1974) the variety 'Vodenka' is an early-flowering pear variety. The pear 'Evropsko avche' is characterized as early-intermediate variety, but the pear 'Carigradsko avche' is a late- intermediate variety. The variety 'Tiranka' is an early-flowering pear variety (Gjurgjević and Šoškić 1968) to late-intermediate variety (Dimitrovski, 1974). The pear 'Zimska kajkushka' is late-flowering pear variety (Gjurgjević and Šoškić 1968).

Depending of the ripening time, the varieties 'Carigradsko avche', 'Evropsko avche', 'Sherbetka', 'Sinec' and 'Letna kajkushka' are summer pear varieties. The pear 'Vodenka' is an autumn variety, the varieties 'Trupnjak', 'Tiranka' and 'Zimska kajkushka' are winter varieties.

Different varieties have different time of ripening, depending of the climatic conditions and the altitude. In the region of Skopje, situated on low altitude, the fruits of the variety 'Carigradsko avche' ripen early, at the beginning of July, during the orthodox holiday Petrovdan. In the region of Resen, this variety ripens later. The fruits of the variety 'Evropsko avche' ripen the earliest in the regions of Gevgelija, Skopje and Veles, but the latest in the regions of Debar and Resen (Selamovska *et al.*, 2013). The fruits of 'Sinec' ripen the earliest in the regions of the Skopje and Kriva Palanka, and the latest in the Debar region. The variety 'Letna kajkushka' ripens the earliest in the region of Gevgelija and the latest in the Resen region. The pear 'Vodenka' ripens in the first half of September in the region of Skopje and Kumanovo, at the end of September in the Debar region and its surroundings, and at the beginning of October in Resen, Berovo, Pehchevo and Kriva Palanka (Selamovska, 2013).

The fruit size is a variety characteristic and it depends on the ecological conditions, the type of pollination, etc. (Vujanić-Varga, 1985). Significant differences are found in this characteristic among the analyzed pear varieties (Table 2). According to the Rubcov classification, the varieties 'Carigradsko avche', 'Evropsko avche', 'Sherbetka', 'Sinec', 'Letna kajkushka' and 'Zimska kajkushka' have small fruits. The pears 'Vodenka', 'Tiranka' and 'Trupnjak' form medium-large fruits. The obtained data are in agreement with the results from the previous studies. The pear 'Carigradsko avche' forms very small to small fruits with average mass of 36 g, fruit length of 5.3 cm and fruit width of 4 cm (Dimitrovski, 1974; Selamovska, 2013). The variety 'Evropsko avche' has fruits with mass of 63 g, fruit length of 6 cm and fruit width of 4.7 cm (Selamovska, 2013). The pear 'Letna kajkushka' forms small fruits with mass of 28.1 g, fruit length of 3.2 cm and fruit width of 3.7 cm (Selamovska, 2013). The pear 'Vodenka' has medium-small fruits with average mass of 87.55 g (Mratinić, 2000) to medium-large fruits with average mass of 180-300 g (Niketić, 1951; Dimitrovski, 1974, Milutinović *et al.*, 1998, Avramovski *at al.*, 2005, Milutinović *et al.*, 2005, Selamovska, 2013). In dry conditions, the fruit productivity is alternative. The fruits are smaller and with lowest quality with puckery taste and highest value of stone cells (Dimitrovski, 1974). According to Selamovska (2013) the variety 'Sherbetka' forms medium-small fruits with average fruit mass of 60.6 g, fruit length of 5.3 cm and fruit width of 4.9 cm. The pear 'Sinec' has medium-small fruits with average fruit mass of 53.7 g, fruit length of 5.3 cm and fruit width of 4.4 cm. The variety 'Tiranka' has medium-large fruits with average fruit mass of 175.8 g, fruit length of 7.1 cm and fruit width of 7.0 cm. The pear 'Trupnjak' forms fruits with average fruit mass of 130.9 g, fruit length of 5.7 cm and fruit width of 6.2 cm. The largest fruits are measured in the regions of Skopje and Kriva Palanka (Selamovska, 2013). The fruits of the variety 'Zimska kajkushka' are small (Mratinić, 2000), with average fruit mass of 45.7 g, fruit length of 3.7 cm and fruit width of 4.5 cm (Selamovska, 2013).

As presented in the Table 2, the detected differences in the length of fruit stalk among the analyzed pear varieties are statistically significant. The pears 'Vodenka', 'Evropsko avche' and 'Zimska kajkushka' have medium-long fruit stalks and the other pear varieties have long fruit stalks. The length of the fruit stalk is a positive characteristic for the variety's growing in windy and unsuitable conditions (Dimitrovski, 1974). According to Selamovska (2013) the variety 'Carigradsko avche' has long fruit stalks (3.8 cm), medium-thick, on oblique position. The pear 'Evropsko avche' has medium-thick and long fruit stalks (average 3.7 cm) on lateral position. The average length of fruit stalk of the variety 'Sherbetka' is 4.1 cm. The pear 'Sinec' has medium-thin and long fruit stalks with average value of 4.4 cm. The fruit stalk of the variety 'Letna kajkushka' is thick, medium-long, with average value of 3.1 cm. The pear

'Vodenka' has thin and long fruit stalk (average 3.5 cm) and a little curve. The fruit stalk of the variety 'Trupnjak' is quite a thick, medium-long with average value of 3.3 cm, on vertical position. The pear 'Tiranka' has a firm, curve and long fruit stalk, with average value of 4.4 cm, while the variety 'Zimska kajkushka' has thin, medium-long (3.0 cm), vertical fruit stalk, situated on a low hole (Selamovska, 2013).

The content of seeds in a fruit speaks about the fertility of the genotype i.e. variety. The low value of seeds points to triploidy of the varieties (Dimitrovski, 1974) or tendency to partenocarpy (Nyeki *et al.*, 1998). The analyzed varieties contain low quantity of seeds in the fruit (average 2.7). Significant differences are found in the number of seeds in the fruit, among the researched pear varieties (Table 2). According to Selamovska (2013), the variety 'Carigradsko avche' produces 2.7 seeds, the pear 'Evropska ache' contains 1.2 seeds, the variety 'Sherbetka' has 0.5 seeds, the pear 'Sinec' contains 1.0 seeds, the variety 'Letna kajkushka' has 4.4, the pear 'Vodenka' produces 1.5 seeds, the variety 'Trupnjak' has 2.0 seeds, the variety 'Tiranka' produces 2.8 seeds and the pear 'Zimska kajkushka' has 5.1 seeds.

The pear 'Trupnjak' is characterized by the firmest fruits and its name comes from this characteristic. Statistically significant differences are found in the fruit firmness among the analyzed pear varieties (Table 2).

Also, significant differences are found in the soluble dry matter, total acids and total sugar among the analyzed pear varieties (Table 3). The highest sugar index is characteristic of the varieties 'Evropska ache', 'Letna kajkushka' and 'Trupnjak'. But, if we take into consideration the other elements such as taste, fruit firmness, quality and juicy mesocarp, presence of aromatic components, tannins, stone cells etc., the best flavor and juicy mesocarp is characteristic of the pear 'Vodenka'. This variety has thin and soft exocarp. When the fruit is ripe, the fruit peel cracks and the juice leaks out as water. Its name comes from this characteristic. This cultivar is named "Sonlija" in the regions of Berovo and Pehchevo. Namely, the metaphoric meaning of the name "Sonlija" is nice like sun (Selamovska, 2013).

The lowest taste is characteristic of the pear 'Zimska kajkushka'. This variety has firm and granular mesocarp with puckery taste because of its high quantity of tannins (Dimitrovski, 1974). Because of this, this pear causes a feeling of choking during the eating. And this is a reason for its local name (gushodavka - meaning: something that makes you choke) in some areas. The other pear varieties have medium to good taste.

According to Selamovska (2013), the fruits of the variety 'Carigradsko avche' contain 19.8 % total dry matter, 13.0 % soluble dry matter, 11.7 % total sugar and 0.39 % total acids. The average fruit firmness is 1423.7 g/cm<sup>2</sup>. It is mostly used for consumption when fresh. The fruits of the variety 'Evropsko avche' contain 14.1 % average soluble dry matter, 13.6 % total sugar and 0.28 %

total acids (Selamovska, 2013). This pear variety gives quality fruit, sensitive to manipulation and transport. It is suitable for fresh consumption, drying and making compote (Dimitrovski, 1974; Popov *et al.* 1983). The fruits of the variety 'Sherbetka' contain 12.8 % soluble dry matter, 11.7 % total sugar and 0.32 % total acids (Selamovska, 2013). They are used for fresh consumption, drying and making compote.

According to Selamovska (2013), the fruits of the variety 'Sinec' contain 12.3 % soluble dry matter, 12.0 % total sugar and 0.32 % total acids. They are used for making brandy in the Kriva Palanka region (Selamovska, 2013).

The pear 'Letna kajkushka' has 20.91 % average total dry matter, 13.1 % soluble dry matter, 14.2 % total sugar and 0.20 % total acids (Selamovska, 2013). Dimitrovski (1974) recommends this variety only for domestic usage.

The fruits of the variety 'Vodenka' contain 18.5% total dry matter, 15.4 % soluble dry matter, 14.0 % total sugar and 0.23 % total acids (Selamovska 2013). According to Mratinić (2000) the fruits of the pear 'Vodenka' contain 19.5 % dry matter, 0.17% total acids and 17.9 % total sugar.

The fruits of the variety 'Trupnjak' have 15.5 % soluble dry matter, 13.6 % total sugar and 0.20 % total acids (Selamovska, 2013). They are used for consumption and processing.

In the variety 'Tiranka' there are 23.0 % total dry matter, 15.3 % soluble dry matter, 14.2 % total sugar and 0.27 total acids (Selamovska, 2013, Selamovska *et al.*, 2012) measured. Its fruits are used for boiling, baking and in brine. In some areas in the east region of Macedonia, they are used for making brandy. These fruits look nice and have good quality. From the above mentioned, this variety deserves to be part of the pear production.

The fruits of the pear 'Zimska kajkushka' contain 19.7 % total dry matter, 17.0 % soluble dry matter, 15.5 % total sugar and 0.24% total acids (Selamovska, 2013). These fruits were used for drying and making tea, compote and brine in the past. According to Mratinić (2000) the fruits of 'Zimska kajkushka' contain 15.5 % dry matter, 0.19 % total acids and 14.36 % total sugar.

### Conclusion

The varieties 'Carigradsko avche', 'Evropsko avche', 'Vodenka', 'Sherbetka', 'Sinec', 'Letna kajkushka', 'Trupnjak', 'Tiranka' and 'Zimska kajkushka' exist in the west region of Macedonia. According to the flowering time, the variety 'Sherbetka' flowers the earliest, the next are the pears 'Carigradsko avche', 'Evropsko avche', 'Trupnjak', 'Vodenka' and 'Tiranka'. The varieties 'Sinec' and 'Letna kajkushka' flower in the middle of April. The pear 'Zimska kajkushka' flowers the latest.

According to the ripening time, the pears 'Carigradsko avche', 'Evropsko avche', 'Sherbetka', 'Sinec' and 'Letna kajkushka' are classified as summer pear varieties, the pear 'Vodenka' is an autumn pear variety and the pears 'Trupnjak', 'Tiranka' and 'Zimska kajkushka' are winter pear varieties.

Statistically significant differences among the researched pear varieties for all fruit characteristics were found. According to the Rubcov classification, the varieties 'Vodenka', 'Tiranka' and 'Trupnjak' form medium-large fruits. The other pear varieties have small fruits. All analyzed pear varieties have long fruit stalks except the varieties 'Vodenka', 'Evropsko avche' and 'Zimska kajkushka', which have medium-long fruit stalks. The lowest quantity of seeds is detected in the variety 'Sherbetka'. The pears 'Letna kajkushka', 'Zimska kajkushka' and 'Carigradsko avche' produce medium to high quantity of seeds in the fruits.

The average content of soluble dry matter, total acids and total sugar in the analyzed pear varieties is 15.8%, 0.26 % and 14.4 %, respectively. The highest content of soluble dry matter was measured in the pears 'Vodenka' and 'Zimska kajkushka'. The highest value of total sugar is measured in the varieties 'Zimska kajkushka'. Also, the highest value of total sugar (15 % or more) is detected in the fruits of 'Evropsko avche', 'Tiranka' and 'Vodenka'.

The best flavor and juicy mesocarp is characteristic of the pear 'Vodenka'. The lowest taste is characteristic of the pear 'Zimska kajkushka'. The other pear varieties have medium to good taste.

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## **AUTOHTONE SORTE KRUŠKE ZAPADNOG REGIONA REPUBLIKE MAKEDONIJE**

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### **Rezime**

U ovom radu, predstavljamo rezultate ispitivanja morfoloških, fenoloških i hemijskih karakteristika plodova 9 autohtonih sorti kruške koje su tipične za zapadni region Makedonije ('Carigradsko avche', 'Evropsko avche', 'Vodenka', 'Sherbetka', 'Sinec', 'Letna kajkushka', 'Trupnjak', 'Tiranka' and 'Zimska kajkushka'). Prema vremenu zrenja, 'Carigradsko avche', 'Evropsko avche', 'Sherbetka', 'Sinec' and 'Letna kajkushka' se svrstavaju u letnje sorte krušaka, 'Vodenka' jesenja, a sorte 'Trupnjak', 'Tiranka' and 'Zimska kajkushka' zimске. Pronađene su statistički značajne razlike između sorti za sve karakteristike ploda. Najkrupnije plodove imale su sorte 'Vodenka', 'Tiranka' and 'Trupnjak'. Plodovi svih sorti osim 'Evropsko avche', 'Vodenka' and 'Zimska kajkushka' imaju duge peteljke. Srednje visoka količina semenki nalazi se u plodovima sorti 'Letna kajkushka', 'Zimska kajkushka' and 'Carigradsko avche'. Najveći sadržaj rastvorljivih suvih materija pronađen je kod 'Vodenka' and 'Zimska kajkushka'. Najveći sadržaj ukupnih šećera (15% i više) utvrđen je kod sorti 'Zimska kajkushka', 'Evropsko avche', 'Tiranka' and 'Vodenka'. Najbolji ukus i najsočniji mezokarp utvrđen je kod sorte 'Vodenka'.

**Ključne reči:** genetički resursi, sorte kruške, autohtono.