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ANALYSIS OF SOME ESSENTIAL BLOOD NUTRIENTS AND PHYTOCHEMICAL SCREENING OF SOME MEDICINAL PLANTS IN YOLA, ADAMAWA STATE, NORTH-EASTERN NIGERIA

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ABSTRACT

The present study evaluated the phytochemicals, minerals, amino acids and vitamin compositions of *Boswellia dalzielii, Ficus platyphylla, Pterocarpus erinaceus, Ficus sycomorus* and *Justicia carnea*. The analysis of the plant samples were carried out using standard methods. Phytochemical analysis of the plant samples indicates that the plant species contain phytochemicals in varying amounts. Mineral analysis indicates higher concentrations of Ca (875.00 ppm) and Fe (492.42 ppm) in *Boswellia dalzielii,* K (750.0 ppm), in *Justicia carnea* and Mg (116.84 ppm) in *Pterocarpus erinaceus*. The amino acid content of each of the selected plants were below normal concentrations except for isoleucine, leucine, phynylalanine, total aromatic amino acid, arginine, aspartic acid, glutamic acid and proline from *Justicia carnea* and aspartic acid from *Ficus platyphylla* and *Pterocarpus erinaceus.* The result of vitamin C content of the plants under study were relatively appreciable when compared with the World Health Organization recommended intake with *Pterocarpus erinaceus* having the highest Vitamin C content of 69.25 mg/100 ml and *Ficus sycomorus*, with the least content of 22.91 mg/100 ml. The result of this study showed that the selected plant samples contained reasonable amount of nutritional values and phytochemical constituents which suggest the application of the plants in traditional medicine.

***Key words*:** Amino acid, medicinal plants, minerals, phytochemicals and vitamins

INTRODUCTION

Plants provide a variety of resources that contribute to the fundamental needs of both human being and animals such as food, clothing and shelter. Among plants of economic importance are medicinal plants. Plants have been utilized as therapeutic agents since time immemorial in both organized and unorganized forms [1]. The healing properties of many herbal medicines have been recognized in many ancient cultures [2].

According to the World Health Organization, a medicinal plant is any plant which, in one or more of its organs, contains substances that can be used for therapeutic purposes, or which are precursors for chemo-pharmaceutical semi-synthesis. Such a plant will have its parts including leaves, roots, rhizomes, stems, barks, flowers, fruits, grains or seeds, employed in the control or treatment of a disease condition and therefore contains chemical components that are medically active [3,4]. In recent years, there has been a significant increase in interest in botanical sources of natural pharmaceuticals, cosmetics, nutritional supplements, herbal teas, and other health-promoting items [5]. Throughout the world, medicinal plants have been confirmed to contain essential bioactive compounds that can help to prevent different types of diseases such as cancer, heart disease, and diabetes. Medicinal plants serve a critical role in oral health diseases such as bleeding gums, mouth ulcers, dental caries, gingivitis, and halitosis since they have maximal efficiency or fewer side effects [6,7].

Medicinal plants such as *Boswellia dalzielii, Ficus platyphylla, Pterocarpus erinaceus Ficus sycomorus* and *Justicia carnea* are continually utilized as therapeutic agents in formulations for treating diseases in the traditional ethno-medicinal system in Northern Nigeria. Previous studies on some medicinal plants (*Anchomanes difformis , Anisopus mannii, Pavetta crassipes, Stachytarpheta angustifolia* and *Vernonia blumeoides*) also revealed that medicinal plants hold tremendous promise in providing the variable secondary metabolites and mineral supply that could enhance the curative process of ill health [8].

This study was designed to evaluate the phytochemical, amino acids, vitamins and mineral compositions of *Boswellia dalzielii, Ficus platyphylla, Pterocarpus erinaceus Ficus sycomorus* and *Justicia carnea* commonly used in traditional medicine in North-eastern Nigeria, with a view to assessing their nutritional and therapeutic values in relation to their uses.

MATERIALS AND METHODS

Collection of Plants Material

Boswellia dalzielii, Ficus platyphylla and Pterocarpus erinaceus were collected from Yola South Local Government Area while *Ficus sycomorus* and *Justicia carnea* were collected from Yola North Local Government Area, all in Adamawa State, Nigeria. The plants were identified and authenticated at the Herbaria of the Department of Botany, Faculty of Science, Modibbo Adama University, Yola, and voucher specimens were deposited there for future references.

Plant Extraction

The plant samples collected were washed, air dried for seven days. The dried leaves were pounded into a homogenous powder using mortar and pestle. The plant materials were stored in specimen bottles for future use. About 10 g each of the dry plant materials were soaked in 120 ml of methanol at room temperature for two days. The extracts were filtered using a whatman filter paper No. 42 (125 mm), and then through cotton wool. The extracts were allowed to air dried, and were then stored in the refrigerator for further use [8].

Qualitative Phytochemical Analysis

Preliminary phytochemical analysis of the crude methanol extract of the plants samples were carried out to detect the secondary metabolites present in the plant by using the standard methods described by Silva et *al* [9].

Test for Saponins

Frothing test

The sample (0.4 g) was added to 10 ml of water in a test tube; the mixture was shaken vigorously for 5 min and observed for the presence of froth which persisted for more than 10 min without ceasing [9].

Test for Tannins

Lead acetate test

A solution of 1% lead acetate solution was added to 5 ml solution of the sample in a test tube, a cream colored precipitate indicates the presence of tannins [9].

Test for Flavonoids

Shinoda test

Exactly 0.2 g of the sample was dissolved in methanol. Few pieces of magnesium chips was added followed by few drops of concentrated hydrochloric acid, a pink, orange, or red to purple colouration indicates the presence of flavonoid [9].

Test for Anthraquinones

Bontrager's test

The sample (0.1 g) was dissolved in 5 ml chloroform, shaken and filtered. To the filtrate, an equal volume of 10% ammonia solution was added with continuous shaking, bright pink colour in the aqueous upper layer indicates the presence of anthraquinone [9].

Test for Alkaloids

Mayer's test

To 2 ml acidic solution of the sample in a test tube, 2-3 drops of Mayer's reagent were added, a cream precipitate indicates the presence of alkaloids [9].

Test for Cardiac Glycosides

Keller-Kiliani test

Exactly 0.2 g of the sample was dissolved in 1 ml glacial acetic acid containing traces of ferric chloride solution. The solution was then transferred into a dry test tube to which an equal volume of sulphuric acid was added, a brown ring obtained at the interface indicates the presence of a deoxy sugar characteristic of cardinolides. A violet ring may appear below the brown ring, while in the acetic acid layer a greenish ring may form just above the brown ring and gradually spread throughout [9].

Test for steroid

Lieberman's test

The sample (0.4 g) was extracted with chloroform in a test tube followed by filtration and 2 ml of acetic anhydride was added to the filtrate. About 2-3 drops of conc. H_2SO_4 were added along the sides of the test tubes cautiously and the appearance of blue coloration at the interface indicated the existence of steroids [9].

Test for Alkaloids

Mayer's test

Exactly 1 ml of the extract was measured into a watch glass and 2 ml each of dilute hydrochloric acid and Mayer's reagents were added to the solution; the formation of a white precipitate indicated the presence of alkaloids [9].

Quantitative Phytochemical Analysis

Estimation of alkaloids

Alkaloids were quantified by the method described by Agoreyo *et al* [10]. Five grams sample was weighed into beaker and 200 ml of 10% acetic acid in ethanol were added. The mixture was covered and allowed to stand for four hours. After that, the mixture was filtered and the filtrate was concentrated on water bath at 100 ºC, to one-quarter of the original volume. Concentrated ammonium hydroxide was added to the extract in the form of drops until precipitation completed. After settlement, the extract was filtered and the precipitate washed with dilute ammonium hydroxide and then dried and weighed.

Estimation of flavonoids

The method was described by Bharathidasan *et al.* [10]. About 100 ml of 80% aqueous methanol was used to extract ten grams of the sample. The mixture was filtered by using whatman filter paper No. 42 (125 mm). The filtrate was evaporated until dried, and then weighed until constant weight was achieved.

Estimation of saponins

The method was described by Gupta [12]. About 20 grams of plant sample was put into a conical flask and 100 ml of 20% ethanol was added. The solution was heated over water bath at 100 ºC for 4 hours with continuous stirring at 55 ºC. The solution was then filtered and the residue re-extracted with another 200 ml of 20% ethanol. The combined extracts were reduced to 40 ml over a water bath. The concentrate was transferred into a 250 ml separating funnel and 20 ml of diethyl ether was added to the extract and was vigorously shaken. The aqueous layer was recovered while the ether layer was discarded and the purification process was repeated. 60 ml of nbutanol was added, the combined extract was washed twice with 10 ml of 5% NaCl. The

remaining solution was heated in a water bath and after evaporation. The sample was dried in the oven at 105 ^{o}C to a constant weight.

Estimation of tannins

Exactly 100 ml of distilled water was added to two grams of the sample. The solution was kept in water bath at 90 ^{o}C for one hour. The mixture was filtered by using Whatman's paper No. 1 and the residue was re-extracted again. The two filtrates were collected together and allowed to cool. Distilled water was added to the filtrates up to 500 ml. One hundred ml of the solution transferred to a beaker, and then 10 ml of 40% formaldehyde and 5 ml of concentrated sulphuric acid were added respectively. The whole mixture was refluxed for 30 minutes and was left to cool. The mixture was filtered and the precipitate dried and weighed [11].

Estimation of Cardiac gylcosides

Cardiac glycoside content in the sample was evaluated using Buljet's reagent as described by Bharathidasan *et al* [11]. Exactly 1 g of the fine powder of the sample was soaked in 10 ml of 70% alcohol for 2hr and then filtered. The extract obtained was then purified using lead acetate and Na_2HPO_4 solution before the addition of freshly prepared Buljet's reagent (containing 95 ml aqueous picric acid + 5 ml 10% aqueous NaOH). The difference between the intensity of colours of the experimental and blank (distilled water and Buljet's reagent) samples gives the absorbance and is proportional to the concentration of the glycosides.

Determination of Mineral Composition

The major elements comprising calcium, magnesium, potassium iron and manganese were determined according to the method of Maria *et al*. with slight modification [13]. The ground samples were sieved with a 2 mm rubber sieve and 2 g of each of the plant samples were subjected to dry ashing in a well-cleaned porcelain crucible at 550 °C in a muffle furnace. The resultant ash was dissolved in 5 ml of HNO_3 /H_2O_2 (1:1) and heated gently on hot plate until brown fumes disappeared. To the remaining material in each crucible, 5 ml of deionized water was added and heated until a colourless solution was obtained. The mineral solution in each crucible was transferred into a 100 ml volumetric flask by filtration through a whatman filter paper and the volume was made to mark with deionized water. This solution was used for elemental analysis by atomic absorption spectrophotometer (perkin–elmer 3100 model, USA).

Determination of Amino Acid Compositions

The samples were dried to constant weight, defatted, hydrolyzed and evaporated in a rotary evaporator after PTH amino acid analyzer was used to determine the amino acid present in each sample [13]. The mixture of chloroform/methanol (2:1) was used to de-fat the samples after weighing the sample into an extraction thimble. The extraction was carried out for 15 hours in soxhlet extraction apparatus [13].

Method of calculating Amino Acid Values

An integrator attached to the analyzer calculates the peak area proportional to the concentration of each of the amino acids.

Determination of Vitamin C

The methods described by Olotu *et al* [14] were used. Sample solution (25 ml) was measured and poured into 125 ml Erlenmeyer flask and 10 drops of 1% starch solution was added and mixed with it. A burette was rinsed with a small volume of iodine solution and then filled with an iodine solution. The initial volume of the iodine solution was noted. The iodine solution was then titrated against the standard Vitamin C solution until a blue color that persisted for 20 seconds of swirling was observed. The final volume of the iodine solution in the burette was recorded and subtracted from the initial volume to determine the volume of the iodine used. The procedure was repeated two more times and the average was determined to find the amount of Vitamin C present in the different samples of the fresh vegetables using the equation:

$$Mg\ (Vitamin\ C) = M\ (Iodine\ solution) \times ml\ (Iodine\ solution) \times 176.12\ g/mole$$

Where Mg is the concentration of Vitamin C, M is the concentration of iodine solution; ml is the volume of iodine solution used and 176.12 g/mole is the molar mass of Vitamin C.

Statistical analysis

Data were analysed using the descriptive statistical analyses where means and standard deviation (SD) were obtained using Microsoft Excel 2013 version. Results were expressed as mean ± SD.

RESULTS AND DICUSSION

The result of qualitative phytochemical analysis are shown in Table 1

Table 1: Qualitative phytochemical analysis of selected plant samples

Phytochemicals	*Boswellia dalzielii*	*Ficus platyphylla*	*Pterocarpus erinaceus*	*Ficus sycomorus*	*Justicia carnea*
Flavonoids	+	+	+	+	+
Alkaloids	+	+	+	+	+
Tannins	+	+	+	+	+
Steroids	+	+	+	+	+
Saponins	+	+	+	+	+
Glycosides	+	+	+	+	+
Anthraquinones	-	-	+	-	-

+= positive; - = negative

The result of quatitative phytochemical analysis are shown in Table 2

Table 2: Quatitative phytochemical analysis of selected plant samples

Phytochemicals	*Boswellia dalzielii*	*Ficus platyphylla*	*Pterocarpus erinaceus*	*Ficus sycomorus*	*Justicia carnea*
Flavonoids	4.33±0.20	0.55±0.00	0.48±0.01	4.23±0.00	0.48±0.01
Alkaloids	4.54±0.03	4.77±0.00	`ND	6.22±0.34	2.33±0.30
Tannins	0.89±0.01	0.37±0.01	0.55±0.01	6.55±0.44	0.55±0.01
Steroids	0.65±0.02	4.66±0.01	2.65±0.02	4.12±0.02	2.65±0.02
Saponins	1.08±0.05	7.16±0.02	2.33±0.30	2.33±0.22	ND
Glycosides	1.98±0.03	1.86±0.01	1.58±0.05	3.45±0.23	1.58±0.05
Anthraquinones	ND	ND	1.52±0.03	ND	ND

ND = Not detected

The results of elemental analysis are shown in Table 3

Table 3: Elemental analysis of selected plant samples

Mineral (PPM)	*Boswellia dalzielii*	*Ficus platyphylla*	*Pterocarpus erinaceus*	*Ficus sycomorus*	*Justicia carnea*
Ca	875.00	106.5	125.00	281.25	218.75
Mg	20.619	73.883	116.84	20.619	67.010
K	375.0	500.0	250.0	375.0	750.0
Fe	492.42	454.55	265.15	151.52	189.39
Mn	N.D	N.D	N.D	N.D	N.D

ND = Not detected

The results of essential amino acids concentrates are shown in Table 4

Table 4: Essential amino acid concentrates in selected plant samples

AMINO ACID	*Boswellia dalzielii*	*Ficus platyphylla*	*Pterocarpus erinaceus*	*Ficus sycomorus*	*Justicia carnea*
Leucine	0.61	0.68	0.79	0.41	5.08
Lysine	0.34	0.34	0.32	0.37	1.25
Isoleucine	0.20	0.34	0.32	0.20	2.10
Phenylalanine	0.18	0.67	0.66	0.12	2.13
Valine	0.35	0.72	0.88	0.44	0.70
Methionine	0.16	0.13	0.14	0.08	0.32
Tyrosine	0.34	0.65	0.35	0.52	1.38
Threonine	0.28	0.78	0.84	0.14	0.44
Cystein	0.06	0.76	0.64	0.06	0.18
Total Sulphur amino acid	0.22	0.47	0.48	0.14	0.50
Total Aromatic amino acid	0.52	1.32	1.01	0.64	3.51

The results of non-essential amino acids concentrations are shown in Table 5

Table 5: Non-essential amino acids concentrations in selected plant samples

AMINO ACID	*Boswellia dalzielii*	*Ficus platyphylla*	*Pterocarpus erinaceus*	*Ficus sycomorus*	*Justicia carnea*
Leucine	0.61	0.68	0.79	0.41	5.08
Lysine	0.34	0.34	0.32	0.37	1.25
Isoleucine	0.20	0.34	0.32	0.20	2.10
Phenylalanine	0.18	0.67	0.66	0.12	2.13
Valine	0.35	0.72	0.88	0.44	0.70
Methionine	0.16	0.13	0.14	0.08	0.32
Tyrosine	0.34	0.65	0.35	0.52	1.38
Threonine	0.28	0.78	0.84	0.14	0.44
Cystein	0.06	0.76	0.64	0.06	0.18
Total Sulphur amino acid	0.22	0.47	0.48	0.14	0.50
Total Aromatic amino acid	0.52	1.32	1.01	0.64	3.51

The results of ascorbic acid concentrations are shown in Table 6

Table 6: Ascorbic acid concentrations in selected plant samples

Sample	**Amount of Vitamin C (mg/100 ml)**
Boswellia dalzielii	33.18
Ficus platyphylla	33.44
Pterocarpus erinaceus	69.25
Ficus sycomorus	22.91
Justicia carnea	35.55

Qualitative phytochemical constituents of the plants studied were investigated for the following metabolites: alkaloid, anthraquinone, flavonoid, saponin, tannin, steroids and glycoside. Qualitative screening indicated the presence of all the phytochemical constituents with the exception of anthraquinones in *Boswellia dalzielii, Ficus platyphylla, Ficus sycomorus and Justicia carnea while saponins was absent in Justicia carnea* (Table 1). Quantitative analysis of the pharmacologically important phytochemicals in the plants indicated that all the species contain these phytochemicals in varying amounts in the plants. The phytochemical with the highest quantity was alkaloids, followed by flavonoids, tannins, and saponins as shown in Table 2.

Alkaloids are very important in medicine and constitute most of the valuable drugs. They have marked physiological effect on animals [15]. The concentrations of alkaloids in *Ficus sycomorus* (6.22±0.34 g/100g), *Ficus platyphylla* (4.77±0.00 g/100g), *Boswellia dalzielii* (4.54±0.03 g/100g), and *Justicia carnea* (2.33±0.30 g/100g) indicate potential source of useful drugs. Alkaloids have a wide range of pharmacological properties including antimalarial, antiasthma, anticancer properties as reported by [16]. They are used in medicine especially the steroidal alkaloids and also show considerable pharmacological activity [17]. It was also reported to have cholinomimetic, vasodilatory, antiarrhythmic, antihyperglycemic activities, analgesic and antibacterial properties [18, 19]. Though they can be toxic too [20].

Flavonoid was present in all the plants materials, but appreciable quantity was only seen in *Boswellia dalzielii* (4.33±0.20 g/100g) *and Ficus sycomorus* (4.23±0.00 g/100g). The abundance of flavonoids which are hydroxylated phenolics substances might be responsible for their therapeutic effectiveness against wide array of microorganisms, probably due to their ability to complex with extracellular and soluble proteins and to complex with the bacterial cell wall [21]. Flavonoids and other phenolic compounds are potent water soluble antioxidants and free radical scavengers, which prevent oxidative cell damage, have strong anti-cancer activity [22, 23].

Saponin concentration was appreciable in *Ficus platyphylla* (7.16±0.02 g/100g), *Pterocarpus erinaceus* (2.33±0.30 g/100g), and *Ficus sycomorus* (2.33±0.22 g/100g). It has the property of binding with cholesterol, bitterness and hemolytic activity in aqueous solution [24]. These might contribute to some medicinal properties of the plants.

Tannins, steroids and glycoside were also observed interchangeably in appreciable amount as shown in table 2 while free anthraquinone were absent in all the selected plants. These compounds have been shown to be active against potentially significant pathogens including those that are responsible for enteric infections [8].

All the selected plants used in this study contained appreciable amount of minerals in mg/100g of dry weight. In this study, nutritionally valuable minerals analysis show that the plants are rich sources of Ca, Fe, K and Mg, with *Boswellia dalzielii* having the highest concentration of Ca (875.00 ppm), *and* Fe (492.42 ppm), *Justicia carnea* having the highest concentration of K (750.0 ppm), and *Pterocarpus erinaceus* having the highest concentration of Mg (116.84 ppm) as show on table 3. The values obtained for all the plants were higher than the ones reported from other plants species by Oluyemi *et al.*, [25] in parts per million (ppm) except for Mn which was not detected. The differences in the composition of minerals in the plants may be due to the differences in the locality of their growth. These mineral elements are very important in human nutrition. Calcium, potassium and magnesium are required for repair of worn out cells, strong bones and teeth in humans, building of red blood cells and for body mechanisms. Minerals are required also required for normal growth, activities of muscles and skeletal development, cellular activity and oxygen transport (copper and iron), chemical reaction in the body and intestinal absorption (magnesium), fluid balance and nerve transmission (sodium and potassium). Iron is useful in prevention of anemia and other related diseases [26]. Deficiency of these nutrients and minerals are known to affect the performance and health in both humans and livestock's [27]. Iron is required in mammalian nutrition to prevent anemia, and is part of hemoglobin and myoglobulin molecules involved in oxygen transport to and within cells. Zinc forms metalloproteinase and enzymes complexes which cannot be dissociated without loss of activity. Calcium is an important constituent of body fluids and bone formation in conjunction with phosphorus. Magnesium is an activator in enzyme systems which maintain electrical potential in nerves, while potassium influences osmotic pressure and contributes to normal pH equilibrium. Nutrients rich foods are vital for proper growth both in adults and children. Since most of the selected medicinal plants are usually eaten in combination with other dietary nutrients rich foods are vital for proper growth both in adults and children. Since most of the selected medicinal plants are usually eaten in combination with other dietary components, some of which may be better sources of the minerals under consideration.

The appreciable concentrations of minerals such as potassium, iron, calcium and magnesium obtained in the plants are interesting. It showed that the plants hold tremendous promise in providing the variable secondary metabolites and mineral supply that could enhance the curative process of ill health.

The amino acid content of each of the five plants viz *Boswellia dalzielii*, *Ficus platyphylla*, *Pterocarpus erinaceus*, *Ficus sycomorus* and *Justicia carnea* are summarized in table 4 and 5. Nineteen amino acids were detected and the separation of these amino acids in the sample is reasonably resolved. All the essential amino acids and non-essential amino acids were found to be present in the five plants. Protein biological and nutritive value of plants is dependent upon its constituent amino acids and its tendency to meet the nitrogen and essential amino acids requirements. Aside isoleucine, leucine, phynylalanine, total aromatic amino acid, arginine, aspartic acid, glutamic acid and proline from *Justicia carnea and* aspartic acid from *Ficus platyphylla* and *Pterocarpus erinaceus* the concentrations of other amino acids (both essential and non-esssential amino acids) detected in the plants are below normal. Leucine is a branched chain amino acid that critically enhances protein synthesis in the body. it assists in muscle and worn out tissue repair in the body. Leucine works closely with insulin to regulate the blood sugar levels stimulates wound healing [28]. The recommended daily allowance of leucine is 42 mg per day [28]. Phenylalanine is the precursor of some hormones and the pigment melanin in hair, eyes and tanned skin [29], while Aspartic acid is needed in the body to generate adenosine triphosphate (ATP), the fuel that powers all cellular activity [28]. Glutamic acid and glycine participate in the synthesis of glutathione increasing the antioxidant capacity of the plant [30]. Aside the structural functions, amino acids are the main precursors for the manufacture of many important substances in the body of living organisms and could also serve as valuable sources of energy especially in the absence of carbohydrate and fats in the body [31]. Ascorbic acid (Vitamin C) can exist in food either in the reduced form or in the oxidized form as dehydroascorbic acid. It is known to play essential physiological roles in the human body and it is therefore important to determine its concentrations in plant which are a major source of this vitamin for humans. The Vitamin C content of the plants under study were analyzed and were found to be relatively appreciable when the values were compared with the World Health Organisation recommended intake [32], with *Pterocarpus erinaceus* having the highest Vitamin C content of 69.25 mg/100 ml and *Boswellia dalzielii*, with the least of 22.91 mg/100 ml. The

Vitamin C contents of these medicinal plants could be responsible for the reason for the poly-folklore uses. The body requires Vitamin C for normal physiological and biochemical functions. Vitamin C helps the body in the synthesis and metabolism of aromatic amino acids such as tyrosine, folic acid and tryptophan, hydroxylation of glycine, proline, lysine, carnitine and catecholamine [32]. Thus reduces the accumulation of excess acids in the stomach and could be responsible for the use of these plants as preventive and treatment of constipation, colic pain, ulcer, gastritis, flatulence, indigestion, diarrhoea and dysentery. Vitamin C increases the absorption of iron in the gut by reducing ferric to a ferrous state of iron [14], and could be the reason for the use of these plants in the management of anemia and weak patients. As an antioxidant, Vitamin C protects the body from various deleterious effects of free radicals, pollutants and toxins [31]. and should be the reason why the plants were used for the prevention and treatment of common cold, cancer, inflammation, diabetes, atherosclerosis, catarrh, stroke, heart diseases, macular degeneration and infections.

CONCLUSION

The aim of this study is to analyze some essential blood nutrients and phytochemical screening of some medicinal plants in Yola**.** All the plant species used in this study have been discovered to possess medicinal and nutritive potentials. These findings provide quantitative estimation of the phytochemicals, minerals, amino acid and vitamin C concentrations which are important in understanding the nutritional and pharmacological actions of medicinal plants. Further work on extraction and purification of active constituents should be of interest.

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Conflict of Interest

The authors declare no conflict of interest.

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