Food and Public Health 2012, 2(2): 21-27
DOI: 10.5923/j.fph.20120202.05

Nutritive and Anti – Nutritive Composition of *Chanca Piedra* (Stone Breaker)

Gafar M. K., Itodo A. U.*, Senchi D. S.

Department of Chemistry, Kebbi State University of Science and Technology, Aliero, Nigeria

Abstract The fresh plants of *Chancapiedra* collected from Zuru Emirate of Kebbi State, Nigeria were dried, pulverized and subjected to nutritive and anti-nutritive analysis. The proximate composition revealed the presence of Moisture (0.03±0.06% fresh weight), Ash (5.55 ±0.01% dry weight), Crude Lipid (3.15±0.01% dry weight), Crude Proteins (9.52± 0.02% dry weight), Crude fibre (17.10±0.14%), Carbohydrate (64.31± 0.18%) and calorific value of 279.18kcal/100g. The mineral composition revealed include Calcium (25.58±1.03mg/100g), Magnesium (25.85±4.03mg/100g), Potassium (12.10 ± 0.10mg/100g), Phosphorus (15.42±3.05mg/100g), Sodium (0.44±0.35mg/100g), Iron (3.1±0.03mg/100g), Manganese (1.27±0.02mg/100g) and Zinc (0.45±1.05mg/100g). The anti-nutritive compositions are Oxalate (5.34±0.4mg/100g), Phytate (27.58±1.7mg/100g), Hydrogen cyanide (16.10±0.14mg/100g), Nitrate (22.42±0.028mg/100g) and Tannins (15.2± 0.13mg/100g). The results revealed that the plant *Chancapiedra* contained some essential nutrients.

Keywords Food, Nuritive, Anti-nutrients, *Chancapiedra, Stone Breaker*

1. Introduction

The intake of food and supplementsare utilized in the body for maintenance of good health, growth and energy[1]. A balanced diet mainly consists of macro nutrients, micro nutrients and water. The macronutrients include carbohydrates, fats and proteins whereas the micronutrients are vitamins and minerals. All these are very essential factors for normal functioning of the body[1]. The conventional food plants provides most of these nutrients and they are becoming less available to the middle and lower class people in the society due to the economic constrain and other factors such as increasing population[2], so more people from these classes are now incorporating the non conventional food (wild) plants into their daily mealwhich not only they provide nutrients but also used traditionally for treatment of various ailments[3].As available and cheap as they are thousands of these wild plants are yet to be discovered.

*Chancapiedra*is a wild edible plant belongs to the family of*Euphorbiaceacephyllanthus*, and belongs to species of-*Niruriamarus.* It is synonyms *to Phyllanthuscarolinianus*, *P. sellowianusP. fraternus,P. kirganella,P. lathyroides*, *Nymphanthusniruri*. It is commonly called *Chancapiedra* in Spain. In Brazil the plant is known as *Quebra- pedra*or*Arranca-pedras*, carry-me-seed, gale-wind grass, quinine weed which translates to as Stone– breaker[4]. The Hausas of the north Nigeria called itGerontsunsaye.*ChancaPiedra* is a small, erect, annual herb that grows 30-40cm in height. Itis indigenous to the rainforest of the Amazon and other tropical areas throughout theworld, including Bahamas, Southern India, Africa and China. *Phyllanthusniruri*is quite prevalent in the Amazon,some tropical areas in Africa and also include some wet rainforest, growing and spreading freely (much like a weed).*P. amarus* and *P. sellowianus* are closely related to *Phyllanthusniruri*in appearance, phytochemical structure and history of use, but typically are found in dry tropical climate of India, Brazil and even Florida and Texas[5].

The *ChancaPiedra*plant has a long history in herbal medicine in every tropical country where it grows. It is employed to similar condition worldwide. The plant is used for the treatment of numerous illness which includes; colic, diabetes, malaria, dysentery fever, flu, tumors, jaundice, and dyspepsia, and also considered as analgesic, and as an aperitif, carminative, digestive, laxative, stomachic, it expels worms, stone from kidneys, increase urination, relieves pain, protect liver, reduces inflammation, treat viral infections, its aids digestion, reduces blood sugar, lowers blood pressure, lowers cholesterol.The natural remedy is usually just standard infusion or weak decoction of the whole plant or its aerial parts[5]. *Chancapiedra* plant has been subjected to phytochemical research to determine the active constituents and their pharmacological activities, it was revealed that it is a rich source of photochemical including many which have been found only in the *Phyllanthus* genus many of the active constituents are glycosides, flavonoids, alkaloids, tannins and phenylpropanoids, lipids, sterols and flavones found in the leaf, steam and root of the plant[6]. This plant has shown

* Corresponding author:
itodoson2002@gmail.com (Itodo,A.U.)
Published online at http://journal.sapub.org/fph

a promising utilization in the pharmaceutical industries but not much has been done on it nutritional aspect.

2. Materials and Methods

Sampling and sample treatment: *Chancapiedra* plants were collected from Zuru local government inKebbi State and identified by a taxonomist at Botany department in Kebbi State University of Science and Technology, Aliero. They were sun dried for threedays and blended into fine powder with a blender machine, sieved and stored in a covered plastic container for further uses. All reagents were of analytical reagent grade unless otherwise stated. Distilled water was used in the preparation of solutions and dilution unless otherwise stated while the proximate composition, mineral composition and anti-nutritive component determinations unless otherwise stated were carried out in triplicates.

Proximate analysis: The estimation of the various food parameters in*Chancapiedra* plant was carried out using the following methods.

Determination of moisture content: This is a measure of the % moisture lost due to drying at a temperature of 105℃. 2g of the fresh plants of *Chancapiedra* was weighed (W_1) into preweighed crucible (W_0) and placed into a hot drying oven at 105℃ for 24 hours. The crucible was removed, cooled in a desiccator and weighed. The process of drying, cooling and weighing were repeated until a constant weight (W_2) was obtained andthe weight loss due to moisture was obtained by the equation[6].

$$\% \text{ moisture} = \frac{W_1 - W_2 x 100\%}{W_1 - W_0} \quad \text{(i)}$$

WhereW_0 = Weight of the empty crucible, g

W_1=Weight of fresh sample + empty crucible, g

1. W_2=Weight of dried sample + empty crucible, g

2. Determination of ash content: This is a measure of the residue remaining after combustion of the dried sample in a furnace at a temperature of 600℃ for 3 hours. 2g of the powdered plants sample of *Chancapiedra*was weighed (W_1) into preweighed empty crucible (W_0) and placed into a Lentonfurnace at 600℃ for 3 hours. The ash was cooled in a desiccator and weighed (W_2). The weight of the ash was determined by the difference between the powdered leaves sample, preweighed crucible and the ash in the crucible[7]. Percentage ash was obtained by equation ii.

$$\%\text{Ash} = \frac{W_2 - W_0 x 100\%}{W_1 - W_0} \quad \text{(ii)}$$

WhereW_0=Weight of empty crucible, g

W_1=Weight of crucible + powder sample, g

W_2=Weight of crucible + ash sample, g

Determination of crude lipids: The crude lipid content in the sample of *Chancapiedra* was extracted using soxhlet extraction.The powder sample (2g) was weighed (W_0) into a porous thimble and covered with a clean white cotton wool. Petroleum ether ($200cm^3$) was poured into a $250cm^3$ extraction flask, which was previously dried in the oven at 105℃ and weighed (W_2). The porous thimble was placed into the soxhlet and the rest of the apparatus was assembled. Extraction was done for 5 hours,the thimble was removed carefully and the extraction flask was placed in a water bath so as to evaporate the petroleum ether and then dried in the oven at a temperature of 105℃ to completely free the solvent and moisture. The flask was then cooled in a desiccator and reweighed (W_1). The percentage crude lipid was calculated using the equation below

$$\text{Crude lipid} = \frac{W_1 - W_2 x 100}{W_0} \quad \text{(iii)}$$

Where W_0=Weight of sample, g

W_1=Weight of flask + oil, g

W_2=Weight of flask, g

Determination of crude fiber content: 2g of powder sample of *Chancapiedra*was weighed (W_0) into a 1 dm^3 conical flask. Water ($100cm^3$) and $20cm^3$ of 20% H_2SO_4 were added and boiled gently for 30 minutes. The content was filtered through Whatmann No. 1 filter paper. The residue was scrapped back into the flask with a spatula. Water ($100cm^3$) and $20cm^3$ of 10% NaOH were added and allowed to boil gently for 30 minutes. The content was filtered and the residue was washed thoroughly with hot distilled water, then rinsed once with 10% HCl and twice with ethanol and finally three times with petroleum ether. It was allowed to dry and scrapped into the crucible and dried overnight at 105℃ in an air oven. It was then removed and cooled in a desiccator. The residue was weighed (W_1) and ashed at 600℃ for 90 minutes in a Lenton muffle furnace. It was finally cooled in a desiccator and weighed again (W_2)[6]. The percentage crude fiber was calculated using equation viii.

$$\% \text{ Crude fibre} = \frac{W_1 - W_2 x 100\%}{W_0} \quad \text{(iv)}$$

WhereW_0=weight of sample, g

W_1=weight of dried residue, g

W_2=weight of ash residue, g

Determination of crude protein content: The crude protein of the *Chancapiedra*sample was determined using the micro – Kjeldahlmethod[8]. The principle of this method is based on the transformation of protein and that of the other nitrogen containing organic compounds, other than nitrites and nitrates into ammonium sulphate by acid digestion.

$$\text{Sample nitrogen} + H_2SO_4 \xrightarrow{\text{Catalyst}} (NH_4)_2SO_{4(aq)} \quad \text{(v)}$$

$$(NH_4)_2SO_{4(aq)} + 2NaOH_{(aq)} \rightarrow 2NH_{3(aq)} + 2H_2O + Na_2SO_{4(aq)} \quad \text{(vi)}$$

$$NH_{3(aq)} + H_3BO_{3(aq)} \rightarrow NH^+_{4(aq)} + H_2BO^-_{3(aq)} \quad \text{(vii)}$$

$$N^+_{(aq)} + H_2BO^-_{3(aq)} \rightarrow H_3BO_{3(aq)} \quad \text{(viii)}$$

The sample (2g) was weighed along with $20cm^3$ of distilled water into a micro – Kjeldahl digestion flask. It was shaken and allowed to stand for sometime. One tablet of selenium catalyst was added followed by the addition of $20cm^3$ concentrated sulphuricacid. The flask was heated on

the digestion block at 100℃ for 4 hours until the digest became clear. The flask was removed from the block and allowed to cool. The content was transferred into 50cm^3 volumetric flask and diluted to the mark with water. An aliquot of the digest (10cm^3) was transferred into another micro-Kjeldahl flask along with 20cm^3 of distilled water, and placed in the distilling outlet of the micro – Kjeldahl distillation unit. A conical flask containing 20cm^3 of boric acid indicator was placed under the condenser outlet. Sodium hydroxide solution (20cm^3, 40%) was added to the content in the Kjeldahl flask by opening the funnel stopcock. The distillation start and the heat supplied were regulated to avoid sucking back. When all the available distillate was collected in 20cm^3 of boric acid, the distillation was stopped. The nitrogen in the distillate was determined by titrating with 0.01M of H_2SO_4, the end point was obtained when the colour of the distillate changed from green to pink.

Crude protein is a measure of nitrogen in the sample. It was calculated by multiplying the total nitrogen content by a constant, 6.60. This is based on the assumption that, proteins contain about 16%N which includes both true protein and non – protein N and does not make a distinction between available or unavailable protein[6]. The crude protein was calculated using equation ix

$$\% \text{ crude protein} = \%N \times 6.60 \quad \text{(ix)}$$

The nitrogen content of the sample is given by the formula below.

$$\% N = \frac{TvxNax0.014xV_1x100}{GxV_2} \quad \text{(x)}$$

Where Tv=Titre value of acid (cm^3)

Na=Concentration or normality of acid

V_1=Volume of digest and distilled water used for dilutingthe digest (50cm^3).

V_2=Volume of aliquot used for distillation (10cm^3)

G=Original weight of sample used, g

Determination of carbohydrates: The James's method[7] was adopted where the total proportion of carbohydrate in the plant sample was obtained by calculation using the percentage weight method. That is by subtracting the % sum of food nutrients: % protein, % crude lipids, % crude fiber and % ash from 100%.This is done by using the equation below.

$$\% C_x(H_2O)_y = 100\% - (\% \text{ crude protein} + \% \text{ crude lipid} + \% \text{ crude fiber} + \% \text{ ash}) \quad \text{(xi)}$$

Estimation of energy value: The sample calorific value was estimated (in kcal) by multiplying the percentages of crude protein, crude lipid and carbohydrate by the recommended factors (2.44, 8.37 and 3.57 respectively) used in vegetables analysis[9]

Mineral analysis: The triple acid digestion method was employed. The powder plant sample (2.0g) was weighed into a micro-Kjeldahl digestion flask to which 24cm^3 of mixture of concentrated HNO_3, H_2SO_4, and 60% $HClO_4$ (9:2:1 v/v) were added. The flask was put on a heating block and digested to a clear solution, it was cooled and the content wastransferred into a 50cm^3 volumetric flask and made-up to the volume mark with distilledwater[10]. The solution was used for determination of mineral elements; calcium, magnesium, potassium, iron, sodium, manganese, zinc and phosphorus.

Minerals analysis using atomic absorption spectrometry (AAS): calcium, magnesium, potassium, iron, sodium, manganese and zinc were analyzed using atomic absorption spectrometry (AAS). The method[11] gives a good precision and accuracy. The principle of the method is based on nebulising a sample solution into an air acetylene flame where it is vaporized. Elemental ions were then atomized and the atoms then absorb radiation of a characteristic wavelength from a hallow-cathode lamp. The absorbance measured, is proportional to the amount of analyte in the sample solution.

Determination of phosphorus: The clear supernatant solution (2cm^3) after digestion was placed into 50cm^3 volumetric flask. 2cm^3 of extracting solution was added, followed by 2cm^3 of ammonium molybdate solution. Then distilled water was added to make-up to 48cm^3. The content was properly mixed, and 1cm^3 of dilute stannous chloride solution was added and mixed again. 1cm^3 of distilled water was added to make-up to 50cm^{3}mark and left to stand for 5minutes. The percentage absorbance on thespectrophotometer at 660nm wavelength was used to determine the concentration of phosphorus[12].

Determination of Oxalates content: To 1g of the powder plant sample, 75cm^3 of 1.5M H_2SO_4 was added. The solution was carefully shaken on a mechanical shaker for 1 hour and then filtered using Whattman No.1 filter paper. The filtrate (25cm^3) was then collected and titrated against 0.1M $KMnO_4$ solution till a faint pink colourthat persisted for 30 seconds appeared. 1cm^3 of 0.1M $KMnO_4$ = 0.00450g oxalic acid[13].

Determination of phytates content: The powder sample (4g) was soaked in 100cm^3 of 2% HCI for 3 hours and filtered. The filtrate (25cm^3), 5cm^3 of 0.3% NH_4SCN and 53.5cm^3 of water were mixed together and titrated against standard $FeCl_3$ solution (containing 0.00195g Fe/cm^3) until a brownish yellow colour which persisted for 5 minutes appeared. Phytin – phosphorus (cm^3 Fe = 1.19 mg phytin-phosphorus) was determined and phytate content was calculated by multiplying the value of phytin - phosphorous by 3.55[14].

Determination of tannins content: The powder sample (5g) was weighed into a 100cm^3 volumetric flask. 50cm^3 of distilled water was added and shaken for 1 hour on a mechanical shaker. This was filtered into a 50cm^3 volumetric flask and made up to the mark with water. 5cm^3 of the filtrate was pipette out into a test tube and mixed with 3cm^3 of 0.1 M $FeCI_3$ in 0.1M HCI and 3cm^3 of 0.008M potassium ferrocyanide. The absorbance was measured using a spectrophotometer at 520nm wavelength, within 10min. A blank sample was prepared the colour was developed the same as the sample and absorbance read at the same wavelength. A standard was prepared using tannic acid[15]. Tannins concentration was calculated in (mg/dl)

using the absorbance table and the equation below

Conc. Inmg%	0.5	0.1	0.2	0.3	0.4	0.5
Absorbance at 520nm	0.0	0.34	0.110	0.112	0.135	0.155

$$\text{Tannins} = \frac{\text{abs of test sample x conc of standard (100ppm)}}{\text{abs of standard}} \quad \text{(xii)}$$

Determination of Nitrate content: 100grams of the powder sample was weighed into a 15cm^{3}centrifuge tube and 10ml of distilled water was added. The suspension was incubated at 45℃ for an hour. 2 cm^3 of the extract was pipette into 50 cm^3 volumetric flask and mixed thoroughly with 8 cm^3 of the 50% w/v salicylic acid – H_2SO_4 reagent and was allowed to stand for 20 minutes. 19 cm^3 of 2N NaOH was slowly added to raise the pH above 12. The content was cooled at room temperature and its absorbance was measured at 410nm with spectrophotometer.Nitrate concentration was calculated in (mg/100g) using the absorbance table and the equation below[16].

Conc. In mg%	0.5	0.1	0.2	0.3	0.4	0.5
Absorbance at 410nm	0.010	0.020	0.038	0.056	0.075	0.95

$$\text{Nitrate} = \frac{\text{abs of test sample x conc of standard (100ppm)}}{\text{abs of standard}} \quad \text{(xiii)}$$

Determination of cyanogenic glycosides: This is based on the reaction between alkaline picrate and hydrogen cyanide (HCN) resulting in an orange colour which is measured at 490nm.The lipid free sample (2.0g) was dissolved in 10cm^3 of water allowed to stand for 24hours, it was then filtered and 1.0cm^3 of filtrate was pipette into a test tube, 4cm^3 of alkaline picrate solution was added and incubated for 5 minutes in a water bath at 90℃. The test tube was cooled to room temperature and absorbance of the solution was recorded at 490nm[8]. The concentration of cyanide in the sample was determined from the table of standards for cyanide and their absorbance below[8].

Concentration in mg%	0.0	0.1	0.2	0.3	0.4	0.5
Absorbance at 450nm	0.00	0.132	0.270	0.412	0.540	0.660

$$\text{Cyanide} = \frac{\text{abs of test sample x conc of standard (100ppm)}}{\text{abs of standard}} \quad \text{(xiv)}$$

3. Results and Discussion

The results of the various analyses conducted on the sample are presented in Tables 1, 2 and 3

Proximate composition The result revealed that the moisture content 0.03± 0.06% is lower than those of some common Nigerian leafy vegetables such as *Xanthosemsagittifolum* 14.7%, *Vernonia amygdaline*27.4% and *Adansoniadigitata* 9.5%[17]. The plant has low moisture content below the value of 15% above which was reported to have favour microbial activities during storage[18]. The low moisture content of the sample is an indication that they have good storage property with minimum fungal and bacterial attack [18].

Table 1. Proximate composition of *Chancapiedra* plant

Parameters	Concentration %
Moisture	0.03±0.06
Ash	5.55±0.01
Crude protein	9.52±0.02
Crude lipid	3.15±0.01
Crude fiber	17.10±0.14
Carbohydrate	64.31±0.18
Calorific value (kcal/100g)	279.18

Values expressed as: Mean ± SD

Table 2. Mineral composition of *Chancapiedra* plant

Parameters	Concentration (mg/100g)
Calcium	25.58±1.03
Magnesium	25.85±4.03
Potassium	12.10±0.10
Phosphorus	15.42 ± 3.05
Sodium	0.44 ± 0.35
Iron	3.10 ± 0.03
Manganese	1.27 ± 0.02
Zinc	0.45 ± 0.05

Values expressed as: Mean ± SD

Table 3. Anti-nutritive factors of*Chancapiedra* plant

Parameters	Concentration %
Oxalate	5.34 ± 0.40
Phytate	27.58 ± 1.70
Hydrogen Cyanide	16.10 ±0.14
Nitrate	22.42 ± 0.03
Tannins	15.20 ± 0.13

Values expressed as: Mean ± SD

The ash content of the sample is a measure of its mineral content. The ash of the plant content of was found to be 5.55± 0.014%, the valve obtained is higher compared to 1.8% reported in sweet potato leaves[9], but lower than 19.61% in *Amaranthushybridus*leaves[19], 10.83% in water spinach leaves and 18.00% Balsam apple leaves[19] A plant material intended for feed formulation should have ash content not more than 2.5%[18].

The crude proteins content in the sample is 9.52±0.02% is higher compared to 6.30% in water spinach[21], 4.6% in *Monordicafoecide* leaves consumed in Swaziland[22] but lower compared with 11.29% in balsam apple leaves[23], 24.85% in sweet potatoes leaves[24]. The recommended dietary allowance (RDA) for children, adult males, adult females, and pregnant women are 28, 63, 50, 60g of protein daily[25]. For 100g of *Chancapiedra*provide 0.34g, 0.15g, 0.19g, 0.15g of proteins respectively, this indicate that the plant is a poor source of daily proteins.

The plant contained 3.15±0.014 crude lipid, which is lower than 11% in water spinach leaves[26], 12% in *Senna obtusfollan*[26]but higher when compared to spinach leaves (0.3%) and Chaya leaves (0.4%) and 1.60% in *Amaranthushybridus* leaves[19]. Consumption of dietary fat and oils are the principle sources of energy but should not exceed the

daily recommended dose of not more than 30 calories[27,28] so as to avoid obesity and other related diseases. One gram of lipid provides 8.37kcal, which indicates that 100g of *Chancapiedra* should provide about 0.26kcal.

The crude fiber content 17.10± 0.14 is high compared to 7.20% in sweet potatoes leaves[24], 13% in *Tribubusterrestris* (*Tsaida*) leaves[28], dietary fiber helps to reduce serum cholesterol level, risk of coronary heart disease, colon and breast cancer and hypertension[25]. The recommended daily allowance (RDA) for fiber is 18-35g[29] that means 100g of *Chancapiedra* can provide 0.17g of daily fiber for the body.

The carbohydrate content of the *Chancapiedra* is considered high 64.31± 0.18 compared to some other leafy vegetables like *Tribulusterrestris* (*Tsaida*) 55.67%[28], 54.20% in water spinach leaves[21] but lower than 82.8% in *Corchorustridens* leaves[9]. The main function of carbohydrate and lipid is to provide the body with energy. The carbohydrate content per 100g of *Chancapiedra*provides279.18kcal of energy on dry weight which is within 248.8 – 307.1 kcal/100g reported in some Nigeria leafy vegetables[30]. That means*Chancapiedra* can serve as a good source of energy for the body.

MineralsThe result of minerals analyses of *Chancapiedra* plant in table 2 imply that manganese content is higher in the plant compared to other minerals while sodium has the lowest content. The potassium content of *Chancapiedra* 12.10± 0.10mg/100g is high compared with 6.42mg/100g found in *Diospyrosmespiliformis*[31]but lower compared to 220.00± 7.8mg/100g in *Cassiasiamea* leaves[32]. The recommended daily allowance (RDA) of potassium is 2000mg for adults[33] and the plant contributed 0.6% to R.D.A meaning the plant cannot provide the body with the dietary potassium.

The sodium content of *Chancapiedra* 0.44± 0.35mg/100g is low compared with 5.00± 0.6mg/100g reported in *Tribulusterrestris*leaves[28]and 45mg/100g in *Sennaobtustolla* [26]. The sodium content is low. It contributes 0.08% RDA while the RDA value of sodium for adults is 500mg[33]. Despite the low sodium content in *Chancapiedra* it could be a good source of food for hypertensive patients.

The calcium content in the plant 25.58±1.03mg/100g is high compared with the calcium content 3.05mg/100g of *Diospyrosmespiliformis*(L)[31] and 17.95± 2.00mg/100g in *Cassiasiamea*leaves[32] but lower than 941mg/100g in *Momordicabalsamina* L. leaves[23]. The RDA values of calcium for adult men with 3000kcal/day; recommended energy intake is 1200mg[33] and *Chancapiedra* can only contribute 0.85% to the RDA. The values indicate that for calcium which is needed for growth and maintenance of bones, teeth and muscle[34], *Chancapeidra*, cannot contribute meaningful amount of dietary calcium.

The phosphorus content 15.42± 3.05mg/100g is high compared with the phosphorus content of *Diospyrosmespiliformis* (L) 1.0mg/100g[31] but lower than 166-460 mg/100g found in some green leafy vegetable consumed in Sokoto[35]. The RDA value for phosphorus is 1200mg for adult male[33], *Chancapiedra* plant is a poor source of phosphorus since it contributes 1.2% to RDA and phosphorus, like calcium is required for growth, maintenance of bones, teeth and muscles[34].

Magnesium is an important mineral element in connection with circulatory diseases such as ischemic heart disease and calcium metabolism in bones[36]. The magnesium content of the plant is 25.85± 4.03mg/100g which is high compared with2.56mg/100g in *Diospyrosmespiliformis*(L) and low when compared with magnesium content 400.00 ± 00.00 mg/100 in *Cassia siamea*leaves[32] the RDA value for magnesium in adult male is 350mg[33] and *Chancapiedra*contribute 7.3% to the RDA. This implies that the plant is a poor source of magnesium.

Iron is required for haemoglobin formation and its deficiency leads to anemia[34]. The iron content of *Chancapiedra* is 3.1± 0.03mg/100g which is higher than 2.80± 0.7 mg/100g in *T.terrestris*leaves[28] andin some cultivated vegetables such as spinach (1.6mg/100g) lettuce (0.7 mg/100g) and cabbage (0.3mg/100g)[34] but lower than 70.00 ± 0.80mg/100g in *Cassiasiamae*leaves[32]. The RDA value for iron for a male adult is 10-15mg[33]. The plant contribute 31%-20% of iron to the RDA, this shows *Chancapiedra* can provide the daily iron requirement for a male adult when the anti-nutrient agents are ignored.

The zinc content of *Chancapiedra* 0.45± 1.05mg/100g was found to the high when compared to 0.023mg/100g in *Diospyrosmespiliformis*(L)[31] but lower when compared to 6.85± 1.00mg/100g in *Cassiasiamea*leaves[32]. Zinc plays a vital role in gene expression, regulation of cellular growths and participates as a co-factor of enzymes responsible for carbohydrates, proteins and nucleic acids metabolism[37]. The RDA value of zinc for a male adult is 12-15mg[33] *Chancapiedra* contributes 3.7%-3% to the RDA. This shows that *Chancapiedra* plant is a poor source of zinc.

Manganese is a micro element essential for human nutrition. It acts as in activator for many enzymes[38]. The manganese content in *Chancapiedra* 1.27±0.02 which is higher than 0.98mg/100g reported in some locally green leafy vegetables[39] but lower than 11.6mg/100g in Balsam apple (*MormordicaBalsamina* L.) leaves[23]. The RDA value for manganese is 2-5mg/100g to a male adult[33] *Chancapiedra* contribute 63.5%-25.4% of manganese to the RDA. *Chancapiedra* is a good source of manganese.

Anti-nutritive Factors The oxalate content of *Chancapiedra* was found to 5.344± 0.4mg/100g dry matter. This value is higher when compared to 02.20±0.07mg/100g in *Borassusaethiopum*[40] but lower when compared to those reported for dehulled seeds of African locust beans (695mg/100g) and (851mg/100g) in seed kernel of *Blanitesaegytitia*[41]. The level of oxalate in the *Chancapiedra* plant is within physiological tolerance level of 2-5g.Oxalate can bind to calcium present in food thereby rendering calcium unavailable for normal physiological and biochemical roles. Oxalate present in food is insoluble, it may also precipitate around soft tissue such as the kidney, causing kidney stones[42].

The phytate content of the plant 27.58±1.70mg/100g which is higher compared to 8.24mg/100g in *Cassiasiamea*leaves[32] but lower than 392.23mg/100g in egg plant leaves[43]. It is also lower when compared to some common cereals such as maize 348mg/100g, millet 104mg/100g. Soya beans 808mg/100g[5].Phytic acid can bind to mineral element such as calcium, zinc, magnesium, iron and manganese to form complexes that are indigestible, thereby decreasing the bioavailability of these elements for absorption[44]. The low phytate content in the plant indicate that the consumption of the plant will not affect the bioavailability of minerals especially calcium and zinc for absorption.

Cyanogenic glycosides content of the plant is 16.1±0.14 mg/100g. This Substance can be very poisonous when consumed in large amount. Although, moderately it is lower than the toxic level of 35mg/100g dry weight and 20 mg/HCN equivalent per kg sample recommended by standard organization of Nigeria (SON)

Nitrate content in the plant was found to be 22.42± 0.028 mg/100g. This is below acceptable daily intake level of 3.7mg/kg body weight equivalent of 220mg for 60kg person[45].

The tannins content in the plant is 15.2± 0.13mg/100g. This value is higher when compared to 7.40±0.14mg/100g in *Balaniteaegyptiaca* and 4.83±0.15 mg/100g in *Vitexdonianan*[40] but higher than 0.93±0.11 mg/100g in *Parkiabiglobosa*[41]. Tannins in food impose an astringent taste affecting palatability, reduce the intake of the food and consequently body growth. Tannins can bind to both exogenous and endogenous proteins including enzymes of the digestive tract, thereby affecting the utilisation of protein[40].

4. Conclusions

The *Chancapiedra* plant cannot provide the entire nutrient required by human system. Yet, it contains some essential nutrients like carbohydrate, iron and manganesewhich if utilized can serve as an alternative source of nutrients. It is quite safe for consumption since it contains low anti- nutritive agents such as the oxalate, phytate, cyanide and tannins contents.

REFERENCES

[1] Tomori, W. B., (2000). Mineral composition of some less utilized vegetables in Nigeria African journal of science and technology1: 153 – 157.

[2] Hassan, L. G., K. J. Umar and A. A. Tijjani, (2007). Preliminary investigation on the feed quality of Monechmacilitionseeds.Chem. class journal Zaria, 4:83.

[3] Tukan, S. K., H. R. Takruri and D. M. Al-Eisaw, (1998). The use of wild edible plants in the Jordanian diet.Int. J. Food sci. nutr.,49: 225-235

[4] Manda, M., (1998). Mineral nutrient composition of some edible wild plants.Journal of food composition and analysis.11: 322-328

[5] Mitchikpe, E. (2008). Nutritional composition of some wild edible leaves. Journal of food comparative analysis21: 17 – 25.

[6] Udo, E. J. and Oguwele, J. A. (1986). Laboratory manual for the analysis of soil, plants and water samples.3rd edition, department of crop production, University of Ilorin, Kwara State Nigeria.pp. 131 – 152.

[7] James, C. S., (1995). Analytical chemistry of food. Chapman and Hall, London, pp. 64 – 65.

[8] AOAC. (1990). Official Methods of Analysis.14th edition, Association of Official Analytical Chemists, Washington DC.

[9] Asibey- Berko, E. and Tayie, F. A. K.(1999). Poximate analysis of some underutilizedGhannian vegetables. Ghana-Journal of Science, 39:91 – 92.

[10] Sahrawat, K. L., Kuaar, G. R. and Rao, J. K. (2002). Evaluation of tarcid and dry ashing procedures for detecting potassium, calcium, magnesium, iron, zinc, manganese and copper in plant materials.Communication of Soil Sciences and Plant Analysis. 33 (1& 2):95 – 102.

[11] Ojeka, E. O. and Ayodele, J. T. (1995). Determination of chromium, copper, lead and nickel in some Nigerian vegetables oils.Spectrum.2(1&2): 75 – 78.

[12] Bray, R. H. and Kutz, L. T. (1975). Determination of total organic and available forms of Phosphorus in soils.Soil science.59:39 – 45.

[13] Day, R. A. and Underwood, A. L., (1986). Quantitative analysis. 5th edition prentice-Hall

[14] Ola, F. L. and Oboh, G. (2000). Food value of two Nigerian edible mushrooms(Termotomycetes stratus and termomycetesRoburtus). The Journal of Technosceince.4: 1-3.

[15] El-Olemy, M. M., Al-Muhtadi, F. J., Afifi, A. A.(1994). Experimental phytochemistry.A laboratory Manual.King Saud University Presspp. 8 – 9.

[16] Bakare, I. (1998). Methods of biochemical analysis of plant tissues (unpublished document). Agronomy department, University of Ibadan pp146-152

[17] Tunde, O. (1998). Green leaf Vegetables. Nutritional quality of plant foods, post harvest research unit, Department of Biochemistry University of Benin, Benin City, Nigeriapp 120 – 133.

[18] Hassan, L. G., Umar K. J., Dangogo S. M. and Ladan M. J., (2005). Protein and Amino Acids Composition of African Locust bean (Parkiabigblobosa L.)Journal of tropical and Subtropical agroesystems.

[19] Nwaogu, L. A., Ujowundu, C. O. and Mgbemena, A. I. (2000). Studies on thenutritional and phytochemical composition of Amarantushybridus Leaves. Bio-Research4(1): 28 – 31.

[20] Hassan, L. G. and Umar, K. J. (2004). Anti-nutritive factors in African locust Beans (ParkiaBioglobosa). Proceedings of the 27th International Conference of the chemical Society of Nigeria, University of Benin, Benin City, Nigeria, pp 208 – 210.

[21] Umar, K. J., Hassan, L. G., Dangoggo, S. M. and Ladan, M. (2007). Nutritional composition of water spinach (Ipomoea aquaticaForsk.) leaves. Journal of Applied Sciences,7(6):803 – 809.

[22] Ogle. B. M. and Griveti, L. E (1985). Legacy of chameleon edible wild plant in kingdom of Swaziland, South Africa. A Cultural, Ecological, Nutritional study Part iv – nutritional analysis and conclusion. Ecological Food Nutrition.17:41 – 64.

[23] Hassan, L. G. and Umar, K. J. (2006). Nutrional value of balsam apple (Momordicabalsamina L.) leaves Journal of Nutrition, 5 (6): 522-529.

[24] Antia B. S. Akpan, E. J. Okon, P. A. and Umoren, I. U. (2006). Nutritive and Anti-nutritive evaluation of sweet potatoes leaves. Pakistan Journal of Nutrition.5(2): 166 – 168

[25] Ganong, W.F., (2003). Review of medical physiology. 21st edition, McGraw Hill. Companies Inc, New York, pp. 316-318, 514.

[26] Faruq. U. Z., Sani, A. and Hassan L. G. (2002). Proximate composition of sickle pod leaves. Nigerian Journal of Basic and applied Sciences. 11: 157 – 164

[27] Levin, R. J(1998). Modern Nutrition in Health and Disease.The African Journal of Clinical Nutrition.9: 49 – 66.

[28] Hassan, L. G., Umar, K. J. and Usman, A. (2005). Nutrient content of the leaves of Tribulusterrestris(“Tsida”).Journal of Tropical Biosciences,5(2): 77-82.

[29] Gulthrine. H. A. (1989). Nutritional and its Disorder.3rd Edition Church Living Stone, London.Pp. 1 – 43.

[30] Isong, E. U. and Adewusi, S. A. R., (1999). Nutritional and phytogeriatorical studies of three variation of Gnetumafricum (“Afang”).Food Chemistry64: 489 – 493

[31] Hassan L.G., Abdulrahaman, F.W. and Zuru, A. A. (2004). Nutritional and Phytochemical investigation of Diospyrosmespiliformis (L).Nigerian Journalof Basic and Aplied Science13: 1 – 8.

[32] Ngaski, M. M. (2006). Phytochemical screening and proximate analysis of Cassia siamea leaves. M.Sc. Dissertation (Unpublished). Submitted to postgraduate school, UsmanuDanfodiyo University, Sokoto.

[33] National Research Council NRC. (1989). Recommended Dietary Allowances. National Academy Press, Washington DC.

[34] Turan, M., Kordis, S., Zeyin, H., Dursan, A., and Sezen Y. (2003). Macro and micro minerals content of some wild edible leaves consumed in eastern Anatolia. Tailors and Francis.Pp 129 – 130.

[35] Ladan, M. J., Bilbis L. S., and Lawal, M. (1996). Nutrient composition of some green leafy vegetables consumed in Sokoto. Nigerian Journal of Basic and Applied Sciences, 5(1&2): 39 – 44.

[36] Ishida, H., Suzuno, H., Sugiyama, N., Innami, S., Todokoro, T. and Maekawa, A. (2000). Nutritonal evaluation of chemical composition of leaves, stalks and stems of sweet potatoes (Ipomoea batatasPoir). Food chemistry, 68:359-367.

[37] Camera, F. and Amaro, C. A.(2003).Nutritional aspect of zinc availability. International Journal of FoodScience and Nutritional, 47:143 – 151.

[38] McDonald, P., Edward, R. A., Greenhalti, F. D. and Morgan, C. A. (1995). Animal nutrition. Prentices Hall, London, Pp. 101 – 122.

[39] Sena, L. P., Vanderjagt, C., Rivera, A. T. C., Tsin, I., Muhammadu, O., Muhamadou, M., Milson, A., Pastosyn, and Glew, R. H. (1998). Analysis of nutritional components of eight famine foods of the Republic of Niger.Plant Foods Human Butri.,52:17 – 30.

[40] Umaru H. A., Adamu R., Dahiru D. and Nadro (2007). Level of anti-nutritionalfactors in some wild edible fruits of Northern Nigeria. African Journal of Biotechnology,6(16): 1935 – 1938.

[41] Umar, K. J (2005). Proximate analysis of seeds and Pulp of African Locust Beans (Parkiabiglobosa L.) M.Sc. Dissertation (Unpublished). Submitted to postgraduate school, UsmanuDanfodiyo University, Sokoto.

[42] Oke, O. L. (1969). Chemical studied on the more commonly used vegetables in Nigeria. Africa Science Association, 11: 42- 48.

[43] Oboh, G., Ekperigin, M. M., and Kazeem, M. I. (2005). Nutritional and haemolytic properties of eggplant (solanummacrocarpno) leaves.Journal of Food Composition and Analysis, 18:153- 160.

[44] Erdman J. N. (1979). Oily seed phytates nutritional implications.Journal of American Oil Chemical Society (JOCS).56:736- 741.

[45] W.H.O., 1997. The World Report.Conquering suffering, enriching humanity. World Health Organisation, Geneva.