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Pharmacognostic Potentials of Dried Powdered Seeds of Traditional Medicinal Plant *Usteria guineensis* used for the Treatment of Typhoid Fever in Sierra Leone

Lahai Koroma[1,2*], L. M. Kamara[2], Ronnie Frazer-Williams[2], Augustine Kpaka[1] and Jonathan Kpaka[1]

[1]*Department of Chemistry, Eastern Technical University of Sierra Leone, Kenema, Sierra Leone.*

[2]*Department of Chemistry, Fourah Bay College, University of Sierra Leone, Freetown, Sierra Leone.*

***Correspondence:**
Lahai Koroma, Department of Chemistry, Eastern Technical University of Sierra Leone, Kenema, Sierra Leone.

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ABSTRACT

Pharmacognostic potentials and mineral analysis was carried out on the of dried powdered seeds of traditional medicinal plant Usteria guineensis used for the treatment of Typhoid fever in Sierra Leone. The results indicate the colour of the dried powdered seeds of the plant to be light yellow with fruit odour and had a bitter taste indicating that the powdered plant material contains alkaloids. The following reagents 1M NaOH (aq), 1M NaOH (alc.), Ammonia, 50% HCl, and 50% HNO_3 exhibited fluorescent activities when added to portions of the dried powdered seeds of U. guineensis and viewed under UV Lamp. The plant organ investigated contained high contents of carbohydrates, alkaloids, flavonoids, proteins sterols/terpenes and tannins, saponins in the Ethanolic, methanol and aqueous extract during phytochemical screening. The detection of the above secondary plant metabolites supports the use of the plant in traditional medicine. Elemental analysis of the dried powdered seeds of U. guineensis using Niton XL3t GOLDD + Hand held X-ray Fluorescence (Thermo Fisher). The spectrum acquisition time was 480sec for the sample and the dead time was around 50% a total of fifteen elements (K, Ca, Mg, Al, Ti, V, Mn, Fe, Cu, Zn, Rb, Sr, Zr, Mo, and Sc) were determined in the dried powdered seeds of Usteria guineensis plant by using EDXRF.

The results indicate that the plant organ investigated contained K (29458 ± 163 ppm), Ca (3702 ± 54.00 ppm), Mg (5528 ± 1223 ppm), Al (1389 ± 168 ppm) and Fe (167.11 ± 9.20 ppm). The other elements present in smaller quantities were Ti (64 ± 12.00 ppm), Sr (4.74 ± 0.40 ppm), Zn (56.65 ±2.46 ppm), Rb (47.34 ± 1.00 ppm), Zr (20.73 ± 0.67 ppm), and Mo (6.94 ± 0.74 ppm). The elements Sc, Mn, Cu and V were out of limit of detection of the equipment. The above elements detected are essential components of biological structures that mediate vital effect on and play a key role in a variety of the biochemical processes necessary for life.

Keywords

Usteria guineensis, typhoid fever, pharmacognostic, mineral analysis, organoleptic evaluation, phytochemical screening.

Introduction

This research work was geared towards the pharmacognostic investigation of dried powdered seeds of traditional medicinal plant *Usteria guineensis* used for the treatment of Typhoid fever in Sierra Leone. The plant occurs in West Africa stretching from Senegal East to the Central African Republic and south to Angola [1]. It occurs in secondary forest and thickets, in open localities in rainforest and in tree savanna from sea-level up to1200m altitude [2]. The Plant is reported to be a climbing Shrub 3-12 m tall, branchlets glabrous. Leaves ovate, entire, coriaceous, glabrous, penninerved; lower 3–4 in. long; petiole short; stipule reduced to a mere line. Cymes arranged in copious simple broad axillary and terminal panicles; pedicels short; bracts ovate, minute. Produced lobe of calyx linear-oblong, 1/6– 1/4 in. long [3].

Botanical name: *Usteria guineensis* Willd.

Classification

Kingdom: Plantae
Phylum: Magnoliophyta
Class: Angiospermatophyta
Category: Lamiids
Order: Gentianales
Family: Loganiaceae
Genus: *Usteria*
Species: *guineensis*

Local vernacular names in Sierra Leone

Mende: NGOLO-Kpa, (DOMI)
Kissi: DODO

Figure 1: Photo of *Usteria guineensis.*

The hot decoction of dried powdered seeds of traditional medicinal plant *Usteria guineensis* is used for the treatment of Typhoid fever and stomach ache in Sierra Leone [1,4].

Hot decoctions of the fruits or roots are taken to treat coughs, common cold, and malaria. In Togo, a root decoction is taken to treat gonorrhea, Sap of warmed stems is used as ear drops to treat earache In Senegal a twig decoction is taken or used as a bath to treat fever in children [1,4].

It has been reported in Liberia that the Dan people use the leaves as an ingredient of arrow poison [1, 4]. In Benin the fruits are used as an ingredient of arrow poison [1,4]. The plant is harvested from the wild for local medicinal use and as a source of tying material. It has been reported that the leaves, roots, twigs and fruits of *Usteria guineensis* are collected and traded locally [5,6].

As part of the Pharmacognostic investigation, this research work will also determine the elements/minerals present in the dried powdered seeds of traditional medicinal plant *Usteria guineensis* and their role in biochemical processes necessary for life.

The medicinal value of plants lies in some chemical substances that produce a definite physiological action on the human body. The most important of these bioactive compounds are alkaloids, flavonoids, tannins and phenolic compounds [7-10].

Collection and Preparation of Dried Plant Materials

Fresh seeds were obtained from the fruits of *Usteria guineensis* were harvested from the Gola Forest and sun-dried for 7-8 days. After drying, the seeds were then reduced in size by crushing it into smaller pieces using a cutlass, grounded using a laboratory mill and kept in a proper container until the time of the extraction. The image of *Usteria guineensis* plant is shown in Figure 1.

A voucher specimen No. 408 of *Usteria guineensis* was deposited in the Herbarium of the Botany Department, Fourah Bay College (University of Sierra Leone). The powdered plant material was used to carry out the following analyses below:
Organoleptic evaluation
Fluorescence analysis
Phytochemical screening
Mineral analysis

Experimental

Organoleptic characters

Organoleptic evaluation was carried out by means of sense organs, which provide the simplest as well as quickest means to establish the identity and purity to ensure quality of a particular drug. Organoleptic characters investigated [10] are size, colour, odour, taste and texture of the dried powdered seeds of *Usteria guineensis*.

The results are shown in Table 1 and the image of the dried powdered seeds of *Usteria guineensis* shown in Figure 2.

Fluorescence analysis

5 mg of powdered dried seeds of *Usteria guineensis* was placed in a petri dish and 2-3 drops freshly prepared reagent solution was added, mixed by gentle with a glass rod and waited for few minutes. The freshly prepared reagents used are;

1.0M NaOH (aq), 1.0M NaOH (alc.), Ammonia, Picric acid, Petroleum ether, 1.0M HCl, 1.0M H_2SO_4, 1.0M HNO_3, Ethyl acetate, Ethanol, Methanol, and Bromine water.

The colours of contents in each of the Petri dish were observed in visible light, short (254 nm) and long (365 nm) ultra violet radiations using a U/V Lamp. A piece of white paper was dipped in each of the solutions and viewed using both visible light and under the U/V Lamp to compare the colours obtained. The colours observed by application of different reagents in different radiations are recorded [11,12] as shown in Table 2.

Phytochemical analysis

Soxhlet extraction was carried out on the dried powdered seeds of *Usteria guineensis* using solvents of increasing polarity (i.e. Petroleum ether [60-80°C], Acetone, Chloroform Methanol, 95% Ethanol and Water. Each of the solvent extracts was concentrated, reduced to a semisolid mass using a Rotary Evaporator at 50°C and kept is special containers for phytochemical screening and mineral analysis.

The Phytochemical screening involved testing each of the Solvent Extracts for the various classes of secondary plant metabolites.

The methods used for detection of various phytochemicals were followed by qualitative chemical test and by standard procedures [13-15] to give general idea regarding the nature of constituents present in each of the solvent extracts of the plant part investigated [16-22]. They are generally tested for the presence of secondary plant metabolites such as Carbohydrates, reducing sugar, starch, saponins, proteins, Sterols/triterpenes, tannins, alkaloids and flavonoids.

Test for Carbohydrates, reducing sugar and starch.

500 mg of each of the **Solvent Extract** was dissolved in 50 ml distilled water and filtered. The filtrates were subjected to the following tests to detect the presence of carbohydrates, reducing sugar and starch.

Teat for Carbohydrates

The **Molisch's test** was used to test for carbohydrates

During the test 5 ml of each of the extract filtrate was treated with 3 drops of alcoholic α-naphthol solution in a test tube and 3 ml of concentrated tetraoxosulphate (VI) acid added carefully down the sides of the test tubes. The formations of violet/purple ring at the junction between the two liquids indicate the presence of carbohydrates.

Test for reducing sugars

The Fehling reagent was used to test for reducing sugar. During the experimental work 5ml of each of the extract filtrate was treated in equal volumes with 2ml Fehling A and 2ml Fehling B solutions, boiled for one minute and then boiled for 5-10 minutes on water bath. The formation of reddish-brown precipitate due to formation of cuprous oxide indicates the presence of reducing sugar.

Iodine Test

2-3 drops of iodine solution were added to 5 ml of each of the extract filtrates and observed. The formation blue-black colour indicates the presence of starch.

Test for Saponin

Froth test: - Each of the Extract filtrate was treated with water in a tube shaken vigorously. The appearances of a persistent froth on the top of the extract filtrates indicate the presence of saponins.

Test for Proteins

The Biuret test is the general test used to detect the presence of proteins. During the test 5 ml each of the Extract filtrate was treated with 2 ml 10% sodium hydroxide solution and heated. 3-5 drops of 0.7% copper (II) tetraoxosulphate (VI) solution was added to the mixture, stirred and allowed to stand for few minutes. The formation of purplish violet colour may indicate the presence of proteins.

Test for Sterols and Triterpeniods

Liebermann-Burchard test

During the test each of the Extract filtrate was treated with 5-6 drops of acetic anhydride and boiled for few minutes. The mixture was cooled and concentrated tetraoxosulphate (VI) acid added down the side of the test tubes. A brown ring at the junction of two layers with the upper layer turning green indicates the presence of sterols while formation of deep red colour indicates the presence of Triterpeniods.

Salkwoski's test

During the test each of the Extract filtrate was treated with 3 ml of chloroform and few drops of concentrated tetraoxosulphate (VI) acid, shaken well and allowed to stand for some time. The appearance of red colour in the lower layer indicates the presence of sterols while formation of yellow coloured lower layer indicates the presence of Triterpeniods.

Tests for tannins

Ferric chloride test

5 ml of each of the Extract filtrate was shaken with water and warmed. 2 ml of 5% Iron III chloride solution was added and observed. The formation of green or blue colour indicates the presence of tannins

Gelatin test

3ml of 1% gelatin solution containing 10% sodium chloride was added to each of the Extract filtrate. The formation of white buff coloured precipitate indicates the presence of tannins

Test for alkaloids

50mls of distilled water was added to 500 mg of each of the Solvent Extracts stirred with about 5 ml of dilute hydrochloric acid separately and filtered. Each of the Extract filtrate was tested with the following reagents:

Dragendroff's test

Few drops of Dragendroff's reagent were added to each Extract filtrate and observed. The formation of orange yellow precipitate indicates the presence of alkaloids.

Mayer's test

Few drops of Mayer's reagent were added to each Extract filtrate and observed. The formation of white or cream colour precipitate indicates the presence of alkaloids.

Tests for flavonoids

20 mls of distilled water was added to 50 mg of each of the Solvent Extracts stirred and filtered. Each of the Extract filtrate was tested with the following reagents:

Shinoda's test

5ml. 95% ethanol was added separately to each of the Extract filtrate. Each mixture was treated with 0.5g magnesium turnings and few drops of conc. HCl. The formation of pink colour indicates the presence of Flavonoids.

Alkaline reagent test

Lead acetate solution was added a small quantity of each of the Extract filtrate and observed. The formation of yellow precipitates after few minutes indicates the presence of Flavonoids.

Results are shown in Table 3.

Mineral Analysis

Sample preparation

Sample was thoroughly washed with pure water and rinsed with double distilled water in order to remove the sand or dust particles and all other surface contamination. The plant sample was then air dried, grounded and homogenized in an agate mortar and sieve through a 250µm diameter sieve. A quantity of 3.0g mass of the powdered sample was weighed with an analytical balance and placed in a sample cup holder.

Sample analysis

Elemental analysis of the sample was performed with a Niton XL3t GOLDD + Hand held X-ray Fluorescence (Thermo Fisher). The Niton Hand held XRF Instrument uses a Ag-anode X-ray tube with a voltage of 50kV and equipped with a Si-drift detector (SDD). Accurate energy and efficiency calibrations of the spectrometer were made using a certified reference material – SRM 1573a – Tomato Leaves supplied by the International Energy Agency (IAEA), Vienna, Austria. The spectrum acquisition time was 480sec for the sample and the dead time was around 50%.

X-Ray Fluorescence has long been recognized as a powerful technique for the qualitative and quantitative elemental analysis. It has the advantage of being non-destructive, multi-elemental, fast and cost-effective. Furthermore, it offers a fairly uniform detection limit across a large portion of the Periodic Table and is applicable to a wide range of concentrations.

In this study, a total of fifteen elements (K, Ca, Mg, Al, Ti, V, Mn, Fe, Cu, Zn, Rb, Sr, Zr, Mo, and Sc) were determined in the dried powdered seeds of *Usteria guineensis* plant by using EDXRF. The mean concentrations of various metals in the plant sample are shown in Table 4.

Figure 2: EDXRF used for elemental analysis of powdered plant sample.

EDXRF technique is well suited for multi - elemental determinations in plant samples. The samples do not need any chemical treatment and any possible contamination is therefore avoided.

XRF is one of the sensitive, rapid and simple analytical techniques to study the essential element content of medicinal plants [22,23]. Many trace elements play significant roles in various physiological and biochemical events. Excessive levels of these elements in medicinal plants could lead to toxicity. Food and Nutrition Board recommends calcium intake as 1000 mg/day whereas the recommended daily intake of sodium and potassium are 1500 mg/day and 2300 - 3200 mg/day, respectively [24].

Results And Discussions

Organoleptic evaluation

The results of organoleptic evaluation of the dried powdered seeds of *Usteria guineensis* are reported in Table1 below with the photo of the dried powdered seeds shown in Figure 2.

Table 1: Results of organoleptic evaluation on the dried powdered seeds of *Usteria guineensis.*

Plant Organ Investigated	Property Tested				
	Colour	Odour	Taste	Texture	Particle Size
Seeds	Light yellow	Fruit odour	Bitter	Powdered	100 # wire gauge

The bitter taste indicates that the powdered plant material contain alkaloids. The colour of the powdered plant material shown in Figure 3 will also help who so ever wish to buy and use dried powdered seeds of *Usteria guineensis* for medicinal purpose. It helps prevent adulteration.

Figure 3: Photo of dried powdered seeds of Usteria guineensis.

Fluorescence analysis

The results of fluorescence studies carried out on the dried powdered seeds of *Usteria guineensis* using different chemical reagents are reported in the Table 2 below.

Table 2: Results of fluorescence analysis carried out on the dried powdered seeds of *Usteria guineensis.*

Test	Powdered plant material	Visible/day light	Ultra violet light
1	Powder	White	White
2	Powder + 1M NaOH(aq)	White	Light orange
3	Powder + 1M NaOH(alc)	White	Bright orange
4	Powder + Ammonia	Cream white	Bright orange
5	Powder + Picric acid	Light yellow	Yellow
6	Powder + Petroleum ether	White	Black
7	Powder + 50% HCl	White	Light blue
8	Powder + 50% H_2SO_4	White	dark green
9	Powder + 50% HNO_3	White	Cream white
10	Powder + ethyl acetate	White	White
11	Powder + Ethanol	White	Black
12	Powder + Methanol	White	Black
13	Powder + Br_2 water	Orange	Black

The above table showed a colour change in reagents 1M NaOH(aq), 1M NaOH(alc.), Ammonia, 50% HCl, and 50% HNO_3.

Some constituents of plant extracts did not show fluorescence in the visible range in daylight. The Ultra Violet light produces fluorescence in many natural products which did not fluoresce in daylight. The decomposition products by application of different reagents to each of the solvent extracts that fluoresce are as illustrated in Table 2 above. Fluorescence analysis is one of the parameters for pharmacognostic evaluation of crude drugs [14] in traditional medicinal plants. Thus, the process of standardization can be achieved by stepwise pharmacognostic studies as shown above. This research work helps in identification and authentication of dried powdered seeds of *Usteria guineensis* used in traditional medicine. Such information can act as reference information for correct identification of dried powdered seeds of *Usteria guineensis* plant and also will be useful in making a monograph of the plant. Further, it will act as a tool to detect adulterants and substituents which will help in maintaining the quality, reproducibility and efficacy of natural drugs.

Phytochemical Screenings

The results of phytochemical screening carried out on dried powdered seeds of *Usteria guineensis* are shown in Table 3.

Petroleum ether, acetone, chloroform, methanol, ethanol and aqueous crude extracts of the dried powdered seeds of traditional medicinal plant *Usteria guineensis* used for the treatment of Typhoid fever in Sierra Leone was evaluated for the presence of secondary plant metabolites.

The results according to Table 3, revealed from moderate to high contents of carbohydrates, alkaloid, flavonoids, proteins sterols/terpenes and saponins in the Ethanolic, methanol and aqueous extract. All of the solvent extracts revealed moderate concentration of Tannins. The petroleum ether extracts gave the least concentration of the phytoconstituents investigated. The detection of the above secondary plant metabolites supports the use of the plant in traditional medicine.

The results of the current study as shown in Table 4 revealed that all the metals investigated (K, Ca, Mg, Al, Ti, V, Mn, Fe, Cu, Zn, Rb, Sr, Zr, Mo, and Sc) were accumulated in greater or lesser extent in the dried powdered seeds of *Usteria guineensis* plant. The plant organ contained large amounts of nutrients and were rich in K (29458 ± 163 ppm), Ca (3702 ± 54.00 ppm), Mg (5528 ± 1223 ppm), Al (1389 ± 168 ppm) and Fe (167.11 ± 9.20 ppm). The other elements present in smaller quantities were Ti (64 ± 12.00 ppm), Sr (4.74 ± 0.40 ppm), Zn (56.65 ±2.46 ppm), Rb (47.34 ± 1.00 ppm), Zr (20.73 ± 0.67 ppm), and Mo (6.94 ± 0.74 ppm). The elements Sc, Mn, Cu and V were out of limit of detection of the equipment.

The above elements detected are essential components of biological structures that mediate vital effect on and play a key role in a variety of the biochemical processes necessary for life. Excessive levels higher than that needed for biological functions of these elements can be toxic for the body health. They are closely linked to human growth and general health [26]. Hence any Pharmacognostic investigation of traditional medicinal plants

Table 3: Results of Phytochemical Screenings Results of Phytochemical Screenings.

Experiment		Solvents					
Secondary Plant Metabolites	**Tests/Reagents**	**PZ**	**AC**	**CHLO**	**MeOH**	**EtOH**	**Water**
Carbohydrates	**Molisch's Test**	-	+	+	+	+	++
	Fehling's Test	-	+	+	+	+	++
	Benedicts Test	-	+	+	+	-	++
	Barfoed's Test	-	+	+	+	+	++
	Iodine Test	-	-	+	+	-	++
Alkaloids	**Mayer's Test**	+	++	+	++	+++	+++
	Hager's Test	+	++	+	++	+++	+++
	Wagner's Test	+	++	+	++	+++	+++
	Dragendroff's Test	+	++	-	++	+	++
Tannins and Phenolic Compounds	**Iron (III)Chloride Test**	-	-	-	-	-	+
	Gelatin Test	-	++	++	++	+++	+++
	Iodine Test	-	++	++	++	+++	+++
	Dil.HNO_3 Test	-	++	++	++	+++	+++
Flavonoids	**Shinoda's Test**	-	-	-	+	+	++
	Lead acetate Test	-	+	+ +	+	++	+++
	KOH Test	-	-	-	+	+	++
Sterols/Triterpenes	**Liebermann-Burchard Test**						
	Salkwoski's Test						
Amino acids and Proteins	**Biuret Test**	+	++	+	++	+	++
	Million's Test	+	++	+	++	+	++
	Xanthoproteic test	+	++	+	++	+	++
Glycosides and Saponins	**Keller Kelliani Test**	-	-	-	-	+	++
	Borntrager's Test	-	-	-	-	+	++
	Froth Test	-	-	-	-	+	++

KEY: PZ: Petroleum ether; AC: Acetone, CHLO: Chloroform, MeOH: Methanol, EtOH: Ethanol; + + + : Intense; + + : Moderate; + : Slight; - : Absent.

Table 4: Showing the total contents of elements (in ppm) in the dried powdered seeds of *Usteria guineensis* plant.

Plant Organ	**K**	**± SD**	**Ca**	**± SD**	**Mg**	**± SD**	**Al**	**± SD**
Powdered seeds	29458	163	3702	54.00	5528	1223	1389	168
Plant Organ	**Ti**	**± SD**	**V**	**± SD**	**Mn**	**± SD**	**Fe**	**± SD**
Powdered seeds	64	12.00	< LOD	6.93	< LOD	12.27	167.11	9.20
Plant Organ	**Cu**	**± SD**	**Zn**	**± SD**	**Rb**	**± SD**	**Sr**	**± SD**
Powdered seeds	< LOD	4.34	56.65	2.46	47.34	1.00	4.74	0.40
Plant Organ	**Zr**	**± SD**	**Mo**	**± SD**	**Sc**	**± SD**		
Powdered seeds	20.73	0.67	6.94	0.74	< LOD	10.0		

without mineral analysis cannot be completed. The plant extract contained a large concentration of Potassium (29458 ± 163 ppm) which has been reported to participate actively in the maintenance of the cardiac rhythm [27] and in constipation.

Plant metabolites and a number of mineral elements play important role in the metabolism [28]. They remain chelated with organic ligands and make them bioavailable to the body system [29]. Vartika and co-workers concluded that the medicinal values of some plant species used in homeopathic system are due to the presence of Ca, Cr, Cu, Fe, Mg, K and Zn [30]. These elements take part in neurochemical transmission and serve as constituents of biological molecules and in a variety of different metabolic processes [31]. Determination of mineral elements in plants is very important since the quality of many foods and medicines depends upon the concentration and type of minerals present in plant organs [32].

The Zn concentrations dried powdered seeds of *Usteria guineensis* plant is 56.65 ± 2.46 ppm. Zinc is the component of more than 270 enzymes [33] and its deficiency in the organism is accompanied by multisystem dysfunction. Zn is also responsible for sperm manufacture, fetus development and proper function of immune response [34]. Low levels of Zn can induce the pathogenesis of lung cancer [35]. Breast cancer patients had low levels of Ca, Mg, Fe, Cu, Mn and Zn in their hair [36]. Therefore, it is of major interest to establish the levels of some metallic elements in commonly used plants because, at elevated levels, these metals could be dangerous and toxic [37,38].

The Fe concentration was 167.11 ± 9.20 ppm. According to FAO/WHO, the concentration of Fe in dried powdered seeds of *Usteria guineensis* plant was found to be within the maximum permissible limit [39].

Summary

This research work was geared towards investigating the pharmacognostic potentials of dried powdered seeds of traditional medicinal plant *Usteria guineensis* used for the treatment of Typhoid fever in Sierra Leone. Pharmacognostic evaluation involving organoleptic evaluation, Fluorescence analysis, phytochemical screening and Mineral analysis were carried out on the dried powdered seeds of traditional medicinal plant *Usteria guineensis.*

During organoleptic evaluation, the size, colour, odour, taste and texture were carried out on the dried powdered seeds of *Usteria guineensis*. The results indicate the colour of the dried powdered seeds of the plant to be light yellow with fruit odour and had a bitter taste indicating that the powdered plant material contains alkaloids.

Decomposition products were obtained when the following reagents 1M NaOH(aq), 1M NaOH(alc.), Ammonia, 50% HCl, and 50% HNO_3 were added to portions of the dried powdered seeds of *U. guineensis* produced fluorescent activities under UV Lamp. Fluorescence analysis is one of the parameters for pharmacognostic evaluation of crude drugs [14] in traditional medicinal plants.

Solvent extracts of petroleum ether, acetone, chloroform, methanol, ethanol and aqueous crude of the dried powdered seeds of traditional medicinal plant *U. guineensis* were subjected to phytochemical screening. The results revealed from moderate to high contents of carbohydrates, alkaloid, flavonoids, proteins sterols/terpenes and tannins, saponins in the Ethanolic, methanol and aqueous extract. The petroleum ether extracts gave the least concentration of the phytoconstituents investigated. The detection of the above secondary plant metabolites supports the use of the plant in traditional medicine

The plant organ is reported to contained large amounts of nutrients and was rich in K (29458 ± 163 ppm), Ca (3702 ± 54.00 ppm), Mg (5528 ± 1223 ppm), Al (1389 ± 168 ppm) and Fe (167.11 ± 9.20 ppm). The other elements present in smaller quantities were Ti (64 ± 12.00 ppm), Sr (4.74 ± 0.40 ppm), Zn (56.65 ±2.46 ppm), Rb (47.34 ± 1.00 ppm), Zr (20.73 ± 0.67 ppm), and Mo (6.94 ± 0.74 ppm). The elements Sc, Mn, Cu and V were out of limit of detection of the equipment.

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Plant metabolites and a number of mineral elements play important role in the metabolism [28]. They remain chelated with organic ligands and make them bioavailable to the body system [29].

Excessive levels higher than that needed for biological functions of these elements can be toxic for human body health. The plant extract contained a large concentration of Potassium (29458 ± 163 ppm) which has been reported to participate actively in the maintenance of the cardiac rhythm [27] and in constipation.

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The Fe concentration was 167.11 ± 9.20 ppm. According to FAO/WHO, the concentration of Fe in dried powdered seeds of *Usteria guineensis* plant was found to be within the maximum permissible limit [39].

Conclusion

Pharmacognostic potentials involving organoleptic evaluation, fluorescence analysis, phytochemical screening and mineral analysis was carried out on the of dried powdered seeds of traditional medicinal plant *Usteria guineensis* used for the treatment of Typhoid fever in Sierra Leone. The results indicate the colour of the dried powdered seeds of the plant to be light yellow with fruit odour and had a bitter taste indicating that the powdered plant material contains alkaloids.

The results of phytochemical screening indicate high contents of carbohydrates, alkaloid, flavonoids, proteins, sterols/terpenes tannins and saponins in the Ethanolic, methanol and aqueous extract. The petroleum ether extracts gave the least concentration of the phytoconstituents investigated. The detection of the above secondary plant metabolites support the use of the plant in traditional medicine

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Plant metabolites and a number of mineral elements play important role in the metabolism. They remain chelated with organic ligands and make them bioavailable to the body system preventing most of the infectious diseases. This supports the use of the dried powdered seeds of *Usteria guineensis* in traditional medicine.

Recommendation

Further research works is needed in order to carry out antimicrobial sensitivity testing of solvent extracts, isolate plant metabolites, characterize them and compare their mode of action to existing drugs used for the treatment of typhoid fever.

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