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Research Article

Pomological and Biochemical Characteristics of Local Pomegranate Genotypes of Kahta (Adıyaman) Region

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Abstract: In the study carried out to determine the pomological characteristics of local pomegranate genotypes grown in Kahta district center and Bostanli, Eceler, Balli, Kilisk, Sarica, and Narince villages of Adıyaman province, one orchard belonging to a grower in each region and 1 genotype in each orchard were determined. 10 fruits in each genotype were harvested, and pomological measurements and biochemical analyses were performed. The largest fruit was obtained with the Sarıca genotype and Narince was the genotype with the smallest fruit. In genotypes, the fruit weight was between 196.300-328.909 g, the fruit length 61.528-72.801 mm, and the fruit width between 73.047-86.613 mm. Total aril weight was between 94.144-203.567 g and the fruit volume was between 188.333-327.000. The Sarıca genotype had the highest juice volume and the lowest juice ratio was recorded in the Eceler genotype. Calyx length was longer in the Sarıca genotype and the highest values in terms of calyx radius were recorded with the Kilisk genotype. The Eceler genotype had thicker shells and the Narince genotype had thinner shells. The number of chambers in the genotypes was between 5 and 6. There were significant differences between genotypes in terms of fruit skin and aril color. The soluble solids content (SSC) in genotypes was determined between 12.011-17.267, pH was 3.583-4.073 and total acidity (TA) was 0.736-1.489%. Phenolic compounds such as protocatechuic acid, rutin, gallic acid, chlorogenic acid, epicatechin, ferulic acid, floridzin, vanillic acid, hydroxycinnamic acid, catechin, caffeic acid, syringic acid, and *p*-coumaric acid were detected in pomegranate fruit, and rutin was phenolic compound with the highest concentration.

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1. Introduction

The changing climatic conditions, the nutritional problem of the increasing world population, and the problems related to food supply reveal the fact that the most important natural resource of the current century is genetic resources and make it necessary to preserve these resources and turn them into benefits. Türkiye is one of the few countries in the world in terms of plant genetic resources, which allows the cultivation of most horticultural crops due to favorable ecological conditions, being on trade

routes and hosting many civilizations since the first ages of history (Agaoglu et al., 1995). Improving the use of plant genetic resources for food and agriculture can be achieved by determining all the properties of the material and bringing those with superior characteristics into breeding (Sehirali and Ozgen, 1987). The selection of the most suitable types and varieties considering the production purpose with selection breeding is one of the requirements of rational fruit growing (Guleryuz, 1977). Pomegranate cultivation has been carried out for more than 7 thousand years in Anatolia (Ozbek, 1977), which is among the homeland of pomegranate and has extremely suitable ecological conditions for its cultivation (Kaygisiz, 2009).

Pomegranate, which is known as a "super fruit" in the global functional food industry due to its medicinal uses (Mertens et al., 2006) has been grown as a hedge plant and border tree in Türkiye for many years while providing a good profit to its producer (Onur and Kaska, 1979; Onur, 1983) and the understanding of its health benefits (Lansky et al., 1998; Al-Maiman and Ahmad, 2002; Fischer et al., 2011) has increased day by day cultivation in the form of orchard. With this increase, Türkiye has become one of the leading countries in world pomegranate production. Pomegranate production in Türkiye is concentrated in the Mediterranean, Aegean, and Southeastern Anatolia regions (Anonymous, 2018).

The southeastern Anatolia Region, where continental climate prevails, realizes 10% of Türkiye's pomegranate production with pomegranate cultivation in microclimatic areas. Adıyaman province, which enables the cultivation of subtropical climate fruits such as pistachio, olive, fig, persimmon, and pomegranate, as well as many temperate climate fruit species with its suitable climate characteristics, ranks 11th in pomegranate production in Türkiye. In the region, which has an important pomegranate potential, cultivation has been carried out with traditional habits and local varieties (Katırbaşı) until recent years, but with the increase in the added value of pomegranate to the people of the region, more modern cultivation has started with standard varieties. However, it should not be ignored that local varieties that have been cultivated since ancient times are genetically important. There are many varieties and types in Türkiye, which is one of the homelands of pomegranate. Many studies have been carried out in different parts of the country to reveal the characteristics of these varieties and types and to benefit genetically. As a result of these selection studies, many pomegranate genotypes were determined. However, no study has been performed in terms of pomegranate selection in the Adıyaman region. Our study, it was aimed to determine the pomological and biochemical characteristics of local pomegranate genotypes grown in and to select the promising ones among these genotypes. The study is important as it is a guide presented to researchers and producers in the process of standardizing promising genotypes and expanding their commercial production.

2. Materials and Methods

As plant material in the study that was carried out in 2022, the genotypes of local pomegranate cultivars grown in Adıyaman province, Kahta district center, and Bostanlı, Eceler, Ballı, Kilisk, Sarıca, and Narince villages were used. Within the scope of the study, an orchard belonging to a grower was determined in each region. In line with the statements of the owner of the orchard, one genotype was determined by considering the fruit quality characteristics and the fact that the orchard was established with a single variety and it is a local variety that has been grown in the region for years. During the harvest period, 10 fruits of each genotype were harvested from the trees and transferred to the Van Yuzuncu Yil University, Horticulture Department laboratory, and pomological measurements and biochemical analyses were performed with the following methods.

2.1. Fruit physical characteristics

Fruit weight and peel weight were determined by weighing 5 randomly selected fruits with a scale sensitive to 0.01 grams and taking their averages. Fruit width was determined by measuring the diameter of the equatorial region in 5 fruits, and the fruit length was determined by measuring the distance between the stem part and the lower part of the calyx with a 0.01 mm digital caliper. The calyx length, calyx radius, and shell thickness of the fruit were determined by measuring with a digital caliper sensitive to 0.01 mm and averaging them (Onur, 1983). The juice volume and pulp were determined by removing the juice from 5 fruits and putting them in the measuring cylinder, the juice volume in ml, and the remaining fruit pulp was weighed with a scale sensitive to 0.01 g, and the pulp weights were

determined as g. The arils of five fruit were removed and each of them was weighed separately and the total aril weight was determined by taking the average. The number of upper and lower chambers was determined by counting the upper and lower chambers separately in 5 fruits. The ease of the husking was determined as easy, medium, and hard by husking. Fruit skin color and aril color were determined in terms of L^*, a^*, and b^*. It was determined in 5 fruits and their arils by measuring by means of a colorimeter (Minolta, model CR-400, Tokyo, Japan) from points determined at 2 opposite poles of the equatorial part of the fruit and the arils. According to the prepared scale, the a^* value is expressed as redness-greenness, and the b^* value is expressed as yellowness-blueness. The chroma value = (a^*2+b^*2)1/2 and the hue angle value will be determined by the formula $h^o= \tan^{-1} \times b^*/a^*$ (McGuire, 1992).

2.2. Biochemical characteristics

SSC, titratable acidity, and pH: the fruit juices were obtained by extracting the arils of the five fruits, squeezing them with a blender, and passing them through cheesecloth. By taking enough of the obtained fruit juice sample, SSC was determined by digital refractometer (PAL-1, Atago, USA) and expressed as %. To determine the titratable acidity, the obtained juice was taken from the sample, 10 mL of the sample was diluted with 10 mL of distilled water and titrated with 0.1 mol L^{-1} (N) sodium hydroxide (NaOH) until the pH reached 8.1, and the amount of NaOH consumed in the titration was taken. It was expressed in terms of citric acid (g citric acid 100 mL^{-1}) based on. The pH was determined in the juice obtained by measuring with a pH meter.

Individual phenolic compounds: Individual phenolic compounds were analyzed as follows. Homogeneously selected fresh fruit samples were weighed as 1 gram and extracted with methyl alcohol (5 mL) in a test tube for 6 hours. The extract was analyzed by high-pressure liquid chromatography (HPLC) (Perkin-Elmer series 200, Norwalk, USA). The HPLC system was equipped with a UV detector (Series 200, UV/Vis detector) and a quaternary solvent dispersion system (Series 200, analytical pump) and used at 280 nm. Analytes were separated with a Phenomenex Kromasil (Phenomenex, Torrance, USA) 100A C18 (250 mm x 4.60 mm, 5 µm) column. The clone temperature was maintained at 26°C using a water bath (Wisebath, WB-22, Daihan Scientific, Seoul, Korea). The mobile phase was formed from acetonitrile (A) containing water and 2.5% formic acid (B). The mobile phase flow rate was maintained at 1 mL per minute, and the 20 µL of sample was injected and the results of the peak areas obtained were expressed as mg 100 g^{-1}.

2.3. Statistical analysis

The data obtained in the study were evaluated according to the significance level of $p<0.05$ by analysis of variance according to the randomized plot design. Statistics; Expressed as mean±SH. Duncan multiple comparison test was used to determine the differences between genotypes. “IBM SPSS v23.0” statistical package program was used in the calculations (SPSS. 2023).

3. Results and Discussion

3.1. Pomological characteristics

There were very significant differences between genotypes in fruit size. The largest fruit was obtained with the Sarıca genotype, and Narince was the genotype with the smallest fruit. In genotypes, fruit weight was between 196.300-328.909 g, fruit length was 61.528-72.801 mm and fruit width was between 73.047-86.613 mm in proportion to fruit size while total aril weight was 94.144-203.567, fruit volume was between 188.333-327.000 (Table 1). When compared with similar studies, it will be seen that the genotypes have medium-sized fruit with fruit weights varying between 196.300 and 328.909 g. Gundogdu (2006), obtained similar findings (fruit weight: 197-328 g) in his thesis study he conducted to determine the characteristics of local pomegranate genotypes in the Pervari (Siirt) region. In studies conducted with local varieties, it has been reported that the fruit weight of pomegranate was 208-553 g (Ercan et al., 1992), 250-461 g (Polat et al., 1999), 192-388 g (Yildiz et al., 2003), 131-337 g (Muradoglu et al., 2006), 157.4-402.3 g (Ak et al., 2006) and 161.45-302.35 g (Gundogdu et al., 2010) and in

standard varieties, the fruit size was 374.9 g (Turkmen and Eksi, 2010) and 251.01-530.25 g (Gundogdu et al., 2015).

Sarıca genotype with the largest fruits had the highest juice volume, and the lowest fruit juice ratio was recorded in the Eceler genotype. Significant differences occurred between genotypes in terms of calyx sizes. While the calyx length was longer in the Sarıca genotype, which had the largest fruits, the highest values in terms of calyx radius were recorded with the Kilisk genotype. The significant differences were detected in terms of shell thickness and shell weight. The Eceler genotype had the thickest shells, it was observed that the shells were thinner in the Narince genotype. The shell weight was higher with the Bostanlı genotype, and the lowest shell weight was recorded with the Narince genotype. The number of chambers in the genotypes varied between 5 and 6, and the seed had a hard and medium hard structure (Table 1). Gundogdu (2006), determined that in his thesis study conducted with the local pomegranate genotypes of the Pervari (Siirt) region, the amount of the juice was 76-170 ml, the fruit density was 0.78-2.05 g cm^{-3}, the total arils weight was 31.7-52.6 g, aril yield was 51.6-66.4%, calyx length was 20.1-24.8 mm, calyx radius was between 11.2 and 15.3 mm, shell thickness was between 2.2 and 4.5 mm. In the study conducted by Kılıc (2014), it was determined that the fruit volume was 275.00-731.67 ml, juice amount was 81-98 ml, fruit density was 0.868-0.974 g cm^{-3}, total arils weight was 141.33-361.33 g, calyx length was 13.47-22.49 mm and calyx radius was 10.19-17.03 mm. Gundogdu et al. (2015) who determined the characteristics of standard pomegranate cultivars, reported that in pomegranate varieties such as Hicaznarı, Silifke aşısı, Katırbaşı, 33N23-Çevlik, 01N04, fellahyemez, 33N34, İzmir26, İzmir23, İzmir1513, 33N24 and Kuşnarı, the fruit volume was 230.00-542.50 cm^3, the fruit juice amount was 106.66-186.00 ml and the fruit density was between 0.92-1.19 g cm^{-3} values. In another study (Ozturk et al., 2019) determined that total arils weight was 84-400 g, 100 arils weight was 25.3-49.5 g, aril yield was 40.5-78.4%, juice amount was 78-296 ml, calyx length was 12.1-17.9 mm and calyx radius was between 9.15 and 22.50 mm.

Table 1. Pomological characteristics of pomegranate genotypes

Genotype	Fruit weight (g)	Fruit length (mm)	Fruit width (mm)	Total arils weight (g)	Fruit volume	Juice volume
Kahta	267.632±41.991^{ab}	68.522±3.405^{ab}	83.298±3.599^{ab}	119.203±11.955^{b}	277.444±50.651^{ab}	67.889±6.918^{bcd}
Bostanlı	291.668±11.239^{ab}	70.697±0.641^{a}	83.896±3.060^{ab}	139.704±8.415^{b}	308.444±23.865^{a}	80.333±8.720^{abc}
Eceler	212.012±26.257^{b}	65.747±1.683^{ab}	76.121±1.680^{ab}	91.957±16.173^{b}	220.000±23.540^{ab}	43.111±12.010^{d}
Ballı	248.262±19.409^{ab}	66.100±2.646^{ab}	79.530±1.716^{ab}	154.538±14.704^{ab}	252.000±19.313^{ab}	96.444±10.819^{ab}
Kilisk	214.060±41.730^{b}	64.700±4.386^{ab}	74.139±7.271^{ab}	94.144±28.416^{b}	222.333±44.108^{ab}	53.778±15.602^{cd}
Sarıca	328.909±37.553^{a}	72.801±2.279^{a}	86.613±3.412^{a}	203.567±28.525^{a}	327.000±36.226^{a}	112.111±13.132^{a}
Narince	196.300±11.827^{b}	61.528±1.671^{b}	73.047±2.291^{b}	119.448±10.202^{b}	188.333±13.132^{b}	68.333±5.667^{bcd}
Genotype	**Calyx length (mm)**	**Calyx diameter (mm)**	**Peel thickness (mm)**	**Peel weight (g)**	**Top cubby number**	**Base cubby number**
Kahta	22.126±2.569^{ab}	22.688±2.470^{ab}	4.670±0.476^{a}	131.786±31.789^{ab}	5.778±0.111^{ab}	5.778±0.111^{ab}
Bostanlı	21.251±1.663^{ab}	21.214±1.313^{abc}	4.424±0.612^{a}	141.363±13.910^{a}	5.667±0.333^{ab}	5.667±0.333^{ab}
Eceler	18.067±1.590^{b}	20.366±0.656^{abc}	4.889±0.248^{a}	102.046±15.264^{ab}c	5.222±0.294^{b}	5.222±0.294^{b}
Ballı	18.888±1.041^{b}	17.183±0.480^{cd}	3.093±0.141^{b}	80.747±5.608^{bc}	6.556±0.484^{a}	6.556±0.484^{a}
Kilisk	20.974±0.834^{ab}	23.211±0.702^{a}	4.382±0.499^{a}	109.980±15.034^{abc}	5.222±0.401^{b}	5.222±0.401^{b}
Sarıca	25.179±2.589^{a}	18.870±1.252^{bcd}	3.129±0.157^{b}	115.267±12.596^{abc}	6.556±0.401^{a}	6.556±0.401^{a}
Narince	20.742±1.527^{ab}	16.056±0.994^{d}	2.723±0.436^{b}	67.461±4.723^{c}	5.444±0.401^{ab}	5.444±0.401^{ab}

Means in columns with the same letter do not differ P<0.05.

Significant differences were detected between genotypes in terms of fruit skin and aril color. When the fruit peel L^*, a^*, and b^* values were examined, a^* and b^* values were higher in the Kahta Genotype while the Kilisk genotype had the highest L^* value. The smallest values in L^* a^* and b^* color values were recorded with Narince, Sarıca, and Narince genotypes, respectively. The highest values in terms of hue angle were determined in the Eceler genotype, Bostanli genotype had lower values. The highest chroma values were obtained with the Kilisk Genotype while the lowest values were recorded with the Narince genotype. It was observed that the aril color of the genotypes was very different. Considering a value, which expresses the red color, it can be said that the arils are redder in the Eceler genotype, and the arils have a lighter color in the Narince and Sarıca genotypes (Table 2).

Table 2. Fruit and aril color (L^*, a^*, b^*, chroma, and hue angle) characteristics of pomegranate genotypes

Genotype	Fruit Color				
	L^*	a^*	b^*	Chroma	Hue angle
Kahta	60.268±1.543^{cd}	16.590±3.842^{a}	33.248±1.455^{a}	39.014±0.883^{ab}	64.714±5.475^{a}
Bostanli	63.117±2.844^{bcd}	19.026±9.779^{a}	29.898±4.340^{a}	38.966±1.769^{ab}	58.371±15.780^{a}
Eceler	58.263±0.847^{d}	25.489±1.646^{a}	31.196±0.274^{a}	42.561±1.056^{a}	52.213±2.028^{a}
Balli	67.454±3.639^{abc}	19.852±5.341^{a}	31.063±2.269^{a}	39.130±0.630^{ab}	56.089±6.381^{a}
Kilisk	60.884±1.882^{cd}	13.409±5.520^{a}	32.733±1.086^{a}	36.920±2.334^{b}	68.803±7.748^{a}
Sarıca	70.812±2.102^{a}	9.939±3.044^{a}	36.070±1.518^{a}	38.746±0.420^{ab}	74.278±5.238^{a}
Narince	69.286±2.304^{ab}	9.143±2.328^{a}	36.096±0.586^{a}	40.363±0.845^{ab}	75.899±3.215^{a}
Genotype	**Fruit Arils Color**				
	L^*	a^*	b^*	Chroma	Hue angle
Kahta	45.239±2.903^{ab}	9.606±4.766^{ab}	16.123±0.744^{a}	20.231±2.081^{ab}	62.268±12.217^{abc}
Bostanli	44.061±0.184^{ab}	6.331±2.002^{ab}	14.868±0.728^{ab}	16.489±1.070^{b}	67.639±6.166^{ab}
Eceler	46.127±1.492^{a}	14.092±0.973^{ab}	15.921±1.130^{a}	21.677±0.344^{a}	49.137±3.709^{abc}
Balli	38.213±0.526^{bc}	15.044±1.857^{a}	12.954±0.472^{bc}	20.199±1.072^{ab}	41.376±4.651^{bc}
Kilisk	48.277±2.191^{a}	5.342±3.011^{b}	15.487±0.885^{ab}	17.094±0.614^{b}	71.451±9.868^{a}
Sarıca	41.498±0.786^{abc}	13.910±1.776^{ab}	14.031±0.361^{abc}	20.566±0.986^{ab}	46.614±4.524^{abc}
Narince	35.698±4.084^{c}	15.360±3.650^{a}	11.882±1.235^{c}	20.126±1.811^{ab}	39.650±10.313^{c}

Means in columns with the same letter do not differ P<0.05.

3.2. SSC, TA, and pH

SSC and pH contents showed significant differences between genotypes. The SSC amount in genotypes varied between 12.011 (Kilisk) and 17.267 (Balli and Narince), and the pH was determined between 3.583 (Kilisk) - 4.073 (Bostanlı). There was no difference between genotypes in terms of titratable acidity content. When the studies are examined, it will be seen that the SSC, titratable acidity, and pH contents vary and the cultivar and region used in the studies are effective in the emergence of these results. Generally, it can be said that the SSC ratio in pomegranates varies between 9-19% and the SSC ratio of genotypes in our study was at normal levels (Table 3). In his thesis study carried out by Gundogdu (2006) to determine the characteristics of the local pomegranate genotypes of the Pervari (Siirt) region, the SSC amount was determined as 12.4%-14.9%, pH was 3.60-4.40% and total acidity was 0.55-2.99%. Muradoglu et al. (2006) reported that pH value varied between 2.6-3.8 and total acidity was between 1.5-2.9% in pomegranates in the Hakkari region. In the study conducted by Kılıc (2014) in order to determine the characteristics of the local pomegranate genotypes of the Siverek (Şanlıurfa) region, the SSC amount was determined between 12.64-16.68%, pH was 2.84-3.31%, and total acidity was 0.55-2.99%. In the study conducted by using varieties such as Hicaznarı, Silifke aşısı, Katırbaşı, 33N23-Çevlik, 01N04, fellahyemez, 33N34, İzmir26, İzmir23, İzmir1513, 33N24 and Kuşnarı in order to determine the physicochemical properties of pomegranate cultivars and genotypes, it was determined that SSC amount was between 11.50-14.60%, pH was 3.45-4.71, total acidity was 0.19-1.17% (Gundogdu et al., 2015). In the Artuklu and Kızıltepe districts of Mardin province, the SSC amount in local pomegranates varied between 15.00-18.00%, pH was 2.38-3.49% and total acidity was 0.06-0.69% (Ozturk et al., 2019).

Table 3. SSC, pH, and titratable acid content of pomegranate genotypes

Genotype	SSC (%)	pH	Titratable Acidity (%)
Kahta	16.022±1.626^{ab}	3.731±0.048^{ab}	1.312±0.256^{a}
Bostanlı	14.656±0.323^{b}	4.073±0.247^{a}	0.736±0.330^{a}
Eceler	17.022±0.426^{a}	3.663±0.098^{b}	1.422±0.225^{a}
Ballı	17.256±0.349^{a}	3.620±0.041^{b}	1.604±0.088^{a}
Kilisk	12.011±0.400^{c}	3.583±0.045^{b}	1.489±0.164^{a}
Sarıca	17.000±0.306^{a}	3.636±0.060^{b}	1.387±0.164^{a}
Narince	17.267±0.133^{a}	3.730±0.130^{ab}	1.402±0.412^{a}

Means in columns with the same letter do not differ P<0.05.

3.4. Individual phenolic compounds

Fruits are acceptable as a natural source of antioxidants such as anthocyanins and polyphenols, which can reduce the risk of cancer, heart disease, and stroke (Gilgun-Sherki et al., 2002) and prevent cardiovascular diseases (Cuzzocrea et al., 2001) and asthma (Kirkham and Rahman, 2006). The phenolic compounds such as protocatechuic acid, rutin, gallic acid, chlorogenic acid, epicatechin, ferulic acid, fluoroidzin, vanillic acid, hydroxycinnamic acid, catechin, caffeic acid, syringic acid, and *p*-coumaric acid were detected in pomegranate fruit. However, some of them were not given numerically because they were in very trace amounts. The phenolic compound content generally did not change depending on the genotype, only the protocatechuic acid and gallic acid content changed. Rutin is the phenolic compound with the highest concentration, followed by protocatechuic acid, gallic acid, chlorogenic acid, floridzin, ferrulic acid, and epicatechin, respectively (Table 4). Turgut and Seydim (2013) reported that there were similar phenolic compounds in pomegranate juice, in their study, it was determined 3 hydroxybenzoic acids (gallic, vanillic, and syringic acids), 2 flavanols (epicatechin, catechin), 1 hydroxycinnamic acid (chlorogenic acid), 1 flavanone (floridzin), and 1 flavonol (rutin). In the same study was reported that epicatechin was the dominant phenolic component in all pomegranate juice samples. However, in our study, this phenolic compound had a very low concentration. Poyrazoglu et al. (2002) determined that in raw pomegranate juice, gallic acid was 0.34-30.86 g L^{-1}, protocatechuic acid was 0.12-2.09 g L^{-1}, catechin was 0.13-8.44 g L^{-1}, chlorogenic acid was 0.09-4.72 g L^{-1}, caffeic acid was 0.09-2.89 g L^{-1}, *p*-coumaric acid was 0.04-0.15 g L^{-1}, ferulic acid was 0.01-0.06 g L^{-1}, *q*-coumaric acid was 0.07-0.30 g L^{-1}, floridzin was 0.06-4.93 g L^{-1} and quercetin was 0.23-5.30 g L^{-1}. Pande and Akoh (2009) stated that caffeic acid was 12.3-14.4 mg 100 g^{-1}, *p*-coumaric acid was 6.6-8.1 mg 100 g^{-1}, ferulic acid was 1.3-2.0 mg 100 g^{-1}, catechin was 82.7-101.2 mg 100 g^{-1}, epicatechin was 9.6 -11.7 mg 100 g^{-1} quercetin was 66.7-77.1 mg 100 g^{-1} in pomegranate juice. Swatsitang et al. (1999) reported that the amounts of phenolic compounds found in pomegranate juice are 3.49 mg 100 g^{-1} was gallic acid, 0.39 mg 100 g^{-1} was protocatechuic acid, 4.23 mg 100 g^{-1} was p-hydroxybenzoic acid, 2.16 mg 100 g^{-1} was vanillic acid, 0.24 mg 100 g^{-1} was caffeic acid, 10.01 mg 100 g^{-1} was *p*-coumaric acid 13.95 mg 100 g^{-1} was ferulic acid. On the other hand, Kelebek and Canbas (2010) reported that there were phenolic compounds such as gallic acid (13.95 mg mL^{-1}), protocatesic (4.98 mg mL^{-1}), caffeic acid (6.39 mg mL^{-1}), vanillic acid (2.33 mg mL^{-1}) and *p*-coumaric acid (16.62 mg mL^{-1}) in pomegranate. It is thought that the differences in the results of the study are due to factors such as genetic, environmental, and climatic factors, cultural practices and analysis methods used.

Table 4. Content of individual phenolic compounds of pomegranate genotypes

Phenolic Compounds (mg kg^{-1})	Genotype						
	Kahta	**Bostanli**	**Eceler**	**Balli**	**Kilisk**	**Sarica**	**Narince**
Protocatechuic Acid	1.8097± 0.9106^{a}	0.6520± 0.2176^{ab}	0.8126± 0.1891^{ab}	1.0187± 0.3722^{ab}	0.2184± 0.0514^{b}	0.8335± 0.2327^{ab}	0.7385± 0.4654^{ab}
Rutin	1.8599± 1.5195^{a}	0.0578± 0.0203^{a}	0.6359± 0.3746^{a}	1.3201± 0.4715^{a}	0.1910± 0.0669^{a}	0.6879± 0.2541^{a}	0.7183± 0.5623^{a}
Gallic Acid	0.0532± 0.0210^{b}	0.0935± 0.0329^{ab}	0.2096± 0.0735^{a}	0.0086± 0.0010^{b}	0.0499± 0.0174^{b}	0.0285± 0.0071^{b}	0.1847± 0.0612^{a}
Chlorogenic Acid	0.0097± 0.0051^{a}	0.0035± 0.0026^{a}	0.0169± 0.0123^{a}	0.0260± 0.0115^{a}	0.0048± 0.0022^{a}	0.0097± 0.0047^{a}	0.0022± 0.0006^{a}
Epicatechin	0.0006± 0.0004^{a}	0.0005± 0.0003^{a}	0.0002± 0.0001^{a}	0.0003± 0.0002^{a}	0.0006± 0.0004^{a}	0.0001± 0.0001^{a}	0.0010± 0.0003^{a}
Ferulic Acid	0.0037± 0.0030^{a}	0.0008± 0.0003^{a}	0.0186± 0.0079^{a}	0.0450± 0.0362^{a}	0.0001± 0.0001^{a}	0.0285± 0.0208^{a}	0.0013± 0.0010^{a}
Floridzin	0.0074± 0.0038^{a}	0.0006± 0.0003^{a}	0.0152± 0.0140^{a}	0.0116± 0.0070^{a}	0.0003± 0.0002^{a}	0.0122± 0.0039^{a}	0.0006± 0.0001^{a}

Means in columns with the same letter do not differ P<0.05.

4. Conclusion

Fruit size varied depending on genotype. Larger fruits were harvested with the Sarıca genotype. Narince was the genotype with the smallest fruits. Sarıca genotype had the highest fruit juice volume, and the lowest fruit juice rate was recorded in the Eceler genotype. The Eceler genotype had the thickest shells, but the Narince genotype had thinner shells. The number of chambers in the genotypes varied between 5 and 6, and the nuclei had a hard and medium hard structure. While the a* and b* values were

higher in the Kahta genotype, the Kilis genotype had the highest L* value. The amount of SSCM in the genotypes was between 12.01 (Kilisk) and 17.25 (Ballı and Narince), and the pH was between 2.71 (Narince) and 4.38 (Kilisk). No difference was found between genotypes in terms of titratable acidity content. Phenolic compounds such as protocatechuic acid, routine, gallic acid, chlorogenic acid, epicatechin, ferulic acid, phloridzin, vanillic acid, hydroxycinnamic acid, catechin, caffeic acid, shincinic acid, and p-coumaric acid were detected in pomegranate fruit.

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