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Original article

Estimate the Antioxidant Capacity, Total Phenol Contents, Mineral Concentrations, and Total Carbohydrate of *Capparis Spinosa* L. (Kabbar), *Ceratonia Siliqua* L. (Kharuwb), and *Juniperus Phoenicea* L (Arar) Plants

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Phytochemical. Carbohydrate, Antioxidant, Phenols, Minerals, Plants, Libya.

ABSTRACT

In this research, some of the phytochemical compounds were detected by using phytochemical screening in leaves and stems of three different plants collected from Al-Gabal Al-Ahder region, Libya, and the concentrations of anti-oxidant capacity, total phenol content, minerals, and total carbohydrate were measured for the selected plants of *Capparis spinosa L. (Kabbar), Ceratonia siliqua L. (Kharuwb),* and *Juniperus phoenicea L (Arar)*. The spectrophotometer was used to estimate the contents of antioxidants, total phenols, and total carbohydrates, whereas the Flame photometer was used to determine the contents of sodium, calcium, and potassium. The outcomes of this study found that, the levels of anti-oxidant were ranged as follows:(222.72 -302.64 ppm) in leaves and (307.62 -319.03 ppm) in stems, while the contents of total phenols were ranged from 307.62 to 319.03 ppm in stems, the total phenols contents were ranged from 9.07 to 10.59 ppm and from 9.95 to 10.65 ppm in stems, respectively while the concentrations of carbohydrate were ranged from 0.039 to 0.155 ppm and from 0.070 to 0.123 ppm for leaves and stems, respectively. . whereas the sodium, potassium, calcium were ranged from 0.958 to 2.625 ppm in leaves and from 0.88 to 4.08 ppm in stems, for potassium the values were ranged from 3.56 to 77.16 ppm in leaves, but for stems the values of potassium were ranged from 42.96 to 76.96 ppm. While the calcium contents ranged from 0.08 to 0.28 ppm in leaves, and for stems ranged from 0.375 to 0.875 ppm in stems. The phytochemical investigation showed the present important quantiles of sterols, flavonoids, alkaloids, tannins, anthraquinones, saponins, and phenols.

Introduction

Libya has been considered to be abundant in therapeutic plants commonly utilised in traditional medicine, particularly Cyrenaica, which is home to the majority of these plants [1]. The Sylphium of antiquity was the most well-known medicinal plant that greatly enriched Cyrenaica in distant times. Due to its enigmatic ability to treat a wide range of illnesses, this valuable plant, which produced a gum-resin valued at an equivalent weight of silver, was well-known in Cyrene and sold to nearby nations.

Sylphium was certainly overexploited for many centuries, which resulted in its scarcity and eventual extinction by the fifth century A.D. [2]. In many societies, medicinal plants form the foundation of health care systems. Over 60% of the global population and 80% of those living in underdeveloped nations mostly rely on plants for their medicinal needs. The preservation of biodiversity, the development of new medications, and the improvement of the standard of living in impoverished rural communities are all tied to the recovery of knowledge and procedures related to these plant resources [2]. The therapeutic and medicinal qualities of different plants are utilized in herbal supplements, botanical-based nutraceuticals, and teas, in addition to serving as the foundation for between 30% and 40% of modern conventional medications [3].

Ethnobotanical research on medicinal plants has taken many different forms, sometimes detailing the usage of plants in specific cultural contexts and other times testing theories of use as well as knowledge [4]. Libya is one of the countries in Africa which have a variety of plants, especially in the eastern north side of Libya. Therefore, many studies were carried out to estimate many different compounds [5-38], besides the contents of minerals and metals were studied in different samples by using different methods [38-69]. This study aims to estimate some of the chemical constituents (Carbohydrates, total phenols, and antioxidants) in some selected plants. Using phytochemicals of leaves and stems. To measure the contents of the (minerals: Na, K, and Ca) in leaves and stems of *Capparis spinosa L. (Kabbar), Ceratonia siliqua L. (Kharuwb),* and *Juniperus phoenicea L. (Arar)* growing at Al-Gabal Al-Ahder regions, Libya.

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Methods

Sampling

In this study, the leaves and stems of *Capparis spinosa L. (Kabbar), Ceratonia siliqua L. (Kharuwb),* and *Juniperus phoenicea L. (Arar*) plants were selected, where the samples were collected from different locations, including the valley called Wadi Derna, and Karsah in the West, Al-Dhahr Al-Ahmar in the South, and the Mediterranean coast in the North. The study region is situated on the second terrace of El-Jabal El-Akhdar Mountain, which is part of Wadi Derna in the Derna region of northeastern Libya. The Wadi separates the city into two halves between longitudes (33°00'–32° 30 'N and 22°30'–22°45'E). The Wadi is between 40 and 300 meters above sea level. With a mean temperature of roughly 20^{o}C, the research area's climate is similar to El-Jabal El-Akhdar. Between 200 and 300 mm of rain falls on average.

Sample extraction

10 grams of each dried sample were taken and transferred to a beaker containing 100 ml of distilled water, and the mixture was mixed. then the extraction was carried out by an evaporator system at 75 ^{0}C. The mixture was filtered. After two hours, the filtrate was used to determine the phytochemical screening [6-10].

Phytochemical Analysis

The central lab of the Faculty of Science at Omar Al Mukhtar University processed all of the phytochemical screening tests in accordance with the normal procedures, which are detailed in earlier research [11–15].

sterols and/or triterpines test: Libermann-Burchard's test

After adding 0.3 ml of acetic anhydride and 1 ml of the alcohol and aqueous extracts from each sample, only a few drops of concentrated sulphuric acid were applied through the side of dry test tubes. Once sterols and/or triterpines exist, a reddish-violet hue is created at the intersection of the two layers, and then the chloroform solution turns green.

Flavonoids test

The analyzed aqueous extracts, in addition to alcohol, were additionally extracted by using hydrochloric acid (1%). Each sample was then placed through the following test: 10ml from each extract was made alkaline, which produces a yellow when flavonoids are present.

Alkaloids test

The examined species' alcohol and aqueous extracts were extracted using 20 ml of diluted hydrochloric acid, kept cool, and made alkaline using a diluted ammonium hydroxide solution, followed by being extracted using chloroform.

The following tests are performed on the chloroform extract: Dragendorff's reagent preparation: Solution (a): A mixture of 10 ml acetic acid with 40 ml distilled aqueous was used to dissolve around 0.85 g of basic bismuth nitrate. Solution (b): 20 ml of water was used to dissolve about 8 grams of potassium iodide. Stock remedy: Solutions (a) and (b) are combined in equal volumes. Filter paper was treated with a few drops of chloroform extract, dried, and then sprayed with the reagent. When alkaloids are present, an orange hue is seen.

Tannins test

The solution of hydro-alcoholic clearis is put through the following test after the alcohol and aqueous extracts of the examined species were additionally extracted with 50% ethanol, followed by filtering out: Test for ferric chloride: The alcohol and aqueous solution were mixed with one ml of the reagent (1% FeCl3). When pyrogallol tannins are present, a blue hue appears.

Anthraquinones test

Borntrück'stest

After adding one ml each of the alcohol and aqueous extract of the subsequent extracts, either caustic soda or aqueous ammonia, the mixture is shaken. When anthraquinone glycosides are present, the aqueous layer takes on a rose-red hue.

Modified-Bornträger's test

Alcoholic potassium hydroxide is used to hydrolyse one ml each of the alcohol and aqueous extract of the subsequent extracts of the tested plants. This process is then acidified and continues as Borntrück's test. When anthraquinones are present, the aqueous layer turns rose-red.

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Saponine test
After adding 5 ml of the tape aqueous solution to one ml of each alcohol and aqueous extract, the mixture is rapidly agitated for 5 minutes. The presence of saponin is indicated by the development of a foam that is one centimeter high and lasts for fifteen minutes.

Determination of Phenol Compounds by the Folin-Ciocalteu Method
The purpose of this experiment was to identify phenolic compounds. Using gallic acid as a reference, the content of total phenolics in the extracts was measured using the Folin-Ciocalteu reagent in accordance with the method of Slinkard and Singleton (10). Following the introduction of samples (two duplicates of each sample) into test cuvets, 0.8 ml of Na2CO3 (7.5%) and 1.0 ml of Folin-Ciocalteu reagent were added. The Shimadzu UV-Vis spectrophotometer was used to measure the absorbance of each sample at 765 nm following a 1.5-hour incubation period at 30 °C. PPM of fresh weight was used to express the results.

Determination of antioxidant capacity by the Prussian blue method
One gram of the powdered substance was defatted using petroleum ether. The defatted powder has been extracted again using 10 ml of 1% hydrochloric acid: methanol (v/v) after two rounds of stirring with 10 ml of methanol. subsequently, those three combined extracts were vacuum-evaporated, and the residue was dissolved in 10 mL of methanol. Half a milliliter of the solution was mixed together with 3 distilled aqueous solutions, 3 ml of K3Fe (CN)6 (0.008 M), 3 ml of 0.1M HCl, and one milliliter of 1% FeCl3.
The absorbance is measured at 720 nm in the central lab of Omar Al-Mukhtar University's Faculty of Science after the blue colour is allowed to develop for five minutes.

Determination of Carbohydrates
To estimate total carbohydrates, a known weight of 0.2 g of the dried sample was ground, then 5 mL of sulphuric acid was added. After completing, the samples were dissolved, the samples were cooled at room temperature, then a small quantity of Barium carbonate (Ba_2CO_3) was added, and the mixture was heated again. After cooling, the samples were filtered. One ml of solution was taken, then one ml of 5% phenol was added. The total carbohydrate was determined by the method carried out in a previous study. Where the absorbance was measured at a wavelength of 490 nm [8-10].

Determination of Minerals
In the Faculty of Science at Omar Al-Mukhtar University central lab, the contents of sodium, potassium, and calcium were measured using a Flame Photometer (JENWAY Flame Photometer) in accordance with the approach outlined by several researchers [60–70].

Results
This study verified the presence of sterols in all the selected samples. There is are relative increase in their contents in leaves compared with stems in the plants of *Capparis Spinosa, Ceratonia silique,* and *Juniperus phoenicea.* The high contents of flavonoids were recorded in leaves compared with the other samples of Ceratonia *silique* leaves and stems of the other plants. The results also recorded that the alkaloids were completely absent in Capparis *Spinosa* stems, while high content was detected in *Ceratonia siliqua* plant *leaves* and *Juniperus phoenicea* plant stems. Tannin compounds were recorded in all the studied samples except in *Capparis Spinosa* stems. Also, the Anthraquinones were not detected in the leaves and stems of the *Capparis Spinosa* plant samples. On the other side, the Anthraquinones showed relatively higher content in the leaves of the *Ceratonia siliqua* plant sample. The saponins were detected in all the selected samples of plants in this study. (Table 1&2).

Table 1. The phytochemical screening of sterols, flavonoids, and Alkaloids of the studied plants

Scientific name	**Sterols**		**Flavonoids**		**Alkaloids**	
Compounds	Leaves	Stems	Leaves	Stems	Leaves	Stems
Capparis Spinosa.	+ +	+	+ +	+	+	-
Ceratonia siliqua.	+ +	+	+ + +	+	+ + +	+ +
Juniperus phoenicea	+ +	+ +	+	+ +	+	+ + +

Table 2. The phytochemical screening of the studied plants

Scientific name	**Tannins**		**Anthraquinones**		**Saponine**	
Compounds	Leaves	Stems	Leaves	Stems	Leaves	Stems
Capparis Spinosa.	+	-	-	-	+ + +	+
Ceratonia siliqua.	+ + +	+ + +	+ + +	+ +	+ + +	+
Juniperus phoenicea	+ +	+ +	+ +	+ +	+ + +	+ +

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Total phenols, Anti–Oxidant, and Carbohydrate Contents

The concentrations of total phenol contents showed variations between leaf and stem samples, fluctuating in the ranges of (222.72 -302.646 ppm) and (307.625 -319.013 ppm) of leaves and stems, respectively, (Table 3). A relative decrease in total phenol contents was observed in leaves compared with their values in *Ceratonia silique* and *Juniperus phoenice* plants. The antioxidant activity, were ranged between (9.07 -10.59 ppm) and (9.955 –10.655 ppm), respectively. For the carbohydrate compounds, the results no recorded variations were observed between their contents in leaves compared with stems, where their values ranged between (0.039 -0.155 ppm) and (0.0016 – 0.029 ppm) were observed for anti-oxidant between stems and leaves.

Table 3. The contents (ppm) of Phenols, Anti-oxidant, and Carbohydrate in the studied samples

Scientific name	**Total Phenols**		**Anti-Oxidant**		**Carbohydrate**	
Compounds	Leaves	Stems	Leaves	Stems	Leaves	Stems
Capparis Spinosa.	302.646	319.0313	9.077	9.955	0.039	0.029
Ceratonia siliqua.	285.97	307.625	10.02	10.33	0.108	0.013
Juniperus phoenicea	222.72	318.549	10.595	10.655	0.155	0.0016

Minerals

The study results of this recorded presence of sodium, potassium and calcium in leaves and stems of the studied plants, the contents of sodium were ranged as following: (0.958 – 2.625 ppm) and (0.88 – 9.08 ppm) in leaves and stems, correspondingly, the results indicated that there as increase the sodium contents in *Capparis Spinosa* and *Ceratonia silique* plants comparing with Juniperus phoenicea plant, especially in stems, the concentrations of potassium showed higher levels comparing with sodium and calcium, also there are high concentrations in *Capparis Spinosa plant comparing* with *Ceratonia silique* and *Juniperus phoenicea* plants. The results of Minerals showed high contents of potassium in both leaves and stems of the studied samples, compared with the contents of Sodium and Calcium. (Table 4) The Potassium levels were ranged as (3.56 -77.16 ppm) for leaves and from (42.96- -76.96 ppm) for stems. For the calcium contents, the results of this study showed lower contents in leaves compared with stems of the studied plants, where the contents ranged between (0.08 -0.28 ppm) for leaves and between (0.375 -0.875 ppm), (Table 4).

Table 4. The contents (ppm) of minerals (Na, K, and Ca) in the studied samples

Scientific name	**Sodium**		**Potassium**		**Calcium**	
Compounds	Leaves	Stems	Leaves	Stems	Leaves	Stems
Capparis Spinosa.	2.625	9.08	77.16	76.96	0.28	0.541
Ceratonia siliqua.	0.958	4.08	6.16	48.16	0.08	0.375
Juniperus phoenicea	1.041	0.88	3.56	42.96	0.08	0.875

Discussion

The phytochemical screening in this study presented the presence of diverse amounts of natural compounds as flavonoids, alkaloids, sterols, tannins, phenols, Saponins, and anthraquinones, in the studied plants of *Ceratonia silique, Ceratonia siliqua,* and *Juniperus phoenicea*. The results showed variations in their contents between the studied plants, also between the leaves and stems. Colour tests were used to apply the deflection in accordance with conventional procedures. For the chemical analysis, most of the selected plants contain very important contents of Natural products, as sterols, phenols, Tannins, anthraquinones, and carbohydrates. Most of the selected plants have antioxidant and phenol compounds, which may be attributed to the presence of different aromatic chemical compounds.

Most medicinal plants contain benzene derivatives and different substitutions alkanes, which give special odors to most of them. Numerous secondary metabolites, including quinines, alkaloids, phenols, sterols, flavonoids, tannins, and saponins, are typically produced by plants and are significant sources of biocides and numerous other pharmaceutical medications. In pharmacological studies as well as drug development, plants with medicinal properties are crucial. The western pharmacopoeia contains about 7,000 therapeutic substances that originated from plants.

Given that they produce an extensive variety of bioactive chemicals, the majority of which are expected to originate as chemical defense against infection or predation and antioxidant substances, plants have been an excellent source of medications. Numerous plants have antibacterial properties, and these properties are employed to treat various illnesses [70]. Although they support an organism's proper growth and development, the organic substances created in the kingdom of plants do not directly contribute to the development, growth, or reproduction of organisms. Plant Ingredients that are biosynthetically produced from primary metabolites but have a more restricted distribution within the kingdom of plants are known

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as secondary metabolites. carbohydrates, flavonoids, alkaloids, saponins, terpenes, tannins, lipids, and Phenolics are among the classes of secondary plant metabolites [71]. Therefore, open-access journals must motivate scientists and medical professionals to put in a lot of effort to identify the primary active components that can be isolated from plants for medicinal purposes. The variety and richness of electronic material about medicinal plants as a reemergent health aid has exploded due to recent and renewed interest in these plants, as well as advancements in information technology [72]. On the other side the main sources of minerals in the plants are comping from the areas around the plants as the agriculture soil and the climate or from the water [73-85], in this study high contents of potassium were observed comparing with sodium and calcium, generally most of natural plants containing higher potassium value due to its importance for the most plants. Also, there are chemical methods used to show the types the salts of minerals as XRD, XRF, ICP, and others. Some of these salts included minerals chlorides, minerals carbonate, minerals sulphate to explain their resources from sources a soils or comping from other sources as pollution of the sea water evaporator especially for the plants growth nearly of location near seas .some studies used different instrumental methods as XRF, atomic absorption, flame photometer to estimation the types and contents of minerals and metals in different natural and environmental samples included soil, sediment, water, plant, vegetable and others. Some studies have found some chemical compounds in natural samples as soils, plants, and waters, mainly coming from human activities [86-95]. Some studies used the metals in other applications as antibacterial agents and other uses [96-103].

Conclusion

The study's findings indicate that the chosen plants include a variety of natural compounds, including sterols, saponins, phenols, flavonoids, tannins, anthraquinones, and alkaloids, as well as differences in their contents in the leaves and stems. Small amounts of calcium were recorded compared with potassium and sodium. The results also showed that the studied plants contained different amounts of antioxidants and total phenols in both leaves and stems.

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Conflict

The authors provide that no conflict in the results recorded in this, a contrast to other studies.

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