



# Comparison of the levels of some important components and elements in grape seeds of grapes grown in two different regions

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**ABSTRACT:** Phenolic compounds and certain minerals have become one of the most intensively researched topics recently, especially as health and healthy nutrition have become prominent. Numerous scientific studies have demonstrated that phenolic chemicals contained in grape skins and seeds have proven benefits for human health. In this study, seeds from different grape cultivars collected from different regions were examined. Accordingly, the phenolic ingredient and antioxidant capability of the Tayfi grape seeds were determined to be higher than those of the Boğazkere grape. When the elemental concentrations of these two grape seeds were compared, Na, Mg, Ca, and Fe were found to be higher in the Boğazkere grapes, while K and Mn were higher in the Tayfi grapes. Co and Zn were not detected in either grape seed.

**KEYWORDS:** Grape seed, Antioxidant Capacities, elemental compositions

## INTRODUCTION

Turkey, the world's sixth-largest grape producer, is estimated to produce 4,175,356 tons annually [1]. When examining grape production by geographical region, it is seen that the cultivation of seedless raisins is developing in the Aegean Region, Early-growing grapes in the Mediterranean basin, wine, must, table, and seeded grapes for getting dried in Central and Southeastern Anatolia, and table and wine grapes in the Marmara geographical area [2].

Grapes strengthen the immune system and improve kidney and liver function. Additionally, the resveratrol in the body protects against cancer and increases the body's resistance to viruses, while the skins and seeds accelerate digestion without harming the stomach [3]. Grape seeds have been well documented in the literature for their antibacterial, anti-inflammatory, and antioxidant qualities [4-6]. make up, on a dry weight basis, 38–52% of the grape pomace [7]. Therefore, the utilization of grape seeds and extract is considered an important approach for recycling waste and therefore economically viable [8].

Almost 400 mg of fiber, 160 mg of essential oil, 110 mg of protein, and 70 mg of intricate phenolic chemicals are found in grape seeds per gram [9-13]. Grape seeds contain some natural phenolic antioxidants that prevent oil oxidation, such as tocopherols and tocotrienols, commonly known as vitamin E, and chemically known as tocals [14].

Grape seeds and skins, which constitute a significant portion of grape pomace, are shown to be important sources of phenol compounds [15]. Studies have reported that catechin (monomeric flavan-3-ol) is the most plenty phenolic combined, in grape seeds, with the amount varying between 62.8 and 206 µg/g depending on the grape variety. Other monomeric flavan-3-ols found in grape seeds include epicatechin, gallocatechin, epigallocatechin, and epicatechin 3-O-gallatechin. Along with gallic acid, caffeic and ferulic acids are also important phenolic acids found in grape seed oil [16].

## MATERIALS AND METHODS

The grapes used as material for this study were obtained from two different sources grown in two different regions. The examined varieties were Tayfi and Boğazkere, grown within the borders of Siirt and Elazığ provinces. The grapes were sourced from different vineyards. The varieties used in the study were stored at -20 °C and were removed from the deep freezer before use and analyzed.

The element composition and antioxidant capabilities of grape seeds of both grape cultivars were examined in three replications and this study was carried out in the Siirt University Central Laboratory



was weighed into the Teflon wet digestion system with a sensitivity of 0.0001 g and 3 ml of Nitric acid (65%) and 3 ml of Hydrogen peroxide (30%) were added. The samples were heated using the digestion program below. Device: Berghof Microwave Digestion Speedwave MWS-2.

**Reading with ICP-OES**

Na, Mg, K, Ca, Fe, Co, Zn and Mn analyses were performed using ICP-OES. Prepared samples were read in triplicate, and calculations were made based on the average. All calculations were performed for the analyses. ICP-OES Device: Perkin Elmer ICP-OES Optima 2100 DV

**RESULTS AND DISCUSSION**

Determination of Antioxidant Activity by DPPH Method Grape seeds are a waste product produced in the manufacture of fruit juice, wine, and molasses. After the grape fruit itself, they are the most nutritionally rich portion in terms of phenolic compounds and antioxidant properties. Procyanidin dimers, trimers, epicatechin, galocatechin, epigallocatechin, gallic acid, monomeric flavan-3-ols, and highly polymerized procyanidins are all contained in grape seeds. It was determined that the total phenolic substance amount of red and white grape seeds of different cultivars grown in Türkiye varied between 4778.6 mg/100 g and 13000 mg/100 g Gallic Acid Equivalent (GAE) [24].

There are many studies on the phenolic compounds found in the seeds and skins of grape species grown in various parts of the world and their antioxidant capacities.

The Pinot Noir variety had the greatest amount of these chemical compounds in the seeds (16.518 µg/g), while the Isabella grape variety had the lowest amount (2128 µg/g), in accordance with a study that measured the entire amount of phenol in the skins and seeds of blue grape cultivars [25].

In one research, the Pusa Navarang grape seed's antioxidant activity was measured using the DPPH technique at 33.5 mM Trolox equivalent (DPPH). Accordingly, the phenolic content in grape seeds was determined to be 95.8 mg/mL [26].

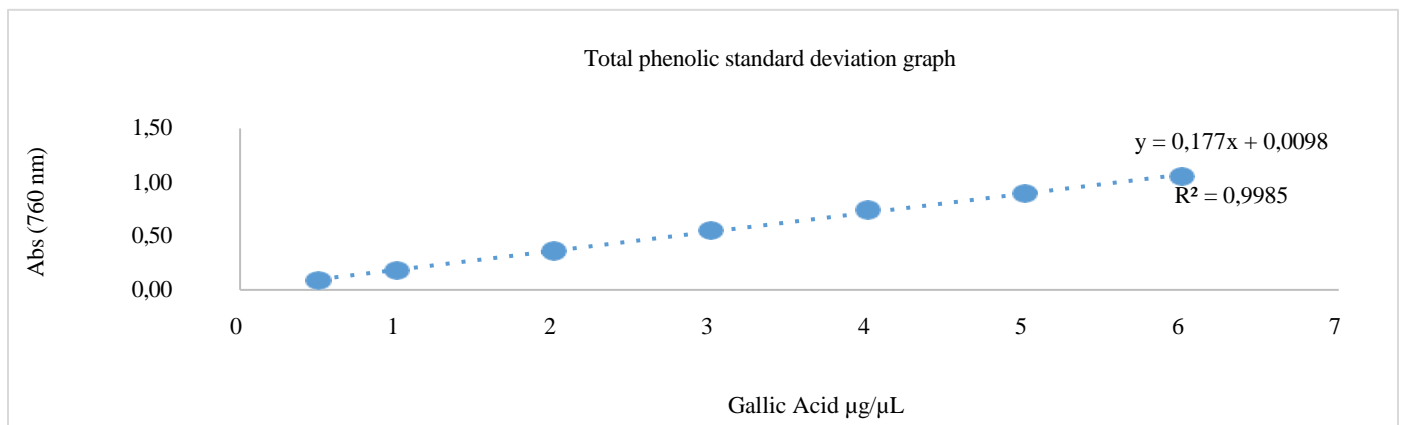
In a survey conducted by Hassanpour et al., they comparatively determined the antioxidant capability and total phenolic ingredient of grape seeds from 20 grape varieties grown in Iran. When the results obtained were examined, it was shown that the antioxidant activity in grape seeds was between 27.34 -78.57 µmol TEg, the FRAP value was between 198.83 - 590.86 µmol TEg and the Total phenolic substance constituent was between 44.86 - 155.1 [27].

**Table 1.** Total phenolic content of samples

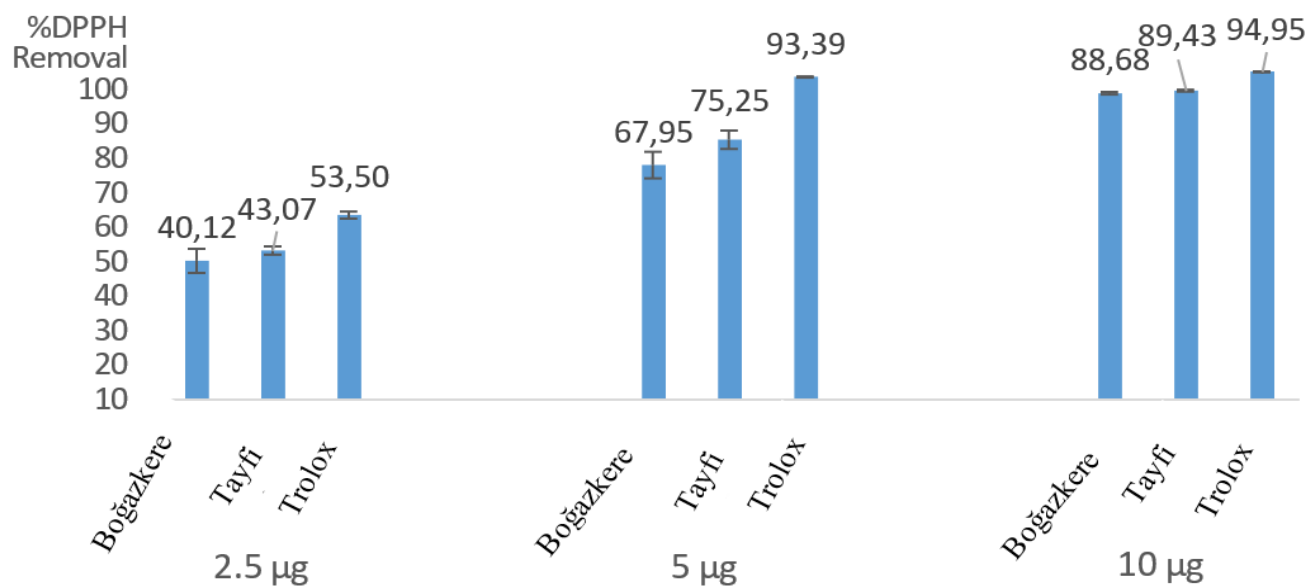
Sample	mgGAE/100g	Std. Deviation
<b>Boğazkere</b>	0,3360	0,0058
<b>Tayfi</b>	0,4173	0,0110

In this study, two different grape varieties (Boğazkere and Tayfi) grown in two different regions were collected. The total phenolic content and antioxidant potential of these grape seeds are shown in Figure 2 standard graph for total phenolic content determination; activity results are shown in Table 1 in terms of gallic acid. Furthermore, the percentage DPPH removal efficiency of the samples is shown in Figure 2.

As a result of this comparison, the total phenolic constituents in the seeds of Tayfi grapes was determined as 0.4173±0.011 mgGAE/100g, while the total phenolic content of the seeds of Bogazkere grapes was determined as 0.3360±0.0058 mgGAE/100g.



**Fig. 1.** Gallic acid standard graph.



**Fig. 2.** DPPH removal activities.

**Table 2.** Element concentrations (mg/kg; dry matter).

No	Element Wavelength (nm)	Grape Seed (Boğazkere)	Grape Seed (Tayfi)	LOD	LOQ	R <sup>2</sup>
1	Na (589.592)	130,47±1,99	118,57±1,91	58,12	193,75	R <sup>2</sup> = 0,9933
2	Mg (285.213)	109,68±1,52	104,32±2,03	5,26	17,54	R <sup>2</sup> = 0,9902
3	K (766.490)	741,01±2,07	1003,05±18,31	1,95	6,51	R <sup>2</sup> = 0,9801
4	Ca (317.933)	208,28±2,03	206,97±1,51	52,40	174,66	R <sup>2</sup> = 0,9999
5	Fe (238.204)	7,65±1,04	2,53±1,08	12,73	42,43	R <sup>2</sup> = 0,998
6	Co (228.616)	ND	ND	0,07	0,22	R <sup>2</sup> = 0,9943
7	Zn (206.200)	ND	ND	2,76	9,19	R <sup>2</sup> = 0,9609
8	Mn (257.610)	1,38±0,67	2,21±0,98	0,42	1,41	R <sup>2</sup> = 0,9936

ND: Not Detecte.

In addition, when the antioxidant capacities of the grape seeds of these two grape cultivars were compared, it was determined that the antioxidant percentage removal of the Tayfi grape seed was higher than the antioxidant removal of the Boğazkere grape seed.

Furthermore, its high concentration of antioxidant capacity, grape seeds also contain some important minerals. There are many studies on these minerals in grape seeds. In an experiment conducted by Zhu and colleagues in 2012, they determined some elements such as calcium, cadmium, chromium, copper, iron, potassium, magnesium, manganese, sodium, nickel, lead and zinc in grape seeds of various grape varieties using ICP-OES [28]. In an another study established by Canbay et al. (2011), the determination of Na, K, Mg, Ca,

Mn, Fe, Zn and Cu in grape seeds and pulp was completed with the help of an ICP/OES device [29]. The total phenolic ingredient and antioxidant capacities of some important minerals in grape seeds of seven different grape varieties were compared in a research conducted by Özcan et al [30].

In our descriptive study, which we conducted in light of this literature (Table 2), we compared the element compositions of grape seeds from two grape varieties taken from different regions. We found that Na, Mg, Ca, and Fe levels were higher in the Boğazkere grape variety than in the Tayfi grape variety, while K and Mn concentrations were higher in the Tayfi grape variety than in the Boğazkere grape variety. Co and Zn could not be determined in either grape variety.

## CONCLUSION

Due to its rich metabolite content, grapes have been a vital food source for humans for centuries. This study compared the total phenolic ingredient, antioxidant capacity, and elemental composition of grape seeds from two different grape cultivars collected from two different regions. Accordingly, it was decided that the phenolic substance amount and antioxidant activity were higher in Tayfi Grape than in Boğazkere Grape. When the element levels were compared, it was shown that Na, Mg, Ca and Fe minerals were higher in Boğazkere grapes than in Tayfi grapes, while K and Mn elements were higher in Tayfi grapes. Considering the climatic characteristics as well as the structure of the soil where the grapes are grown, this can explain the reasons for the difference in the data for these two grapes.

## DECLARATION

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### Competing interests

The authors declared that there is no conflict of interest.

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