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Original article

Evaluation of Mineral (Na, K, Ca) and Metal (Fe, Cu, Ni) Content, Alongside Phytochemical Screening of *Eriobotrya japonica L.* Grown in Two Different Locations in Libya

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Abstract
The current study was carried out on the (*Eriobotrya japonica L.)* plant grown at two different locations in Libya. The samples of the studied plant were collected from some regions around Al Gabal Alkhder and coastal locations. The leaves and fruits were selected. The phytochemical screening and concentrations of some metals (Iron, Copper, and Nickel) and minerals (Sodium, Potassium, and Calcium). The phytochemical investigation was conducted on the samples to detect the natural compounds, and the atomic absorption instrument was used to measure the concentrations of heavy metals (Fe, Cu, and Ni). On the other side, the contents of minerals (Na, K, and Ca) were estimated by a Flame photometer. The results of this study recorded the results of the general phytochemical screening of all parts of the plant. Phytochemical screening of the aqueous and ethanol extracts shows the presence of the natural compounds as tannins, flavonoids, sterols, and/or triterpenes, saponins, alkaloids, anthraquinone, and compounds were present in the extracts with varying amounts. In the present study, results showed that E. japonica plant contains different phytochemical compounds such as Sterols and Saponins. For the Tannins compound, the results showed that the samples leaf contained high levels of tannins in water extracts, high levels of extract ethanol, and the fruitse extract of ethanol containing high contents of compound tannins compared to water extracts. The minerals and metal contents of the studied plants gave variations where the sodium, potassium, and calcium were (2.51 -3.55 ppm) in leaves and (3.76- 4.74 ppm) in fruits. While the concentrations of potassium ranged (26.46 -40.46 ppm) in leaves and (8.50 -31.46 ppm) in fruits. On the other side, the concentrations of calcium fluctuated between (0.26- 0.62 ppm) in leaves and in fruits ranged (7.84-10.45 ppm). The results indicated that the higher concentrations of minerals were recorded in the mountain regions, such as around Al Quba city and Ain Marra town. On the other side, the contents of iron ranged between (0.084 – 2.85 ppm) and (0.49-7.89 ppm) in leaves and fruits, respectively. While the contents of Nickle were ranged between (1.08-2.02 ppm) and (1.32- 7.34 ppm). The concentrations of copper were ranged as follows (2.50-8.46 ppm) and (64.38 – 75.62 ppm) in leaves and fruits. The study stated that there are variations in the minerals and metals contents, with the higher values being recorded in mountain location samples compared with the coastal plant samples. ns in the minerals and metals contents, the higher values were recorded in the mountain location samples compared with the coastal plant samples.
Keywords: Phytochemical Screening, Metals, Minerals, Eriobotrya japonica L.

Introduction

Plants are the principal source of food and medication for all living creatures; many plant species are still unknown today, despite widespread efforts. Aromatic and medicinal plants are among the most numerous natural sources of medicines and essential oils, and they play a critical role in alternative medicine and community preservation, especially in rural regions. Medicinal and aromatic plants from all over the world treat a variety of animal and human illnesses. These therapeutic and preventative applications grabbed scientists' curiosity, encouraging them to ramp up their efforts to understand more about their components and active compounds [1]. Most phytochemicals from plant sources, such as flavonoids and phenolics, have been shown to have a good influence on health and cancer prevention. Cutting-edge Mediterranean and Sprint diets (Dietary Approaches to Stop Hypertension) include phytochemicals rich in calories from natural products and vegetable sources, such as the plant [2].

Eriobotrya plants have been used for centuries to treat many diseases due to their phytochemical contents [3]. The harvest season for loquat fruit lasts from May to June, and the quality, which includes color, sweetness, flavor, and chemical contents, is heavily influenced by the degree of ripeness at harvest [4]. After harvest, loquat fruits are highly susceptible to mechanical damage and microbial fermentation. Loquat plants have been utilized as a traditional medicine for thousands of years [5]. In Ayurveda and Chinese folk medicine, water extracts or crude extracts are used to treat cough, inflammation, diabetes, chronic bronchitis, and cancer. The fruits are considered sedatives and are used to cure wounds in China. The blossoms are used as an expectorant and extracted in oil for cosmetics.

During the 21st century, many studies were carried out to estimate different chemical compounds in plants [6-20]. Most of these studies concluded the presence of different natural compounds in the studied plants located in most of AlGabal Alkhder region, Libya, and the contents of minerals and elements were determined in different plant species in some Libyan regions [21-25]. This study aims to perform phytochemical

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screening and determination of the concentrations of the main minerals, salt, potassium, and calcium, and determination of iron, copper, and nickel in plant and soil samples taken from the study sites.

Methods

The Area of Study

The study area is located on AL-Jabal Al-Akhder in Libya, coastal areas (Ras El-Hilal, Lathron, andSousse), and Mountain areas (Al Qubah, Ain Mara, and Sidi Khaled). It is situated between latitudes 22°38′0" N and 32°46′0″E. (El-Barasi and Saaed, 2013). Al Jabal Al Akhdar is a single plateau 700 to 870 meters above sea level with a nundu lating surface that slightly slopes to the south and runs between longitudes 20°, 35′ E to 23°,15′ E and latitudes 30°,58′ N to 32°56′ N. The fundamental design of Al-Gabalisa is a step-like arrangement of alternating benches and an escarpment rising to 850 metres above sea level. There are two main' carpets, farther apart in the west but increasingly drawing closer to one another eastward, both roughly parallel to the coastline (Figure 1).

Figure 1. The sites of (Al-Qubba, Sidi Khaled, Ain Mara, Ras El Hilal, Sousse, Lathron) Al-Jabal Al-Akhder- Libya.

Sampling

In this study, a plant *(Eriobotrya japonica L.)* was selected. Samples were collected from different areas in Al-Jabal Al-Akhder of Libya. Where the leaves and fruits were separated for each sample (Figure 2).

Figure 2. (Eriobotrya japonica L) plant

Plants Taxonomy

The studied samples were classified according to the protocol of Sylphium herbarium, at the Botany Department, Faculty of Science, Omar Al Mukhtar University (Table 1).

Table 1. The Taxonomy of (Eriobotrya japonica L.)

Kingdom	**Plantae**
Division	Spermatophytes
Class	Rosids
Order	Rosales
Family	Rosaceac
Genus	*Eriobotrya*
Species	*E. japonica*

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Collection of Plant Materials

In this study, the two parts of the plant under investigation were separated (leaves and stems), and the parts were gently washed with tap water, then with distilled water several times. The samples were transferred to the mortar to complete the grinding.

Phytochemical Screening

Preparation of Crude Plant Extracts

Crude plant extracts were prepared by dissolving 100 g of each sample, separately, in 500 mL of successive solvents of increasing polarity (water and ethanol). The plant material was soaked in the solvent overnight, filtered, and evaporated to dryness under reduced pressure in a rotary evaporator. The extracts were then evaporated and weighed. Three replicates were used for each sample [26-31].

Phytochemical Screening of Extracts

The analysis of active intergradient was applied according to the previous investigations [32-40].

Tannins

One ml of the reagent 1% FeCl3(ferric chloride solution) was added to two ml of the ethanol extract in a test tube. Blue color develops in cases of the presence of tannins [32-34].

Saponins

To the plant extract, one ml of tap water was added, and the mixture was shaken gently on a shaker for five minutes. The presence of foam is an indicator for the detection of saponins [35 -37].

Flavonoid

It was detected by mixing two different extracts and adding HCl (1 %) to each ten ml of extract; the appearance of yellow colour is an indication of the presence of Flavonoid [37-40].

Alkaloids

It was measured by using NH4OH solution after being extracted with chloroform using Dragendorff reagent [37-40].

Metals and minerals analysis of plant and soil samples

The metals (Cu, Fe, and Ni) were determined by atomic absorption (PerkinElmer 800) as described by many studies for estimating the metals in solid samples as plants, vegetables, soils, and others [34-35]. Soluble sodium, potassium, and calcium contents were determined using a Flame Photometer (JENWAY Flame Photometer) at the central lab of the Faculty of Science, Omar El-Mukhtar University Where 0.5 g of each sample was designed with 5ml of nitric acid until near dryness, then 10ml of distilled water was added, the mixture was then heated to reduce the volume, then the samples were filtrated, and the volume was completed to 100ml by distilled water, after the contents of sodium, potassium, and calcium were determined in plant leaves and fruits[35].

Results

Phytochemical screening of all parts of the leaves and fruits

The results for the general phytochemical screening of all parts of the plant are shown in (Tables 2-5). Phytochemical screening of the aqueous and ethanol extracts shows that tannins, flavonoids, sterols, and/or triterpenes, saponins, alkaloids, anthraquinone, and compounds were present in the extracts with varying amounts. In the present study, results showed that *E. japonica* plant contains different phytochemical compounds such as Sterols and Saponins. For the Tannins compound, the results showed that the samples leaf that they were contained high of tannins in water extracts high of extract ethanol and it was fruits the extract of ethanol containing high contents of compound tannins comparing to water extracts, the results showed that they were all the samples were contained a similar ratio in water and ethanol extracts, of Alkaloids while no contain in fruit.

For the Flavonoids compound, the results showed that the leaf samples contained a similar ratio of Flavonoids in water and ethanol extracts, and the fruits contained high contents of Flavonoids compared to water extracts. For the Anthraquinones compound, the leaf and fruit results showed that they contain high contents of Anthraquinones in water extracts, but did not show that in ethanol extracts. Saponins and the leaf and fruit results showed that they were all the samples contained high levels of saponins in water extract, but not in ethanol extracts. The findings revealed that all the samples of leaves and fruits showed that they contained Sterols, where the extract of ethanol contained high contents of triterpene compounds compared to water extracts (Tables 2 –5).

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Table 2. Phytochemicals of the leaves in (aqueous extract) of Eriobotrya japonica in study areas, Data are means of three replicates.

Phytochemical screening test	Sousse	Ras El Hilal	Lathron	Al Qubah	Sidi Khaled	Ain Mara
Tannins	++	++	+	+++	++++	+++
Alkaloids	+	++	+	++	+++	+++
Flavonoids	+	++	+	+++	+++	+++
Anthraquinine	+	+	+	++	+++	++
Saponins	+++	+	+++	++	++++	++++
Sterols	+	+	+	++	+++	+++

(Present +), (Absent -)

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Table 3. Phytochemicals of the leaves in the alcoholic extract) of Eriobotrya japonica in the study areas. Data are means of three replicates.

Phytochemical screening test	Sousse	Ras El Hilal	Lathron	Al Qubah	Sidi Khaled	Ain Mara
Tannins	+	++	+	++	+++	+++
Alkaloids	+	++	+	++	+++	+++
Flavonoids	+	++	+	++	+++	+++
Anthraquinine	-	-	-	-	-	-
Saponins	-	-	-	-	-	-
Triterpines	+	++	++	++++	+++	+++

(Present +), (Absent -)

Table 4. Phytochemicals of the fruits in (aqueous extract) of Eriobotrya japonica in the study areas, Data are means of three replicates

Phytochemical screening test	Sousse	Ras El Hilal	Lathron	Al Qubah	Sidi Khaled	Ain Mara
Tannins	++	+	+++	+	+	+++
Alkaloids	-	-	-	-	-	-
Flavonoids	++	++	++	+	+	+
Anthraquinine	+	+	+	+	++	++
Saponins	+	+	++	++	+	+++
triterpines	+	+	++	+	++	+++

(Present +), (Absent -)

Table 5. Phytochemicals of the fruits in (alcoholic extract) of Eriobotrya japonica in the study areas, Data are means of three replicates

Phytochemical screening test	Sousse	Ras El Hilal	Lathron	Al Qubah	Sidi Khaled	Ain Mara
Tannins	+++	+++	++	++	+++	+
Alkaloids	++	+++	+++	+++	++++	+
Flavonoids	+++	++	+++	+++	++++	+
Anthraquinine	-	-	-	-	-	-
Saponins	-	-	-	-	-	-
Triterpines	+++	+	++	++++	++	++

(Present +), (Absent -)

The minerals and metal contents of the studied plants are shown in (Tables 6-11). The concentrations of the elements of the studied plants were fluctuated as follows: The high sodium content (3.5533 ppm) was recorded in leaves of *E. japonica* followed by the samples of fruits high sodium content(4.7533ppm) was recorded of where the sodium in leaves contents were as follows: (Ras El Hilal 2.9100, Lathron 3.5233, Sousse 2.5167, Al Qubah 3.5533, Ain Mara 2.5267 and Sidi Khaled 2.3133 ppm), respectively. and where the sodium in fruits contents were as follows:(Ras El Hilal 4.7533, Lathron 3.7467, Sousse 4.1333, Al Qubah 4.3533, Ain Mara 4.7433 and Sidi Khaled 4.5400 ppm), respectively.

On the other side the higher concentrations of potassium of (40.467ppm) were recorded in leaves of *E.japonica* followed by the samples of fruits high potassium content (31.467 ppm) was recorded of where the potassium in leaves contents were as follows: (Ras El Hilal 30.533, Lathron34.533, Sousse 30.533, Al Qubah40.467, Ain Mara 26.467 and Sidi Khaled 32.533ppm), respectively. And where the potassium in fruits contents were as follows: (Ras El Hilal 17.2667, Lathron 25.400, Sousse 28.3000, Al Qubah 8.500, Ain Mara 31.467, and Sidi Khaled 21.333 ppm), respectively, the results showed that they were all the samples contained a similar ratio of potassium in all areas. The results of calcium contents showed highest

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concentration of total calcium were in fruits of *E. japonica* of mountainous areas (10.4547 ppm), were the highest concentration calcium contents in leaves in mountainous areas too (0.70400 ppm) contents were as follows: (Ras El Hilal 9.04167, Lathron 8.45467, Sousse 7.8493, Al Qubah9.87433, Ain Mara 9.04100 and Sidi Khaled10.4547ppm) in fruits, while The results of calcium contents in leaves followed: (Ras El Hilal 0.45500, Lathron 0.54100, Sousse 0.26467, Al Qubah 0.70400, Ain Mara 0.62100 and Sidi Khaled 0.53633 ppm).

The higher concentrations of the iron (2.8586ppm) was present in leaf of *E. japonica* in mountainous areas, were of fruits highest concentrations iron in mountainous areas too (7.890ppm), where the iron in leaves contents were as follows: (Ras El Hilal 0.0846, Lathron 0.0976, Sousse 0.6353, Al Qubah 2.7050, Ain Mara1.7883 and Sidi Khaled 2.85867 ppm), and where the iron in fruits contents were as follows: (Ras El Hilal 4.943, Lathron 7.508, Sousse 4.202, Al Qubah 5.155, Ain Mara 3.528 and Sidi Khaled 7.890 ppm).

The Nickel was present in higher concentration (2.02333ppm) leaf of *Eriobotrya japonica* L, followed by the samples of fruits high Nickel content (7.3417 ppm), where the Nickel in leaves contents were as follows: (Ras El Hilal 1.37800, Lathron 1.08733, Sousse2.02333, Al Qubah1.27467, Ain Mara 1.28700 and Sidi Khaled 1.29500 ppm), and where the Nickel in fruits contents were as follows: (Ras El Hilal 1.3713, Lathron 1.326, Sousse 1.346, Al Qubah 7.122, Ain Mara 7.3417 and Sidi Khaled 7.192 ppm). The higher concentrations of the iron (2.8586ppm) was present in leaf of *E. japonica* in mountainous areas, were of fruits highest concentrations iron in mountainous areas too (7.890ppm), where the iron in leaves contents were as follows: (Ras El Hilal 0.0846, Lathron 0.0976, Sousse0.6353, Al Qubah2.7050, Ain Mara1.7883 and Sidi Khaled 2.85867 ppm), and where the iron in fruits contents were as follows:(Ras El Hilal 4.943, Lathron 7.508, Sousse 4.202, Al Qubah 5.155, Ain Mara 3.528 and Sidi Khaled7.890 ppm).

The Nickel was present in higher concentration (2.02333ppm) leaf of *Eriobotrya japonica* L, followed by the samples of fruits high Nickel content (7.3417 ppm), where the Nickel in leaves contents were as follows: (Ras El Hilal1.37800, Lathron1.08733, Sousse2.02333, Al Qubah1.27467, Ain Mara1.28700 and Sidi Khaled1.29500 ppm), and where the Nickel in fruits contents were as follows :(Ras El Hilal 1.3713, Lathron 1.326, Sousse 1.346, Al Qubah7.122, Ain Mara7.3417 and Sidi Khaled7.192 ppm).

The higher concentrations of Copper (8.46767ppm) were present in the leaves of *E.japonica,* followed by the other fruit samples. High Copper content (75.62ppm) was recorded in *E.japonica*, where the Copper in leaf contents were as follows: (Ras El-Hilal 4.43567, Lathron 4.11333, Sousse 3.3053, Al Qubah 2.500, Ain Mara 8.46767, and Sidi Khaled 2.81800 ppm). And where the Copper in fruit contents were as follows: (Ras El Hilal 64.33, Lathron 74.33, Sousse 75.62, Al Qubah 65.188, Ain Mara 70.40, and Sidi Khaled 72.67 ppm).

Follows Tables variation in the mean concentration (ppm) of the contents of minerals and metals of *Eriobotrya japonic*a in study areas, Data are means of three replicates.

Table 6. Variation in the concentrations of sodium.

Regions	Total sodium (ppm)		P. value (T. test)
	Leaf	Fruit	
Sousse	2.5167± 0.0404 c	4.1333 ± 0.0252 d	0.000
Ras El Hilal	2.9100 ± 0.0436 b	4.7533 ± 0.0404 a	0.000
Lathron	3.5233 ± 0.0351 a	3.7467 ± 0.0321 e	0.004
Al Qubah	3.5533 ± 0.0404 a	4.3533 ± 0.0208 c	0.001
Sidi Khaled	2.3133 ± 0.0451 d	4.5400 ± 0.0265 b	0.000
Ain Mara	2.5267 ± 0.0493 c	4.7433 ± 0.0473 a	0.000

Values are expressed as means ± SD; n = 3 for each location. Mean values within a column not sharing a common superscript letter (a, b, c, d, e) were significantly different, $p<0.05$. P. Value within raw between fruit and leaves at the same location.

Table 7. Variation in the concentrations of potassium.

Regions	Total potassium (ppm)		P-value (T-test)
	Leaf	Fruit	
Sousse	30.533 ± 0.379 d	28.3000 ± 0.1000 b	0.010
Ras El Hilal	30.533 ± 0.252 d	17.2667 ± 0.1528 e	0.000
Lathron	34.533 ± 0.379 b	25.400 ± 0.300 c	0.00
Al Qubah	40.467 ± 0.351 a	8.500 ± 0.361 f	0.00
Sidi Khaled	32.533 ± 0.379 c	21.333 ± 0.208 d	0.00
Ain Mara	26.467 ± 0.351 e	31.467 ± 0.404 a	0.001

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Table 8. Variation in the concentrations of calcium.

Regions	Total calcium (ppm)		P-value (T-test)
	Leaf	Fruit	
Sousse	0.2646 ± 0.351 e	7.8493 ± 0.0419 e	0.000
Ras El Hilal	0.4550 ± 0.00300 d	9.0416 ± 0.00306 c	0.000
Lathron	0.54100 ± 0.00200 c	8.4546 ± 0.00351 d	0.000
Al Qubah	0.7040 ± 0.00361 a	9.8743± 0.00306 b	0.000
Sidi Khaled	0.5363 ± 0.00643 c	10.4547± 0.0035 a	0.000
Ain Mara	0.6210 ± 0.00361 b	9.0410 ± 0.00200 c	0.000

Table 9. Variation in the concentrations of iron.

Regions	Total iron (PPM)		P-value (T-test)
	Leaf	Fruit	
Sousse	0.63533 ± 0.01528 d	4.202± 0.226 b c	0.001
Ras El Hilal	0.08467 ± 0.00404 e	0.4943 ± 0.0911 d	0.016
Lathron	0.09767 ± 0.00416 e	7.508± 0.660 a	0.003
Al Qubah	2.70500 ± 0.00400 b	5.155 ± 0.623 b	0.021
Sidi Khaled	2.85867 ± 0.00493 a	7.890± 0.646 a	0.005
Ain Mara	1.78833 ± 0.00306 c	3.528 ±0.739 c	0.055

Table 10. The Variation in the concentrations of Nickel.

Regions	Total Nickel (ppm)		P-value (T-test)
	Leaf	Fruit	
Sousse	2.0233 ± 0.00862 a	1.346 ± 0.201 b	0.028
Ras El Hilal	1.3780 ± 0.00300 b	1.3713 ± 0.1540 b	0.947
Lathron	1.0873 ± 0.00404 e	1.326 ± 0.544 b	0.526
Al Qubah	1.2746 ± 0.00252 d	7.122 ± 0.219 a	0.000
Sidi Khaled	1.2950 ± 0.00400 c	7.192 ± 0.211 a	0.000
Ain Mara	1.2870 ± 0.00400 c d	7.3417 ± 0.0649 a	0.000

Table 11. Variation in the concentrations of copper.

Regions	Total copper (ppm)		P-value (T-test)
	Leaf	Fruit	
Sousse	3.3053± 0.00404 c	75.62 ± 4.45 a	0.001
Ras El Hilal	4.4356± 0.00503 b	64.33 ± 2.34 b	0.001
Lathron	4.1133 ± 0.00321b	74.33 ± 5.34 ab	0.002
Al Qubah	2.500± 0.400 d	65.188 ±0.888 ab	0.000
Sidi Khaled	2.8180 ± 0.00458 d	72.67 ±1.81 ab	0.000
Ain Mara	8.4676 ± 0.00702 a	70.40 ± 6.16 ab	0.003

Discussion

The electrical conductivity total dissolved values depend up on the types of soils, and their contents of different factors as the presence of some ores, such as calcite ($CaCO_3$), Dolomite ((Ca Mg $(CO_3)_2$), Magnetite (Fe_2O_3) and others. may be rise in pH is attributed to the nonstoichiometric reactions taking place during the onset of silicate dissolution.Such reactions include the hydrolysis of the dry solid material and metal/proton exchange reactions between the SAR and the mineral surfaces. Many of studies were established in Libya during many years ago to estimate the of metals in different samples most of these studies concluded that they are different resources of metals and minerals in samples mainly coming from original resources or from human actives [36-55], in this study there are small variations in the studied metals mainly due the nature of the soil and water at the studied samples [56-73].

Phenols are plant auxiliary metabolites that constitute one of the most common and far-reaching groups of substances in plants. They constitute a huge store of normal chemicals differing in quality that envelop a colossal range of compounds and proteins and a wide range of components of quality control and of transport of metabolites and chemicals. Plant nutrients are rich sources of phenolics, which are compounds that can act as cancer prevention agents to prevent heart illness, decrease irritation, lower the rate of cancers and diabetes as well as diminish the rates of mutagenesis in human cells. The safety afforded by the utilization of plant items such as natural products, vegetables, and fruits is most associated with the presence of phenolic compounds [74].

Compositional analysis revealed that leaves, fruit, and fruit showed higher contents of total phenolics,

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flavonoids, Saponins, Tannins in Mountainous areas than Coastal areas, as well as greater antioxidant potential in the leaves. Our results are in accordance with previous studies [75]. Tannins are important natural bioactive compounds present in various forms. Tannins are present in many plant species, serving as a defense mechanism against herbivores and potentially playing a role in controlling plant growth [76], the presence of tannins and alkaloids, glycosides, flavonoids, and polyphenolic compounds is tannin in *Eriobotrya japonica*. Alkaloids are known to affect the CNS, and some act as a painkiller (such as morphine). Alkaloids were not present in equal quantities in all the samples tested, as was indicated by the intensity of the color given after the addition of the reagent. Alkaloids are common in the family Chenopodiaceae. As a study conducted by previous studies [77].

The fruits and leaves harbor a rich reservoir of phenolic acids, vitamins, steroids, lipids and minerals, flavonoids, glycosides, terpenes, acids, and tannins. Flavonoids are powerful water-soluble antioxidants that neutralize harmful free radicals that can damage cells and contribute to cancer. Their presence in a fruit suggests that the plant may have protective properties against inflammation, oxidative stress, microbial infections, and tumor development [78]. Anthraquinones, compounds found in moderate amounts in the aqueous extract of leaves and fruits, are traditionally used to alleviate stomach pain and constipation. Saponins, a varied group of substances produced by many plants, are often responsible for the therapeutic effects of traditional medicines. These compounds naturally defend plants against pathogens, explaining their antimicrobial properties.

Saponins are known for their foaming ability in water, their capacity to damage red blood cells, their cholesterol-binding nature, and their bitter taste [79]. The amounts of saponins in loquat fruits investigated suggested that the extract is not toxic. Saponins are absent in ethanol extracts However, saponins are widely distributed amongst plants [80], the presence of saponins in three species of lamiacea The absence of saponins in the ethanol extracts reported in this study could, possibly, be due to undetectable low concentration Number of mineral elements in the samples are serves as the main source of mineral elements needed for human health.

Conclusion

According to the results recorded in this study, there is variations in some chemical constituents Phytochemicals in the studied plant in this study (*Eriobotrya japonica* L) by comparing the plant collected from Mountain regions (Al-Qubba, Sidi Khaled, Ain Mara) and coastal regions (Ras El Hilal, Sousse, Lathron), also the results showed small variations of the metal and minerals contents by comparing the results obtained for the coastal and mountain samples.

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Conflict

No conflict on the results shown in this study between authors or between other studies.

References

1. Radha K, Kumar M, Puri S, Pundir A, Bangar SP, Changan S, Mekhemar M. Evaluation of nutritional, phytochemical, and mineral composition of selected medicinal plants for therapeutic uses from cold desert of Western Himalaya. Plants. 2021;10(7):1429.
2. Sultan MMZ. Loquat (Eriobotrya japonica Lindl.). In: Fruit and Vegetable Phytochemicals: Chemistry and Human Health. 2nd ed. 2007. p. 1107-26.
3. Taskin M, Erdal S. Utilization of waste loquat (Eriobotrya japonica Lindl.) kernel extract for a new cheap substrate for fungal fermentations. Romanian Biotechnol Lett. 2011;16(1):5872-80.
4. Krishnaiah D, Sarbatly R, Nithyanandam R. A review of the antioxidant potential of medicinal plant species. Food Bioprocess Technol. 2011;89(3):217-33.
5. Hueso JJ, Pérez MAF, Cuevas. Harvest prediction in 'Algerie' loquat. Int J Biometeorol. 2007;51:449-55.
6. Eltawaty SA, Abdalkader GA, Hasan HM, Houssein MA. Antibacterial activity and GC-MS analysis of chloroform extract of bark of the Libyan Salvia fruticosa Mill. Int J Multidiscip Sci Adv Technol. 2021;1(1):715-21.
7. Aljamal MA, Hasan HM, Al Sonosy HA. Antibacterial activity investigation and antibiotic sensitivity for different solvent extracts of seeds, leaves, and stems of Laurus azorica and Avena sterilis. Int J Curr Microbiol Appl Sci. 2024;13(11):175-90.
8. Hamade MH, Abdelraziq SA, Gebreel AA. Extraction and determination of beta-carotene content in carrots and tomato samples collected from some markets at ElBeida City, Libya. EPH Int J Appl Sci. 2019;1(1):105-10.
9. Hasan HM, Ibrahim H, Gonaid MA, Mojahidul I. Comparative phytochemical and antimicrobial investigation of some plants growing in Al Jabal Al-Akhdar. J Nat Prod Plant Resour. 2011;1(1):15-23.
10. Hasan H, Jadallah S, Zuhir A, Ali F, Saber M. The anti-cancer, anti-inflammatory, antibacterial, antifungal, antioxidant and phytochemical investigation of flowers and stems of Anacyclus clavatus plant extracts. AlQalam J Med Appl Sci. 2025:415-27.

Received*: 11-07-2025 -* ***Accepted****: 09-09-2025 -* ***Published****: 17-09-2025*

11. Hasan H, Zuhir A, Shuib F, Abdraba D. Phytochemical investigation and exploring the Citrullus colocynthis extracts as antibacterial agents against some Gram-positive and Gram-negative bacteria. AlQalam J Med Appl Sci. 2025:392-400.
12. Md Zeyaullah RA, Naseem A, Badrul I, Hamad MI, Azza SA, Faheem AB, Moshed AR, Arif A. Catechol biodegradation by Pseudomonas strain: a critical analysis. Int J Chem Sci. 2009;7(3):2211-21.
13. El-Mehdawy MF, Eman KS, Hamad MI Hasan. Amino acids contents of leaves and stems for two types of herbal plants (Marjoram and Hybrid tea rose) at Al-Gabal Al-Akhder region. Der Pharma Chemica. 2014;6(6):442-7.
14. El-Mehdawy MF, Eman KS, Hamad MIH. Amino acid contents of leaves and stems for three types of herbal plants at Al-Gabal Al-Akhder region. World J Chem. 2014;9(1):15-9.
15. Hamad MH, Noura AAM, Salem AM. Phytochemical screening, total phenolic, antioxidant, metal and mineral contents in some parts of Plantago albicans grown in Libya. World J Pharm Res. 2024;13(3):1-17.
16. Anees AS, Hamad MI HH, Mojahidul I. Antifungal potential of 1,2-4-triazole derivatives and therapeutic efficacy of Tinea corporis in albino rats. Der Pharmacia Lettre. 2011;3(1):228-36.
17. Hamad Hasan, Marwa Mohammed, Amal Haroon. Determining the contents of antioxidants, total phenols, carbohydrate, total protein, and some elements in Eucalyptus gomphocephala and Ricinus communis plant samples. Libyan Med J. 2015:222-31.
18. Hamad Hasan, Zuhir Akrim, Farag Shuib, Dala Abdraba. Efficiency of Cynara cornigera fruits on antibacterial, antifungal and its phytochemical, antioxidant screening. Libyan Med J. 2025:120-8.
19. Hamad Hasan, Ashour Sulayman, Ahmed Alehrir. Estimation of amino acid composition, total carbohydrate, and total protein content in Ballota pseudodictamnus plant extracts from Al Jabal Al Akhdar region, Libya. Libyan Med J. 2025:266-71.
20. Hamad Hasan, Ahmed Hamad, Wafa Abdelsatar. Evaluation of antioxidant capacity, total phenol, metal, and mineral contents of Ziziphus lotus plant grown at some regions of AlGabal AlKhder, Libya. Libyan Med J. 2025:137-43.
21. Hesien RA, Amira AKA, Ahlaam MA, Hamad MAH. Determination of antioxidant capacity, total phenols, minerals and evaluation of antibacterial activity of leaves and stems of Gaper plant extracts. Schol J Appl Med Sci. 2024;12(4):451-7.
22. Ben Arous NAA, Naser ME, Hamad MAH. Phytochemical screening, antibacterial and antifungal activities of leaves, stems and roots of C. parviflorus Lam and C. salviifolius L. Int J Curr Microbiol Appl Sci. 2014;13(11):262-80.
23. Anas FAE, Hamad MAH, Salim AM, Azza MH. Phytochemical screening, total phenolics, antioxidant activity and minerals composition of Helichrysum stoechas grown in Libya. Afr J Biol Sci. 2024;3(6):2349-60.
24. Naseer RE, Najat MAB, Salma AA, Hamad MAH. Evaluation of metal and mineral contents of leaves, stems and roots of C. parviflorus Lam and C. salviifolius L plants growing at Al Ghabal Al-Khder, Libya. Int J Adv Multidiscip Res Stud. 2024;4(5):191-4.
25. Hamad MAH, Salem AM. Total carbohydrate, total protein, minerals and amino acid contents in fruits, pulps and seeds of some cultivars of muskmelon and watermelon fruit samples collected from AlGabal Alkhder region. Schol J Appl Med Sci. 2024;12(1):1-7.
26. Gonaid MI, Ibrahim H, Al-Arefy HM. Comparative chemical and biological studies of Salvia fruticosa, Ocimum basilicum and Pelargonium graveolens cultivated in Al-Jabal Al-Akhdar. J Nat Prod Plant Resour. 2012;6(2):705-10.
27. Ali RFA, Hamad MAH, Ahlam KA, Hammida MEH. Phytochemical screening of some herbal plants (Mentha, Origanum and Salvia) growing at Al-Gabal Al-Akhder region, Libya. Int J Pharm Life Sci. 2017;8(4):5500-3.
28. Haroon A, Hasan H, Wafa AS, Baset ESM. A comparative study of morphological, physiological and chemical properties of leaves and stem samples of Eucalyptus gomphocephala (Tuart) plant growing at coastal Derna city. J Res Environ Earth Sci. 2024;9(12):10-8.
29. Hamad MAS, Ali AR. Separation and identification of phenolic compounds in fruits and leaves of some medicinal plants (Juniperus phoenicea and Quercus coccifera) growing at AlGabal Al-Akhdar region, Libya. Indian J Pharm Educ Res. 2016;51(3):299-303.
30. Enam FM, Wesam FAM, Hamad MAH. Detection of mineral contents (Na, K, Ca) and some metals (Fe, Ni, Cu) in vegetable and soil samples collected from Al-Marj. Int J Adv Multidiscip Res Stud. 2023;5(3):304-9.
31. Hamad MAH, Safa RM Mousa. Synthesis and (IR and TEM) characterization of leaves and stem nanoparticles of Artemisia plant: comparative study for evaluation of antibacterial efficiency. Int J Adv Multidiscip Res Stud. 2024;4(5):195-9.
32. Elsalhin H, Abobaker HA, Hasan H, El-Dayek GA. Antioxidant capacity and total phenolic compounds of some algae species (Anabaena and Spirulina platensis). Schol Acad J Biosci. 2016;4(10):782-6.
33. Alaila AK, El Salhin HE, Ali RF, Hasan HM. Phytochemical screening of some herbal plants (Mentha, Origanum and Salvia) growing at Al-Gabal Al-Akhder region, Libya. Int J Pharm Life Sci. 2017;8(4).
34. Hasan H, Mariea FFE, Eman KS. Contents of some chemical compounds of leaves and stems of some herbal plants (Thyme, Rosemary, Salvia, Marjoram and Hybrid Tea Rose) at Al-Gabal Al-Akhder region. EPH Int J Appl Sci. 2014;6(3).
35. El-Mehdawe MF, Eman KS, Hamad MIH. Heavy metals and mineral elements contents of leaves and stems for some herbal plants at Al-Gabal Al-Akhder region. Chem Sci Rev Lett. 2014;3(12):980-6.
36. Abdelrazeg A, Khalifa A, Mohammed H, Miftah H, Hamad H. Using melon and watermelon peels for the removal of some heavy metals from aqueous solutions. AlQalam J Med Appl Sci. 2025:787-96.
37. Abdul Razaq A, Hamad H. Estimate of the contents and types of water well salts by the Palmer Roger model affecting the corrosion of Al-Bayda city network pipes. AlQalam J Med Appl Sci. 2025:744-53.
38. Abdulsayid FA, Hamad MAH, Huda AE. IR spectroscopic investigation, X-ray fluorescence scanning, and flame photometer analysis for sediments and rock samples of Al-Gabal Al-Akhder coast region, Libya. IOSR J Appl Chem. 2021;14(4):20-30.

Received*: 11-07-2025 -* ***Accepted****: 09-09-2025 -* ***Published****: 17-09-2025*

39. ALambarki M, Hasan HMA. Assessment of heavy metal contents in air samples collected from the area between Albayda and Alquba cities, Libya. AlQalam J Med Appl Sci. 2025:695-707.
40. Al-Nayyan N, Mohammed B, Hamad H. Estimate of heavy metal concentrations in soil and some plant samples collected near and far from the main road between Al-Bayda city and Wadi Al-Kouf region. AlQalam J Med Appl Sci. 2025;1:816-26.
41. Hamad MAH, Hager AA, Mohammed EY. Chemical studies of water samples collected from area between Ras Al-Halal and El Haniea, Libya. Asian J Appl Chem Res. 2022;12(3):33-46.
42. Hamad MH. Studies on physicochemical parameters and water treatment for some localities along coast of Alexandria. J Alexandria Univ. 2006.
43. Hamad M, Mohammed AA, Hamad MAH. Adsorption and kinetic study for removal of some heavy metals using activated carbon of sea grasses. Int J Adv Multidiscip Res Stud. 2024;4(6):677-85.
44. Hamad MAH, Hamad NI, Mohammed MYA, Hajir OAA, Al-Hendawi RA. Using bottom marine sediments as environmental indicator for Tolmaitha–Toukra region at eastern north coast of Libya. Schol J Eng Technol. 2024;2(14):118-32.
45. Hamad MIH. Heavy metals distribution at coastal water of Derna city, Libya. Egypt J Aquat Res. 2008;34(4):35-52.
46. Hamad MIH, Mojahidul I. Concentrations of some heavy metals of Al-Gabal Al-Akhdar coast sediment. Arch Appl Sci Res. 2010;2(6):59-67.
47. Hamad MAH, Amira AKA. Estimate of concentrations of some heavy metals in shoe polish samples. EPH Int J Appl Sci. 2016;2(2):24-7.
48. Hamad MAH, Hussien SSM, Basit EEM. Accumulation of some heavy metals in green algae as bioindicators of environmental pollution at Al-Haniea region, Libya coastline. Int J Adv Multidiscip Res Stud. 2024;4(5):188-90.
49. Hamad MIH, Ahmed MA. Major cations levels in surface coastal waters of Derna city, Libya. Egypt J Aquat Res. 2009;35(1):13-20.
50. Hamad MIH, Masoud MS. Thermal analysis (TGA), diffraction thermal analysis (DTA), infrared and X-ray analysis for sediment samples of Tobruk city coast, Libya. Int J Chem Sci. 2014;12(1):11-22.
51. Hamad R, Ikraiam FA, Hasan H. Estimation of heavy metals in bones of selected commercial fish from eastern Libyan coast. J Rad Nucl Appl. 2024;9(1):47-51.
52. Hasan HAH. Estimate of lead and cadmium contents of some archeological samples collected from ancient cities Cyrene and Abolonia at Al-Gabal Al-Akhder region, Libya. Univ J Chem Appl. 2021;12(21):902-7.
53. Alfutisi H, Hasan H. Removal of thymol blue from aqueous solutions by pomegranate peel. Int J Appl Sci. 2019;1(1):111-9.
54. Hasan JA, Hasan HMA. Potential human health risk assessment through determination of heavy metals in regularly consumed yogurt in Libya. World J Pharm Pharm Sci. 2024;13(12):100-12.
55. Mamdouh SM, Wagdi ME, Ahmed MA, Alaa EA, Essam AM, Hamad MIH. Rice husk and activated carbon for wastewater treatment of El-Mex Bay, Alexandria coast, Egypt. Arab J Chem. 2016;9:1590-6.
56. Mamdouh SM, Wagdi ME, Ahmed MA, Hamad IH. Heavy metals accumulation in sediments of Alexandria coastal areas. Bull Fac Sci. 2012;47(1-2):12-28.
57. Mamdouh SM, Wagdi ME, Ahmed MA, Alaa EA, Hamad MIH. Chemical studies on Alexandria coast sediment. Egypt Sci Mag. 2005;2(4):93-102.
58. Mamdouh SM, Wagdi ME, Ahmed MA, Alaa EA, Hamad MIH. Distribution of different metals in coastal waters of Alexandria, Egypt. Egypt Sci Mag. 2010;7(1):1-19.
59. Mohamed AE, Afnan SA, Hamad MA, Mohammed AA, Mamdouh SM, Alaa RE, et al. Usage of natural wastes from animal and plant origins as adsorbents for removal of toxic industrial dyes and heavy metals in aqueous media. J Water Process Eng. 2023;55.
60. Mohamed HB, Mohammed AZ, Ahmed MD, Hamad MAH, Doaa AE. Soil heavy metal pollution and associated toxicity risk assessment in Ajdabiya and Zueitina, Libya. Sci J Damietta Fac Sci. 2024;14(1):16-27.
61. Nabil B, Hamad H, Ahmed E. Determination of Cu, Co, and Pb in selected frozen fish tissues from Benghazi markets, Libya. Chem Methodol J. 2018;2:56-63.
62. Wesam FAM, Hamad MAH. Detection of heavy metals and radioactivity in bones of frozen chicken samples collected from Libyan markets. Int J Adv Multidiscip Res Stud. 2023;3(3):761-4.
63. Wesam FAM, Hamad MAH. Study of mineral and heavy metal accumulation in Ulva, Cladophora, Polysiphonia, and Laurencia algae samples at eastern north region of Libya coast. J GSC Biol Pharm Sci. 2023;23(3):147-52.
64. Citrine, Hamad H, Hajer AF. Contents of metal oxides in marine sediment and rock samples from eastern Libyan coast, using X-ray method. AlQalam J Med Appl Sci. 2015;13:16-21.
65. Hamad R, Ikraiam FA, Hasan H. Estimation of heavy metals in bones of selected commercial fish from eastern Libyan coast. J Rad Nucl Appl. 2024;9(1):47-51.
66. Hanan MA, Hamida E, Hamad MAH. Nitrogen, phosphorus and mineral contents (Na, K, Ca) of some algae species (Anabaena and Spirulina platensis). Int J Curr Microbiol Appl Sci. 2016;5(11):836-41.
67. Hamad MAH, Amira AKA. Estimate of concentrations of some heavy metals in shoe polish samples. EPH Int J Appl Sci. 2016;2(2):24-7.
68. Mardhiyah F, Hamad H. Assessment of soil contamination by heavy metals in Al-Fatayeh region, Derna, Libya. AlQalam J Med Appl Sci. 2025:1081-91.
69. Hamad MIH, Aaza IY, Safaa SH, Mabrouk MS. Biological study of transition metal complexes with adenine ligand. Proceedings. 2019;41(1):77.
70. Ahmed O, Ahmed NH, Hamad MAH, Fatin ME. Chemical and biological study of some transition metal complexes with guanine as ligand. Int J New Chem. 2023;10(3):172-83.
71. Hamad MAH, Enas UE, Hanan AK, Hana FS, Somia MAE. Synthesis, characterization, and antibacterial applications of compounds produced by reaction between barbital with threonine, glycine, lysine, and alanine. Afr J Biol Sci. 2024;6(4).

Received*: 11-07-2025 -* ***Accepted****: 09-09-2025 -* ***Published****: 17-09-2025*

72. Mabrouk MS, Salama S, Moussa SF, Hamad MAH. Synthesis, characterization, and antibacterial studies of metal complexes with tyrosine ligand. Int J New Chem. 2023;10(5):323-39.
73. Hamad Hasan. Biological study of some first series transition metal complexes with adenine ligand. 23rd Int Electron Conf Synth Org Chem. 2019 Nov 14. doi:10.3390/ecsoc-23-06601.
74. Khoddami A, Wilkes MA, Roberts TH. Techniques for analysis of plant phenolic compounds. Molecules. 2013;18(2):2328-75.
75. Chedia A, Ghazghazi H, Brahim H, Abderrazak M. Total phenolic content, antioxidant and antibacterial activities of Marrubium vulgare methanolic extract. Tun J Med Plants Nat Prod. 2024;11:1-8.
76. Kalam MA, Ahmad B, Ahmad R, Avid M, Akhtar F, Raza MA. Loquat (Eriobotrya japonica; family: Rosaceae): nutritional and medicinal properties, in the light of Unani medicine and scientific studies. Eur J Med Plants. 2024;35(6):94-104.
77. Bolatkyzy N, Nurmakhanova A, Berganayeva G, Dyusebaeva M. Study of the chemical composition of the Rubus vulgaris plant. Chem J Kazakhstan. 2024;1.
78. Okwu DE. Phytochemicals and vitamin content of indigenous spices of southeastern Nigeria. J Sustain Agric Environ. 2004;6:30-7.
79. Eleazu CO, Eleazu KC, Awa E, Chukwuma SC. Comparative study of the phytochemical composition of leaves of five Nigerian medicinal plants. J Biotechnol Pharm Res. 2012;3(2):42-6.
80. Sparg SG, Light ME, Van Staden J. Biological activities and distribution of plant saponins. J Ethnopharmacol. 2004;94(2-3):219-43.

Received*: 11-07-2025 -* ***Accepted****: 09-09-2025 -* ***Published****: 17-09-2025*