Determination of phenolic compositions and quality characteristic of some local Turkish table grape varieties cultivated in Egirdir/Isparta

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Abstract. This study was carried out to determine the phenolic substances and antioxidant activities of 11 local grape cultivars (Burdur Dimriti, Siyah Gemre, Ak Gemre, Antep Büzgülü, Şam Büzgülü, Kuş Yüregi, Ak Dimrit, Marzimat, Senirkent Dimriti, Devegözü, Tilki Kuyruğu) grown in Egirdir/Isparta province of Turkey by the means of High Performance Liquid Chromatography (HPLC) and also were evaluated for their yield and quality characteristics. Burdur Dimriti, Antep Büzgülü, Şam Büzgülü cultivars were evaluated good for yield and table consumption. Ak Gemre, Marzimat, Devegözü, Ak Dimrit, Senirkent Dimriti and Kuş Yüregi varieties were evaluated good for must production. Gallic acid, caffeic acid, p-cumaric acid, ferulic acid, catechin, epicatechin, epicatechin gallate, epigallocatechin, epigallocatechin-3-gallate, kaemferol, myricetin, rutin hydrate, resveratrol, quercetin were determined in berry samples of 11 cultivars. Phenolic substances varied between 0 and 101.466 µg/ml in frozen berry samples varying to grape variety. Some of the cultivars can be evaluated as a good source of resveratrol, gallic acid, quercetin, and catechin. Antep Büzgülü, Burdur Dimriti, Kuş Yüregi, Senirkent Dimriti, Siyah Gemre were evaluated hopeful phenolic sources for further studies. Further detailed studies will be planned about phenolic and antioxidant compositions of these hopeful local varieties according to research results.

1. Introduction

Grape, cultivated since ancient times is one of the most significant edible and processing for wine crop due to its beneficial influences on human health and economic significance on a large scale (6) and Turkey is one of the major players in this market: according to FAO records, Turkey placed 6th position in the World in terms of amount of grape production according to the data of 2013.

Grapes composition revealed that phenolic compounds are the most widely distributed component within the plant secondary metabolites. Thousands of phenolic compounds with the different characteristics, amounts, and functions have been identified [10,11]. Phenolic compounds in foods cause variation in various organoleptic qualities like taste, bitterness and sourness; and color properties are also altered with phenolic compounds and anthocyanins. Moreover, attributable to beneficial effects on human health in particular, importance of phenolic compounds has increased with each passing day [12]. Phenolic compounds from plants source are categorized into two groups as “phenolic acids” and “flavonoids” while phenolic acids are further subcategorized into two groups as cinamic (hydroxycinnamic) and benzoic (hydroxybenzoic) acids [15].

Phenolic compounds are a subdivision of the phytochemical group and they have attracted passionate interest of both researchers and consumers due to their antioxidants and antimicrobial activities [1]. The antioxidant activities of phenolic compounds are attributed to their free radical scavenging and metal chelating properties, as well as their effects on cell signaling pathways and on gene expression

[2–4]. The mechanism of the antioxidant activity has been mainly influenced by the number of OH groups and their position on the ring in the molecule, which determines the antioxidant capacity of phenolic compounds [2]. The phenolics in grapes are classified in two groups: the flavonoids and non-flavonoids. In flavonoids group are present flavan-3-ols (catechin), flavonols (quercetin) and anthocyanins. The nonflavonoids group contains gallic acid, hydroxycinnamates and stilbenes (resveratrol) [2]. Phenolic compounds were indicated to reduce coronary heart diseases [7], some cancer types and various dermal disorders (Yilmaz and Toledo, 2004). The antioxidant activity of grapes is direct correlated with total phenolic content as it is demonstrated by some papers [5]. Despite the existence of thousands of cultivars of *Vitis vinifera* in grape producer countries, only a few dozen cultivars account for the vast majority of world-wide production. Numerous local cultivars have regional importance and historically played a significant role in many viticulture regions [6]. In fact local cultivars show great variability in particular given biochemical traits and they can be use locally for wine, raisins, and fresh market table grapes [8]. Therefore it is crucial to determine how much variability can be found in local grape cultivars for the given biochemical traits to use them in breeding activities. This may also help the growers to pick the right cultivar according to their market opportunities. Several variables viz. total soluble sugar, titratable acidity; nitrogen and phenolic compounds balance provide a major contribution in the description of the grape quality [9], which are very significant in case of table grape. Therefore, due to beneficial effects of the grape on human

health, the researchers have more focused in particular on the identification of biochemical composition and bioactive compounds for grape cultivars grown in distinct geographic regions throughout the World.

Various studies are conducted in the world to determine the phenolic compounds and antioxidant activities of different grape varieties [13,14]. Conversely, the Turkey has great biodiversity in grapes especially Isparta province (located in west south Anatolia of Turkey known as Lakes Region) and limited studies are conducted on phenolic substances and antioxidant contents of the grapes cultivars grown in this region. This study was carried out to determine yield and quality characteristics and also the phenolic compounds (Gallic acid, caffeic acid, cumaric acid, ferulic acid, catechin, epicatechin, epicatechin gallate, epigallocatechin, epigallocatechin 3 gallate, kaemferol, myricetin, rutin hydrate, resveratrol, quercetin) of the grapes genotypes (Burdur Dimriti, Siyah Gemre, Ak Gemre, Antep Büzgülü, Şam Büzgülü, Kuş Yüregi, Ak Dimrit, Marzımat, Senirkent Dimriti, Devegözü, Tilki Kuyruğu) grown in Eğirdir/Isparta province of the Turkey by the means of HPLC.

2. Material and method

This study was carried out in Eğirdir Fruit Research Station farmlands during 2012–2013 vegetation season products. Eğirdir is a district of Isparta. Its altitude is 920 m high and it represents passing zone climate and ecological conditions (Figs. 2.2, 2.3). Geographical coordinates of Eğirdir district; are 37° 50' 41", 38° 16' 55" N latitude, 30° 57' 43", 30° 44' 39" E latitude [16]. Isparta has ideal ecological conditions for viticulture in the Lakes Region area. Average rainfall is between 445 and 764 mm. Temperature varies between –14°C and +37°C. Any ecological condition that could affect vine growing negatively had not been occurred in the experimental period as seen in Table 2.1.

Soil analyses were done in Eğirdir Fruit Research Station Soil analyses laboratories. Soil analyses report is in Table 2.2.

2.1. Plant material

11 grapevine cultivars (Burdur Dimriti, Siyah Gemre, Ak Gemre, Antep Büzgülü, Şam Büzgülü, Kuş Yüregi, Ak Dimrit, Senirkent Dimriti, Devegözü, Tilki Kuyruğu and Marzımat (Figs. 2.1.1–2.1.6). Quality features (phenology stages, soluble solid (%), titratable acidity (g/l), yield

Table 2.1. Some climatic data of the experiment area.

Year	Avg. Temperature (°C)	Min. Temperature (°C)	Max. Temperature (°C)	Avg. Precipitation (mm)	Avg. Humidity
Average	12.2	–14.9	38.6	764	66.5
2011	11.9	–8.2	37.4	669	66.3
2012	12.9	–12.7	38.6	622	68.9
2013	13.1	–7.9	34.1	654	63.7
2014	13.4	–6.3	36.1	669	70.9

Table 2.2. Soil analyses of the experiment area.

Physical analyses		
	Texture	Loam
	pH	7.78
	Lime (%)	9.8
	Saturation (%)	49
Chemical analyses		
	Organic matter (%)	2.8
	N (ppm)	1617
	P (ppm)	4.52
	K (ppm)	221.1
	Ca (ppm)	4679
	Mg (ppm)	492
	Na (ppm)	13.48
	Fe (ppm)	13.64
	Cu (ppm)	4.23
	Mn (ppm)	6.25
	Zn (ppm)	1.04

Figure 2.1. World Map.

Figure 2.2. Turkey Map and Isparta City.

(kg/vine), average bunch weight (g), must ratio (%) data had been obtained in vineyard for two years. Samples of the grape cultivars used in this study were obtained from Eğirdir Fruit Station research vineyard in 2013, at the same developmental stage when harvested. The fully ripened and matured fruits were harvested in September and they were stored for about 7 months at -80°C .

Figure 2.3. Lakes Region and Eğirdir town.

Figure 2.1.3. Ak Gemre and Antep Büzgülü varieties.

Figure 2.1.4. Şam Büzgülü and Marzimat varieties.

Figure 2.1.1. Burdur Dimriti and Senirkent Dimriti varieties.

Figure 2.1.5. Kuş Yüreği and Devegözü varieties.

Figure 2.1.2. Ak Dimrit and Siyah Gemre varieties.

Figure. 2.1.6. Tilki Kuyruğu variety.

2.2. Experimental methods

Quality analyses were done in the vegetation period. Phenology stages, yield and quality properties data had been obtained in vineyard. Soluble solid (%), titratable acidity (g/l), yield (kg/vine) were determined. Also climate data for 2013 year in the study had been recorded. Phenolic compound analyses were done in Ege University Faculty of Pharmacy Pharmaceutical Sciences Research Centre laboratories in 2014 year by HPLC. Thermo Scientific brand Accela model liquid chromatography device was used in the analyses. Device has a pump, photo diod array detector (PDA), 25 µl loop volume automatic sampler, and integrated collar oven to the automatic sampler). Separation was done on a ACE type collar size 250 mm × 4.6 mm × 5 microns. Solvent A was consisting of % 0.25trifloroacetic acid and water solvent b was consisting of acetonitril. Acetonitril in HPLC purity trifloroacetic acid in spectro purity, water in HPLC purity, methanol (MeOH) in HPLC purity were used in analyses. All standards were weighed 1 mg and they were solved in 1 mL MeOH main reserves (1000 µg/ml) were stored in 4°C for one month and dilutions were made with MeOH (Table 2.2.1).

2.3. Polyphenols extraction

Polyphenols extraction grapes, in three replicated each, was extracted by grinding the 2 g sample 1 min at 20,000 rpm in a blender with 2 ml of acidified methanol (85:15 v/v, MeOH:HCl) and stored for one night. The homogenate was centrifuged at 4500 rpm for 10 min at 25°C. The extract was separated and the residual tissue was re-extracted until the extraction solvents became colorless. The filtrates were combined in a total extract and dried using for 2 days time in lyophilizator. This producer was also done with acetonitril (ACN) but good results were not obtained with (ACN), for that reason MeOH extraction systems which resulted better were used in the analyses.

2.4. Separation of phenolic acids

Samples were filtered from 45 µm and a sample with 10 µL injection volume was injected into HPLC and

Table 2.2.1. Standards used in the analyses.

Standart Number	Standart Name
STD1	Gallic Acid
STD2	Epigallocatechin
STD3	Katechin
STD4	Epigallocatechin-3-gallat
STD5	Ferulic Acid
STD6	Myricetin
STD7	Resveratrol
STD8	Quercetin
STD9	Kamferol
STD10	Kafeic Acid
STD11	p-Kumaric Acid
STD12	Rutinhidrate

mobile phase gradient was used with flow 1000 µL/min. (Tables 2.4.1, 2.4.2). Separation was done on an ACE type collar size 250 mm × 4.6 mm × 5 microns, a wavelength of between 254 and 280 nm. For each injection and 10,000 µL extract was used at a working temperature of 25°C. 2 different method were used in the determination seen on (Tables 2.4.1, 2.4.2).

3. Results and discussion

3.1. Yield and quality characteristic of varieties

Grape varieties which were evaluated in the study, all phenological stages were determined. Buds burst time, Full blossom time, verasion period and harvest time were given in Table (3.1). All varieties buds burst time was mid of the April. The earliest varieties were Senirkent Dimridi, Ak Dimrit and Burdur Dimriti were determined. Full blossom time in all varieties were second and third week of the June in observation. Harvest time of varieties were late August and September and beginning of the October. Generally all varieties are harvested in September.

Among the 11 variety yield and quality properties data had been obtained in vineyard. Yield (kg/vine), soluble solid (%), total titratable acidity (g/l), Average bunch weight (g), must ratio (%) was determined. Data were given in Table 3.1.2. Highest total yield were evaluated from Burdur Dimridi, Şam Büzgülü and Antep Büzgülü varieties. Highest bunch weight was evaluated from Ak Gemre and Tilki Kuyruğu varieties. All varieties were good in must ratio. Generally must ratios were at %60 or more. Ak Gemre, Marzımat, Kuş Yüreği and Dimrit varieties (Burdur Dimriti, Senirkent Dimriti, Ak Dimrit) have high must ratios. Titratable acidity had varied 4.6–6.9 g/l. Some varieties were evaluated for good for must ratios and yield characteristics.

Table 2.4.1. Gradient solvents program used for HPLC separation (first method).

Solvent type	Time (min)	Time (min)	Time (min)	Time (min)	Flow rate
	0	4.50	15.00	20.00	µL/min
Solvent A%	10	20	70	10	1000
Solvent B%	90	80	30	90	1000

Solvent A: acetonitril ACN with %0.25 trifloroacetic acid TFA.
Solvent B: water with %0.25 with trifloroacetic acid TFA.

Table 2.4.2. Gradient solvents program used for HPLC separation (second method).

Solvent type	Time (min)	Time (min)	Time (min)	Time (min)	Flow rate
	0	4.00	13.00	15.00	µL/min
Solvent A%	10	20	70	10	1000
Solvent B%	90	80	30	90	1000

Solvent A: acetonitril ACN with %0.25 trifloroacetic acid TFA.
Solvent B: water with %0.25 with trifloroacetic acid TFA.

Table 3.1. Phenologic stages of varieties.

Variety	Bud burst time	Flower time	Berry colour set time	Harvest time
Ak Gemre	18.04	15.06	26.08	30.09
Antep Büzgülü	22.04	14.06	06.08	26.09
Şam Büzgülü	22.04	16.06	02.08	17.09
Kuş Böreği	21.04	16.06	25.08	30.09
Ak Dimrit	17.04	13.06	26.08	12.09
Senirkent Dimriti	18.04	12.06	30.07	25.08
Devegözü	24.04	15.06	19.08	02.10
Tilki Kuyruğu	20.04	15.06	25.08	03.10
Burdur Dimriti	20.04	12.06	29.07	27.08
Siyah Gemre	19.04	10.06	10.08	25.09
Marzimat	21.04	14.06	20.08	26.09

Table 3.1.2. Quality features of varieties.

Variety	Yield kg/vine	Avg. bunch weight (g)	Total solub (%)	Acidity (g/l)	Must ratio (%)
Ak Gemre	12.25	640	15.0	5.6	58
Antep Büzgülü	18.66	533	17.6	6.7	56
Şam Büzgülü	21.78	622	17.8	5.3	57
Kuş Böreği	16.10	600	16.4	4.8	61
Ak Dimrit	11.30	230	15.5	6.5	59
Senirkent Dimriti	12.40	322	15.9	6.6	63
Devegözü	7.50	368	15.4	6.1	58
Tilki Kuyruğu	10.66	740	17.0	4.6	60
Burdur Dimriti	21.60	375	18.5	6.9	62
Siyah Gemre	16.45	383	17.2	6.3	54
Marzimat	12.35	365	16.8	5.8	59

3.2. Phenolic composition results

Phenolic compositions were determined by two different methods and extraction was done by MeOH and HCl. 20 min method gave better results than 15 min results. 20 min HPLC and meoh and HCl extraction methods were given on tables below.

3.2.1. Gallic acid

Gallic acid values and reaction equation results are given in Table 3.2.1 and Fig. 3.2.1. Highest gallic acid values were evaluated from Siyah Gemre, Antep Büzgülü, Şam Büzgülü and Ak Dimrit varieties and the other varieties gallic acid values were determined less or not found (NF).

Table 3.2.1. Average gallic acid results according to variety.

Ak Gemre HCl	NF	µg/mL
Ak Gemre MeOH	NF	µg/mL
Ak Dimrit HCl	NF	µg/mL
Ak Dimrit MeOH	0,425	µg/mL
Antep Büzgülü HCl	0,076	µg/mL
Antep Büzgülü MeOH	NF	µg/mL
Burdur Dimriti HCl	NF	µg/mL
Burdur Dimriti MeOH	NF	µg/mL
Devegözü HCl	NF	µg/mL
Devegözü MeOH	NF	µg/mL
Kuş Yüreği HCl	NF	µg/mL
Kuş Yüreği MeOH	0,220	µg/mL
Marzimat HCl	NF	µg/mL
Marzimat MeOH	NF	µg/mL
Ak Gemre 20 µg/mL HCl	1,586	µg/mL
Ak Gemre 20 µg/mL MeOH	28,566	µg/mL
Ak Dimrit 20 µg/mL HCl	3,269	µg/mL
Ak Dimrit 20 µg/mL MeOH	30,221	µg/mL
Antep Büzgülü 20 µg/mL HCl	2,505	µg/mL
Antep Büzgülü 20 µg/mL MeOH	28,902	µg/mL
Burdur Dimriti 20 µg/mL HCl	2,489	µg/mL
Burdur Dimriti 20 µg/mL MeOH	17,282	µg/mL
Devegözü 20 µg/mL HCl	2,343	µg/mL
Devegözü 20 µg/mL MeOH	28,022	µg/mL
Kuş Yüreği 20 µg/mL HCl	2,396	µg/mL
Kuş Yüreği 20 µg/mL MeOH	17,795	µg/mL
Marzimat 20 µg/mL HCl	4,932	µg/mL
Marzimat 20µg/mL MeOH	16,441	µg/mL
Şam Büzgülü 20 µg/mL HCl	0,168	µg/mL
Şam Büzgülü 20 µg/mL MeOH	28,469	µg/mL
Senirkent Dimriti 20 µg/mL HCl	2,317	µg/mL
Senirkent Dimriti 20 µg/mL MeOH	28,235	µg/mL
Siyah Gemre 20 µg/mL HCl	2,42	µg/mL

Table 3.2.1. Continued.

Siyah Gemre 20 µg/mL MeOH	28,202	µg/mL
Tilki Kuyruğu 20µg/mL HCl	2,317	µg/mL
Tilki Kuyruğu 20µg/mL MeOH	28,356	µg/mL
Şam Büzgülü HCl	2,706	µg/mL
Şam Büzgülü MeOH	NF	µg/mL
Senirkent DimritiHCl	5,282	µg/mL
Senirkent Dimriti MeOH	NF	µg/mL
Siyah Gemre HCl	NF	µg/mL
Siyah Gemre MeOH	0,228	µg/mL
STD1:20ppm_	21,876	µg/mL
Tilki Kuyruğu HCl	NF	µg/mL
Tilki Kuyruğu MeOH	NF	µg/mL

Figure 3.2.1. Gallic acid reaction equation.

3.2.2. Epigallocatechin

Epigallocatechin values and reaction equation results are given in Table 3.2.2 and Fig. 3.2.2. Highest Epigallocatechin values were evaluated from Siyah Gemre, Senirkent Dimriti, Ak Gemre, Şam Büzgülü and Ak Dimrit for other varieties epigallocatechin values were determined less or not found (NF).

Table 3.2.2. Epigallocatechin results according to variety.

Ak Gemre HCl	NF	µg/mL
Ak Gemre MeOH	NF	µg/mL
Ak Dimrit HCl	NF	µg/mL
Ak Dimrit MeOH	NF	µg/mL
Antep Büzgülü HCl	NF	µg/mL
Antep Büzgülü MeOH	NF	µg/mL
Burdur Dimriti HCl	NF	µg/mL
Burdur Dimriti MeOH	NF	µg/mL
Devegözü HCl	NF	µg/mL
Devegözü MeOH	NF	µg/mL
Kuş Yüreği HCl	NF	µg/mL

Kis Yüreği MeOH	NF	µg/mL
Marzımat HCl	NF	µg/mL
Marzımat MeOH	NF	µg/mL
Ak Gemre 20 µg/mL HCl	NF	µg/mL
Ak Gemre 20 µg/mL MeOH	30,530	µg/mL
Ak Dimrit 20 µg/mL HCl	NF	µg/mL
Ak Dimrit 20 µg/mL MeOH	29,661	µg/mL
Antep Büzgülü 20 µg/mL HCl	4,453	µg/mL
Antep Büzgülü 20 µg/mL MeOH	28,741	µg/mL
Burdur Dimriti 20 µg/mL HCl	1,642	µg/mL
Burdur Dimriti 20 µg/mL MeOH	18,983	µg/mL
Devegözü 20 µg/mL HCl	NF	µg/mL
Devegözü 20 µg/mL MeOH	28,281	µg/mL
Kuş Yüreği 20 µg/mL HCl	NF	µg/mL
Kuş Yüreği 20 µg/mL MeOH	18,391	µg/mL
Marzımat 20 µg/mL HCl	4,655	µg/mL
Marzımat 20µg/mL MeOH	17,219	µg/mL
Şam Büzgülü 20 µg/mL HCl	NF	µg/mL
Şam Büzgülü 20 µg/mL MeOH	29,069	µg/mL
Senirkent Dimriti 20 µg/mL HCl	NF	µg/mL
Senirkent Dimriti 20 µg/mL MeOH	33,279	µg/mL
Siyah Gemre 20 µg/mL HCl	2,473	µg/mL
Siyah Gemre 20 µg/mL MeOH	55,896	µg/mL
Tilki Kuyruğu 20µg/mL HCl	NF	µg/mL
Tilki Kuyruğu 20µg/mL MeOH	27,850	µg/mL
Şam Büzgülü HCl	NF	µg/mL
Şam Büzgülü MeOH	NF	µg/mL
Senirkent DimritiHCl	NF	µg/mL
Senirkent Dimriti MeOH	NF	µg/mL
Siyah Gemre HCl	NF	µg/mL
Siyah Gemre MeOH	NF	µg/mL
STD1:20ppm_	20,967	µg/mL
Tilki Kuyruğu HCl	NF	µg/mL
Tilki Kuyruğu MeOH	NF	µg/mL

Figure 3.2.2. Epigallocatechin reaction equation.

3.2.3. Catechin

Catechin values and reaction equation results are given in Table 3.2.3 and Fig. 3.2.3. Highest catechin values were evaluated from Kuş Yüreği and Burdur Dimrit varieties other varieties values were determined less or not found (NF).

Table 3.2.3. Catechin results according to variety.

Ak Gemre HCl	0,186	µg/mL
Ak Gemre MeOH	1,242	µg/mL
Ak Dimrit HCl	NF	µg/mL
Ak Dimrit MeOH	9,383	µg/mL
Antep Büzgülü HCl	NF	µg/mL
Antep Büzgülü MeOH	NF	µg/mL
Burdur Dimriti HCl	NF	µg/mL
Burdur Dimriti MeOH	NF	µg/mL
Devegözü HCl	NF	µg/mL
Devegözü MeOH	NF	µg/mL
Kuş Yüreği HCl	NF	µg/mL
Kuş Yüreği MeOH	11,650	µg/mL
Marzımat HCl	NF	µg/mL
Marzımat MeOH	1,783	µg/mL
Ak Gemre 20 µg/mL HCl	NF	µg/mL
Ak Gemre 20 µg/mL MeOH	NF	µg/mL
Ak Dimrit 20 µg/mL HCl	0,414	µg/mL
Ak Dimrit 20 µg/mL MeOH	19,953	µg/mL
Antep Büzgülü 20 µg/mL HCl	1,007	µg/mL
Antep Büzgülü 20 µg/mL MeOH	0,355	µg/mL
Burdur Dimriti 20 µg/mL HCl	NF	µg/mL
Burdur Dimriti 20 µg/mL MeOH	23,802	µg/mL
Devegözü 20 µg/mL HCl	11,034	µg/mL
Devegözü 20 µg/mL MeOH	16,501	µg/mL
Kuş Yüreği 20 µg/mL HCl	NF	µg/mL
Kuş Yüreği 20 µg/mL MeOH	31,190	µg/mL
Marzımat 20 µg/mL HCl	14,441	µg/mL
Marzımat 20µg/mL MeOH	22,361	µg/mL
Şam Büzgülü 20 µg/mL HCl	NF	µg/mL
Şam Büzgülü 20 µg/mL MeOH	15,917	µg/mL
Senirkent Dimriti 20 µg/mL HCl	NF	µg/mL
Senirkent Dimriti 20 µg/mL MeOH	16,439	µg/mL
Siyah Gemre 20 µg/mL HCl	18,02	µg/mL
Siyah Gemre 20 µg/mL MeOH	19,298	µg/mL
Tilki Kuyruğu 20µg/mL HCl	NF	µg/mL
Tilki Kuyruğu 20µg/mL MeOH	19,006	µg/mL
Şam Büzgülü HCl	NF	µg/mL
Şam Büzgülü MeOH	NF	µg/mL
Senirkent DimritiHCl	NF	µg/mL

Senirkent Dimriti MeOH	4,520	µg/mL
Siyah Gemre HCl	NF	µg/mL
Siyah Gemre MeOH	4,450	µg/mL
STD1:20ppm_	20,376	µg/mL
Tilki Kuyruğu HCl	0,239	µg/mL
Tilki Kuyruğu MeOH	NF	µg/mL

Figure 3.2.3. Catechin Reaction Equation.

3.2.4. Epigallocatechin-3-Gallate

Epigallocatechin-3-gallate values and reaction equation results are given in Table 3.2.4 and Fig. 3.2.4. Highest epigallocatechin-3-gallate values were evaluated from Senirkent Dimriti, Antep Büzgülü, Şam Büzgülü, Devegözü varieties. Senirkent Dimriti variety has a significant epigallocatechin-3-gallate content. The other varieties values were determined less or not found (NF).

Table 3.2.4. Epigallocatechin-3-gallate results according to variety

Ak Gemre HCl	1,532	µg/mL
Ak Gemre MeOH	0,925	µg/mL
Ak Dimrit HCl	3,289	µg/mL
Ak Dimrit MeOH	2,155	µg/mL
Antep Büzgülü HCl	0,693	µg/mL
Antep Büzgülü MeOH	3,055	µg/mL
Burdur Dimriti HCl	0,809	µg/mL
Burdur Dimriti MeOH	NF	µg/mL
Devegözü HCl	0,675	µg/mL
Devegözü MeOH	1,162	µg/mL
Kuş Yüreği HCl	1,071	µg/mL
Kuş Yüreği MeOH	5,106	µg/mL
Marzımat HCl	0,902	µg/mL
Marzımat MeOH	0,756	µg/mL
Ak Gemre 20 µg/mL HCl	66,447	µg/mL
Ak Gemre 20 µg/mL MeOH	20,154	µg/mL

Table 3.2.4. Continued.

Ak Dimrit 20 µg/mL HCl	56,150	µg/mL
Ak Dimrit 20 µg/mL MeOH	19,653	µg/mL
Antep Büzgülü 20 µg/mL HCl	91,059	µg/mL
Antep Büzgülü 20 µg/mL MeOH	2,586	µg/mL
Burdur Dimriti 20 µg/mL HCl	94,567	µg/mL
Burdur Dimriti 20 µg/mL MeOH	30,472	µg/mL
Devegözü 20 µg/mL HCl	89,054	µg/mL
Devegözü 20 µg/mL MeOH	17,812	µg/mL
Kuş Yüreği 20 µg/mL HCl	96,227	µg/mL
Kuş Yüreği 20 µg/mL MeOH	19,588	µg/mL
Marzımat 20 µg/mL HCl	66,902	µg/mL
Marzımat 20µg/mL MeOH	19,589	µg/mL
Şam Büzgülü 20 µg/mL HCl	97,014	µg/mL
Şam Büzgülü 20 µg/mL MeOH	21,738	µg/mL
Senirkent Dimriti 20 µg/mL HCl	101,466	µg/mL
Senirkent Dimriti 20 µg/mL MeOH	18,185	µg/mL
Siyah Gemre 20 µg/mL HCl	87,119	µg/mL
Siyah Gemre 20 µg/mL MeOH	20,155	µg/mL
Tilki Kuyruğu 20µg/mL HCl	92,491	µg/mL
Tilki Kuyruğu 20µg/mL MeOH	20,071	µg/mL
Şam Büzgülü HCl	0,675	µg/mL
Şam Büzgülü MeOH	2,103	µg/mL
Senirkent DimritiHCl	2,030	µg/mL
Senirkent Dimriti MeOH	5,658	µg/mL
Siyah Gemre HCl	NF	µg/mL
Siyah Gemre MeOH	NF	µg/mL
STD1:20ppm_	21,938	µg/mL
Tilki Kuyruğu HCl	0,812	µg/mL
Tilki Kuyruğu MeOH	0,746	µg/mL

Figure 3.2.4. epigallocatechin-3-gallate Reaction Equation.

3.2.5. Cafeic acid

Cafeic acid values and reaction equation results are given in Table 3.2.5 and Fig. 3.2.5. Highest cafeic acid values were evaluated from Siyah Gemre variety and for the other varieties values were determined less or not found (NF). Cafeic acid was determined in 4 variety according to results. These varieties were Siyah Gemre, Devegözü, Antep Büzgülü and Senirkent Dimriti.

Table 3.2.5. Cafeic acid results according to variety.

Ak Gemre HCl	NF	µg/mL
Ak Gemre MeOH	NF	µg/mL
Ak Dimrit HCl	NF	µg/mL
Ak Dimrit MeOH	NF	µg/mL
Antep Büzgülü HCl	NF	µg/mL
Antep Büzgülü MeOH	NF	µg/mL
Burdur Dimriti HCl	NF	µg/mL
Burdur Dimriti MeOH	NF	µg/mL
Devegözü HCl	NF	µg/mL
Devegözü MeOH	NF	µg/mL
Kuş Yüreği HCl	NF	µg/mL
Kis Yüreği MeOH	NF	µg/mL
Marzımat HCl	NF	µg/mL
Marzımat MeOH	NF	µg/mL
Ak Gemre 20 µg/mL HCl	NF	µg/mL
Ak Gemre 20 µg/mL MeOH	NF	µg/mL
Ak Dimrit 20 µg/mL HCl	NF	µg/mL
Ak Dimrit 20 µg/mL MeOH	NF	µg/mL
Antep Büzgülü 20 µg/mL HCl	NF	µg/mL
Antep Büzgülü 20 µg/mL MeOH	12,513	µg/mL
Burdur Dimriti 20 µg/mL HCl	NF	µg/mL
Burdur Dimriti 20 µg/mL MeOH	NF	µg/mL
Devegözü 20 µg/mL HCl	NF	µg/mL
Devegözü 20 µg/mL MeOH	8,885	µg/mL
Kuş Yüreği 20 µg/mL HCl	NF	µg/mL
Kuş Yüreği 20 µg/mL MeOH	NF	µg/mL
Marzımat 20 µg/mL HCl	NF	µg/mL
Marzımat 20µg/mL MeOH	NF	µg/mL
Şam Büzgülü 20 µg/mL HCl	NF	µg/mL
Şam Büzgülü 20 µg/mL MeOH	NF	µg/mL
Senirkent Dimriti 20 µg/mL HCl	NF	µg/mL
Senirkent Dimriti 20 µg/mL MeOH	10,665	µg/mL
Siyah Gemre 20 µg/mL HCl	NF	µg/mL
Siyah Gemre 20 µg/mL MeOH	14,825	µg/mL
Tilki Kuyruğu 20µg/mL HCl	NF	µg/mL
Tilki Kuyruğu 20µg/mL MeOH	NF	µg/mL
Şam Büzgülü HCl	NF	µg/mL

Table 3.2.5. Continued.

Şam Büzgülü MeOH	NF	µg/mL
Senirkent DimritiHCl	NF	µg/mL
Senirkent Dimriti MeOH	NF	µg/mL
Siyah Gemre HCl	NF	µg/mL
Siyah Gemre MeOH	NF	µg/mL
STD1:20ppm_	NF	µg/mL
Tilki Kuyruğu HCl	NF	µg/mL
Tilki Kuyruğu MeOH	NF	µg/mL

Figure 3.2.5. Caffeic acid reaction equation.

3.2.6. Rutinhidrate

Rutinhidrate values and reaction equation results are given in Table 3.2.6 and Fig. 3.2.6. Highest rutinhidrate values were evaluated from Marzımat and Antep Büzgülü varietes for the other varieties rutinhidrate values were determined less or not found (NF).

Table 3.2.6. Rutinhidrate results according to variety.

Ak Gemre HCl	NF	µg/mL
Ak Gemre MeOH	NF	µg/mL
Ak Dimrit HCl	NF	µg/mL
Ak Dimrit MeOH	NF	µg/mL
Antep Büzgülü HCl	NF	µg/mL
Antep Büzgülü MeOH	NF	µg/mL
Burdur Dimriti HCl	NF	µg/mL
Burdur Dimriti MeOH	NF	µg/mL
Devegözü HCl	NF	µg/mL
Devegözü MeOH	NF	µg/mL
Kuş Yüreği HCl	NF	µg/mL
Kis Yüreği MeOH	NF	µg/mL
Marzımat HCl	NF	µg/mL
Marzımat MeOH	NF	µg/mL

Ak Gemre 20 µg/mL HCl	NF	µg/mL
Ak Gemre 20 µg/mL MeOH	17,813	µg/mL
Ak Dimrit 20 µg/mL HCl	NF	µg/mL
Ak Dimrit 20 µg/mL MeOH	NF	µg/mL
Antep Büzgülü 20 µg/mL HCl	NF	µg/mL
Antep Büzgülü 20 µg/mL MeOH	25,099	µg/mL
Burdur Dimriti 20 µg/mL HCl	NF	µg/mL
Burdur Dimriti 20 µg/mL MeOH	23,745	µg/mL
Devegözü 20 µg/mL HCl	NF	µg/mL
Devegözü 20 µg/mL MeOH	21,233	µg/mL
Kuş Yüreği 20 µg/mL HCl	NF	µg/mL
Kuş Yüreği 20 µg/mL MeOH	24,647	µg/mL
Marzımat 20 µg/mL HCl	0,661	µg/mL
Marzımat 20µg/mL MeOH	25,987	µg/mL
Şam Büzgülü 20 µg/mL HCl	NF	µg/mL
Şam Büzgülü 20 µg/mL MeOH	21,719	µg/mL
Senirkent Dimriti 20 µg/mL HCl	NF	µg/mL
Senirkent Dimriti 20 µg/mL MeOH	20,070	µg/mL
Siyah Gemre 20 µg/mL HCl	NF	µg/mL
Siyah Gemre 20 µg/mL MeOH	20,665	µg/mL
Tilki Kuyruğu 20µg/mL HCl	NF	µg/mL
Tilki Kuyruğu 20µg/mL MeOH	21,066	µg/mL
Şam Büzgülü HCl	NF	µg/mL
Şam Büzgülü MeOH	NF	µg/mL
Senirkent DimritiHCl	NF	µg/mL
Senirkent Dimriti MeOH	NF	µg/mL
Siyah Gemre HCl	NF	µg/mL
Siyah Gemre MeOH	NF	µg/mL
STD1:20ppm_	24,394	µg/mL
Tilki Kuyruğu HCl	NF	µg/mL
Tilki Kuyruğu MeOH	NF	µg/mL

Figure 3.2.6. Rutinhidrate reaction equation.

3.2.7. *p*-Cumalic acid

p-Cumalic acid values and reaction equation results are given in Table 3.2.7 and Fig. 3.2.7. Highest *p*-cumalic acid values were evaluated from Burdur Dimriti and Kuş Yuregi varieties and for the other varieties values were determined less or not found (NF).

Table 3.2.7. *p*-kumalic results according to variety.

Ak Gemre HCl	NF	µg/mL
Ak Gemre MeOH	NF	µg/mL
Ak Dimrit HCl	NF	µg/mL
Ak Dimrit MeOH	NF	µg/mL
Antep Büzgülü HCl	NF	µg/mL
Antep Büzgülü MeOH	NF	µg/mL
Burdur Dimriti HCl	NF	µg/mL
Burdur Dimriti MeOH	NF	µg/mL
Devegözü HCl	NF	µg/mL
Devegözü MeOH	NF	µg/mL
Kuş Yüreği HCl	NF	µg/mL
Kuş Yüreği MeOH	NF	µg/mL
Marzımat HCl	NF	µg/mL
Marzımat MeOH	NF	µg/mL
Ak Gemre 20 µg/mL HCl	0,255	µg/mL
Ak Gemre 20 µg/mL MeOH	15,296	µg/mL
Ak Dimrit 20 µg/mL HCl	0,935	µg/mL
Ak Dimrit 20 µg/mL MeOH	15,760	µg/mL
Antep Büzgülü 20 µg/mL HCl	NF	µg/mL
Antep Büzgülü 20 µg/mL MeOH	15,993	µg/mL
Burdur Dimriti 20 µg/mL HCl	0,613	µg/mL
Burdur Dimriti 20 µg/mL MeOH	23,135	µg/mL
Devegözü 20 µg/mL HCl	0,457	µg/mL
Devegözü 20 µg/mL MeOH	18,154	µg/mL
Kuş Yüreği 20 µg/mL HCl	0,534	µg/mL
Kuş Yüreği 20 µg/mL MeOH	24,102	µg/mL
Marzımat 20 µg/mL HCl	1,033	µg/mL
Marzımat 20µg/mL MeOH	21,436	µg/mL
Şam Büzgülü 20 µg/mL HCl	0,526	µg/mL
Şam Büzgülü 20 µg/mL MeOH	17,821	µg/mL
Senirkent Dimriti 20 µg/mL HCl	1,176	µg/mL
Senirkent Dimriti 20 µg/mL MeOH	13,303	µg/mL
Siyah Gemre 20 µg/mL HCl	1,125	µg/mL
Siyah Gemre 20 µg/mL MeOH	18,029	µg/mL
Tilki Kuyruğu 20µg/mL HCl	0,443	µg/mL
Tilki Kuyruğu 20µg/mL MeOH	14,035	µg/mL
Şam Büzgülü HCl	NF	µg/mL
Şam Büzgülü MeOH	NF	µg/mL
Senirkent DimritiHCl	NF	µg/mL

Senirkent Dimriti MeOH	NF	µg/mL
Siyah Gemre HCl	NF	µg/mL
Siyah Gemre MeOH	NF	µg/mL
STD1:20ppm_	24,433	µg/mL
Tilki Kuyruğu HCl	NF	µg/mL
Tilki Kuyruğu MeOH	NF	µg/mL

Figure 3.2. *p*-cumalic acid reaction equation.

3.2.8. Ferulic acid

Ferulic acid values and reaction equation results are given in Table 3.2.8 and Fig. 3.2.8. Highest ferulic acid values were evaluated from Kuş Yuregi, Burdur Dimriti and Marzımat varieties for the other varieties values were determined less or not found (NF).

Table 3.2.8. Ferulic acid results according to variety.

Ak Gemre HCl	NF	µg/mL
Ak Gemre MeOH	NF	µg/mL
Ak Dimrit HCl	NF	µg/mL
Ak Dimrit MeOH	NF	µg/mL
Antep Büzgülü HCl	NF	µg/mL
Antep Büzgülü MeOH	NF	µg/mL
Burdur Dimriti HCl	NF	µg/mL
Burdur Dimriti MeOH	NF	µg/mL
Devegözü HCl	NF	µg/mL
Devegözü MeOH	NF	µg/mL
Kuş Yüreği HCl	NF	µg/mL
Kuş Yüreği MeOH	0,304	µg/mL
Marzımat HCl	NF	µg/mL
Marzımat MeOH	0,163	µg/mL
Ak Gemre 20 µg/mL HCl	0,487	µg/mL
Ak Gemre 20 µg/mL MeOH	19,012	µg/mL
Ak Dimrit 20 µg/mL HCl	0,815	µg/mL
Ak Dimrit 20 µg/mL MeOH	19,160	µg/mL

Table 3.2.8. Continued.

Antep Büzgülü 20 µg/mL HCl	1,123	µg/mL
Antep Büzgülü 20 µg/mL MeOH	19,305	µg/mL
Burdur Dimriti 20 µg/mL HCl	0,738	µg/mL
Burdur Dimriti 20 µg/mL MeOH	20,473	µg/mL
Devegözü 20 µg/mL HCl	0,645	µg/mL
Devegözü 20 µg/mL MeOH	21,802	µg/mL
Kuş Yüreği 20 µg/mL HCl	0,812	µg/mL
Kuş Yüreği 20 µg/mL MeOH	21,300	µg/mL
Marzımat 20 µg/mL HCl	1,117	µg/mL
Marzımat 20µg/mL MeOH	20,426	µg/mL
Şam Büzgülü 20 µg/mL HCl	1,175	µg/mL
Şam Büzgülü 20 µg/mL MeOH	21,628	µg/mL
Senirkent Dimriti 20 µg/mL HCl	1,190	µg/mL
Senirkent Dimriti 20 µg/mL MeOH	17,489	µg/mL
Siyah Gemre 20 µg/mL HCl	1,108	µg/mL
Siyah Gemre 20 µg/mL MeOH	21,635	µg/mL
Tilki Kuyruğu 20µg/mL HCl	0,730	µg/mL
Tilki Kuyruğu 20µg/mL MeOH	17,010	µg/mL
Şam Büzgülü HCl	NF	µg/mL
Şam Büzgülü MeOH	NF	µg/mL
Senirkent DimritiHCl	NF	µg/mL
Senirkent Dimriti MeOH	NF	µg/mL
Siyah Gemre HCl	NF	µg/mL
Siyah Gemre MeOH	NF	µg/mL
STD1:20ppm_	21,275	µg/mL
Tilki Kuyruğu HCl	NF	µg/mL
Tilki Kuyruğu MeOH	0,222	µg/mL

Figure 3.2.8. Ferulic acid reaction equation.

3.2.9. Myricetin

Myricetin values and reaction equation results are given in Table 3.2.9 and Fig. 3.2.9. Highest myricetin values were evaluated from Burdur Dimriti, Marzımat and Senirkent Dimriti for the other varieties values were determined less or not found (NF).

Table 3.2.9. Myricetin results according to variety.

Ak Gemre HCl	NF	µg/mL
Ak Gemre MeOH	0,700	µg/mL
Ak Dimrit HCl	NF	µg/mL
Ak Dimrit MeOH	NF	µg/mL
Antep Büzgülü HCl	NF	µg/mL
Antep Büzgülü MeOH	NF	µg/mL
Burdur Dimriti HCl	NF	µg/mL
Burdur Dimriti MeOH	NF	µg/mL
Devegözü HCl	NF	µg/mL
Devegözü MeOH	NF	µg/mL
Kuş Yüreği HCl	NF	µg/mL
Kuş Yüreği MeOH	NF	µg/mL
Marzımat HCl	NF	µg/mL
Marzımat MeOH	NF	µg/mL
Ak Gemre 20 µg/mL HCl	15,571	µg/mL
Ak Gemre 20 µg/mL MeOH	16,447	µg/mL
Ak Dimrit 20 µg/mL HCl	19,916	µg/mL
Ak Dimrit 20 µg/mL MeOH	17,005	µg/mL
Antep Büzgülü 20 µg/mL HCl	2,110	µg/mL
Antep Büzgülü 20 µg/mL MeOH	18,371	µg/mL
Burdur Dimriti 20 µg/mL HCl	15,615	µg/mL
Burdur Dimriti 20 µg/mL MeOH	21,625	µg/mL
Devegözü 20 µg/mL HCl	8,522	µg/mL
Devegözü 20 µg/mL MeOH	16,181	µg/mL
Kuş Yüreği 20 µg/mL HCl	17,383	µg/mL
Kuş Yüreği 20 µg/mL MeOH	21,072	µg/mL
Marzımat 20 µg/mL HCl	25,573	µg/mL
Marzımat 20µg/mL MeOH	20,914	µg/mL
Şam Büzgülü 20 µg/mL HCl	NF	µg/mL
Şam Büzgülü 20 µg/mL MeOH	14,014	µg/mL
Senirkent Dimriti 20 µg/mL HCl	NF	µg/mL
Senirkent Dimriti 20 µg/mL MeOH	16,534	µg/mL
Siyah Gemre 20 µg/mL HCl	1,457	µg/mL
Siyah Gemre 20 µg/mL MeOH	15,686	µg/mL
Tilki Kuyruğu 20µg/mL HCl	15,780	µg/mL
Tilki Kuyruğu 20µg/mL MeOH	16,475	µg/mL
Şam Büzgülü HCl	NF	µg/mL
Şam Büzgülü MeOH	NF	µg/mL
Senirkent DimritiHCl	NF	µg/mL
Senirkent Dimriti MeOH	NF	µg/mL
Siyah Gemre HCl	NF	µg/mL
Siyah Gemre MeOH	NF	µg/mL
STD1:20ppm_	18,060	µg/mL
Tilki Kuyruğu HCl	NF	µg/mL
Tilki Kuyruğu MeOH	NF	µg/mL

Figure 3.2.9. Myricetin reaction equation.

3.2.10. Resveratrol

Resveratrol values and reaction equation results are given in Table 3.2.10 and Fig. 3.2.10. Highest resveratrol values were evaluated from Burdur Dimriti, Kuş Yuregi, Sam Büzgülü, Siyah Gemre and Marzımat for the other varieties values were determined less or not found (NF).

Table 3.2.10. Resveratrol results according to variety.

Ak Gemre HCl	NF	µg/mL
Ak Gemre MeOH	0,010	µg/mL
Ak Dimrit HCl	0,540	µg/mL
Ak Dimrit MeOH	0,663	µg/mL
Antep Büzgülü HCl	NF	µg/mL
Antep Büzgülü MeOH	NF	µg/mL
Burdur Dimriti HCl	NF	µg/mL
Burdur Dimriti MeOH	NF	µg/mL
Devegözü HCl	NF	µg/mL
Devegözü MeOH	0,029	µg/mL
Kuş Yüreği HCl	NF	µg/mL
Kuş Yüreği MeOH	NF	µg/mL
Marzımat HCl	NF	µg/mL
Marzımat MeOH	0,045	µg/mL
Ak Gemre 20 µg/mL HCl	NF	µg/mL
Ak Gemre 20 µg/mL MeOH	NF	µg/mL
Ak Dimrit 20 µg/mL HCl	13,356	µg/mL
Ak Dimrit 20 µg/mL MeOH	20,347	µg/mL
Antep Büzgülü 20 µg/mL HCl	14,159	µg/mL
Antep Büzgülü 20 µg/mL MeOH	21,958	µg/mL
Burdur Dimriti 20 µg/mL HCl	12,321	µg/mL
Burdur Dimriti 20 µg/mL MeOH	23,585	µg/mL

Devegözü 20 µg/mL HCl	21,526	µg/mL
Devegözü 20 µg/mL MeOH	20,555	µg/mL
Kuş Yüreği 20 µg/mL HCl	13,276	µg/mL
Kuş Yüreği 20 µg/mL MeOH	25,125	µg/mL
Marzımat 20 µg/mL HCl	27,981	µg/mL
Marzımat 20µg/mL MeOH	23,763	µg/mL
Şam Büzgülü 20 µg/mL HCl	33,277	µg/mL
Şam Büzgülü 20 µg/mL MeOH	22,074	µg/mL
Senirkent Dimriti 20 µg/mL HCl	25,836	µg/mL
Senirkent Dimriti 20 µg/mL MeOH	22,215	µg/mL
Siyah Gemre 20 µg/mL HCl	11,021	µg/mL
Siyah Gemre 20 µg/mL MeOH	22,248	µg/mL
Tilki Kuyruğu 20µg/mL HCl	13,540	µg/mL
Tilki Kuyruğu 20µg/mL MeOH	21,809	µg/mL
Şam Büzgülü HCl	NF	µg/mL
Şam Büzgülü MeOH	0,029	µg/mL
Senirkent DimritiHCl	NF	µg/mL
Senirkent Dimriti MeOH	0,014	µg/mL
Siyah Gemre HCl	NF	µg/mL
Siyah Gemre MeOH	0,016	µg/mL
STD1:20ppm_	24,384	µg/mL
Tilki Kuyruğu HCl	NF	µg/mL
Tilki Kuyruğu MeOH	NF	µg/mL

Figure 3.2.10. Resveratrol reaction equation.

3.2.11. Quercetin

Quercetin values and reaction equation results are given in Table 3.2.11 and Fig. 3.2.11. Highest quercetin values were evaluated from Burdur Dimriti, Kuş Yuregi and Sam Büzgülü varieties for the other varieties values were determined less or not found (NF).

Table 3.2.11. Quercetin results according to variety.

Ak Gemre HCl	NF	µg/mL
Ak Gemre MeOH	NF	µg/mL
Ak Dimrit HCl	NF	µg/mL
Ak Dimrit MeOH	NF	µg/mL
Antep Büzgülü HCl	2,828	µg/mL
Antep Büzgülü MeOH	2,797	µg/mL
Burdur Dimriti HCl	2,827	µg/mL
Burdur Dimriti MeOH	NF	µg/mL
Devegözü HCl	NF	µg/mL
Devegözü MeOH	NF	µg/mL
Kuş Yüreği HCl	NF	µg/mL
Kuş Yüreği MeOH	NF	µg/mL
Marzımat HCl	2,943	µg/mL
Marzımat MeOH	NF	µg/mL
Ak Gemre 20 µg/mL HCl	22,233	µg/mL
Ak Gemre 20 µg/mL MeOH	17,157	µg/mL
Ak Dimrit 20 µg/mL HCl	27,403	µg/mL
Ak Dimrit 20 µg/mL MeOH	16,543	µg/mL
Antep Büzgülü 20 µg/mL HCl	22,530	µg/mL
Antep Büzgülü 20 µg/mL MeOH	16,206	µg/mL
Burdur Dimriti 20 µg/mL HCl	25,551	µg/mL
Burdur Dimriti 20 µg/mL MeOH	16,087	µg/mL
Devegözü 20 µg/mL HCl	23,352	µg/mL
Devegözü 20 µg/mL MeOH	23,139	µg/mL
Kuş Yüreği 20 µg/mL HCl	32,322	µg/mL
Kuş Yüreği 20 µg/mL MeOH	17,722	µg/mL
Marzımat 20 µg/mL HCl	21,042	µg/mL
Marzımat 20µg/mL MeOH	12,886	µg/mL
Şam Büzgülü 20 µg/mL HCl	12,757	µg/mL
Şam Büzgülü 20 µg/mL MeOH	24,164	µg/mL
Senirkent Dimriti 20 µg/mL HCl	17,112	µg/mL
Senirkent Dimriti 20 µg/mL MeOH	NF	µg/mL
Siyah Gemre 20 µg/mL HCl	2,798	µg/mL
Siyah Gemre 20 µg/mL MeOH	NF	µg/mL
Tilki Kuyruğu 20µg/mL HCl	NF	µg/mL
Tilki Kuyruğu 20µg/mL MeOH	NF	µg/mL
Şam Büzgülü HCl	NF	µg/mL
Şam Büzgülü MeOH	NF	µg/mL
Senirkent DimritiHCl	NF	µg/mL
Senirkent Dimriti MeOH	NF	µg/mL
Siyah Gemre HCl	NF	µg/mL
Siyah Gemre MeOH	NF	µg/mL
STD1:20ppm_	18,188	µg/mL
Tilki Kuyruğu HCl	2,997	µg/mL
Tilki Kuyruğu MeOH	NF	µg/mL

Figure 3.2.11. Quercetin acid reaction equation.

3.2.12. Kaemferol

Kaemfeol values and reaction equation results are given in Table 3.2.12 and Fig. 3.2.12. Highest kaemferol values were evaluated from Ak Dimrit, Burdur Dimriti, Kuş Yüreği and Marzımat and for the other varieties values were determined less or not found (NF).

Table 3.2.12. Kaemferol results according to variety.

Ak Gemre HCl	NF	µg/mL
Ak Gemre MeOH	NF	µg/mL
Ak Dimrit HCl	NF	µg/mL
Ak Dimrit MeOH	NF	µg/mL
Antep Büzgülü HCl	NF	µg/mL
Antep Büzgülü MeOH	NF	µg/mL
Burdur Dimriti HCl	NF	µg/mL
Burdur Dimriti MeOH	NF	µg/mL
Devegözü HCl	NF	µg/mL
Devegözü MeOH	NF	µg/mL
Kuş Yüreği HCl	NF	µg/mL
Kuş Yüreği MeOH	NF	µg/mL
Marzımat HCl	NF	µg/mL
Marzımat MeOH	NF	µg/mL
Ak Gemre 20 µg/mL HCl	33,921	µg/mL
Ak Gemre 20 µg/mL MeOH	21,516	µg/mL
Ak Dimrit 20 µg/mL HCl	48,564	µg/mL
Ak Dimrit 20 µg/mL MeOH	30,590	µg/mL
Antep Büzgülü 20 µg/mL HCl	32,820	µg/mL
Antep Büzgülü 20 µg/mL MeOH	25,742	µg/mL
Burdur Dimriti 20 µg/mL HCl	33,253	µg/mL
Burdur Dimriti 20 µg/mL MeOH	44,727	µg/mL
Devegözü 20 µg/mL HCl	33,573	µg/mL
Devegözü 20 µg/mL MeOH	26,654	µg/mL
Kuş Yüreği 20 µg/mL HCl	35,244	µg/mL

Table 3.2.12. Continued.

Kuş Yüreği 20 µg/mL MeOH	44,143	µg/mL
Marzımat 20 µg/mL HCl	59,177	µg/mL
Marzımat 20µg/mL MeOH	41,558	µg/mL
Şam Büzgülü 20 µg/mL HCl	32,761	µg/mL
Şam Büzgülü 20 µg/mL MeOH	22,796	µg/mL
Senirkent Dimriti 20 µg/mL HCl	32,553	µg/mL
Senirkent Dimriti 20 µg/mL MeOH	27,701	µg/mL
Siyah Gemre 20 µg/mL HCl	32,158	µg/mL
Siyah Gemre 20 µg/mL MeOH	25,292	µg/mL
Tilki Kuyruğu 20µg/mL HCl	33,137	µg/mL
Tilki Kuyruğu 20µg/mL MeOH	31,119	µg/mL
Şam Büzgülü HCl	NF	µg/mL
Şam Büzgülü MeOH	NF	µg/mL
Senirkent DimritiHCl	NF	µg/mL
Senirkent Dimriti MeOH	NF	µg/mL
Siyah Gemre HCl	NF	µg/mL
Siyah Gemre MeOH	NF	µg/mL
STD1:20ppm_	37,396	µg/mL
Tilki Kuyruğu HCl	NF	µg/mL
Tilki Kuyruğu MeOH	NF	µg/mL

Figure 3.2.12. Kaenferol acid reaction equation.

4.3. Conclusion

When quality features were evaluated Burdur dimriti variety was determined good for table grape consumption and must production. It can be determined as an earlier variety for the region. Antep Büzgülü, Şam Büzgülü and Siyah Gemre varieties have homogen grape skin colour and good bunch and berry structures for table consumption. They were evaluated for table consumption for late time harvested varieties. Ak Gemre, Marzımat, Devegözü, Ak Dimrit, Senirkent Dimriti and Kuş Yüreği varieties were evaluated better for must production than table grape production. These varieties are advised to be used in must

production. Ak Dimrit, Burdur Dimriti, Antep Büzgülü and Şam Büzgülü were evaluated good for yield.

11 local grape varieties were evaluated for 12 phenolic compounds (Gallic acid, caffeic acid, p-cumaric acid, ferulic acid, catechin, epicatechin, epicatechin gallate, epigallocatechin, epigallocatechin-3-gallate, kaempferol, myricetin, rutin hydrate, resveratrol and quercetin). Phenolic substances varied between 0 and 101.466 µg/ml in frozen berry samples varying to grape variety. When phenolic contents were compared other studies for local grape varieties, results of our study values were acceptable according to previous studies. Aras (2006), Orak (2007) and Şensoy (2012) had studied local grape cultivars phenolic contents in Turkey. We got nearly same results with their studies. Phenolic compounds were not evaluated significantly highest but some varieties were determined hopeful for some phenolics. Epigallocatechin-3-gallat resveratrol, Kameferol quersetin were determined significant level in some varieties. Epigallocatechin content was determined high in Senirkent Dimriti variety, epigallocatechin content determined high in Siyah Gemre variety. Rutinhdate was determined in all varieties except Ak Dimrit variety. Myricetin was determined high in Burdur Dimriti, Marzımat and Kuş Yüreği varieties. Resveratrol was determined high in Şam Büzgülü and antep Büzgülü varieties. Quercetin was determined high in Ak Dimrit, Kus Yüreği and Marzımat varieties. Antep Büzgülü, Burdur Dimriti, Kuş Yüreği, Senirkent Dimriti and Siyah Gemre varieties were determined hopeful varieties for future studies.

Researches on phenolic content of local grape varieties must be continued. Local grape varieties can be a good source of phenolics. Some local varieties cannot be good for table consumption, drying and other purposes but can be used for health because of their high phenolic contents. Studies and researches about local grape varieties phenolics will be continued and researches on hopeful varieties will be planned to be done in the future by adding different treatments like water stress, pruning, etc. Different treatments may result better phenolic contents in hopeful local grape varieties. Phenolics of local grape varieties will be continued by using this first research data.

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