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INVESTIGATION OF ORGANOLEPTIC CHARACTERISTICS OF POMEGRANATE (PUNICA GRANATUM L.) VARIETIES

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ABSTRACT

Investigation of organoleptic characteristics and determination of some biochemical compounds content in the fruit of eight traditional pomegranate (*Punica granatum L.*) varieties and types: *Lifanka, Bejnarija, Karamustafa, Ropkavac, Valandovska kisela, Lifanka clone, Zumnarija and Hicaz,* from Valandovo area (North Macedonia), was performed. Fruit from Valandovska kisela and Hicaz varieties are characterized with the lowest value of pH and also with highest content of citric acid. The content of fructose sugar prevails over the content of glucose in 1,1 ratio. Anthocyans are the most common in fruits from Hicaz variety. The Valandovska kisela variety has the highest content of phenols. The fruits from Ropkavac and Zumnarija varieties have the highest content of flavan-3-ols which give them a characteristic flavor. According to organoleptic evaluation of external fruit appearance, the best ranked is the Karamustafa variety. According to the internal characteristics, i.e. the fruit aril, again stood out as the best the Karamustafa variety, by all parameters. The respondents are pointed out also Ropkavac and Bejnarija varieties in evaluation of aril flavor and aroma, such as very good varieties, especially by the aril juiciness. According to all organoleptic (external and internal) characteristics, the highest ranked is Karamustafa variety which is recommended as a perspective variety of pomegranate for spreading in R North Macedonia.

Key words: Anthocyans, phenols, flavan-3-ols, aril, flavor.

INTRODUCTION

In agricultural science, there is a certain group of domesticated crops that have so far received little attention or have been ignored, or less treated by the agronomy, breeders or relevant institutions, known as "Neglected and Underutilized Species" (NUS) (Padulosi, S., Thompson, J., Rudebjer, P. 2013). They are wild or partially domesticated species, adapted to some, especially local needs, as food, remedy or material. Due to the genetic erosion, some of them even now can be considered extinct, because of their growing in isolated conditions near inhabited places (FAO 2010). Recently, the international support to the importance and role of the sustainable agricultural systems in exploitation of the less utilized crops and species has increased. This includes more targets such as: increased agrobiodiversity, partial response to the climate changes, contribution to the maintenance of the ecosystem stability, more varied food offer with exceptional bioactive components important to human health and also opening new market perspectives and opportunities (FAO 2010). The Pomegranate (*Punica granatum L*) undeservedly belongs to NUS category. The using of its fruits is mentioned in the sacred books: Bible, Quran, in Budistic and old Chinese texts. According to the latest archaeobotanical researches, the pomegranate was used such as agricultural crops 5000 years ago. It originates from areas of Iran to the eastern coasts of Mediterranean sea (Sarkhosh,A.,

Williamson J, 2018). The pomegranate is deciduous shrub, seldom it is possible to find single trunked trees, with 3-5 m height. It is cultivated for small and local markets in Turkey, Spain, Tunisia, Egypt, Russia and other countries (Morton, J. 2012). In North Macedonia it is represented such as self-seeding shrub or it was introduced from Asia Minor and from Midlle East in middle and lower course of Vardar River and in the surrounding southern areas (Gevgelija, Valandovo, Dojran). Pomegranate is drought tolerant fruit crop. Conversely, in very humid areas, the pomegranate suffers from root rotting, because of the favorable conditions for fungal diseases development. It is not tolerant of very low winter temperatures (bellow -12^{0}C) (Holland. D., K. Hatib, I. Bar-Ya'akov., 2009). The pomegranate has remarkable diversity. There are at least 500 varieties of pomegranate in the world and only 50 from them are cultivated (Stover, E., Mercure, E.W., 2007). A large population of types with quality characteristics of the fruits (among which and seedless varieties) is found in Kandachar (Afganistan). In Dashnabad (Uzbekistan) are selected speciments which are tolerate lower winter temperatures up to -25^{0}C (Venat, O., Peticilă, A. 2021). Basically, the pomegranate is characterized with two major geographical gene pools. The first included the populations located in Eastern Mediterranean basin and the second are located in Turkmenistan. There is third gene pool which is not geographically determined, but it is represented by the second species in Punicaceae family, that is Punica protopunica Balf.f., which is considered as an ancestor of pomegranate varieties (Özgüven, A.I. & Yılmaz, C., Keleş, D., 2012). The pomegranate fruits are characterized by its remarkable taste properties. Besides that, they are very important source of bioactive compounds, necessary for human health. The main bioactive compounds with antioxidant activity that are found in pomegranates are punicalagins, anthocyanins and hydrolysable tannins (Danesi F, Ferguson LR. 2017). Despite the increasing commercial importance of pomegranate, especially because of it recently discovered health-promoting benefits, relatively little is yet known regarding its sensory quality and flavor preferences, or about the biochemical constituents that determine its sensory characteristics (Mayuoni-Kirshinbaum L, Porat R., 2014). The pomegranate fruit taste occurs such as result of presents of some chemical compounds. Greatest influence on the richness of the taste experience has the presence of sugars (glucose and fructose) and organic acids (primarily citric and malic acid). Various alcohols, aldehydes, ketones and terpenes have influence on aroma and its intensity, which create a wide range of different aromatic variations. The sensory satisfaction during the eating of pomegranate arils is complemented by various mouthfeel sensations, including seed hardness and astringency sensations (Mayuoni-Kirshinbaum L, Porat R., 2014). The differences in flavor characteristics are dependent from pomegranate shrub cultivation in orchards. The soil characteristics, the application of agrotechnical measures, irrigation and fertilization may significantly affect over taste characteristics of pomegranate fruit. Also, postharvest treatment of pomegranate fruits has influence over keeping or acquiring of new flavor characteristics. Within the framework of this paper, traditional varieties of pomegranate from the Valandovo area have been examined. Namely, considering the chemical composition of the fruits, a comparative degustation analysis of the taste properties of the pomegranate varieties was made.

MATERIALS AND METHODS

During the period 2015-2016, fruits of eight traditional pomegranate varieties (*Lifanka, Bejnarija, Karamustafa, Ropkavac, Valandovska kisela, Lifanka clone, Zumnarija and Hicaz*) from two locations from the vicinity of Valandovo in the south part of R.N. Macedonia were investigated. The fruits of different varieties were harvested and kept at a temperature of 4 ^{o}C. Three repetitions by 15 randomly taken fruits from the tree crown were investigated. The characteristics of 50 arils per fruit, in three repetitions were investigated. The parameters used in the analysis include aril length (AL), aril width (AW), mass of aril (AM), cross section area

of aril (AA) and cross section perimeter of aril (AP). The examination of the aril characteristics (except their mass) is made by scanning device for obtaining high resolution images, which are processed with the digital image processing method, that performs precise analysis of the object dimensions (AL, AW, AA, AP) (Markovski & Velkoska-Markovska, 2015) through computer software "ImageJ" (IJ) and Tomato Analyzer (TA). Color calibration was performed by X-rite ColorChecker card at the same flatbed scanner for measuring aril color, on the basis of CIELa color system. In the CIELab color space L*, a* and b* describe a three-dimensional space, where the values for +L* are lightness direction, values for –L* show darkness direction and consequently, +a* is red direction, -a* is green direction, +b* is yellow direction, -b is blue direction (Ornelas-Paz et al, 2008). Investigation of chemical composition (pH, dry maters, total acids, total sugars, glucose, fructose, citric acid, antocyanins, phenols, flavan-3-ols) of pomegranate varieties fruit aril was performed. Aril color characteristics by the CIELab color system was also investigate. The content of soluble dry maters and total sugars is refractometrically determined. Total acids are determined potenciometrically.

The content of total phenols, antocyanins, and flavan-3-ols are determined with spectrophotometric method. Total phenols in speciments were determined by *Folin-Ciocalteu* method (Slinkard and Singelton, 1999). The content of total antocyanins was determined by *Acid ethanol* method (Somers et al., 1977). Quantification of the content of total flavan-3-ols was used p-Dimethylaminocinnamaldehyde (p- DMACA) (Di Stefano et al., 1989).

The degustation analysis is implemented troughs sensory evaluation. The sensory panel includes twenty (20) individuals (aged 25-50 years) having already consumed pomegranate fruits. The sensory evaluation of arils developed from different pomegranate varieties was carried out using a 5-point hedonic scale as described by Larmond (1970). Fruit quality was assessed by comparing outside characteristics (attractiveness, size, shape and color) and inside characteristics (taste, aroma, juiciness) of pomegranate aril. For visual evaluation or flavor, the samples order was randomized and encrypted. During flavor evaluation panelists rinsed their mouth with water at room temperature after intake of each variety of product (Aberoumand A.,2015). Statistical analysis of the date was performed with statistical software Minitab 16 and Xlstat 2014.

RESULTS AND DISCUSSION

The obtained results from the investigation showed statistically significant differences in the length and width of the arils among the pomegranate varieties fruits. The Lifanka variety is characterized with the largest arils (Table 1). Also, evident differences in aril mass were noted between the pomegranate varieties from Valandovo region. The fruits from Lifanka variety are characterized with statistically different greatest mass of the aril. The Lifanka variety dominated with the mass of the arils compared to the other varieties.

The Bejnarija, Karamustafa and Ropkavac varieties are almost equal according to aril mass, while the LC variety is characterized with statistically smallest aril mass. Using the advantages of ImageJ software tools, the cross-section area and the perimeter of the arils are determined, where statistically the greatest values for these parameters are characterized the arils of the Lifanka variety. The Hicaz variety is characterized with statistically smallest cross section area of the arils, while according to perimeter, this variety is equated with the Zumnarija variety and LC (Table 1).

Statistically, Valandovska is characterized with the lightest arils (L* 35.1) compared to the other varieties, where the aril basis has significantly greater pale coloration, and generally gives the visually red-white impression of the aril coloration. The Hicaz variety is characterized with statistically darkest arils (L* 19.3). The varieties LC, Bejnarija and Karamustafa are characterized with statistically greatest values for a* (31.0, 30.9, 30.3) or red coloration. These three varieties have exceptionally uniform red coloration and from our point of view, are

characterized with the most attractive arils among the investigated varieties. The Hicaz variety has again the statistically lowest values for a* (13.1), which means also the weakest red coloration, despite that the arils visually have a dark red colour. Same variety has lowest values for b* coloration, or for yellow coloration (5.3) of the aril. LC variety is characterized with statistically greatest value for b* coloration, which gives a characteristically red-orange coloration of the arils (Table 1).

Table 1. Aril characteristics of pomegranate varieties

Variety	Dimension of aril cross section				Mass (g)	CieLab system of coloring		
	Area (mm^2)	Perimeter (mm)	Length (mm)	Width (mm)		L	a	b
Lifanka	95.3^{A}	40.4^{A}	12.6^{A}	9.5^{A}	0.50^{A}	34.4^{AB}	18.1^{C}	13.1^{E}
Bejnarija	88.5^{B}	38.1^{B}	12.2^{B}	9.2^{B}	0.37^{B}	25.9^{DE}	30.9^{A}	17.4^{A}
Karamustafa	79.4^{C}	36.0^{C}	11.6^{C}	8.6^{C}	0.36^{B}	24.5^{E}	30.3^{A}	16.3^{B}
Ropkavac	79.3^{C}	35.9^{CD}	11.5^{C}	8.7^{C}	0.35^{B}	26.6^{CD}	24.2^{B}	12.6^{E}
Valandovska	65.1^{D}	34.6^{D}	10.3^{E}	7.9^{D}	0.27^{C}	35.1^{A}	19.9^{C}	15.3^{C}
LC variety	62.8^{DE}	31.9^{E}	10.4^{E}	7.6^{E}	0.21^{D}	27.7^{C}	31.0^{A}	17.6^{A}
Zumnarija	61.3^{E}	31.9^{E}	9.9^{F}	7.8^{DE}	0.27^{C}	33.3^{B}	23.2^{B}	14.6^{D}
Hicaz	61.1^{E}	31.9^{E}	10.7^{D}	7.2^{F}	0.27^{C}	19.3^{F}	13.1^{D}	5.3^{F}
Average	74,1	35,1	11,2	8,4	0,33	28,4	23,9	14,1

The means followed by the same letter in each column are not significantly different at $P \leq 0.05$

According to the pH value of juice from pomegranate arils, with most acidic reaction are characterized the Valandovska and Hicaz varieties (Table 2). The Ropkavac variety has the lowest pH values for acidic aril juice (pH 4,3). The Valandovska, Hicaz, and Lifanka varieties are characterized with the lowest values for dry matters and with the hightest content of total acids (Tab. 2). According to the previous investigations of the fruit species, the taste of the fruits is mostly determined from the presence of total acids and total sugars as well as their ratio.

It can be noted that content of total sugars in pomegranate aril is in positive dependence with total dry matter content in all genotypes, without exception. The Zumnarija variety is characterized with highest content of total sugars and total dry matters.

Table 2. Chemical composition of varieties and types Pomegranate

Variety	pH	Dry maters (Brix)	Total acids g/l	Total sugars g/l	Gluco-se g/l	Fructo-se g/l	Citric acid g/l	Anto-cyanins mg/kg FW	Phenols mg/kg FW	Flavan-3-ols mg/kg FW
Bejnarija	3.4	12.6	5.0	134	59.24	63.34	0.868	79.85	1629.57	24.24
Hicaz	3.2	11.5	21.6	128	49.55	54.34	1.388	298.95	2028.55	20.54
Lifanka	3.4	9.5	22.5	100	48.14	51.34	0.769	72.62	1540.58	21.21
Zumnarija	3.5	13.8	5.8	152	69.04	73.39	0.844	195.72	2527.33	39.59
LC variety	3.4	12.4	5.5	131	60.78	70.22	0.821	58.67	1768.73	22.03
Valandovska	3.0	10.7	34.7	117	56.51	60.75	0.338	97.02	2614.59	19.22
Karamustafa	3.4	12.4	4.9	132	61.94	68.11	0.619	110.81	1853.31	14.54
Ropkavac	4.3	13.5	3.2	141	61.72	68.03	1.027	99.66	1652.08	40.94
Average	3.5	12.9	12.1	129	58.37	63.69	0.834	126.66	1951.84	25.29

The same variety (Zumnarija) is characterized with highest content of glucose (69,0 g/l) as well as fructose (73,4 g/l). It is noticeable that fructose sugar in aril is slightly more present than the glucose at the all investigated varieties. Zumnarija has the lowest fructose /glucose ratio (1,063), while in the arils of Ropkavac variety the ratio value is the highest (1,102).

It is interesting to note that the variety with biggest fruits and with largest arils is characterized with lowest content of total sugars and dry matter in arils. The highest content of citric acid is found in arils of the Hicaz variety (1,388 g/l), that affects the value of low pH and also the high content of total acids in arils. But, the arils from Valandovska variety have lowest content of citric acid (0,338 g/l) besides the highest content of total acids (34,7 g/l), and also the lowest pH, among the investigated pomegranate varieties. Perhaps, that is related to the presents of other organic acids, whose content is much larger than the content of citric acid. According to antocyanins content, Hicaz variety dominates (298,95 mg/l), far above the other varieties. The investigation of arils coloring shows that the Hicaz variety has the lowest values for L*, a*, and b* according to CIELab color system, that may be as a result of the high anthocyanins content, which may affect the dark, almost black coloring of fruits of some fruit species. On the other side, LC variety is characterized with highest values for a* and b*, and at the same time there is low antocyanins content (58,67 mg/l). The phenols in the plant tissues are secondary metabolites which serve to protect plants from UV radiation, infections, and also act as pollinator attractors (Mera, I. at all, 2020). Recently, it has been proven the inhibitory influence of phenolic compounds over mutagenesis and carcinogenesis (Newmark HL, 1992). The phenolic compounds have influence over the bitterness, astringency, color and aroma of the arils (Newmark HL, 1992). In our case, with highest phenols content is characterized the variety with most sour fruits, the Valandovska variety. With highest content of flavan-3-ols in arils are characterized Ropkavac and Zumnarija varieties, that probably give the fruits a specific taste, much different than the taste of the arils of the rest of investigated varieties, and which one is preferred by respondents and pomegranate growers in Valandovo region. Otherwise, flavan-3-ols also affect the taste, which cannot be defined as either bitter or astringent. A parameter for the taste impact would be the information that flavan-3-ols content is very height in cocoa (Heiss, C. at all, 2003).

The rating of pomegranate varieties by organoleptic evaluation is shown in Table 3. According to visual evaluation, such most attractive and most good looking (good color) were ranked the arils from the fruits of the Hicaz variety. Considering the aril size and shape, the Lifanka variety was selected as the best (Tab. 3). However, considering the average results, the Karamustafa variety is ranked as the best in terms of general external characteristics of arils.

Table 3. Organoleptic evaluation of arils from pomegranate varieties (ranking list)

No	Variety	Visual characteristics of arils					Flavor				General assess-ment
		Attracti-veness	Size	Shape	Colour	Avera-ge	Taste	Aroma	Juiciness	Avera-ge	
1	Kara-mustafa	4.7	4.8	4.7	4.6	4.7	4.6	4.5	4.6	4.6	4.6
2	Hicaz	4.9	4.0	4.3	4.8	4.5	3.5	3.6	3.6	3.5	4.0
3	Bejnarija	4.2	4.4	4.0	4.2	4.2	3.6	3.4	4.5	3.8	4.0
4	LC variety	4.2	4.1	4.1	4.0	4.1	3.2	3.0	4.2	3.5	3.8
5	Ropkavac	3.2	3.5	3.1	3.8	3.4	4.1	4.1	4.2	4.2	3.8
6	Lifanka	4.1	4.9	4.8	3.3	4.2	3.0	2.9	4.0	3.2	3.7
7	Zumnarija	2.4	3.0	4.5	2.4	3.1	2.8	3.4	3.5	3.2	3.1
8	Valandovska	2.7	3.2	3.1	2.3	2.8	2.5	2.5	3.5	2.8	2.8
	Average	3,8	4.0	4.1	3.7	3.9	3.4	3.4	4.0	3.6	3.7

When evaluating the flavor characteristics of the arils, on the contrary, there was no doubt that the Karamustafa variety proved to be the best by the all organoleptic investigated

parameters. In terms of taste and aroma, the respondents rated the Ropkavac variety very well, as well as the Bejnaria variety by the juiciness of the arils.

Table 4. Correlation between Organoleptic evaluation and chemical compositions of pomegranate varieties fruit aril. Correlation matrix (by Pearson)

Variables	pH	Dry maters	Total acids	Total sugars	Anto-cyanins	Phenols	Flavan-3-ols	Attracti-veness	Colour	Taste	Aroma	Juici-ness
pH	1	0.5625	-0.6394	0.4359	-0.1864	-0.4531	0.7395	-0.1884	0.1248	0.4945	0.5468	0.3487
D.maters	0.5625	1	-0.8053	0.9802	0.1350	0.0992	0.6558	-0.2737	0.0925	0.3759	0.5592	0.1967
T.acids	-0.6394	-0.8053	1	-0.7074	0.1655	0.4337	-0.4373	-0.1196	-0.3866	-0.6113	-0.6599	-0.6363
T.sugars	0.4359	0.9802	-0.7074	1	0.2939	0.2515	0.6355	-0.3034	0.0437	0.2795	0.5075	0.0410
Antocyan.	-0.1864	0.1350	0.1655	0.2939	1	0.3974	0.1073	0.1245	0.1914	-0.0244	0.2142	-0.5639
Phenols	-0.4531	0.0992	0.4337	0.2515	0.3974	1	0.1016	-0.6346	-0.6520	-0.5656	-0.3319	-0.7654
Flavan-3.	0.7395	0.6558	-0.4373	0.6355	0.1073	0.1016	1	-0.6506	-0.3670	-0.0741	0.1591	-0.2262
Attract.	-0.1884	-0.2737	-0.1196	-0.3034	0.1245	-0.6346	-0.6506	1	0.9099	0.5551	0.3503	0.5326
Colour	0.1248	0.0925	-0.3866	0.0437	0.1914	-0.6520	-0.3670	0.9099	1	0.7702	0.6145	0.6177
Taste	0.4945	0.3759	-0.6113	0.2795	-0.0244	-0.5656	-0.0741	0.5551	0.7702	1	0.9275	0.7664
Aroma	0.5468	0.5592	-0.6599	0.5075	0.2142	-0.3319	0.1591	0.3503	0.6145	0.9275	1	0.5447
Juiciness	0.3487	0.1967	-0.6363	0.0410	-0.5639	-0.7654	-0.2262	0.5326	0.6177	0.7664	0.5447	1

*Values in bold are different from 0 with a significance level alpha = 0.05

Chemical composition of pomegranate aril is connected with sensory attributes of colour, aroma, taste, and mouthfeel, but contribution of chemical compounds to sensory properties of foods has not been widely investigated. For example, antocyanins are reported to have a “mild taste” and increasing astringency, in particular subqualities as “fine grain” (Paissoni, M. at all, 2018). Acetylated and coumaroylated anthocyanins contributed to both astringency and bitterness (Gonzalo-Diago, A., Dizy, M., Fernández-Zurbano, P, 2014). Anthocyanins have different colors in different pH values. Anthocyanins are more stable at low pH values (acidic conditions) which gives a red pigment. The higher pH value of anthocyanin will provide color fading of the color blue (Wahyuningsih, Sri and all, 2016). Bitterness is a major sensory attribute of several common foods and beverages rich in phenol compounds and it is a white crystalline solid that is volatile (Soares S, and all, 2013). According to some sources flavan-3-ols had tastes that consisted primarily of astringency and bitterness. Therefore, taste palatability decreased with increasing flavan-3-ols concentrations (Narukawa M., and all 2010). In other side, the nonesterified flavan-3-ols have a sweet taste, whereas the esterified flavan-3-ols are astringent and responsible for a bitter taste. Catechins are colorless and readily soluble in water and polar organic solvents (Kopustinskiene D.M., 2021). However, the presence of total sugars and total acids in the fruits, their ratio and type have the greatest influence on the sensory characteristics (Mayuoni-Kirshinbaum L, Porat R., 2014). To determine the influence of different chemical compounds as well as measurements of physical characteristics, on the visual and sensory properties of the aril of pomegranate fruits evaluated through the organoleptic survey, the calculation of the statistical correlation between the characteristics was performed (Table 4).

The medium-high negative correlation between the content of phenols and the juiciness of the aril is noted. As the content of phenols increases, the juiciness decreases and vice versa. A medium-high negative correlation was observed between organoleptic properties (Attractiveness, Color, Taste and Aroma) and the content of phenols. Also, a medium-high negative correlation between flavan-3-ols and fruit attractiveness was determined (Table 4).

Table 5. Correlation between Organoleptic evaluation and some physical characteristics of pomegranate varieties fruit aril. Correlation matrix (by Pearson)

Variables	Aril cross section area	Mass	CieLab system of coloring L*	a*	b*	Attracti-veness	Colour	Juiciness
Aril cross.	1	0.9347	0.1246	0.1909	0.2362	0.2634	0.1769	0.6143
Mass	0.9347	1	0.2010	-0.1035	0.0004	0.2028	0.0675	0.3703
L*	0.1246	0.2010	1	-0.0577	0.4435	-0.7341	-0.9190	-0.3686
a*	0.1909	-0.1035	-0.0577	1	0.8541	0.0696	0.1919	0.7613
b*	0.2362	0.0004	0.4435	0.8541	1	-0.2496	-0.2718	0.4958
Attract.	0.2634	0.2028	-0.7341	0.0696	-0.2496	1	0.9099	0.5326
Colour	0.1769	0.0675	-0.9190	0.1919	-0.2718	0.9099	1	0.6177
Juiciness	0.6143	0.3703	-0.3686	0.7613	0.4958	0.5326	0.6177	1

*Values in bold are different from 0 with a significance level alpha = 0.05

Total acids are in medium-high negative correlation with taste, aroma and color of arils. From the evaluation, we can see that the respondents connected the taste with the juiciness of the aril, as well as the taste with the aroma, through the highly pronounced positive correlation. But we also see an illogical connection of taste, aroma and juiciness with the color of the aril (Table 4). From the comparison of the organoleptic properties with the physical properties of the aril, it is immediately noticeable that the attractiveness and color are rated more poorly the more brightly colored the aril is (Table 5). Also, the respondents qualified as juicier the arils that had a more intense red coloring. According to the evaluation, the varieties with a larger arils also have a juicier arils (Table 5), which is logical, because the differences in the inedible part of the aril, regarding that the differences of the volume of the seeds in the varieties with a large and small aril are minimal (because the largest part belongs to the edible juicy part), so the larger the aril is, the more juiced it should be.

CONCLUSIONS

The pomegranate varieties are very well adapted in the conditions of South areas of North Macedonia. In the same cultivation conditions, the aril from Lifanka variety has almost twice greater mass (0.5 g) than the other varieties (0.33 g), including the arils from Ropkavac variety (0.37 g), which are similar with Lifanka arils by the dimensions. Chemical investigations shown high content of anthocyanins (126,7 mg/kg FW) in pomegranate arils. Pomegranate arils also contain high content of phenols and flavan-3-ols. But, investigation shows that some of these bioactive compounds (phenols, total acid) are in negative correlation with some aril flavor characteristics. Total sugars have some influence over aroma variety ranking among the participants in organoleptic evaluation. The obtained results from the correlation also shown, probably, that there are other chemical components and their combinations in pomegranate arils which also have influence over organoleptic characteristics and which are not investigated in this paper. Organoleptic evaluation show that the Karamustafa variety is much better ranked than the Hicaz variety that is now dominant variety in North Macedonian fruit market. Therefore, contributing these organoleptic evaluation data for the fruit quality and its acceptance by the evaluation participants, we recommend Karamustafa variety for further greater share in the establishment of future pomegranate plantations, if the other conditions allows (fruitfulness, disease tolerance, cold tolerance, storage and postharvest losses etc.).

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