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PROXIMATE AND PHYTOCHEMICAL SCREENING: EVALUATION OF MINERALS AND VITAMIN COMPOSITION OF (hypoestes rosea) PLANT HARVESTED IN CALABAR, CROSS RIVER STATE, NIGERIA

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ABSTRACT

The positive values of medicinal plants cannot be over emphasized. Therefore, hypoestes rosea (hr) has been found to be useful in traditional health practice for the treatment and management of several illnesses such as hypertension, malaria, skin diseases, and diabetes mellitus. The plant materials were collected washed and blended then analyzed using standard methods. The ash content, fat, protein, fiber, moisture, and carbohydrate (mg/100ml) were; 8.50 ± 0.25, 8.60 ± 0.074, 2.90 ± 0.095, 12.11 ± 0.154, 62.50 ± 2.50, 9.06 ± 1.73 respectively. For the phytochemical analysis (mg/100ml) the following were determined involving saponins, terpenoids, flavonoids and alkaloids were; 17.86 ± 0.14, 3.30 ± 0.30, 11.935 ± 0.065, 4.34 ± 0.36 respectively. Result of vitamin composition showed that hypoestes rosea sample contains 0.033+ 0.001 (mg/100g) of vitamin A, 0.065+ 0.0005 (mg/100g) of vitamin B12, 0.0455+0.0005 of vitamin C, and 0.1655+ 0.0005 of vitamin E respectively. It was observed that a 100g of hypoestes rosea was high in vitamin C (0.0455+ 0.0005) followed by vitamin B12 (0.0365+0.0005). Also, the result of mineral composition showed that Hypoestes rosea contains 0.035 + 0.00495 of Fe, 0.225 + 0.0005 of Zn, 1.045 + 0.00495 of K, 2.12 + 0.0 of Na, 0.26 + 0.01 of CL- respectively. The findings provide evidence that the extract of the plant contained some phytochemicals, thus suggested the presence of bioactive compounds which justifies their use in traditional medicines for the treatment of different diseases and also contribute greatly to human nutritional requirement for normal growth and development.

Keywords: Hypoestes rosea. Proximate Analysis., phytochemical., flavonoid., Alkaloids., Saponin

INTRODUCTION

Plants have been serving as sources of food and medicine since the beginning of mankind (Wink, 2012). Recently, the knowledge and usage of medicinal plants has increased the ability of pharmacists worldwide in facing the challenges of providing adequate medical solutions to several diseases of mankind (Wink, 2012).The non-nutritive plant chemical substance or compound/bioactive components are often referred to as photochemical (phyto from Greek word meaning 'plant') or phyto-constituents which are responsible for protecting plants against microbial and fungal infections or infestations by pests (Casciaro *et al.*, 2019). *Hypoestes* is a flowering plant with a genus comprising of several species and *Hypoestes rosea* is one of these species. Although a few research have been done *on hypoestes rosea*, but not much have been done to find out the actual proximate and phytochemical compositions of this species of Hypoestes (*Hypoestes rosea*).

However, *Hypoestes rosea* has been said to be used in different traditional medicine for the treatment of ailments such as skin diseases, respiratory infections, anemia, malaria, scabies, typhoid, hypertension and gonorrhea (Kunle *et al*., 2011). The ethno-pharmacological studies of other species of the plant belonging to this genus indicated that they possess various bioactivities as cytotoxic, anti-leismanial, anti- malarial, antimicrobial, antioxidant and anti-trypanosomal, which is the reason they are being used as medicinal plants.

Traditionally, *Hypoestes rosea* has also been used in treating several diseases including Malaria, typhoid fever, anemia and other related diseases. Also, consumption of vegetable for nutritional values is becoming expensive, and the nutrients in vegetable are necessary for healthy living. Some Leafy vegetables contain plant anti -oxidants and other properties which help in promoting and maintaining good health, as well as prevention of disease (Hanit *et al*., 2006). It is therefore essential to find out the proximate and some phytochemical compositions of Hypoestes rosea leaves. Vegetables are the edible parts of plants that are consumed widely or in parts, raw or cooked as part of main dish or salad. Vegetables may include leaf, stem, bark, root, flower, seed, fruits, bulb, tuber, and fungi. Vegetables are good sources of carbohydrates, minerals and vitamins depending on the vegetable consumed (Ihekoronye and Ngoddy, 1990).

In many developing countries example Nigeria, the supply of minerals is inadequate to meet the mineral requirements of the rapidly growing human population; hence consumption of edible plant as sources of food is beneficial. These vegetables apart from healing provide the necessary nutrients for health and development of the body (Olujobi, 2001).

Vegetables are highly beneficial for maintaining good health and also for the prevention of diseases when consumed or utilized, they help to improve and build up the immune system (Hanit *et al.*, 2006). They may be aromatic, bitter or tasteless, but are the cheapest and most accessible sources of proteins, vitamins, minerals (Fasuyi, 2006). The fresh leaves of *Hypoestes rosea* is used as traditional medicine for the treating of various illness such as, typhoid, anemia, malaria, hypertension and other disease. *Hypoestes rosea* has been found to possess varied bioactivities as anti-inflammatory, antibacterial, anti-malaria (Mensah *et al*., (2008). It becomes necessary to investigate the traditional use of *Hypoestes rosea*, which lack adequate research and information on the nutritional values of this plant. Therefore it is imperative to find out the phytochemical composition of this plant so as to encourage its consumption as a vegetable.

MATERIALS AND METHODS

Chemicals and Reagents

Wagner's reagent, concentrated sulphuric acid, petroleum ether, 0.5ml chloroform, 10% lead acetate, 5% sodium bicarbonate, methanol, concentrated ammonia, dilute ammonium hydroxide, ethanol, acetic

acid, distilled water, 5% sodium chloride, n-butanol, diethyl ether, perchloric acid.

Equipment and glass ware

The following equipment and glass ware were used in the course of this research; soxhlet extractor, condenser, flat bottom flask, dropper, hot plate, retort stand, burette, stopper, weighing balance knife, beaker, pipette, test tubes, separating funnel filter paper, glass wool, glass rod, oven, measuring cylinder, volumetric flask pistle and mortar.

Collection and treatment of plant material

Mature leaves of *Hypotheses rosea* were collected from a garden at 8-miles, Calabar. The leaves were taken to Pure and Applied Chemistry Laboratory, University of Calabar, Calabar. The leaves were plug off from its stem and thereafter dried at room temperature and ground using a grinder and stored for biochemical analysis.

Phytochemical analysis

Phytochemical screening are simple but standard chemical test for detecting terpenoids, alkaloids, flavonoids, and saponins in plant extract.

Extraction procedure

Soxhlet extraction is a piece of laboratory apparatus invented in 1879 by Frank Von Soxhlet. The solvent used in the process was methanol. 50.0g of the ground dried sample was weighed into the soxhlet extractor connected to the neck of the 500ml flask containing the solvent (methanol) 300ml held over the heating mantle. Vapour produced from the heating solvent evaporate to the soxhlet through the side arms and condensed by passing through the condenser. The solvent then condenses and drops on plant powder in the soxhlet dissolving the required substance, the solution is filtered through the downward arm (reflux arm) into the flask holding the solvent, and this process continued until the solvent that passed through the arm became colorless.

The extract was distilled to recover solvent and finally evaporated to obtain solid sample for the phytochemical test. Phytochemical screening is divided into two which are; qualitative and quantitative analysis. Qualitative analysis is the presence of a particular phytochemical, while quantitative has to do with amount of phytochemical that was present in a plant extract. Qualitative and quantitative analysis was carried out on the test sample using methods as described by (AOAC, 2005); Trease & (Evans, 2005) including percentage composition of Alkaloids, Saponins, Terpenoids, and Flavonoids.

Qualitative analysis

Test for Alkaloid (Trease & Evans, 2005)

5ml of the sample extract was measured into a test tube, and few drops of Wagner's reagent was added and the formation of reddish brown precipitate indicates the presence of Alkaloids.

Test for Flavonoids (AOAC, 2005)

5ml of the sample extract (Hypoestes rosea) was measured into a test tube with few drops of 10% lead acetate solution was added.

Observation

Appearance of yellow color precipitate indicates the presence of Flavonoids.

Test for Saponins (Trease & Evans, 2005)

5ml of the sample extract was measured into a test tube, followed by few drops of 5% sodium bicarbonate solution. The mixture was shaken vigorously and allowed to stand for 3 minutes.

Observation

Formation of honey comb-like froth shows the presence of Saponins.

Test for Terpenoids (AOAC, 2005)

1ml of the sample extract was measured into a test tube with 0.5ml chloroform been added, followed by a few drops of concentrated sulphuric acid.

Observation

Formation of reddish brown precipitate indicates the presence of Terpenoids in the extract.

Quantitative Analysis

Test for alkaloid (AOAC, 2005)

5g of the sample was weighed into a beaker, 100cm^3 of 100% acetic acid in ethanol (1:1 radio) was measured into the sample container and covered to stand for 4 hours. The extracted sample was filtered after four hours, it was then concentrated using water bath to a quantity of the original volume. Ammonia solution was added to the concentrated sample (extract) drop wise until the precipitate was completed. The precipitate was then allowed to settled, and was filtered and washed with dilute ammonium hydroxide. The residue left was taken as the crude alkaloid.it was then dried in an oven and weighed.

Test for Flavonoid (AOAC, 2005)

The sample (5 g) was weighed into a beaker and extracted with 50cm^3 of 80% methanol at room temperature for 1 hour. The solution was filtered using weighed whatsman filter paper. The filtrate was evaporated to dryness over water bath and put in the oven. The weight of the dried extract was weighed.

Saponin test (Trease & Evans 2005)

The sample (5 g) was dispensed in 50cm^3 of 20% ethanol in a beaker. The suspension was heated over a hot water bath for 4hrs with a continuous stirring at about 60^{0}c. The mixture was filtered after four hours and the residue was re-extracted with another 20cm^3 of 20% ethanol. The combined extract was concentrated to reduce to 40cm^3 over water bath at 90^{0}c. The solution was transferred into a separatory funnel and 20cm^3 of diethyl ether was added and shaken thoroughly. The aqueous layer of the extract was recovered, while the ether layer was discarded. The purification process was repeated and 60cm^3 of n-butanol was added and the extract was washed twice with 10cm^3 of 5% aqueous sodium chloride. The remaining extract was evaporated in a water bath and dried in an oven to a constant weight.

Test for Terpenoid (Ladan *et al.*, 2014; Ferguson, 1956)

The crude Terpenoids of *Hypoestes rosea* were obtained by soaking 5g of the powdered leaves in 50ml of 25% ethanol for 24 hours. The extract was filtered and the filtrate extracted with petroleum ether (boiling point 60^{0}c -80^{0}c) and concentrated to dryness.

Proximate analysis

Moisture content determination

The moisture content of the whole plant was determined by weighing 2.0g of the fresh leaf sample into an empty crucible of known weight. The crucible was placed in a vacuum electrostatic oven at 80^{0}c for 24 hours. The crucible and the content were cooled in a dessicator containing magnesium sulphate as a drying agent. (AOAC, 1984)

Determination of ash content

A crucible was thoroughly washed and dried in an oven for 2 hours and cooled to room temperature in dessicator.2.0g of the sample was accurately weighed and placed in a muffle furnace and ash at 600^{0}c for 3 hours. At the end of the ash period, the ash sample was removed and it was placed in a dessicator to cool at room temperature.

Fiber content determination

Free fat sample (5 g) was weighed out into a 250ml beaker and boiled with 100ml of distilled water for 30 minutes with constant stirring. After boiling the sample was filtered and washed with H_2SO_4 solution, followed by washing with distilled water to remove the acid content. The residue was further treated with 100ml of 2% NaOH solution and washed with distilled water. The residue was further treated with ethanol and filtered, followed by washing with distilled water. The residue was ignited in a furnace at 550^{0}c.

Determination of protein content

Digestion: 5.0g of the grounded sample was weighed into 250ml standard kjeldahl flask and 20ml of concentrated H_2SO_4 was introduced into the flask containing the sample and antibombing was added. The bottle was placed under a tap and shaken gradually.10g of sodium sulphate (Na_2SO_4) was introduced into the flask followed by 3g of copper sulphate (Cu_2SO_4). The flask was placed in the fume cupboard under low temperature in order to avoid explosion. The flask was allowed to heat for about 3-4 hours, it was brought out and allowed to cool. 100ml of distilled water was added to the sample, the sample changed from milky color to sea blue.

Distillation: 10ml of the protein digest was measured and a few grain of anti-bombing was introduced into a 250ml flask. The beaker which was used as a receiver, 10ml of 2% Boric acid was added and a drop of double indicator (methyl red and methyprotein, the boric acid became blue. 30ml of 40% NaOH was introduced into the protein digest when it started boiling. The protein digest started dropping into the boric acid and there was change in color from deep blue to sea blue.

Titration: 0.1m of HCl was prepared and poured into a burette. The sample that entered the receiver was used for titration, there was a change in color from sea blue to purple pink, indicating the presence of protein.

Crude fat extraction and determination

The fat content in the sample extract (hypoestes rosea) was determined by using 10.0g of the dried grinded sample, the sample was placed in a soxhlet extractor with petroleum ether as extracting solvent.

The sample was weighed into a thimble and150ml of ether was measured into a 250ml flat bottom flask of known weight. Soxhlet extractor which carries one thimble was fitted into the flask followed by a condenser which was connected to a tap. As the ether in the flask begins to boil, it evaporates and drops back into the flask. This is done repeatedly until the fat content is being extracted. Hence, the ether content was evaporated in a water bath. Measurement was made to obtain the weight of the fat.

Determination of total carbohydrate

The calculation was done by the differential method which is; total CHO=100 (% moisture + fat + protein + fiber). That is carbohydrate=100 subtract all the percentage from 100, the value that was obtained is CHO content.

Determination of Vitamins concentration

The vitamin concentration in *Hypoestes rosea* were determined according to the procedure of Association of Official Analytical Chemist (AOAC, 1990) to determine the various vitamins as detailed below.

Determination of Vitamin A concentration

Vitamin A was determined by soaking 1g of the sample in 5ml of methanol for 2hrs at room temperature under dark condition, in order to get a complete extraction. The vitamin A layer was separated using hexane through separating funnel. The volume was made up to 10ml with hexane and when this layer was a passed through sodium suphonate through a funnel in order to remove any moisture from the layer. The absorbance of the layer was measured at 436 nm using hexane as a blank.

Determination of Vitamin B_{12} concentration

Vitamin B_{12} was determined with 50 ml of sodium acetate buffer ph 4.0/ at 100degrees Celsius for 35 minutes in the presence of sodium cyanide, followed by a purification prior to the LC analysis. An enzymatic hydrolysis (pepsin at 37 degrees Celsius and ph 4 to 3 hr) prior to purification step efficiently released the bound vitamin B12 content in food products. Vitamin B_{12} was monitored by UV at 361 nm after its separation on a reverse phase narrow – bore column with a gradient of mobile phase made of water/acetonitric and trifluoroacetic acid (TFA) 0.025%.

Determination of Vitamin C by titration

Reagents

Iodine solution: (0.005 mol^{-}) weigh 2g of potassium iodide into a 100ml beaker. Weigh 13g of iodine and add it into the same beaker. Add a few ml of distilled water and swirl for a few minutes until iodine is dissolved. Transfer iodine solution to a 1L volumetric flask making sure to rinse all traces of solution into the volumetric flask using distilled water. Make the solution up to the 1L mark with distilled water.

Starch indicator solution (0.5 %): weigh 0.25g of soluble starch and add up to 50 ml of near boiling water in a 100 ml conical flask. Stir to dissolve and cook before using.

Method

Introduce 100g sample into a mortar and pestle and grind, add 10ml portion of distilled water. Several times while grinding the sample, each time decant off the extract into a 100ml volumetric flask. Finally, strain the ground sample pulp through cheese cloth, rinsing the pulp with a few 10 ml portions of water and collecting all filtrate and washing in the volumetric flask, make the extracted solution up to 100ml in a volumetric flask.

Titration

Pipette a 20 ml aliquot of the sample solution into a 250 ml conical flask and add about 150ml of distilled water and add 1ml of starch indicator system.

Titrate the sample with 0.005/mol iodine solution. The end point of the titration is identified as the first permanent trace of a dark- blue black colour due to the starch iodine complex.

Repeat the titration with further aliquots of sample solution until you obtain a concordant result (titer agreeing with 0.1 ml).

Calculation

Calculate the average volume of iodine solution used from your concordant titers.

Calculate the moles of iodine reacting.

Using the equation of the titration below, determine the number of moles of ascorbic acid reacting:

$$\text{Ascorbic acid} + I_2 \longrightarrow 2I^- + \text{dehydroascorbic acid}$$

Determination of Vitamin E concentration

One gram (1g) of the original sample was weighed, macerated with 20 mls of n hexane in a test tube for 10 minutes. The solution was filtered; 3ml of the filtrate was transferred into a dry test tube in duplicates and evaporated to dryness in a boiling water bath. Following this, 2ml of 0.5 N alcoholic potassium hydroxide was added and boiled for 30 minutes in a water bath. Then 3mls of n hexane was added and was shaken vigorously. The n- hexane was transferred into another set of test tubes and evaporated to dryness. A volume, 2ml of ethanol was added to the residue.

Another volume. 1ml of 0.2% ferric chloride in ethanol was added. Then 1ml of 0.5% of dipyridyl in ethanol was added followed by the addition of 1ml of ethanol to make up to 5ml. The solution was mixed and absorbance taken at 520nm against for the blank.

Digestion process for the minerals

Apparatus:

Beaker
Weighing balance
Volumetric flask
Hot plate
Measuring cylinder
Glass funnel
Filter paper

Reagents

Aqua regia (HNO_3: HCl,1:3 V/V)
Concentrated Perchloric acid ($HCLO_4$)

Method

About 1g portion of crushed leaf sample is accurately weighed into a conical flask. Then 15 ml of aliquot of aqua regia (HNO_3, 1:3 VV) is to be added followed by 5ml of concentrated Perchloric acid ($HCLO_4$) and it is allowed to stand at room temperature for an hour before the mixture is then emptied into a tefllour vessel were it is properly corked and placed in a hot plate and is heated at 120 degree Celsius for 23 hours until a clear solution is obtained.

The mixture is then transferred into 50ml volumetric flask and is allowed to cool and the volume is adjusted to the mark with deionized water. Then the prepared sample is finally transferred into a corked glassy container, labeled and UV analysis is carried out.

Procedure for Iron determination

To 50 cm^3 of acidified H_2O sample, 20 cm^3 0f phenanthioleine solution and 10 cm^3 of aminovilline acetate buffer solutions was added and shake vigorously for 2 minute. It was then distilled to 100 cm_3 and was allowed to stand for 10 minutes for the colour intensity to develop. The Iron content was measured in the spectrophotometer at the wavelength of 510 nm.

Procedure for Zinc determination

To 50 cm^3 of the sample, 6N sodium hydroxide or hydrochloric acid was used to adjust the ph oh the water to ph 7. To 10cm^3 of prepared sample of sodium ascorbate, 5 cm^3 buffers, 2 cm^3 KCN and 3cm^3 of zinc ion reagent was added to the sample and shaken vigorously. 1cm^3 of cyclohexane was added to the sample and swirled for few seconds. The zinc concentration was then determined with the spectrophotometer at the wavelength of 620 nm or 535 nm.

Procedure for potassium determination

About 5 ml of sample was pipette into a test tube in duplicate. Then 2mls of cobal nitrite was added, shaken vigorously and allowed to stand for 45 minutes and then centrifuged for 15 minutes. The supernatant was drained off and 2mls of ethanol was added to the residue. The solution was shaken vigorously and centrifuged for

another 15 minutes. The supernatant was drained off and 2mls of distilled water was added to the residue. The solution was boiled for 10 minute, with frequent shaking to dissolve the precipitate. About 1ml of 1% of choline hydrochloride and 1ml of 2% sodium ferric cyanide was added. Then 2ml of distilled water was also added and the solution was shaken to mix well. The absorbance was taken at 620 nm against the blank.

Procedure for sodium determination

A 1g of the leaf sample is placed in 100ml volumetric flask. To this, 10 ml of acid mixture is added and the content of the flask is mixed by swirling. The flask is placed on low heat hot plate in a digestion chamber. Then the flask is heated at higher temperature until the product of red NO2 fume ceases. The contents are further evaporated until the volume is reduced to 35 ml but not to dryness. The complete digestion is confirmed when the liquid becomes colourless. After cooking the flask, add 20 ml of deionized water. Volume is made up with deionized water and the solution is filtered with filter paper. The digest is diluted to a suitable concentration range so that the final concentration lies between 0 to 5 ppm. The sample is then read in a flame photometer at 598nm wavelength.

Procedure for chloride determination

Select test, insert an adapter it requires. Fill the sample cell with 10 ml of the sample. Fill another sample cell with 10ml of deionized water. Pipet 0.8ml of mercurie thiocyanate solution into each sample cell. Swirl to mix. Pipet 0.4ml of ferric iron solution into each samole cell. Swirl to mix. An orange colour will develop if chloride is present. Start the instrument timer. A two minute reaction time will begin. Within 5 minutes after the time has expired, wine the blank and insert it into the holder. Calibrate the instrument. The display will show a 0.0mg/L CL-. Wipe the prepare sample and insert into the cell holder, and read the results in mg/L Cl^-

Statistical analysis data

Data are presented as mean ± SEM. Data were analyzed using a one way analysis of variance (ANOVA) with SPSS (version 20) window statistical software programme Student "t" test was used for pair-wise comparison and differences were considered significant at $p<0.05$.

RESULTS

Qualitative phytochemical screening of *hypoestes rosea* the result of phytochemical screening of hypoestes rosea leaves indicates the presence of saponin, terpenoids, flavonoids, and alkaloids as shown on the table below:

Table 1: Qualitative phytochemical screening of *Hypoestes Rosea*

Phytochemicals	Qualitative screening
Terpenoids	++
Flavonoids	+++
Saponins	+++
Alkaloids	++

Key

++	Moderate concentration
+++	High High concentration

Quantitative phytochemical composition of *Hypoestes rosea*

The quantitative analysis of the extract of *Hypoestes rosea* leaf showed following values; terpenoids 3.3 ± 0.32, saponins 17.86 ± 0.14, Alkaloids 4.34 ± 0.36, Flavonoids 11.935 ± 0.065 (Note; all values are in mg/100g of extract)

Table 2: Quantitative Concentration of Phytochemicals

Phytochemicals	**Composition (mg/100mg)**
Flavonoids	11.935±0.065
Saponins	17.86±0.14
Alkaloids	4.34±0.36
Terpenoids	3.3±0.32

Proximate composition *of hypoestes rosea*

The proximate composition of *hypoestes rosea* leaf are as follows; moisture 62.50 ± 2.50, ash 8.50 ± 0.25, Fat 8.60 ± 0.074, crude fiber 12.11 ± 0.154, protein 2.90 ± 0.095, carbohydrates 9.06 ± 1.73.

Table 3: Proximate composition of *hypoestes rosea*

Parameters	**composition (%)**
Moisture	62.50 ± 2.50
Ash	8.50 ± 0.25
Fat	8.60 ± 0.074
Crude fiber	12.11 ± 0.154
Protein	2.90 ± 0.095
Carbohydrate	9.06 ± 1.73

Elemental Composition of Vitamins in *Hypoestes Rosea* in mg/100g dry matter.

The result of the vitamins (vitamin A, vitamin B_{12}, vitamin C and vitamin E) composition of *hypoestes rosea* in mg/100g dry matter is as stated in table 6 below.

Result of vitamin composition showed that *hypoestes rosea* sample contains 0.033± 0.001 (mg/100g) of vitamin A, 0.065± 0.0005 (mg/100g) of vitamin B_{12}, 0.0455±0.0005 of vitamin C, and 0.1655± 0.0005 of vitamin E respectively. It was observed that a 100g of *hypoestes rosea* contains vitamin C (0.0455± 0.0005) as the highest followed by vitamin B_{12} (0.0365+0.0005).

Table 4: Elemental composition of vitamin A in *Hypoestes rosea* in mg/100g dry matter (Mean ± SD)

Vitamins	(mg)
Vitamin A	0.033 ± 0.0001
Vitamin B_{12}	0.0365 ± 0.0005
Vitamin C	0.0455 ± 0.0005
Vitamin E	0.1655 ± 0.0005

Elemental Composition of Minerals in *Hypoestes Rosea* in mg/100g dry matter

The result of mineral composition showed that *Hypoestes rosea* contains 0.035 ± 0.00495 of Fe, 0.225 ± 0.0005 of Zn, 1.045 ± 0.00495 of K, 2.12 ± 0.0 Of Na, 0.26 ± 0.01 of CL- respectively. It was observed that a 100g sample of *Hypoestes* contained the highest amount of sodium (2.12 ± 0.01), followed by potassium (1.045 ± 0.00495) and Iron (0.035 ± 0.00495).

Table 5: Elemental Composition of Minerals in *Hypoestes rosea* in mg/100g dry matter Mean ± SD

Minerals	(mg)
Iron (Fe)	0.035 ± 0.00495
Zinc (Zn)	0.225 ± 0.0005
Potassium (K)	1.045 ± 0.00495
Sodium (Na)	2.12 ± 0.00
Chloride (Cl^-)	0.26 ± 0.01

Table 5 shows the elemental composition of minerals in *hypoestes rosea* after the standard deviation has been calculated.

DISCUSSION

Relatively few studies have mentioned the phytochemical constituents of *hypoestes rosea* leaves. The present study carried out on *hypoestes rosea* leaves revealed the presence of active medicinal constituents. This study on *hypoestes rosea* leaves revealed the presence of terpenoids, saponins, alkaloids, and flavonoids. The phytochemical composition found in the literature showed abundance of saponin, flavonoid and alkaloid (Kunle *et al*., 2011). In this study, the concentration of saponin was high, flavonoid also high; alkaloid had a moderate concentration while terpenoid concentration was low. Also, it was seen and recorded that the plant extract contained high concentration of tannin (Kunle *et al*., 2011).

Evidence from record shows that the benefit of these compounds detected in *hypoestes rosea* leaves are as follows; it is reported that saponin helps in hypocholesterolaemic immune stimulant, hypoglycemic effect and anticarcinogenic properties (Ojo-Amaize *et al*., 2007). Flavonoids have been reported to help improve cardiac function, decrease anginas and lowers cholesterol level. These compounds act by regulation of inflammation mediators (Hsu *et al*., 2013). Flavonoids have also been shown to reduce production of pathogenic thrombosis in mice models (Lim *et al*., 2006). Alkaloids have been reported to demonstrate antioxidant activity which is responsible for various biological activities with this plant including anti-diabetic activity (Kittakoop *et al.*, 2014).

Proximate analysis of a sample is necessary in determining the nutritional content of such sample. Hussain *et al.* (2009) from analyzing the proximate compositions for *hypoestes rosea* leaves observed that the leaves contained different percentages of moisture, ash, crude fat, crude fiber, protein, and carbohydrate as shown in the results. The high fiber content of *hypoestes rosea* observed in the result may be the reason why the leaves is used traditionally for the treatment several diseases. A previous research has suggested that increase fiber consumption may contribute to a reduction in the incidence of certain diseases such as colon cancer, coronary heart disease, diabetes, high blood pressure, obesity, and various digestive tract disorders (SACN, 2008). From the result obtained in the vitamin analysis of *hypoestes rosea*, it was observed that the leaves of *hypoestes rosea* contains higher amount of vitamin C and vitamin B_{12} than any other vitamin e.g. vitamin A and vitamin E.

Due to the presence of vitamin C in *hypoestes rosea*, it can be used in herbal medicine for preventing certain cancers, enhancing immune functions; and ameliorating chronic inflammatory conditions, such as atherosclerosis through its antioxidant activities (Drake and Frei, 2011). The vitamin B_{12} content of *hypoestes rosea* was 0.0365 ± 0.0005. Vitamin B_{12} is essential for DNA synthesis and for cellular energy production. It is also crucial for neurologic function, red blood cell formation. Due to its function in the production of red blood cells, it can be used to boost blood level and treat anemia (Rwaida and Al-Haidari, 2018). Vitamin A is essential for the stimulation of growth and proper development of skeletal tissues, for normal production, for maintenance of vision (Hoffman *et al.*, 1983). It supports immune functions by supporting the growth and distribution of T- cells, a type of white blood cell that protects the body from infection.

Vitamin E due to its antioxidant activity has been proven to be effective against cancer, ageing, arthritis and cataract. It also reduces the production of prostaglandins such as thromboxane, which causes platelet clumping. It is also vital for the formation and normal functioning of red blood cells and muscles (Lukaski, 2004). These might be the reason *hypoestes rosea* is effective in traditional medicine in managing some diseases.

From the mineral compositions *hypoestes rosea* contains higher amount of sodium and potassium. Sodium regulates the plasma volume and acid base balance, is also involved in the maintenance of osmotic pressure of the body fluids and also activates muscle function (Soetan *et al*., 1960). Potassium is involved in the regulation of osmotic pressure, conduction of nerve impulse, muscle contraction. The highly soluble minerals iron and potassium help in the maintenance of acid base balance of the hydrogen ion concentration of body tissues, They also help complete the absorption of vitamins, proteins, fat and carbohydrates of the food .Iron (Fe) serves as a carrier of oxygen to the tissues from the lungs by red blood cell haemoglobin, required for the proper myelination of spinal cord and serves as a cofactor for a number of enzymes involved in neurotransmitter synthesis (Batra, and Seth, 2002). An adequate intake of zinc enhances the ability to promote healthy skin and hair. It promotes reproductive function. The presence of zinc is an indicator that the leaves of *hypoestes rosea* may enhance nerve function and fertility in men and women. It is also important for normal sexual development, as well as stimulates healthy functioning of the heart and normal growth (Elizabeth, 1994). *hypoestes rosea* is also a good source of Chloride, as we know; Chloride is involved in fluid and electrolyte balance, and gastric fluid. It is also important in maintaining acid base balance as deficiency of chloride can cause renal diseases (Berend *et al.*, 2012).

CONCLUSION

The bioactive components of the medicinal plant indicate it therapeutic importance to human health. Therefore, the nutrient

contained in this medicinal plant if consumed as food could help in maintaining good health and replace death cells. Hence, the plant might also contribute greatly to human nutritional requirement for normal growth and development against some molecular disorders and complications.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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