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Studies on physiochemical, qualitative and quantitative phytochemical, analysis and antibacterial activity of *Oxalis pes-caprae* and *Erodium glaucophyllum* utilized as a traditional folk treatment from Al-Khums Libya

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Abstract
The aqueous and ethanolic extracts of *Oxalis pes-caprae* and *Erodium glaucophyllum* leaves were phytochemicals, physiochemical and antibacterial studied where results of the phytochemical analysis revealed are rich in alkaloids, tannins and phenols, flavonoids, glycosides, terpenes and glycosides and present in height quantity of concentration in both extracts, while saponins, and steroids present in moderate concentration, whereas coumarins were present in low quantity of concentration, though antraquinone's not present in both extracts. The results of pH values were 4 intended for *Oxalis pes-caprae* and 4.82 intended for *Erodium glaucophyllum*, though the per cent yields of a chemical constituent in the aqueous and ethanolic extracts of the plants were 60.4, 50, 78.2 and 38 % for *Oxalis pes-caprae* and *Erodium glaucophyllum*, respectively. While per cent's yields for alkaloids, saponins and flavonoids in the aqueous and ethanolic extracts were 44, 53, 33, 47, 31 and 52 %, individually for *Oxalis pes-caprae*, in addition, 40, 36, 37, 32, 48 and 46 % for *Erodium glaucophyllum*, correspondingly. The physiochemical analysis revealed the results of ash content were 84.5 and 63.5 %, and the results of total ash values 84.5 and 63.5, acid insoluble ash 4.2 and 5.1, water-soluble ash 3.6 and 3.9, soluble in chloroform 2.6 and 2.8, soluble in petroleum ether soluble extractive value 9.6 and 8.3, while the losing on drying was 2 and 3.4 % (W/W) concerning the *Oxalis pes-caprae* and *Erodium glaucophyllum*, respectively. The results of the minerals were iron and phosphorus exists in highest amounts, while each of cobalt and sulphur exists in moderate's values, though each of calcium and manganese exists in low quantities, concerning the *Oxalis pes-caprae* and *Erodium glaucophyllum*, respectively. The results of heavy metals revealed that presence of mercury, nickel, zinc and silver existed in both plants, while cobalt exists in *Oxalis pes-caprae* and not exist in *Erodium glaucophyllum* as well for nickel was not exist at all. The results of the potency of *Oxalis pes-caprae* extracts against the bacterial strains were the inhibition zones against the *Staphylococcus aureus* 8, 9 mm of 50, 100 % of the aqueous extract, and 5, 8 mm of 50 and 100 % of the ethanolic extract. And the results of the potency of *Erodium glaucophyllum* extracts against the bacterial strains were the inhibition zones in contradiction of the *Escherichia coli* were 9, 8 mm of 100 % of the aqueous and ethanolic extracts, and 7, 8 mm of 100 % of both extracts against *Proteus vulgaris*, while the *Pseudomonas aeruginosa* were 8, 7 mm of 100 % of both extracts, although the inhibition zones in contradiction of the *Salmonella* were 7 mm of 100 % of both extracts, though the inhibition zones in contradiction of the *Klebsiella* were 11 and 8 mm of 100 % of both extracts, respectively. On the other hand, there was a negative response of 25 % and almost of 50 % of both extracts against the bacterial strains while it was more effective with increasing of extracts concentrations, In general, there was a considerable response of 100 % extracts concentrations of both plants. From these the results of the above investigation that the selected leaves extracts were showing good antimicrobial activity, and principally of the concentrations 50 and 100 % aqueous and ethanol extract of both plants.

Keywords: *Oxalis pes-caprae*, *Erodium glaucophyllum*, phytochemicals, physiochemical, antibacterial

Introduction
Science ancient time, man has known instinctively and experimentally how to benefit from the wild plants and herbs that grow in his living environment not only in his food but also in the treatment of his illnesses and diseases. Antique documents and manuscripts indicate that the Chinese, the old Egyptians, the Babylonians and the Greeks recorded a lot concerning to it [1-2]. Every plant or herb is, in fact, a pharmacy containing effective substances developed by God Almighty wisdom, where medicinal plants currently occupy a great place in the pharmaceutical, industrial and agricultural production, which is of great importance in the developed countries. Hence, the medicinal plants are considered as one of a primary source of many medical drugs. Molecular genetics research has confirmed the acquisition of a number of pathogenic bacterial strains of the antibiotic resistance that were used in the recent era. The increased effect of these side effects and resistance to microorganisms has reduced their use in many cases of treatments. This agreed with the separation and purification of many of the plant's secondary compounds, which showed significant effective against pathogenic microorganisms [3]. Therefore, a concern in secondary metabolites of plants has increased and the tendency to discover alternative therapies for cancer chemotherapy

enhanced more vital. And for consideration that the secondary metabolites are a vital source of drug-specific drugs, accounting for about 25% of cancer treatments. This which led to the development of special studies to detect vital activity for natural products in plants against cancerous tumours and testing their effectiveness against cancer cells in and out of vivo [4]. And for the importance of the medicinal plants for treating of several diseases, the aim of this study to contribute to some plant extracts of one of the plants of the familial family, which is known scientifically as *Oxalis pes-caprae* and the other plant belongs to the family Gernukia, which is known scientifically as *Erodium glaucophyllum*. *Oxalis pes-caprae* is a member of the important Oxalidaceae family and is spread in the tropics and subtropical areas of the world. It has was used for various purposes of conventional medications for treating several ailments. The local name of this plant in Libya is Homemade, its leaves used in nutrition as a salad and in the treating for many illnesses by folks. Where it has a sour taste. This plant correspondingly has a very high quantity of vitamin C, which has been shown to prevent cancer. The entire plant was converted into a locally used paste to treat swelling. The leaves as well contain oxalic acid, which gives them a sharp flavour [5]. *Erodium glaucophyllum* is one species of Erodium genus and belongs to the Geraniaceae family. It grows dramatically in the Mediterranean and other regions around the world. The local name of this plant in Libya is Rokma, its leaves used in the treating for many illnesses by folks, such as enhance blood circulation in acute and chronic rheumatic disorders and to treat from poisoning of intestinal inflammation. The physiochemical analysis is no less important than the phytochemical analysis of the plant and detection of the components effective found in the ash of the plant, especially that the ashes of plants were used in the treatment of diseases, at an ancient and present time. There are four essential elements: C, H, O and N compose 96% of the dry matter. Meant the plant obtain water, air containing oxygen and nitrogen, and the atmospheric carbon dioxide is released by the process of Photosynthesis representation. Whilst, No plant can grow without one of these Items if other elements are available, It should be noted that the chemical composition of plants varies according to species, varieties, soil type, fertilization and physical nature, especially ventilation, temperature, humidity, pH, amount of fertilizers added to it, environmental conditions, plant age and its members, taste and origin and compatibility. The content of plant tissue ash varies by plant, variety and evolution.

Materials and methods

Plant collection, identification, preparations

The plant's materials samples were obtained freshly during December-January (2018) from the wild of Al-Khums. The plant samples were identified at the Department of Biology, Science College University of El-Mergeb Al-Khums Libya. The plants were washed with running tap water, followed by rinsing well with distilled water. The samples were spread in one layer on filter paper and dried in the drying oven at 45 °C. The samples of plant powder were prepared by grinding of dry plants in an electric mill for fine powder. Then were stored in sealed dark glass bottles in the refrigerator until use.

Preparing of ash

The ashing process was carried out via the weight of 5 g of plant fine powder and burnt in a Muffles oven at a temperature of 550 °C review weighing the samples until constant weight is obtained.

Preparing of extracts (Soxhlet)

Extraction was carried out by using the standard methods for phytochemical investigations of secondary metabolites components. 20 g of the plant powder was placed in the syphon and connected it to the boiler flask has 400ml of appropriate solvents (distilled water, ethanol, separately). Then boiled for 6 to 8 hours respectively. The extracts were filtered using a filter paper (Whatman, No. 1). The evaporation process was performed to remove the solvent used by the rotary evaporator at 50 °C. The extracts were placed in a sterile container suitable for testing [6-7].

Calculate the yield of the extracts

The yield of the extracts was calculated from the mass of the dry matter used, and the dry plant matter mass extracted for both the extracts. The yield of the extracts is the ratio between the mass of the extracted of the dry plant material, which is denoted by (Me) on the mass of dry plant material used (Mv), results as shown in table 1and calculated using the following relationship:

R% = Production productivity of extracts %
Me = Mass of dry plant material extracted after solvent evaporation.
Mv = Dry plant material mass used for extraction.
R% = (Me / M v) * 100

PH measurement of the extracts

In a 100 mL flask, placed 2g of the dry extracts and diluted with 50ml of distilled water. By using pH meter (HANNA Instruments) at 25 °C. Results as shown in table 1

Phytochemical screening

Quantitative phytochemical analysis of the extracts

Alkaloids, saponins and flavonoids were carried out by the described standard methods [8, 9, 10] respectively.

Qualitative phytochemical analysis of the extracts

Afterwards, the extracts were filtered and concentrated using rotary vacuum distillation. The qualitative detection of phytochemical constituents in water and alcohol extracts of the studied plant's extracts (leaves) and powder included tannins, flavonoids, saponins, alkaloids, reduced sugars, Alkaloids glycosides and steroids as per standard procedure [11-16].

Detection of alkaloids

Dragendroff's reagent: 3-4 drops of the Dragendroff's reagent was added to 10 ml of extract (water, ethanolic, separately) an orange colour will observe indicate the presence of alkaloids.

Detection of tannins and phenols

1 to 2 drops of diluted $FeCl_3$ solution to 1% was added to 10 ml of extract, the appearance of dark green or bluish green indicates the presence of tannins

Detection of flavonoids
10 ml of extract was mixed with 18 ml of sodium hydroxide solution (0.1 molars), Appearance of yellow colour turns to colour less after adding 2 ml of diluted hydrochloric acid.

Detection of terpenes
5 ml of chloroform was added to 10 ml of the extract then 3-4 drops of concentrated sulfuric acid. The appearance of a brownish reddish colour evidence of the presence of terpenes (Salkowski's test).

Detection of saponins
1. **Frothing test (Emulsion):**10 ml of plant extract placed in a test tube mixed with a 1-2 drop of olive oil added and the tube was well shaken from 4 to 5 minutes. The appearance of the emulsion indicates the presence of the saponins.
2. **Foam test:** 1ml of distilled water mixed with 2 ml of extract placed in a test tube and then well shaken from 3 to 4 minutes. The appearance of foam will indicate positive detection.
3. **Mercuric Chloride Test:** Addition of 5 mL of mercuric chloride solution to 10 ml extract. The appearance of white precipitation will indicate positive detection.

Detection of steroids
2 ml of the extract placed in a test tube then mixed with 2 ml of chloroform and an equal amount of sulfuric acid was added cautiously on the tube wall, the appearance of a reddish colour formed at the interphase indicates the presence of a steroid ring

Detection of anthraquinones
2 ml of extract was mixed with 5 ml of chloroform and shook well. Then 10% of the ammonia solution was added. The appearance of pink or red in the ammonia layer indicates the presence of the anthraquinones in the extract.

Detection of Glycosides
2 ml of the extract was mixed with 2 ml of acetic acid and then added 1 - 2 drops of ferric chloride solution; after that 1 ml of concentrated sulfuric acid was added. The appearance of brown ring indicates the presence of reduced sugar.

Detection of Coumarins
1 ml of the plant extract was placed in a test tube then was covered with a moisturizing filter paper with a diluted sodium hydroxide solution and then heated in a boiling water bath for a few minutes. The filter paper was exposed to the UV source and a greenish yellow fluorescence indicates the presence of the coumarins.

Physiochemical Screening
- **Water soluble ash:** Water soluble ash that meaning the inorganic salts which are soluble in water.
- **Acid-insoluble ash:** It includes the inorganic salts which are not soluble in water along with 10% of hydrochloric acid.

Ash values determination [17-20]:
Total cash value determination
Pre-cleaned silica crucible was heated at 600°C till the weight of the crucible became constant. 10 gram of finely powdered material of each plant, separately was placed in the silica crucible and heated in a muffle furnace at 505°C until there was no evolution of smoke was observed. The crucible was cooled at room temperature in desiccators and ash was moistened with concentrated H_2 SO_4 (1 ml). Then crucible was set on a hot plate and heated until fumes of H_2SO_4 finished to evolve. The crucible with sulphated ash was then heated in a muffle furnace at 600°C till the weight of the content became constant.

Loss on drying determination
Accurately weighed 4 gm. amount of fine powder of each plant separately was placed in a tarred glass bottle and first weight was taken. The sample was heated at 105°C in an oven and weighed. This process was repeated till a constant weight was gained. The moisture content of the sample was calculated with reference to the dried weight of fine powdered of the plant sample. And the results are in table no. 3 [22].

Water Soluble Ash Determination
The total ash gained from 5g of fine powder of each plant separately was boiled for 5 minutes with 50 ml of water; the insoluble substance was collected on an ashless filter paper, washed with hot water and ignited for 15 min at a temperature not exceeding 450ºC. The weight of insoluble matter was subtracted from the weight of the ash, the difference in weight represents the water-soluble ash. The percentage of water-soluble ash was calculated with reference to the dried weight of fine powdered of the plant sample. The results were given in table no.3.

Acid Insoluble Ash Determination
The total ash obtained from 20g of dried fine powder of each plant separately was boiled for 5 minutes with 100 ml of dilute hydrochloric acid and the insoluble matter was collected on an ashless filter paper. It was washed with hot water, ignited and weighed. The percentage of acid insoluble ash was calculated with reference to the with reference to the dried weight of fine powdered of the plant sample.

Extractive values determination
Chloroform ($CHCl_3$) soluble extractive value Determination
Precisely weighed 10gm of fine powder of each plant separately was macerated with 200 ml of chloroform in a closed flask, shaking frequently during the first 6 hours and allowed to stand for 18 hours. Thereafter, it was filtered rapidly taking precaution against loss of Chloroform. Evaporated 50ml of filtrate to dryness in a tarred flat bottom shallow dish dried at 105°C and weighed. Percentage of chloroform soluble extractive was calculated with reference to the dried weight of fine powdered of the plant sample [21-22].

Petroleum ether (P.E.) (40-60 °C) soluble extractive value Determination
Precisely weighed 10 gm. of fine powder of each plant separately was macerated with 200 ml of Petroleum ether in a closed flask, shaking frequently during the first 6 hours and allowed to stand for 18 hours. Thereafter, it was filtered rapidly taking precaution against loss of Petroleum ether.

Evaporated 50ml of filtrate to dryness in a tarred flat bottom shallow dish dried at 105°C and weighed. Percentage of Petroleum ether soluble extractive was calculated with reference to the dried weight of fine powdered of the plant sample. The results of extractive values are given in table no. 3 [22].

A qualitative investigation of Inorganic matters

Preparation of the samples

For the preparation of samples concerning the investigation of minerals ingredients, the plant material was Burned at 505 ºC to a constant weight. Dried plant material was ground to fine powder and used for dry ashing. Pre-cleared silica crucible was heated at 600 ºf till the weight of the crucible became constant. 5-gram powdered plant material was placed in the silica crucible and heated in a muffle furnace at 505 ºC until there was no smoke was an observer. The crucible was cooled at room temperature in a desiccator and ash was moistened with concentrated H_2SO_4 (0.5 ml). Crucible was placed on a hot plate and heated until fumes of H_2SO_4 ceased to evolve. The crucible with sulphated ash was then heated in a muffle furnace at 505 ºC till the weight of the content became constant [22]. The Physico-chemical analysis includes a number of parameters such as physical state, colour, taste, the percentage of loss on drying as per standard method [23-29]. And ash content, ash value (water, alcohol and acid soluble or insoluble ash), pH value and conductivity, inorganic elements (Ca, P, Mn, Zn, Ni, Fe, K and Mg), the samples in triplicates of selected plants were analyzed [25-29].

Minerals determination

Iron: 5 ml of the test sample and a few drops KSCN reagent was taken. Formation of red colour indicates the presence of Iron.

- **Calcium:** 5 ml of the test sample and a few drops of Conc.H_2SO_4 was taken. White ppt. was formed. It was an indication of the presence of calcium.
- **Phosphorus:** 5 ml of test solution was taken and a few drops of Ammonium Moly date reagent was added. Formations of yellow colour indicate the presence of Phosphorus.
- **Potassium:** 5 ml of test solution was taken and a few drops of 15% $HClO_4$ soln. Formation of $KClO_4$ crystals indicates the presence of K.
- **Manganese:** 5 ml of test solution was taken and was added 10 ml of 1% KOH solution, then a few drops of Benzedrine reagent. Formation of blue colour showed the presence of Mn.
- **Sulphur:** 5 ml of test solution was taken and a few drops of $BaCl_2$ was added. Formations of white ppt. of $BaSO_4$ indicate the presence of Sulphur.
- **Potassium:** 5 ml of test solution was taken and a few drops of 15% $HClO_4$ soln. Formation of $KClO_4$ crystals indicates the presence of K.

Heavy Metals Determination

- **Zinc:** Dissolved 100 mg of the plant's powdered samples separately, in 10 ml of distilled water, and around 1ml of 10 M sodium hydroxide was additional. A white ppt. was formed which dissolved in 8 ml of 10 M sodium hydroxide solution. About 20 ml of 2 M ammonium chloride was added after that 0.5 ml of sodium sulphide solution. A flocculent, white ppt. was produced. It indicates the presence of zinc.
- **Mercury:** Dissolved 100 mg of the plant's powdered separately, 4 ml of distilled water, and about 1 ml of 2 M sodium hydroxide was added until the solution became strongly alkaline. No dense yellow ppt. was formed which indicate the absence of mercury.
- **Silver:** 100 mg the fine powdered of plant's samples separately in 10 ml of distilled water was added and then about 1 ml of 7 M hydrochloric acid was added. A curdy white ppt. was formed that is soluble in about 24-25 ml of 6 M ammonia. A few drops of a 10% W/V aq solution of potassium iodide were added. No yellow ppt. was developed. It indicates the absence of silver.
- **Cobalt:** Dissolved 100 mg of the fine powdered of plant's sample separately in about 3 ml of distilled water, and acidified with a few drops of dip hydrochloric acid. A few drops of a dilute solution of sodium hydroxide were added. No blue pit was formed which indicate the absent of cobalt.
- **Nickel:** 100 mg of the fine powdered of plant's samples separately was added in about 3 ml of water, acidified with a few drops of dilute hydrochloric acid, and the solution of sodium hydroxide was added drop by drop. No blue ppt. was formed which indicate the absence of nickel.

Antibacterial activity

Measurement of the bacterial effect of the different concentrations extracts (Aqueous and ethanolic, separately) of the leaves of the *Oxalis pes-caprae* and *Erodium glaucophyllum* against six types of bacterial strains, were One gram-positive bacteria *Staphylococcus aureus* and four gram-negative bacteria *Escherichia coli, Salmonella, Klebsiella* and *Pseudomonas aeruginosa* were used in the investigation. Antibiotic Discs (Clindamycin, DA2, Code 19047), (Tetracycline TE30 Code 19043), (Nalidixic acid, NA30, Code 19001) and (Gentamicin, CN10, Code19026).

Bacteria culture

Previous to sensitivity investigation, all of the bacteria strains were cultivated onto blood agar plate and incubated for 18 to 24 hours at 37oC. One colony was formerly cultured in 5 ml Mueller Hinton Broth for 4 hours at 37oC. The concentration of bacteria culture obligatory for the test was attuned to a 0.5 McFarland standard, (1.0 x 108 CFU/ml) measured using the Turbido-meter (Oxoid, UK).

Disc Diffusion Method

The disc diffusion method for antimicrobial susceptibility examination was assessed by the standard method [30], in evaluating the existing of antibacterial activities of the plant extracts. 0.5 McFarland standard of bacteria culture, was used to sward Muller Hinton agar plate's consistent manner by a sterile swab. Then plates were dried for 15-20 minutes consequent used for the sensitivity test. The discs which were impregnated with a set of plant extracts were placed on the Mueller-Hinton agar surface (40 µg). A negative control

(discs which were impregnated with different appropriate solvents, only), treated discs (which were impregnated with different appropriate extracts), and positive control, which is a standard commercial antibiotic disc, respectively, (30-40 µg discs of concentrations). The negative control was DMSO (100%). The plate was then incubated at 37°C for 20-24 hours rely on the species of bacteria used in the test. After the incubation, the inhibition zone was then measured and the results were recorded. The test was repeated three times.

Minimum inhibition concentration determination

Minimum Inhibition Concentrations (MIC's) was carried out by using Inhibitory Concentrations in Diffusion (ICD) method, it was performed by carrying out the diffusion test with the discs of different concentration of the plant extracts similar to the concentration used in the sensitivity tests against the five bacteria strains mention earlier [31]. The lowermost concentration that inhibits the growth of bacteria was noted and considered as the MIC value for all of the bacteria strain.

Results and discussion

Phytochemical screening

Quantitative phytochemical analysis of the extracts

Table 1: Results of pH values and per cent yields of chemical constituent:

Plants Name	Type of Extract	Percentage Yield (%)	Alkaloids (%)	Saponins (%)	Flavonoids (%)	pH Value
Oxalis pes-caprae	Aqueous	60.4	44	33	31	4
	Ethanolic	50	53	47	52	
Erodium glaucophyllum	Aqueous	78.2	40	37	48	4.82
	Ethanolic	38	36	32	46	

As shown in table 1 the results of pH values were 4 intended for *Oxalis pes-caprae* and 4.82 intended for *Erodium glaucophyllum*, though the per cent yields of a chemical constituent in the aqueous and ethanolic extracts of the plants were 60.4, 50, 78.2 and 38 % for *Oxalis pes-caprae* and *Erodium glaucophyllum*, respectively. While per cent's yields for alkaloids, saponins and flavonoids in the aqueous and ethanolic extracts were 44, 53, 33, 47, 31 and 52 %, individually for *Oxalis pes-caprae*, in addition, 40, 36, 37, 32, 48 and 46 % for *Erodium glaucophyllum*, correspondingly.

Qualitative phytochemical analysis of the extracts

Absence and presence of the chemical constituents in the extracts are specified via the appearance of colour which produced by the reaction of the composites with determined chemicals which acts as colourants.

Table 2: The phytochemical screening of crude plants extracts (Leaves)

Chemical Component	Tests	*Oxalis pes-caprae*		*Erodium glaucophyllum*	
		Aqueous extract	Ethanol extract	Aqueous extract	Ethanol extract
Alkaloids	Dragendroff's	+++	+++	++	++
Tannins and Phenols	Ferric chloride test	+++	+++	+++	+++
Flavonoids	Sodium Hydroxide test	+++	+++	++	++
Terpenes	Salkowski's test	+++	+++	++	++
Saponins	Frothing test (Emulsion)	++	++	++	++
	Foam's test	++	++	++	++
	Mercuric Chloride Test	++	++	++	++
steroids		++	++	++	++
Anthraquinones	Ammonia solution's test	-	-	-	-
Glycosides	Reducing sugar test	+++	+++	+++	+++
Coumarins	UV Lamp test	+	+	+	+

Table 2 showed the qualitative detection of active constituents in water and alcohol extracts (leaves) were alkaloids, tannins and phenols, flavonoids, glycosides, terpenes and glycosides present in height quantity of concentration in both extracts, although saponins, and steroids present in moderate concentration, whereas coumarins were present in low quantity of concentration, while anthraquinones not present in both extracts. The existence of a greater concentration of active constituents like flavonoids, phenolics, tannins and saponins possibly will be revealed to the antibacterial effectiveness. Also, it is important for chemical compounds to treat humans numerous researchers described that phenolic acid, flavonoids, sterols and terpenoids are perceived to endure bioactive antidiabetic systems [32].

Qualitative Examination of Inorganic Matters

Inorganic components are those which are free from carbon while organic constituents are secondary metabolite produces in the plants. Which meant the purpose of these constituents for medicinal aims are very significant. Studies of together Organic and Inorganic substances were carried out both qualitatively and quantitatively. It includes qualitative analyses of electrolytes, which are existing in the ash of the samples. Several elements played a very important rule in the growth and reproduction. These elements are obligatory in relatively great amounts are called as macronutrients, while nutrients necessary in minor quantities are called as micronutrients. All such these components are benefits active in various metabolic procedures. The diversity of organic

composites created via the plants includes these components in their chemical compositions. Consequently, their attendance may be perceived by the simple chemical investigation.

Physical Characteristics of Ash

Table 3: The Results of physical characteristics of ash:

Plant's Name	Colour	Odour	Ignition	Taste and texture
Oxalis pes-caprae	Dark grey	Distinctive aroma	Black smoke	Normal taste, soft texture
Erodium glaucophyllum	Gray	Distinctive aroma	Blackish White smoke	Normal taste, soft texture

Table 3 showed the physical characteristics of the studied plants, dark grey coloured, distinctive aroma odour, black smoke ignition and normal taste with soft texture.

Table 4: Results of pH and the solubility tests in different solvents:

Plant's Name	pH	Solubility test			
		Distilled Water	Ethyl Alcohol	H_2SO_4	NaOH
Oxalis pes-caprae	3.9	Partially	Partially	Partially	Partially
Erodium glaucophyllum	3	slightly	slightly	slightly	slightly

As revealed in table 4 the results of pH evaluations were 3.9 for *Oxalis pescaprea* and 3 for *Erodium glaucophyllum*. While the solubility tests in different solvents (Distilled Water, Ethyl Alcohol, sulphuric acid solution and sodium hydroxide solution) partially and slightly for both plants. The water-soluble ash is used to estimate the existence of material soluble in water. The acid insoluble ash, which means the ash insoluble in dilute HCl is frequently of abundant value than the total ash.

Table 5: Results of ash content, Conductivity, Total Dissolves substances (TDS), salinity and pH values:

Plant's Name	Ash Content (%)	Conductivity µs	TDS Mg/L	Salinity
Oxalis pes-caprae	84.5	1421	921	2.31
Erodium glaucophyllum	63.5	442	842	0.5

Table 5 presented the results of ash content were 84.5 and 63.5 %, Conductivity 1421 and 442 µS, TDS 921 and 842 Mg/L while the salinity 2.31 and 0.5 concerning the *Oxalis pes-caprae* and *Erodium glaucophyllum*, respectively.

Table 6: Results of the physical assessment of ash values:

Plants Names	Solubility (% W/W)					
	Total Ash Value	Acid Insoluble Ash	Water Soluble Ash	$CHCl_3$ soluble extractive value	P.E. soluble extractive value	Loss of Drying (% W/W)
Oxalis pes-caprae	84.5	4.2	3.6	2.6	9.6	2
Erodium glaucophyllum	63.5	5.1	3.9	2.8	8.3	3.4

The physicochemical evaluation of the medicine is a significant parameter, and as important also in the evaluation of crude medications, which means acid insoluble ash value determination and the ash value. While the total ash and extractive values are particularly important in the evaluation of the purity of medicines, and also are useful in the identification and confirmation of the plant material [33-34]. Table 6 presented the results of total ash values 84.5 and 63.5, acid insoluble ash 4.2 and 5.1, water-soluble ash 3.6 and 3.9, soluble in chloroform 2.6 and 2.8, soluble in petroleum ether soluble extractive value 9.6 and 8.3, while the losing on drying were 2 and 3.4 % (W/W) concerning the *Oxalis pes-caprae* and *Erodium glaucophyllum*, respectively. Ash values of medicine provide an impression of the inorganic conformation and other impurities existing in conjunction with the drug, where the extractive values are beneficial to estimate the chemical constituents of the crude drug [35-36]. The very low value of acid insoluble ash means the existence of the negligible amount of siliceous matter and the high total ash value specifies that existence of inorganic ingredients. Moreover, the moisture content of the crude drug is not high, therefore it could hinder microbe's growth. The water-soluble extractive values and high alcohol soluble make known the existence of a polar substance similar to tannins glycosides and phenols [37].

Table 7: The results of analysis of minerals content in plant samples:

Name of the plants	Minerals content					
	Calcium	Cobalt	Iron	Manganese	Phosphorus	Sulphur
Oxalis pes-caprae	+	++	+++	+	+++	++
Erodium glaucophyllum	✓	++	+++	+	+++	++

Table 7 presented the results of the minerals were iron and phosphorus exists in highest amounts, while each of cobalt and sulphur exists in moderates values, though each of calcium and manganese exists in low quantities. Certain minerals are generally known as macronutrients and are thought as useful for human health in different quantities, and own a number of physiological purposes in living organisms. Likewise, calcium is considering as an important element in development and growth of the plants, where they have together an effect on absorption, transference and choosing of ions from side to side the membrane; also, operated on the organization of chromosomes during mitotic processes [38]. Phosphorus and are the minerals existent in the main quantity in the building of the bones and body [39]. May possibly be responsible for facts on the natural and biological activities of the *Oxalis pes-caprae* and *Erodium glaucophyllum* leaves. Further, the analysis or estimation of such mineral elements could assistance in the finding of the bioactive nutritional elements that are also responsible for the beneficial and healing in accordance with using these plant's leaves. As well, in this research, presence of iron in highest level in leaves of both plants makes them relatively important concerning the presence of benefits as playing a meaningful role in human nutrition as micro-nutrients sources, in detail, deficiency of iron considered as an essential problem in production of red blood cells and hemoglobin which as a result leads to anemia. For that reason, these medicinal plants are rich in some essential minerals are vital for human health.

Table 8: Results of Heavy Metals Determinations:

Plant's Names	Heavy Metals				
	Cobalt	Mercury	Nickel	Zinc	Silver
Oxalis pes-caprae	+	+	-	+	+
Erodium glaucophyllum	-	+	-	+	+

Table 8 exhibited results of heavy metals presence of mercury, nickel, zinc and silver were exist in both plants, while cobalt exists in *Oxalis pes-caprae* and not exist in *Erodium glaucophyllum* as well for nickel was not exist at all. Cobalt, mercury, nickel, zinc and silver metals are recognized as heavy metals and have a risky effect on living organisms in known and determined quantities [40].

Antimicrobial Activity

Table 9: Results of antibacterial activity against *Oxalis pes-caprae* extracts

Bacterial strains	*Oxalis pes-caprae* Extracts (%)						Antibiotic			
	Aqueous			Ethanolic			DA2	TE30	NA30	CN10
	25	50	100	25	50	100				
Staphylococcus aureus	-	8	9	-	5	8	22	-	-	16
Escherichia coli	-	-	-	-	-	-	-	-	-	17
Salmonella	-	-	9	-	-	10	-	15	-	-
Klebsiella	-	-	6	7	7	9	-	-	-	10
Pseudomonas aeruginosa	-	-	-	-	-	-	-	-	10	-
Proteus vulgaris	-	-	8	-	-	-	-	15	-	-

Table 10: Results of antibacterial activity against *Erodium glaucophyllum* extracts:

Bacterial strains	*Erodium glaucophyllum* Extracts (%)						Antibiotic			
	Aqueous			Ethanolic			DA2	TE30	NA30	CN10
	25	50	100	25	50	100				
Staphylococcus aureus	-	-	10	-	-	11	22	-	24	-
Escherichia coli	-	-	9	-	-	7	-	-	-	14
Salmonella	-	-	7	-	-	7	-	-	-	15
Klebsiella	-	-	11	-	-	8	-	20	-	10
Pseudomonas aeruginosa	-	-	8	-	-	7	-	-	10	-
Proteus vulgaris	-	-	7	-	-	8	-	-	-	13

The results of potency against of *Oxalis pes-caprae* extracts against the bacterial strains as shown in table 9, where were the inhibition zones against the *Staphylococcus aureus* 8, 9 mm of 50, 100 % of the aqueous extract, and 5, 8 mm of 50 and 100 % of the ethanolic extract. And as showed in table 11 results of the potency of *Erodium glaucophyllum* extracts against the bacterial strains where were the inhibition zones in contradiction of the *Escherichia coli* were 9, 8 mm of 100 % of the aqueous and ethanolic extracts, and 7, 8 mm of 100 % of both extracts against *Proteus vulgaris*, while the *Pseudomonas aeruginosa* were 8, 7 mm of 100 % of both extracts, although the inhibition zones in contradiction of the *Salmonella* were 7 mm of 100 % of both extracts, though the inhibition zones in contradiction of the *Klebsiella* were 11 and 8 mm of 100 % of both extracts, respectively. On the other hand, there was a negative response of 25 % and almost of 50 % of both extracts against the bacterial strains while it was more effective with increasing of extracts concentrations, In general, there was a considerable response of 100 % extracts concentrations of both plants. And by means of the above

investigation and result that the selected leaves extracts were showing good antimicrobial activity, and principally of the concentrations 50 and 100 % aqueous and ethanol extract of both plants. Consequently, from these effects, it is possible to realize these plants are significant in nutrition, prevention, resistance and treatment of diseases. Thus, the leaves extract of *Oxalis pes-caprae* with both solvents own antimicrobial activity. And from these result, it may be traditionally that is why it was selected for treating from many diseases, because of its potential against microbes. For instance, it used in the treatment of infectious diseases caused by many microorganisms. Moreover, the presence of chemical ingredients like geraniin which separated from *Erodium glaucophyllum* was effective against some bacteria such as *Staphylococcus aureus* and *Escherichia coli* which is in contention with our results [41]. *Erodium glaucophyllum* is used to promote circulation in acute and chronic rheumatologic disorders and as de toxicant for enteritis and bacillary dysentery [42]. Additionally, the use of some plants of the family as a treatment of enteritis and bacillary dysentery and the existence of tannins in *Erodium glaucophyllum* is proved to possess antibacterial activity [43].

Conclusion

In conclusion, both of the studied plants are rich of secondary metabolites phytochemicals, minerals, and heavy metals which may reasons to have a potential as an antimicrobial activities and which can be used as positive agents for diseases treatments or could be used in cosmetically and pharmaceutical industries, or may use in a primary health care systems. Therefore, the identification and characterization of the active phytochemical compounds of the *Oxalis pes-caprae* and *Erodium glaucophyllum* plant different extracts and qualitative standardizations are necessary as well as safety issues and toxicity studies.

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Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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