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# ESSENTIAL ELEMENT AND METAL CONTENT OF CHERRY LAUREL (LAUROCERASUS OFFICINALIS ROEM.) FRUIT AND SEEDS*

# KARAYEMİŞ (LAUROCERASUS OFFICINALIS ROEM.) MEYVESİ VE TOHUMLARININ ESANSİYEL ELEMENT VE METAL İÇERİKLERİ

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**ABSTRACT**

The fruits and seeds of the cherry laurel (*Laurocerasus officinalis* Roem.) are utilized as traditionally in Turkey for the treatment of stomach ulcers, digestive system problems, bronchitis and eczemas, as well as a diuretic and anti-diabetic agent. The aim of this study was to determine the content of essential element and toxic metal in cherry laurel fruit and seed. For this purpose, firstly the dried fruit and seed materials were digested with nitric acid (10%) in microwave digestion unit for 10 min. Then, the content of elements in digested samples was identified by using inductively coupled plasma mass spectrometry (ICP-MS). Our results showed that the fruit and seeds of cherry laurel contained plentiful major essential elements such as K, Mg, Ca, and Na and essential trace elements such as Fe, Cu, Zn, Ni, Mo, Co and Cr, which are necessary for human health. However, the toxic metals such as Hg, Cd, As, Pb, Ag, and Al were not detected in the samples. In conclusion, cherry laurel might be used as a source of natural mineral supplementation.

**Keywords:** Heavy metals, trace element, cherry laurel.

**ÖZ**

Karayemiş'in (*Laurocerasus officinalis* Roem.) meyve ve tohumları, Türkiye'de geleneksel olarak mide ülserleri, sindirim sistem problemleri, bronşit ve ekzama tedavisi ya da diüretik ve anti-diyabetik ajan olarak kullanılmaktadır. Bu çalışmanın amacı, karayemiş meyve ve tohumlarında bulunan esansiyel element ve metal içeriğinin belirlenmesidir. Bu amaçla, ilk olarak kurutulmuş meyve ve tohum örnekleri mikrodalga yakma ünitesinde 10 dk. nitrik asit (%10) ile yakıldı. Sonra, yakılan örneklerdeki elementlerin içeriği indüktif eşleşmiş plazma kütle spektrometresi (ICP-MS) ile belirlendi. Sonuçlarımız, karayemiş meyve ve tohumunun insan sağlığı için gerekli olan çok sayıda K, Mg, Ca, Na, gibi majör esansiyel elementler ile Fe, Cu, Zn, Ni, Mo, Co, Cr gibi esansiyel eser elementleri içerdiğini gösterdi. Bununla birlikte, örneklerde Hg, Cd, As, Pb, Ag ve Al gibi toksik metaller tespit edilmedi. Sonuç olarak karayemiş meyve ve tohumları doğal mineral takviyesi kaynağı olarak kullanılabilir.

**Anahtar kelimeler:** Ağır metaller, eser element, karayemiş.

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## INTRODUCTION

Cherry laurel (*Laurocerasus officinalis* Roem., syn: *Prunus laurocerasus* L. ) is grown as a native fruit crop locally called "Taflan" or "Karayemiş" in the coasts of the Black Sea region of Turkey (1-3). The nutritional value of cherry laurel fruit is due to its phenolic acid, fatty acid, and sugar contents (4,5). Cherry laurel fruits are rich in phenolics and are good source of natural antioxidant protecting humans from several diseases caused by oxidative stress (6). Cherry laurel is also known for its effect as strengthening the antioxidant defense system in human metabolism (3). The fruits and seeds of the cherry laurel are widely utilized as herbal medicine in Turkey for the treatment of stomach ulcers, digestive system problems, bronchitis, eczemas, hemorrhoids, anti-diabetic, analgesic on local pain, and as a diuretic (7).

Fruits are valuable sources of nutritional elements such as K, Mg, Ca, Na, P, Fe, Cu, Zn, Ni, Mo, Co, Cr (8,9). Today scientists pay attention to the content of essential elements in medicinal plant (10). These elements play an important role in the metabolic regulations of the human body. Increased consumption of fruit can improve the mineral regulation and reduce cardiovascular diseases and certain cancer risks (9).

The excessive amount of heavy metals in food is related with etiology of a number of diseases such as cardiovascular, kidney, nervous as well as bone diseases (11). It is important to evaluate the toxic metal contamination in the fruit or vegetables that will ensure the safe consumption in humans.

The aim of this study was to determine the content of trace elements (K, Mg, Ca, Na, Fe, Cu, Zn, Ni, Mo, Co, Cr) and toxic metals such as Hg, Cd, As, Pb, Ag, and Al in fruit and seed of cherry laurel.

## MATERIALS AND METHODS

A multi-element standard solution of 10 mg/L containing all analysed elements (K, Mg, Ca, Na, Fe, Cu, Zn, Ni, Mo, Co, Cr, Hg, Cd, As, Pb, Ag, and Al) were obtained from Agilent (USA). The nitric acide and Whatmann filter paper used in the study were purchased from Merck (Darmstadt, Germany). *Laurocerasus officinalis* fruits were collected from Akçaabat, Trabzon. The fruits were washed with distilled water and their seeds were removed then dried at room temperature. Voucher specimen is deposited in the herbarium of Pharmacy Faculty, Ankara University (AEF 26257).

For metal analysis, the dried fruit and seed materials were accurately weighed 0.250 g into cup of teflon vessel and added 10 mL of nitric acide (65%). The sample vessels were digested in microwave digestion unit (Berghof Speedwave, MWS-2, Germany), according to digestion program presented in Table 1. The digested solutions were left for automatic ventilation for 10 min. After cooling, the samples were filtered using Whatmann filter paper No. 40. The filtrate was then transferred into a volumetric flask and diluted to 50 mL with distilled water. Prior to analysis samples were always kept away from metallic material sand dust to avoid contamination.

The content of toxic metals and essential elements in digested samples was determined by using inductively coupled plasma mass spectrometry (ICP-MS, Agilent 7500A series, USA). The instrumental operating conditions for the ICP-MS are listed in Table 2. For quality control, the internal standards such as Beryllium ($^{9}$Be), Scandium ($^{45}$Sc), Rhodium ($^{103}$Rh), and Bismuth ($^{208}$Bi) were used for correction of matrix effects. Triplicate samples were also used in order to determine precision of the analysis. For each element a minimum of three standards were used to cover the analytical working range of the instrument. To assure the linear rank of the methodology, different standards with low and high known concentrations of each element (0, 1, 5, 10, 20, 30, 40, 50 µg/L) were used. From all sample results, a reagent blank was subtracted. Detection limits were calculated as 3 times the standard deviation for the re-

**Table 2.** The instrumental operating conditions of the ICP-MS

| Parameter | Value (Units) | | |
|---|---|---|---|
| Rf power | 1230 W | | |
| RF matching | 1.7 V | | |
| Plasma gas flow rate (Ar) | 15 L/min | | |
| Auxiliary gas flow rate | 0.9 L/min | | |
| Nebuliser gas flow rate | 1.11 L/min | | |
| Sample depth | 7.6 mm | | |
| Torch- | -1.2 mm | | |
| Torch-V | 0.8 mm | | |
| Nebulizer pump | 0.11 rps | | |
| Spray chamber temperature | 2 $^{o}$C | | |
| Integration time | 3 s | | |
| Number of replicates | 3 | | |
| Internal standards (200 ppb) | $^{9}$Be, $^{45}$Sc, $^{103}$Rh, $^{208}$Bi | | |
| Isotopes | $^{27}$Al | $^{63}$Cu | $^{98}$Mo |
| | $^{75}$As | $^{57}$Fe | $^{23}$Na |
| | $^{40}$Ca | $^{202}$Hg | $^{60}$Ni |
| | $^{114}$Cd | $^{39}$K | $^{208}$Pb |
| | $^{59}$Co | $^{24}$Mg | $^{66}$Zn |
| | $^{52}$Cr | $^{109}$Ag | |

**Table 1.** Operating conditions for the microwave acid digestion program

| Step | Temperature (°C) | Pressure (bar) | Power* (%) | Ramp time (min) | Hold time (min) |
|---|---|---|---|---|---|
| 1 | 145 | 50 | 70 | 10 | 5 |
| 2 | 190 | 50 | 90 | 5 | 10 |

*100% power corresponds to 1400 W

agent blanks**.** The limit of detection (LOD) values were 0.4, 0.3, 0.1, 0.4, 0.2, 0.2, 0.05, 0.08, 0.02, 0.07, 0.2, 0.3, 0.001, 0.002, 0.001, 0.001, and 0,08 µg/L for K, Mg, Ca, Na, Fe, Cu, Zn, Ni, Mo, Co, Cr, Al, As, Ag, Cd, Hg, and Pb, respectively. Also, the limit of quantification (LOQ) of the elements was determined and the values were 1.2, 0.9, 0.3, 1.2, 0.6, 0.5, 0.15, 0.2, 0.06, 0.2, 0.6, 0.9, 0.003, 0.006, 0.003, 0.003, and 0.23 µg/L for K, Mg, Ca, Na, Fe, Cu, Zn, Ni, Mo, Co, Cr, Al, As, Ag, Cd, Hg, and Pb, respectively.

There were three replicates for each fruit and seed samples.

## RESULTS

In this study, the content of essential elements and toxic metals in dried fruit and seed samples of cherry laurel were determined by using ICP-MS.

The average values of major essential elements (K, Mg, Ca, Na) and essential trace elements (Fe, Cu, Zn, Ni, Mo, Co, Cr) in the fruit and seed samples of cherry laurel were shown in Table 3. However, the toxic metals such as Hg, Cd, As, Pb, Ag, and Al were not found in the fruit and seed of cherry laurel.

**Table 3.** The levels of essential element and metals in fruit and

| | Fruit (mg/g) Mean ± S.D. | Seed (mg/g) Mean ± S.D. |
|---|---|---|
| Major essential elements | | |
| K | 67.43 ± 27 | 54.55 ± 15 |
| Mg | 10.45 ± 22 | 21.47 ± 47 |
| Ca | 0.21 ± 33 | 0.44 ± 70 |
| Na | 0.02 ± 1.4 | 0.002 ± 0.6 |
| | Fruit (µg/g) Mean ± S.D. | Seed (µg/g) Mean ± S.D. |
| Essential trace elements | | |
| Fe | 7.94 ± 0.4 | 29.24 ± 0.6 |
| Cu | 11.99 ± 0.5 | 13.76 ± 1.5 |
| Zn | 3.75 ± 0.2 | 22.81 ± 2.2 |
| Ni | 2.46 ± 0.4 | 2.49 ± 0.5 |
| Mo | 0.35 ± 0.0 | 0.24 ± 0.1 |
| Co | 0.06 ± 0.0 | 0.1 ± 0.0 |
| Cr | 0.11 ± 0.0 | 1.25 ± 0.1 |

## DISCUSSION

The result indicate the order of abundance of essential elements, which are important in the diet of human beings, in the fruit samples as follows: K > Mg > Ca > Na > Cu > Fe > Zn > Ni > Mo > Cr > Co and in the seed samples as follows: K > Mg > Ca > Na > Fe > Zn > Ni > Cr > Mo > Co. Kolaylı et al. (12) found similar results for the essential elements and they also did not detected any heavy metal contamination by using atomic absorption spectrometry in fruit of cherry laurel. Ustun and Tosun (13) also determined the mineral composition of wild cherry laurel naturally grown in Samsun. The average element composition of the samples was found to be 901.9 mg/kg K, 10.9 mg/kg Na, 192.6 mg/kg Ca, 61.7 mg/kg Mg, 06.5 mg/kg Mn, and 03.5 mg/kg Fe.

Presence of toxic heavy metals in foods above the permission limits may cause severe health problems. Therefore, it is important to evaluate these metals in fruit and seed for safety of human health. No toxic metals such as Hg, Cd, As, Pb, Ag, and Al were detected in the fruit and seed samples of cherry laurel in this study. Toxic metals were found to be below the detection limit when compared with the permissible limits prescribed by WHO. Thus, the consumption of cherry laurel fruit does not pose a health risk for the consumer. Kolaylı et al. (12) showed that Pb level was very low concentration in cherry laurel fruit. Dhiman et al. (14) exhibited the content of Hg and As was not detectable in *Citrus sinensis* fruit peel. Bagdatlioglu et al. (11) did not detected Cd in fruit samples of cherry, strawberry, grape, tomato grown in Turkey. Sium et al. (15) indicated that the levels of As and Pb were found to be in the permissible limit defined by WHO.

In conclusion, our results showed that the fruit and seeds of cherry laurel contain plentiful essential elements, especially Na, K, Mg, Ca, Fe and Cu and do not contain any toxic heavy metals. Therefore, cherry laurel might be used as a source of natural mineral supplementation and can be safely consumed.

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