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PHYTOCHEMICAL CONSTITUENTS AND PROXIMATE COMPOSITION OF BAMBARA GROUNDNUT (*Vigna Subterranean*) AND PIGEON PEA (*Cajanus cajan*) UNDERUTILIZED IN CALABAR, CROSS RIVER STATE

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ABSTRACT

The proximate constituents and phytochemical compositions of Bambara groundnut (*Vigna subterranean*) and Pigeon pea (*Cajanus cajan)* underutilized in Calabar, Cross River States was investigated. The research will provide solutions to food availability and affordability to interlock their abundance in complex carbohydrates, plant-based proteins, unsaturated fatty acids and essential minerals. Bambara groundnut (*Vigna subterranean*) and pigeon pea (*Cajanus cajan)* obtained from markets in Anambra State and Ugep, Cross River State. The plant extracts were assessed for the existence of phytochemicals by using standard procedures. Phytochemical screening revealed that the plant species used in this research contained alkaloids, flavonoids, and polyphenols. Proximate analysis of the seeds revealed the moisture content of 9.70% for Bambara groundnut and 10.01% for Cajanus, crude fat of 7.50% for Bambara groundnut and 4.50% for *Cajanus cajan*, ash content of 3.21% for Bambara groundnut and 3.31% for *Cajanus cajan*, crude protein of 25.01% for Bambara groundnut and 23.06% for Cajanus cajan, and carbohydrates composition of 70.41% for Bambara groundnut and 71.04% for *Cajanus cajan.* The presence of phytochemicals such as flavonoids, alkaloids, and polyphenols explained the medicinal action of the plants encountered in their therapeutic usage to meet both domestic and commercial needs.

Keywords: Bambara groundnut, *Cajanus cajan*, *Vigna subterranean*, Phytochemical, Polyphenol, Flavonoids

INTRODUCTION

All plants produce chemical compounds which give them an evolutionary advantage, such as defending against herbivores or in the case of salicylic acid, as a hormone in plant defence (Hayat and Ahmed, 2007). These chemical compounds are otherwise naturally occurring, non-nutritive bioactive compounds referred to as phytochemicals. Alkaloids are bitter-tasting chemicals, very widespread in nature, and often toxic, found in many medicinal plants (Aniszewki, 2017). Alkaloids have many pharmacological activities including antihypertensive effects (many indole alkaloids), antiarrhythmic effect (quinidine, spareien), antimalarial activity (quinine), and anticancer actions (dimeric indoles, vincristine and vinblastine). Bambara groundnut (*Vigna subterranean*) is an indigenous African crop that is grown across the African continent. The colour of the seed varies from black, brown or red and may be mottled with various colours (Onimawo 1998; Jideani and Diedericks, 2014). Bambara groundnut belongs to the Leguminosae, subfamily papilionoideae. It is commonly known as Gujiya among the Hausa tribe of Nigeria. Bambara groundnut was once said to be the third most important grain legume after groundnut (*Arachis hypogae L.*) and cowpea (*Vigna unguiculata (L) Walp)* in sub-saharan Africa (Rachie and Silvestre, 1997). It is a major source of cheap dietary phyto-protein for both humans and livestock in the sudano-sahelian parts of tropical Bambara groundnut production and consumption is predominant among subsistence farmers in West African countries (Goli, 1997). In Nigeria, especially in the East, Bambara groundnut is an important food crop and can be used in traditional preparation of various recipes. The seeds are roasted, pulverized, and used in preparing soup (Adu-Dapaah and Sangwan, 2004) or roasted and chewed with palm kernel. The fresh immature green seed is produced and consumed raw as a vegetable or cooked, while dry seeds can be processed as flour to prepare diverse forms of Bambara groundnut such as (Okpa and cake Okpuzor *et al.*, 2010).

Cajanus cajan also known as Pigeon pea is a perennial legume from the family Fabaceae. Originating from Asia to East Africa and America around 3000 years ago, in Nigeria, Pigeon pea is known as 'wake masa' by the Hausas, 'fiofio' by the Igbos, 'otili' by the Yorubas and 'agwuagwu' by the Igalas (Iwu, 1993). Pigeon peas are food crop (dried peas, flour or green vegetable peas) and a forage /cover crop. They contain high levels of protein and the important amino acids methionine, lysine and tryptophan. The extracts or components of Pigeon peas are commonly used all over the world for the treatment of diabetes, dysentery and hepatitis (Aiyedoja and Bello, 2006). Nowadays, these leaves are used for the treatment of wounds, aphtha, bedsores, and malaria as well as diet-induced hypercholesterolemia (Aiyedoja *et al.*, 2006). The plant has been used locally for the treatment of measles, small pox, chicken pox; as diuretic, haemostatic, astringent and mouth wash (Gills, 1992). Pigeon pea provides green forage of outstanding value when other forages are not available. The aim of this study is to determine the proximate constituents and phytochemicals compositions of Bambara groundnut (*Vigna subterranean*) and Pigeon pea (*Cajanus cajan)* underutilized in Calabar, Cross River State.

MATERIALS AND METHODS

Materials and Equipment

Oven, muffle furnace, glass crucibles, Kjeldahl digestion flask, fume cupboard, volumetric flask, distillation apparatus, conical flask, Filter paper (Whatman's filter paper No 1), sieve bowl, funnel, test tube, separating funnel, spectrophotometer, electronic weighing balance, desiccator.

Chemical Reagents

Boric acid, copper sulphate, sodium sulphate, bromocresol green, methyl red mixed indicator, 0.1N HCl, diethyl ether,

petroleum ether, Benzene, ammonia solutions, bromine water, distilled water, olive oil, concentrated sulphuric acid, NaOH, chloroform, Dragendorff's reagent, ethanol, sodium tungstate, Folin-Denis reagent, methanol

Sample Collection and Preparation

Bambara groundnut and *Cajanus cajan* were obtained from markets in Anambra State and Ugep, Cross River State respectively and identified by a taxonomist in the Department of Botany, University of Calabar, Cross River State. The collected materials were washed thoroughly first in tap water and then rinsed with distilled water. The pods were broken using hands to expose the coated seeds and the seed coats removed using local mortar and pestle. The broken seed coats were blown off with the aid of gravitation while the bare seeds were obtained. The seeds were dried completely in shade at room temperature. Subsequently, they were crushed and ground to fine powder using electronic blending machine. The grinding was repeated continuously until a fine powder was obtained to ensure homogeneity. The powder was sieved through mesh sieves to remove any remaining coats. The ground and sieved powder was then stored in airtight plastic container till further use.

Qualitative Phytochemical Screening

The plant extracts were assessed for the existence of phytochemicals by using the standard procedures using the following standard procedures (Sofowora *et al.,* 1978,)

Test for Tannins

10ml of bromine water was added to the extract. Decolouration of bromine water showed the presence of tannins.

Test for Saponins

5.0ml of distilled water was mixed with plant extract in a test tube and mixed vigorously. The frothing was mixed with few drops of olive oil and mixed vigorously and the foam appearance showed the presence of saponins.

Test for Flavonoids

2ml of 2.0% NaOH mixture was added to the plant extract, concentrated yellow colour was produced which became colourless when two (2) drops of diluted acid were added to mixture. This result showed the presence of flavonoids.

Test for Glycosides

2ml of tetraoxosulphate (IV) acid was added to the whole plant extract. A reddish brown color formed which indicated the presence of steroidal aglycone part of the glycoside.

Test for Terpenoids

2.0ml of chloroform was added to the 5ml extract and evaporated on the water path and then boiled with 3ml of concentrated tetraoxosulphate (IV) acid. A grey colour formed showed the presence of terpenoids.

Test for Steroids

2ml of chloroform and concentrated tetraoxosulphate (IV) acid were added to the 5ml plant extract. In the lower chloroform layer, red colour appeared which indicated the presence of steroids.

Quantitative Phytochemical Analysis

Determination of Tannins

Analytical method for quantitative determination of tannin was done according to Amadi *et al.* (2004) and Ejikeme *et al.* (2014). By dissolving 50 g of sodium tungstate (Na_2WO_4) in 37 cm3 of distilled water, Folin-Denis reagent was made. To the reagent prepared above, 10 g of phosphomolybdic acid ($H_3PMo_{12}O_{40}$) and 25 cm3 of orthophosphoric acid (H_3PO_4) were added. Two-hour reflux of the mixture was carried out, cooled, and diluted to 500 cm3 with distilled water. Plant extract in a conical flask was added to 100 cm3 of distilled water. This was boiled gently for 1 hour on an electric hot plate and filtered using number 42 (125 mm) Whatman filter paper in a 100 cm3 volumetric flask. Addition of 5.0 cm3 Folin-Denis reagent and 10 cm3 of saturated Na_2CO_3 solution into 50 cm3 of distilled water and 10 cm3 of diluted extract (aliquot volume) was carried out after being pipetted into a 100 cm3 conical flask for colour development. The solution was allowed to stand for 30 minutes in a water bath at a temperature of 25°C after thorough agitation. With the aid of a Spectrum Lab 23A spectrophotometer optical density was measured at 700 nm and compared on a standard tannic acid curve. The solution was left to stand for 30 minutes in a water bath at 25°C. Optical density was ascertained at 700 nm with the aid of a Spectrum Lab 23A spectrophotometer.

Determination of Alkaloids

Quantitative determination of alkaloid was according to the methodology by Harborne (1973). Exactly 200 cm3 of 10% acetic acid in ethanol was added to sample (2.50 g) in a 250 cm3 beaker and allowed to stand for 4 hours. The extract was concentrated on a water bath to one-quarter of the original volume followed by addition of 15 drops of concentrated ammonium hydroxide drop wise to the extract until the precipitation was complete immediately after filtration. After 3 hours of mixture sedimentation, the supernatant was discarded and the precipitates were washed with 20 cm3 of 0.1 M of ammonium hydroxide and then filtered using Gem filter paper (12.5 cm). Using electronic weighing balance Model B-218, the residue was dried in an oven and the percentage of alkaloid is expressed mathematically as:

% Alkaloid = Weight of Alkaloid / Weight of Sample x100

Determination of Flavonoids

Flavonoid determination was carried out by the standard method reported by (Ejikeme *et al.,* 2014) and (Boham and Kocipai, 1994). Exactly 50 cm3 of 80% aqueous methanol added was added to 2.50 g of sample in a 250 cm3 beaker, covered, and allowed to stand for 24 hours at room temperature. After discarding the supernatant, the residue was re-extracted (three times) with the same volume of ethanol. Whatman filter paper number 42 (125 mm) was used to filter whole solution of each wood sample. Each wood sample filtrate was later transferred into a crucible and evaporated to dryness over a water bath. The content in the crucible was cooled in a desiccator and weighed until constant weight was obtained. The percentage of flavonoid was calculated as:

%Flavonoid = Weight of flavonoids/Weight of Sample x 100

Determination of Saponins

Saponin quantitative determination was carried out using the standard method reported by (Ejikeme *et al.,* 2014). Exactly, 250g of sample in a 250 cm3 conical flask. The mixture was heated over a hot water bath for 4 hours with continuous stirring at a temperature of 55°C. The residue of the mixture was extracted with another 100 cm3 of 20% aqueous ethanol after filtration and heated for 4 hours at a constant temperature of 55°C with constant stirring. The combined extract was evaporated to 40 cm3 over water bath at 90°C. 20 cm3 of diethyl ether was added to the concentrate in a 250 cm3 separator funnel and vigorously agitated from which the

aqueous layer was recovered while the ether layer was discarded. This purification process was repeated twice. 60 cm3 of n-butanol was added and extracted twice with 10 cm3 of 5% sodium chloride (Ochuko, 2002).

Proximate analysis

Determination of Moisture Content

The percentage of moisture content was determined by oven method following standard procedures (David 2014). 2g of sample was dried in the oven for 24 hours at 100°C. The percentage moisture content was calculated by the following formula:

Water content (%) = Initial mass (g) - Final mass (g) / Total mass (g)

Determination of Ash Content

The ash content was determined by direct heating method following standard procedures (David, 2014). 2g of each of the samples was weighed in dried glass crucibles separately. The samples were then incinerated to ash in a muffle furnace for 3 hours at 550°C. The crucibles were then removed, cooled in desiccator and the weight of the ash was determined.

Determination of Protein Content

The crude proteins were determined by the macro Kjeldahl method (David, 2014). 2g of samples was introduced into a Kjeldahl digestion flask together with 10g of copper sulphate and sodium sulphate in the ratio of 5:1. 25ml of concentrated sulphuric acid was added at about 1500°C in the fume cupboard until frothing ceased. The digest was cooled and diluted up to the mark with distilled water in 100ml volumetric flask. 10ml of the diluted mixture was poured into the distillation apparatus and 18ml of 40% sodium hydroxide was added. 25ml of 2% boric acid was added into the receiving conical flask and two drops of bromocresol green and methyl bred mixed indicator was added. The distillation was continued until boric acid solution turned from pink to yellowish green. After the distillation, the solution in the comical flash was titrated against 0.1N HCl until the end point was reached.

Determination of Crude Fat Content

The fat content was determined using standard procedures (David, 2014). 5g of sample was mixed with 0.88ml of ammonia solution and 10ml of 95% ethanol and mixed well. 25ml of diethyl ether was added to the mixture and shaken vigorously for 1 minute. This was then followed by addition of 25ml of petroleum ether and shaken vigorously to mix well. The mixture was then left to stand for an hour to allow aqueous and organic phase to separate. The fat extract (organic phase) was collected and the solvent was removed by distillation. The fat in the flask was dried in the oven at 100°C for 30 minutes and the solvent was removed completely. The flasks were then cooled in a desiccator and we're weighed for their mass of fat.

Determination of Crude Fibre

The crude fibre was determined according to the standard procedures (David, 2014). It was determined as the fraction remaining after digestion with standard sulphuric acid and sodium hydroxide. 2g of samples was hydrolyzed in a beaker containing 299ml of 1.25% of sulphuric acid and then boiled for 30 minutes. The mixture was filtered under vacuum and the residues washed with hot distilled water 3 times and then boiled again for 30 minutes with 200ml of 1.25% of sodium hydroxide and filtered again. The digested sample was washed with HCl to neutralize sodium hydroxide and then with hot distilled water 3 times. The residue was taken into a crucible dried at 100°C for 2 hours in an oven; the sample was cooled in a desiccator and then weighed. The sample in the crucible was incinerated at 500°C for 5 hours until all carbonaceous matter were burnt. Finally, the crucible containing the ash was cooled in the desiccator and weighed.

Determination of Carbohydrates Content

Carbohydrates we're determined using a mathematical function below as described (David, 2014).

Carbohydrates= 100-% (ash + protein +fat + crude fibre + moisture)

Statistical Analysis

Quantitative data were analyzed using One-Way Analysis of Variance ANOVA followed by post hoc (Duncan test) for significant values. Social Science Application Software SPSS version 20 was used for statistical analysis and the charts were plotted using Microsoft excel application software. Data are expressed as mean ± SEM.

RESULTS

The Proximate contents of Bambara groundnut (*Vigna subterranean)* and *Cajanus cajan* (Pigeon pea) were compared in Figure 1**.** The parameters determined include moisture and ash content, crude fat and protein, carbohydrates.

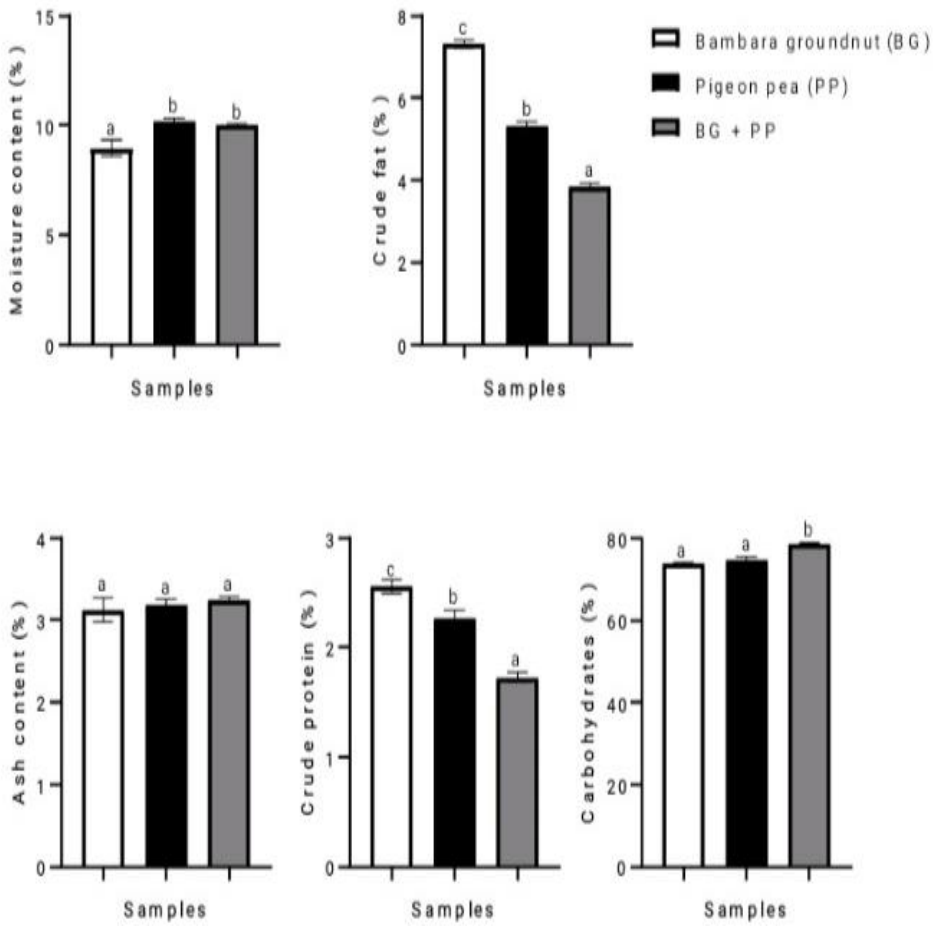

Figure I: Proximate Analysis of Bambara groundnut (*Vigna subterranean*) and *Cajanus cajan* (Pigeon pea) (a) Moisture content (%) (b) Crude fat (%) (c) Ash content (%) (d) Crude protein (%) (e) Carbohydrate content (%) Bars represent mean ±SEM. Bars with different letters are significantly different at P< 0.05

Legumes are known for their low moisture content as this is an indication that the seeds have good storage qualities. However, high moisture content reduces their storage value. As seen in the table above, there was a significant difference between Bambara groundnut and Pigeon pea, Bambara groundnut was slightly lower in moisture content than Pigeon pea. BG also, shows a significant increase in crude fat content compared to Pigeon pea with the mixture of both samples. The mixture of Bambara groundnut and Pigeon pea showed a decrease in crude fat content. Bambara groundnut had the highest crude protein content significantly compared to the mixed samples. The both samples showed a high concentration of carbohydrates.

Phytochemical Analysis

The qualitative analysis of the phytochemical presence in Bambara groundnut (*Vigna subterranean*) and pigeon pea (*Cajanus cajan*) is revealed in Table 1.

Table 1: Quantitative analysis of Bambara groundnut (*Vigna Subterranean*) and Pigeon pea (*Cajanus cajan)*

Phytochemicals	***Vigna Subterranean***	***Cajanus cajan***
Alkaloids	+	+
Cardiac Glycosides	-	+
Reducing Sugar	+	+
Tannins	-	-
Flavonoids	+	+
Steroids	+	-
Polyphenols	+	+
Terpenoids	-	-

Key:
- Absent
+ Present moderately

The results show that the plant species contained alkaloids, flavonoids, polyphenols, tannins and terpenoids weren't present in the plant species. Steroids were detected in Bambara groundnut but not in *Cajanus cajan* while cardiac

glycosides were found in *Cajanus cajan* but not in Bambara groundnut. Table 1 showed the preliminary Phytochemical screening results of the seeds of the plant species. Alkaloids were detected at moderate levels in Bambara groundnut and *Cajanus cajan.* Cardiac glycosides were absent in Bambara groundnut but present in *Cajanus cajan.* Tannins were absent in both Bambara groundnut and *Cajanus cajan.* Flavonoids and polyphenols were both detected at moderate levels in Bambara groundnut and *Cajanus cajan*. Terpenoids were absent in Bambara groundnut and *Cajanus cajan*, steroids were detected in Bambara but not in *Cajanus cajan.*

The proximate analysis of Bambara groundnut (*Vigna subterranean*) and *Cajanus cajan* (Pigeon pea) are shown in Table 2**.** The parameters determined include moisture, ash content, crude fat, protein, and carbohydrates.

Table 2: Proximate Analysis of Bambara groundnut (*Vigna subterranean)* and *Cajanus cajan* (Pigeon pea)

Samples	Moisture Content	Crude Fat	Ash Content	Crude Protein	Carbohydrates
Bambara groundnut	9.70±0.20	7.5±1.82	3.21±0.11	25.01±0.33	70.41±0.65
Pigeon pea	10.01±0.06	4.5±0.12	3.31±0.11	23.06±0.27	71.04±0.66

Values expressed in % (percentage).

DISCUSSION

The phytochemical analysis of Bambara groundnut and *Cajanus cajan* revealed the presence of chemical constituents which have been shown to possess some pharmacological activities which is useful in ethno- medicine. The phytochemical analysis of these seeds showed that they contain alkaloids, flavonoids, and polyphenols. Flavonoids are a large group of polyphenol compounds detected in Bambara groundnut and *Cajanus cajan.* Flavonoids play important role within various organs to maintain plant health, development and growth (Ferreyra *et al.,* 2012). Flavonoids can function as photo- protectors against UV irradiation and in leguminosae, nod inducers for nitrogen-fixing bacteria. Flavonoids have been shown to possess antioxidant activity, free radical scavenging capacity, hepato-protective, anti-inflammatory and anti-cancer activities. Flavonoids in *Cajanus cajan* are also known to possess antimicrobial effect (Agnese *et al.,* 2001). Isoflavonoids are prevalent in the Fabaceae sub-family of the leguminosae plants that are used as alternative compounds for hormone replacement therapy (HRT) for menopausal disorders (Beck *et al.,* 2003). Alkaloids are the most efficient therapeutically significant plant substance. Pure isolated alkaloids and their synthetic derivatives are used as basic medicinal agents because of their analgesic, antispasmodic and anti-bacterial properties. They show marked physiological effect when administered to animals. The presence of alkaloids in the seeds shows that they can be effective anti-emetic agents since raw seeds of Bambara groundnut are chewed and swallowed in order to arrest nausea and vomiting. This remedy is often used to treat morning sickness in pregnant women (Hassan *et al.,* 2012).

Polyphenols are a large family of naturally occurring compounds generally involved in defence against ultraviolet radiation or attack by pathogens. Polyphenols also contribute to the bitterness, astringency, colour, flavor, odor in food. The presence of polyphenols in Bambara groundnut and *Cajanus cajan* suggests that consumption of these plant species limits the incidence of coronary heart diseases (Renaud de Lorgeril 1992; and Nardini, 2007). Atherosclerosis is a chronic inflammatory malignancy that develops in lesion-prone regions of medium sized arteries. Polyphenols are potent inhibitors of LDL oxidation and this type of oxidation is considered to be a key mechanism in the development of atherosclerosis (Aviram *et al.,* 2000). Polyphenols have also been recognized for its anti-diabetic effect as it affects glycaemia through different mechanisms including the inhibition of glucose absorption in the gut or its uptake by peripheral tissues. This lends credence to the fact that Bambara groundnut is used to treat diabetes. The seeds of *Cajanus cajan* are used to treat parasitic infections. This is due to the presence of phenolics reported to have good anti-helminthic properties (Singh *et al.,* 2010). Steroids were found to be present in Bambara groundnut. Steroidal compounds act as precursors in the biosynthesis of sex hormones. This makes Bambara groundnut useful in the treatment of polymenorrhea, nursing venereal diseases and serving as an aphrodisiac or herbal remedy.

For most pulses, moisture content ranges between 9-12% which ensures reduction of microbial attack and storage safety thereby improving germplasm shelf life (Sujeetha *et al*., 2014). In this study, the moisture content of Bambara groundnut and *Cajanus cajan* was observed to be 9.70% and 10.01% respectively and this falls within recommended values which imply that seeds can be stored at room temperature without microbial attack for a period of time. These results agree with that obtained by Benjamin (2015) who established a moisture content of 7.78% and that of (Duplex *et al.,* 2004). (10.55-11.11%) for Bambara groundnut. The result observed in *Cajanus cajan* compares favorably with that obtained by David (2004). (11.20%) for the same plant. The ash content of 3.21% for Bambara groundnut compares favorably with report of (Ahmed *et al.,* (2010) (3.63%) while the ash content of 3.31% was observed in *Cajanus cajan* and this agrees with the result obtained by (Adamu *et al.,* 92015) (3.53%). Ash refers to the inorganic residue remaining after either ignition or oxidation of organic matter in a food sample. The ash content of this study falls within the range of leguminosae crops. Hence, it can be recommended for animal feeds and human consumption as well as serving as microbial media without mineral supplements. Legumes are excellent source of good quality proteins with 20-40% protein that is generally rich in the essential amino acids lysine and leucine (Phillips, 1993). The Protein content of Bambara groundnut observed to be 25.01% and that of *Cajanus cajan* found to be 23.06% agree with the above notion. This also compares favourably with the results obtained by (Benjamin and Gabriel (2015) (18.25%), (Adamu *et al.,* (2015) (18.83%) for Bambara groundnut and the result obtained by (Ene-Obong and Carnovale, 1992) (21.02%) and (David, 2013) (22.40%). The high protein content of legume can be attributed to their association with the activity of the nitrogen-fixing bacteria in their roots which converts the unusable nitrogen gas into ammonium which the plant incorporates into protein synthesis. The values obtained indicate that the plant is a good source of protein and could be used as a supplement for animal protein. In terms of carbohydrates composition, the result obtained for Bambara groundnut 73.41% and *Cajanus cajan* 75.04% support those of (Adamu *et al.,* (2015) (64.37%) and Azman *et al.* (2019) (64.44%). The high carbohydrates content of the plant species indicates that their seeds provide energy to the body when consumed. Leguminous starch is digested slower than starch

from cereals and tubers. As such, legumes have a low glycemic index (GI) rating for blood glucose control (Khalid Elharadallo 2013 and Phillips, 1993) making them suitable for consumption by diabetic patients and those with an elevated risk of developing diabetes. Furthermore, legumes are gluten-free, making them suitable for consumption by celiac disease patients or individuals sensitive to the proteins and glutenin. The lipid composition of Bambara groundnut was found to be 7.05% which is in agreement with the result obtained by (Benjamin and Gabriel, 2015). (5.82%) and Adamu *et al.*, (2015) (7.05%). The fat content of *Cajanus cajan* observed to be 4.50% supports the report of David (2014) (2.74%). The crude fat content obtained in Bambara groundnut, however, contradicts reports by (Dillon, 1985). The fats content of most grain legumes does not exceed 3g/100g. Dietary fats increase with palatability to food by absorbing and retaining flavours. A diet providing 1-2% of its caloric energy as fat is said to be sufficient to human beings as excess fat consumption implicated in certain cardiovascular diseases such as atherosclerosis, cancer and aging. Lipids lend a pleasant taste and texture to food, the essential fatty acids prevent skin dryness and scaling, regulate the action of hormones and facilitate transmission of nerve impulses.

Finally, from our research findings in under-utilized plant based food in many developing countries like Nigeria, the supply of nutrient is inadequate to meet the nutritional requirements of the rapidly growing human population; hence consumption of edible plant as sources of food is beneficial to human need. (Baseey *et al.*, 2021)

CONCLUSION

The research findings provide evidence that the extract of the plants 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. Hence, the research will also, provide solutions and a wakeup call to the plant based food availability and affordability to interlock their abundance in biomolecules.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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