PHYTOCHEMICAL, NUTRITIONAL AND ANTIOXIDANT PROPERTIES OF PUMPKIN LEAF AND FRUIT (*Cucurbita Maxima*) FROM BOSSO-NIGER STATE, NIGERIA

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ABSTRACT

Cucurbita maxima commonly known as pumpkin, is widely cultivated throughout the world for use as vegetable as well as medicine plant. Phytochemical analysis, nutritional and antioxidant properties of *Cucurbita maxima* leaf and fruit methanol extracts were determined in this study. The phytochemical and proximate analysis were performed according to standard method. The antioxidant activity was carried out using 2,2-diphenyl-1-picrylhydrazyl (DPPH) and Ferric reducing antioxidant power (FRAP). The qualitative phytochemical screening of *Cucurbita maxima* fruit and leaf revealed that Alkaloids (9.07±0.01), Tannins (4.32±0.01), and terpenoids (8.64±0.01) were found to have the highest concentration in the fruit while saponins (8.64±0.01), flavonoids (3.86±0.01) and steroids (3.86±0.01) were found to be higher in the leaf. The proximate composition of pumpkin leaf and fruit showed significant difference in moisture (10.65 ± 0.04) (8.07 ± 0.01), fibre (2.03 ± 0.03) (4.16 ± 0.03), ash contents (3.08 ± 0.08) (2.17 ± 0.05), fat (5.12 ± 0.20) (2.07 ± 0.20), (67.99± 0.03) (73.12± 0.01), and protein (10.580.06) (9.72± 0.07) of the pumpkin leaf and fruit respectively. Both extracts exhibited a dose dependent antioxidant activity in DPPH and FRAP assays. The *Cucurbita maxima* extracts exhibited significantly ($p < 0.05$) lower antioxidant activities compared to the standard (ascorbic acid). The results of mineral analysis of pumpkin shows that potassium (48.79±0.01 mg/g) and iron (33.60±0.00 mg/g) contents were higher in the pumpkin methanol fruit extract, followed by sodium (17.88±0.04 mg/g) while potassium (41.57±0.04 mg/g) and zinc (22.30±0.15 mg/g) was the most prominent element followed by iron (8.14±0.00 mg/g) in the pumpkin methanol leaf extract. These results suggest that *Cucurbita maxima* could serve as a valuable source of nutrients and antioxidants, particularly in resource-constrained communities.

Keywords: *Cucurbita maxima*, Phytochemicals, Proximate composition, Antioxidant properties and Mineral analysis.

INTRODUCTION

Oxidative stress has been implicated in the pathogenesis and progression of several diseases such as atherosclerosis, diabetes mellitus, hypertension, cardiovascular diseases, neurodegeneration, autoimmune diseases lung, pancreatic, kidney disorders and cancer to mention a few (Talebi *et al.*, 2021). Stress related disorders have become epidemic in developing and under-developed countries. Conventional therapeutic strategies mostly attempt to relieve the clinical manifestations of these disorders and their complications. However, studies have shown that they tend to increase toxicity leading to damage of sensitive organs (Rahman *et al.,* 2012; Jahan *et al.,* 2023).

In light of this, the use of complementary medicines for conditions linked to oxidative stress has grown, and plant-based antioxidant therapies are now common in the majority of developing nations (Mohan *et al.,* 2013). Several plant extracts and their secondary metabolites are being investigated for their antioxidant activities since antioxidants are essential in reducing oxidative stress-related diseases (Gomathi *et al.,* 2017, Moscolo *et al.*, 2024). Using plant-based antioxidants is crucial for preventing the body's oxidation-induced signaling pathways from being activated (Sies *et al.,* 2020; Talebi *et al.*, 2021).

The consumption of nutritive local foodstuffs will help to supplement the nutrients of the staple carbohydrate foods of the poor who cannot afford enough protein foods of animal origin (Hussain *et al.,* 2022a) and people living with degenerative diseases. The use of available local food sources is increasingly pursued, and many reports on some lesser-known seed and fruit such as pumpkin *(Cucurbita maxima),* indicated that they could be good source of nutrients and medicinal compounds for both man and livestock (Jahan *et al.,* 2023, Duvbiama *et al.*, 2023).

Cucurbita maxima (Pumpkin) is an angiosperm plant belonging to the family *Cucurbitaceae* and genus *Cucurbita* and their usage as a traditional food treating diseases has been widely reported (Omoraye and Dilworth, 2020; Hussain *et al.,*

2022b; Duvbiama *et al.*, 2023). In traditional medicine, it is known to exhibit many health benefits which include prevention of growth and reduction of size of prostrate, reduction of bladder and urethral pressure and alleviates diabetes (Batool *et al.*, 2022; Hussain *et al.,* 2022b). Pumpkin is a versatile vegetable having identical position among all vegetables, due to its peel, flesh and seeds, each possessing outstanding phytochemicals applicable in treatment and prevention of medical disorders (Sharma *et al.*, 2020; Hussain *et al.,* 2021). *Cucurbita maxima* has also exhibited anthelmintic, antihypertensive, anticancer, antibacterial, and anti-inflammatory properties (Saha *et al.,* 2019). Pumpkin is a very common vegetable widely consumed by many people not only in Nigeria but all over the world (Kim *et al.,* 2012, Lestari and Meiyanto, 2018). While several studies have focused on the nutritional value of *Cucurbita maxima* flesh and seeds, there is limited information available on the phytochemical and nutritional profiles of the leaves. Moreso, this plant fruit and leaf is mostly consumed by many people in Nigeria without knowledge of its nutritional compositions. Therefore, it is important to ascertain the nutritional profile of locally obtained *Cucurbita maxima* in Nigeria. In this context the present study was conducted to explore the preliminary phytochemical, proximate compositions and antioxidant properties of pumpkin leaves and fruit.

MATERIALS AND METHODS

Sample collection and preparation

The pumpkin leave and fruits were collected from the natural habitat of Bosso village, Bosso Local Government, Niger State, Nigeria. The pumpkin samples were authenticated at the Biological Sciences department of Federal University of Technology, Minna where it was allocated a voucher no: (FUT/PLB/CONVO/001). The leaves and the fruits were sliced and crushed. The samples extraction was performed using cold maceration for 72 hours with absolute methanol. The samples were then filtered using filter paper and the filtrate was concentrated in a rotary evaporator and kept in airtight polyethylene bags in a refrigerator for further analysis.

Reagents

Some of the reagents used in this research includes, Distilled water, Folin-Ciocalteu's reagent, methanol, 2,2,-Diphenyl-1-picrylhydrazyl (DPPH) and sulphuric acid. All the chemicals and solvents used in this experiment were of good analytical grade

Phytochemical Screening of the sample(s)

Determination of Total Phenol Singleton *et al.*, (1999), Total flavonoid content (Chang *et al.,* 2002), Total alkaloid and saponins, Oloyed, (2005), Tannin content (AOAC, 2005).

Proximate Analysis of the sample(s)

The proximate analysis was carried out for moisture content, ash content, crude fibre, fat content, protein and carbohydrates were carried out using AOAC, 2019 methods:

Determination of Moisture Content

Five grams (5g) of the sample was weighed into a previously weighed moisture can. The sample in the can was dried in the moisture extractor at 105°C for 3 hours. It was cooled in a dessicator and weighed. It was then returned to the oven for further drying. Drying, cooling, and weighing were done repeatedly at an hour interval until there were no further diminutions in the weight (i.e. a constant weight was obtained). The weight of moisture loss was calculated and expressed as a percentage of the weight of sample analysed.

$$\%\ moisture\ content = \frac{W_2 - W_3}{W_2 - W_1} \times 100 \quad \text{.....Equation 1}$$

Where; W_1 = Weight of empty can

W_2 = Weight of empty can + sample before drying

W_3 = Weight of can + sample dried to a constant weight

% total solid (Dry matter) = 100 - % moisture content

Determination of Ash Content

Five grams (5g) of the processed sample was measured into a previously weighed porcelain crucible. The sample was burnt to ashes in a muffle furnace at 550°C. When completely ashed, it was cooled in a desiccator and weighed. The weight of ash obtained was calculated by difference and expressed as a percentage of the weight of sample analysed.

$$\%\ \text{Ash content} = \frac{W2 - W1}{Weight\ of\ sample} \times 100 \quad \text{.....Equation 2}$$

Where; W_1 = weight of empty crucible
W_2 = weight of crucible + Ash

Determination of Crude Fibre

Five grams (5g) of the processed sample was boiled in 150 ml of 1.25% H_2SO_4 solution for 30minutes under reflux. The boiled sample was washed in several portions of hot water using a two-fold muslin cloth to trap the particles. The residue was returned to a flask and boiled again in 150ml of 1.25% NaOH for another 30min under the same condition. After washing in several portion of hot water, the sample was allowed to drain before it is transferred to a weighed crucible where it was dried in the oven at 105°C to a constant weight. It was thereafter taken to a muffle furnace in which it was burnt until only ash was left of it. By difference, the weight of fibre was obtained and expressed as a percentage of the weight of sample analysed.

% crude fibre = $\frac{W2-W3}{Weigh\ \ of\ sample} \times 100$ ……Equation 3

Where, W_2= weight of crucible + sample after boiling, washing and drying.

W_3 = weight of crucible + sample ashing.

Determination of Fat Content

One gram (1g) of sample was wrapped in a previously weighed porous paper (Whatman No 1 filter paper) and placed in a clean dry soxhlet reflux flask. The flask was mounted unto an extraction flask containing 300 ml of hexane. The upper end of the reflux flask was connected to a water condenser. On heating the extraction flask with a non-luminous heat source (hot plate), the solvent boiled, vaporized, and condensed into the reflux flask and covered the wrapped samples. The sample remained in contact with the solvent until the reflux flask filled up and siphoned over thereby carrying extracted oil (fat) down to the boiling flask. The cycle of vaporization, condensation, extraction, and reflux siphon was allowed to go on repeatedly for fourteen times (4h). The defatted wrapped samples were removed (with the aid of pair of forceps) and dried in the oven at 100°C for 30min after which they were cooled in a desiccator and weighed. By difference, the weight of oil (fat) lost was calculated and expressed as a percentage of the sample weight.

% fat = $\frac{W2-W3}{W2-W1}$ x 100 ……Equation 4

Where; W_1 = weight of empty filter paper
W_2 = Weight of paper + sample before defatting
W_3 = weight of paper + sample after defatting

Crude Protein Determination

The total nitrogen was determined and multiplied with factor 6.25 to obtain the protein content. Half gram (0.5g) of the sample was mixed with 10 ml of concentrated H_2SO_4 in a digestion flask. A tablet of selenium catalyst was added to it before it was heated under a fume cupboard until a clear solution was obtained (i.e. the digest). The digest was diluted to 100 ml in a volumetric flask and used for the analysis. 10ml of the digest was mixed with equal volume of 45% NaOH solution in a Kjeldahl distillation into 10ml of 4% boric acid containing three drops of mixed indicator (bromocresol green/methyl red). A total of 50 ml of distillates was collected and titrated against 0.02N EDTA from green to a deep red end point. A reagent blank was also digested, distilled, and titrated. The nitrogen and protein contents were calculated using the formula below:

% protein = % N_2 × 6……...Equation 5

$$\%N_2 = \frac{100}{10} \times \frac{N \times 14}{1000} \times \frac{Vt \times T - B}{Va}$$

Where; W = Weight of sample (0.5g)

Vt = Total digest volume (100ml)

Va = Volume of digest analysed (10ml)

T = Sample titre value

B = Blank titre value

Carbohydrate Determination

This was determined by the difference method (James, 1995). The calculation is given by the equation:

$$\% \text{ Carbohydrate} = 100 - (M+P+F_1+A+F_2) \quad \text{.....Equation 6}$$

Where P = Protein

F_1 = Fat

A = Ash

F_2 = Fibre

Antioxidant Assays

Determination of free radical scavenging activity by 2,2-diphenyl-1-picrylhydrazyl (DPPH)

The antioxidant activity of the plant extracts was estimated using the DPPH radical scavenging assay as described by Oyaizu (1986) as described by Madaki *et al.,* 2019. Briefly, different concentrations of extracts and ascorbic acid (62.5, 125, 250 and 500 µg/mL) were prepared from stock solutions (1000 µg/mL), prepared by weighing and dissolving 0.01g of the extracts and ascorbic acid, respectively in 10 mL of methanol. Thereafter, 2mL of 0.004% DPPH in methanol added to 1 mL of various concentrations of plant extracts and ascorbic acid, respectively. The reaction mixtures were incubated at 25°C for 30 minutes. The absorbance of each test mixture was read against blank at 517 nm using double beam Shimadzu UV-1800 series spectrophotometer. The experiment was performed in triplicates. The percentage antioxidant activity was calculated using the formula below:

$$\% \text{ Inhibition} = \frac{\text{Ablank} - \text{Asampl}}{\text{Ablank}} \times 100 \quad \text{.....Equation 7}$$

Determination of antioxidant activity by FRAP (Ferric Reducing Antioxidant Power) Assay

Estimation of antioxidant activity of the plant extracts via ferric reducing antioxidant power assay was conducted according to the method of Oyaizu (1986) as described by Madaki *et al.,* 2019. Stock solutions of plant extracts and ascorbic acid (1000 µg/mL) were prepared, from which different concentrations 62.5, 125, 250 and 500 µg/mL were prepared. In this assay, 1 mL of each plant extracts and ascorbic acid concentration was mixed with 1 mL of 0.2 M sodium phosphate buffer and 1 mL of 1% potassium hexacyano ferrate (III). The reaction mixtures were incubated at 50 °C for 20 minutes. Thereafter, 1 mL of 10% TCA was added. The reaction mixtures were then centrifuged for 10 minutes at room temperature. Then 1 mL of each supernatant obtained was mixed with 1 mL of distilled water and then 0.2 mL of 0.1% ferric chloride was added. The blank was prepared in the same extracts as samples except that the extracts were replaced by distilled water. The absorbance of the test mixtures was read at 700 nm. The percentage antioxidant activity was calculated using the formula below:

$$\% \text{ activity} = \frac{Asample - Ablank}{Asample} \times 100 \quad \text{----------Equation 8}$$

Mineral Analysis

The samples of pumpkin leaf and fruit were digested into solution by wet digestion using a mixture of concentrated Nitric, perchloric and sulphuric acids in the ratio 9:2:1 respectively. Fe, Zn, Mg, and Ca were determined by Atomic Absorption Spectrophotometer (Model Accusy 211 Bulk Scientific USA), sodium and potassium by flame photometer (Model FP6410 Harris Medical Essex, England), (AOAC, 2019) as described Madaki *et al.* (2016).

Statistical Analysis

Data collected were subjected to one-way Analysis of Variance (ANOVA) using Completely Randomized Design (CRD) of SPSS package and means separated by Duncan's Multiple Range Test (Duncan,2010) using the same computer package.

RESULTS

Quantitative phytochemical Analysis of Pumpkin Leaf and Fruit

Table 1 indicate the quantitative phytochemicals estimated in the methanol leaf and fruit extracts of pumpkin. Terpenoids, Alkaloids and Tannins were found to have the higher concentrations in the fruit compared to the leaf while, Saponins, Flavonoids, Phenols and Steroids were found to be higher in the leaf.

Table 1: Quantitative Phytochemical Constituents of the Methanol Extract of Pumpkin Leaf and Fruit

Phytochemical constituents	Concentration (mg)	
	Leaf	Fruit
Terpenoids	4.06±0.01	8.64±0.01
Alkaloids	8.62±0.01	9.07±0.01
Saponins	4.13±0.01	3.87±0.01
Tannins	3.96±0.01	4.32±0.01
Steroids	4.13±0.01	3.10±0.01
Glycosides	-	-
Phenols	3.26±0.01	1.02±0.01
Flavonoids	3.86±0.01	1.05±0.01

Results are expressed as mean ± SEM (n = 3).

Proximate Compositions of the Leaf and Fruit of Pumpkin

The mean values of the proximate compositions for the pumpkin leaf and fruit are presented in the tables 2. The results revealed that the moisture, protein, fat, fiber, ash, protein, and the carbohydrate contents of the pumpkin (leaf and fruit) were significantly different ($p<0.05$) in both plant parts.

Table 2: Proximate Compositions of the Pumpkin Leaf and Fruit

Proximate compositions	Leaf (%)	Fruit (%)
Moisture content	8.07 ± 0.01^{b}	10.65 ± 0.04^{a}
Ash content	3.08 ± 0.08^{b}	2.17 ± 0.05^{b}
Fat content	5.12 ± 0.20^{b}	2.07 ± 0.20^{a}
Fiber content	2.03 ± 0.03^{b}	4.16 ± 0.03^{a}
Protein content	10.58 ± 0.06^{a}	9.72 ± 0.07^{b}
Carbohydrate content	67.99 ± 0.03^{b}	73.12 ± 0.01^{a}

Values are mean ± standard error of mean (SEM) of triplicate values (n=3). Mean values across the row, with different letters as superscripts are considered significant at ($p < 0.05$)

2,2, -Diphenyl-1-picrylhydrazyl (DPPH) Scavenging Activity of Pumpkin Leaf and Fruit Methanol Extracts

The table 3 below shows that the percentage (%) inhibition of DPPH radical by the plant extracts at different concentration increased with increase in concentration of the extract for the leaf and fruit. The plant extracts exhibited lower antioxidant activity compared to standard (ascorbic acid).

Table 3: 2,2, -Diphenyl-1-picrylhydrazyl scavenging activity of Methanol Extracts of Pumpkin Leaf and Fruits

Concentration (µg/mL)	Methanol extract		Standard (Ascorbic acid)
	Leaf	Fruit	
500	66.23 ± 0.94^{b}	67.63 ± 0.82^{b}	96.38 ± 0.09^{a}
250	48.07 ± 0.04^{a}	50.70 ± 0.01^{a}	93.52 ± 0.02^{b}
125	29.90 ± 0.04^{c}	33.71 ± 0.32^{b}	86.95 ± 0.01^{a}
62.5	17.09 ± 0.07^{c}	19.03 ± 0.07^{a}	74.02 ± 0.01^{c}

Values are expressed as mean ± SEM. Mean values across the row, with different letters as superscripts are considered significant at ($p < 0.05$).

Ferric Reducing Antioxidant Power of Pumpkin Leaf and Fruit Methanol Extracts

The table 4 shows the ferric reducing power of methanol extract of the pumpkin leaf and fruit. The percentage (%) inhibition of FRAP radical by the plant extracts was in dose dependent pattern. The plant extracts exhibited lower antioxidant activity compared to standard (ascorbic acid) with highest activity achieved at 500 µg/mL.

Table 4: Ferric reducing antioxidant power activity of Methanol Extracts of Pumpkin Leaf and Fruits

Concentration (µg/mL)	Methanol extract		Standard (Ascorbic acid)
	Leaf	Fruit	
500	68.21± 0.84^{ab}	69.92±0.72^{a}	97.88± 0.09^{a}
250	50.51± 0.04^{c}	54.75±0.11^{a}	96.43± 0.02^{c}
125	24.09± 0. 44^{a}	31.15±0.35^{b}	92.67± 0.02^{ab}
62.5	11.86± 0.57^{c}	20.03±0.67^{a}	78.81± 0.51^{c}

Values are expressed as mean ± SEM $p<0.05$.

Selected Mineral Composition of Methanol Extracts of Pumpkin Leaf and Fruits

The table 5 shows the concentration of selected mineral content of the pumpkin leaf and fruit methanol extracts. Higher concentrations of sodium, magnesium, potassium, calcium and iron were estimated in methanol fruit extract while zinc was higher in methanol leaf extract.

Table 5: Selected Mineral Composition of Methanol Extracts of Pumpkin Leaf and Fruits

Mineral	Amount (mg/g)		P value
	PF	PL	
Na	17.88±0.04^{b}	2.81±0.01^{a}	0.00
Mg	8.27±0.01^{b}	0.19±0.00^{a}	0.00
K	48.79±0.01^{b}	41.57±0.04^{a}	0.00
Ca	3.77±0.03^{b}	2.02±0.01^{a}	0.00
Fe	33.60±0.00^{b}	8.14±0.00^{a}	0.00
Zn	2.45±0.03^{a}	22.30±0.15^{b}	0.00

Values are presented as mean ± standard error of mean (SEM) of three replicates. Values across row with different superscripts are significantly different at $p < 0.05$. Where, PF=Pumpkin fruit; PL= Pumpkin leaf

DISCUSSION

The use of traditional herbal remedies as preventive measures and to cure certain diseases are very common in developing and develop countries due to their lesser side effects with fewer complications (Hussein *et al.*, 2022a). Extracts of different herbs, fruits and vegetables have been found loaded with biologically active components and are a well alternative source of drugs (Mohammed *et al.*, 2020). This study revealed the nutritional composition including proximate analysis (ash, moisture, protein, fat, fiber, and carbohydrate) and mineral contents, of fruit and leaf, parts of the pumpkin (*Cucurbita maxima*) plant.

The result of this study shows that the qualitative and quantitative phytochemical screening of methanol extracts of pumpkin leaf and fruit contain various phytochemicals including flavonoids, alkaloids, phenol, tannins, terpenoids, and saponins while glycosides were not observed. Muhammed *et al.* (2020) and Halder *et al.* (2022) reported similar phytochemical constituents in their studies of pumpkin leaf and peel respectively. It was also observed that alkaloids have the highest concentration in both the leaf and fruit methanol extracts while the lowest concentration was recorded for phenol in both plant extracts. These phytochemicals possess strong antioxidant activities and exhibit antimicrobial, antidiarrheal, anthelmintic, antiallergic, antispasmodic, and antiviral activities (Sharma *et al.*, 2018). For instance, Alkaloids are reported to possess therapeutic potential in various mood disorders and neurodegenerative diseases (Hussain *et al.*, 2018).

Analysis of nutritional composition is important as it is necessary to understand the quality and the health-beneficiary effects of food or food products (Abou-Elella and Mourad, 2020). The proximate analysis of *C. maxima* showed significantly ($p < 0.05$) higher percentages of carbohydrates and fiber in the fruit when compared to the leaf extract while percentage moisture, protein, fat and ash contents were higher in *C. maxima* Methanol leaf extract which is related to the work of Omimakinde *et al.*, 2019. The carbohydrate composition (67.99± 0.03 %; 73.12± 0.01%) of *C. maxima* leaf and fruit methanol extracts recorded were high, whereas proteins was the second most abundant component in the leaf and fruit has crude fat as the second most prominent which is an indication that the leaves and fruits are a good source of energy to both humans and animals. The values obtained were higher than those reported by Omimakinde *et al.* (2019) (about 51 and 64% in Leaf and Pod, respectively). Crude fat contents of leaf and fruit were very low (2.03 ± 0.03 % and 4.16 ± 0.03 %, respectively) suggesting that regular consumption of pumpkin is healthy cannot lead to

obesity. Moisture content is used as a measure of susceptibility to microbial action or contamination (Uyoh *et al.,* 2013). The relatively low concentration of moisture indicates that their dried leaf may not easily be susceptible to microbial spoilage when preserved. The low moisture content will drastically slow down the development of microorganisms and hinder the hydrolysis of component material (Ngaha *et al.,* 2020). The appreciable amounts of proteins in leaf and fruit shows that they can be used in the human diet to supplement or meet protein needs and reduce poverty and malnutrition among the poor who cannot afford protein rich foods such as meat and fish (Okonya and Maass, 2014). The high amount of protein, especially in leaf justifies its uses in cooking, as the edible parts of pumpkin might help an individual to meet the daily recommended intake of macronutrients (Jahan *et al*., 2023)

The antioxidant potential of a plant or its part, depends upon the presence of biological active ingredients capable of suppressing free radicals and reactive oxygen species in living body complications (Hussein *et al*., 2022). DPPH free radical scavenging activity of pumpkin leaf and fruit methanol extracts was found to increase at dose dependent manner with highest activity (66.23± 0.94; 67.63±0.82) observed at 500 µg/mL concentration**,** which is in contrast with the study conducted by Hussain *et al.* (2021), in which a comparison of antioxidant and antimicrobial activities of pumpkin peel, flesh and seeds was made. In addition, the pumpkin fruit methanol extract exhibited significantly ($p<0.05$) higher antioxidant activity. Similar result was also obtained in the ferric oxide reducing power activity. The results of this research are consistent to those reported by Kabbashi *et al.* (2014). In their study, they reported high antioxidant activity of ethanolic seed extract of *C. maxima*. This indicates that pumpkin not only being used as food in various communities across the globe, but it can also act as an important raw material for drug development in pharmaceutical industries.

Minerals fulfil a wide variety of functions in the optimal functioning of the immune system. The supply of minerals is important for the optimal function of the innate immune system as well as for components of adaptive immune defense; this involves defense mechanisms against pathogens in addition to the long-term balance of pro- and anti-inflammatory regulation (Weyh *et al.,* 2022). The results of mineral analysis of pumpkin shows that potassium (48.79±0.01 mg/g) and iron (33.60±0.00 mg/g) contents were higher in the pumpkin methanol fruit extract, followed by sodium (17.88±0.04 mg/g) while zinc (22.30±0.15 mg/g) was the second most prominent element followed by iron (8.14±0.00 mg/g) in the pumpkin methanol leaf extract. However, zinc recorded the lowest mineral composition in pumpkin methanol fruit extract while magnesium (0.19±0.00 mg/g) was the lowest in pumpkin methanol leaf extract estimated. It was observed that concentrations of most elements were higher in the fruit compared to the leaf with exception of zinc. These results contradict the work of Elinge *et al.* (2012) where higher elemental concentrations were reported in their study of mineral compositions of pumpkin seed extract, this could be due to variation in plant parts, vegetation and solvent of extraction. Zinc is a very important mineral responsible for enhancing metabolism function and immune system. Pumpkins are excellent source of an important mineral Zn, which plays a vital mediating role in activation of enzymes and in this current situation of pandemic consumption of pumpkin can promote antioxidation in the living body thus restricting the attack of viral diseases (Hussain *et al*., 2021).

CONCLUSION

The results of this study shows that methanol extracts of pumpkin leaf and fruit are rich in carbohydrate and protein and could be a good source of carbohydrate and protein for people living in rural areas as well as for animals. This indicates that the plant is a good source of energy to both humans and animals. Pumpkin leaf and fruit methanol extracts possess numerous phytoconstituents which support their use in ethnomedicine. The methanol extract of pumpkin leaf and fruit exhibited significant antioxidant activity as revealed in the FRAP and DPPH assays, which could be attributed to the presence of phytochemical contents, especially flavonoid and alkaloid contents. The supply of minerals is important for the optimal function of the body system which was demonstrated by the presence of minerals in both extracts. The consumption of pumpkin should be encouraged, especially the leaf and fruit.

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