DETERMINATION OF PROXIMATE AND PHYTOCHEMICAL COMPOSITION OF THREE SPECIES OF BEANS SOLD IN ULI

ABSTRACT

Beans, which play an important role in African diets. In the absence of sufficient animal protein for the population, it provides as a main source of protein. Three beans varieties sold in Uli (Potiskum, Aloka and Iron beans) were analyzed for their proximate and phytochemical constituents. Phytochemical screening of the plants was conducted using different standard methods and the result revealed the presence of phytochemicals at different concentrations. The three species contained carbohydrate, protein, fibers and minerals such as calcium, magnesium, potassium, sodium, iron, zinc, manganese and copper. The crude protein content was found to be 15.62 and 17.91%, with brown seeds having the highest concentration. The carbohydrate content was determined to be 56.80 and 60.57%, respectively, with white seeds having the greater amount. The crude lipid had the narrowest range, ranging from 2.13 to 2.42%. The moisture percentage, crude fiber, and total ash levels ranged from 3.56 to 5.08, 13.54 to 14.15, and 4.07 to 4.27%, respectively. Potassium and copper had the highest and lowest concentration in cowpea varieties ranging from 741 to 768 and 0.58 to 0.60 mg/100 g, respectively. There were significant ($p<0.05$) differences between the potassium, calcium, sodium, magnesium, manganese and zinc concentration of the cowpea varieties, except between iron and copper concentration. From the results, it can be deduced that there is relative difference in the nutritional composition of the three beans as the results demonstrated that Iron beans is nutritionally superior to Aloka and Potiskum.

Keywords: [Proximate, phytochemical, composition, Beans, Uli]

1.0 INTRODUCTION

Due to their high protein content and affordability when compared to meat and meat products, legumes, which are the seeds of the leguminosae family that includes peas, beans, and pulses, are "considered as poor man meat" (Adebiyi, et al., 2015). Legumes are important food items for people in tropical developing nations. The population consumes a wide range of species and varieties of legumes because they are low-cost and a significant source of protein (20–40%), carbohydrate (50–60%), and other nutrients that are good for human health and wellbeing (Lakshmi et al., 2010).

The legume plant known as beans (Vigna unguiculata) is a significant food crop in developing nations. Thiamine, folic acid, niacin, riboflavin, and biotin are all found in abundance in it (Minussi et al., 2003). Cowpea seeds are consumed as cooked seeds or in conjunction with food like maize, rice, plantains, among other things, in many regions of West Africa, particularly Nigeria, where it plays a significant role in reducing poverty and malnutrition. They are also turned into paste to make a variety of traditional dishes, including moimoi, which is steaming

cowpea, and akara, which is fried cowpea paste (Henshaw and Sanni, 2005). The quality and quantity of food supply must be improved in a number of ways to keep up with the current yearly rate of population growth in Africa and to ensure that low-income groups have access to enough food to satisfy their protein needs (Agbogidi, 2001).

A chemical method of determining and quantifying the nutritional content of a feed, proximate analysis, also known as Weende analysis, reports the moisture, ash (minerals), crude fibre, crude fat, and crude protein contained in a diet as a percentage of dry weight. A difference determines the presence of carbohydrates (nitrogen-free extract). The proximate analyses provide an overview of the sample's nutritional makeup, which is briefly supplemented by information on the antinutrient and mineral content (Bradley, 1998). Ash, moisture, proteins, fat, and carbohydrates are the five components that make up proximates according to an industry standard (Henneberg and Stohmann, 2004).

The results of a proximate analysis may be used to determine the amount of moisture, ash, volatile matter, fixed carbon, and other substances. Ash, the inorganic residue that remains after water and organic materials have been heatedly removed from the meal, serves as a gauge for the overall quantity of minerals present. Since millions of people eat cowpea grain in place of other foods deficient in protein, minerals, and vitamins, the nutritional value of this grain is significant. Plant compounds known as phytochemicals, which are not edible, have curative or disease-preventive effects. Although plants create these substances to defend themselves, research has shown that many phytochemicals can also shield people from disease (Tsuchiya et al., 2016). Understanding the chemical components of plants is desirable since it was useful for synthesising more complicated chemicals. The use of phytochemical screening has been discussed by a number of employees. According to Dahanukar et al. (2020), phytochemical analysis is the study of organic compounds that build up in plants as a result of their chemical makeup and other biological and natural processes.

1.2 Statement of Problem

The cost of living has recently increased globally, particularly in most emerging countries like Nigeria. The implications of this development will undoubtedly have an impact on the availability of food and nutrients for the general population, and notably the impoverished. A typical African diet tends to be low in animal protein and rich in carbohydrates. Among the widely endorsed human rights that are essential components of human growth are access to appropriate food and health. In Nigeria, a range of various beans are consumed, but the most are not because there is little or no information available on their nutritional profiles.

The underutilization of many of the foods with which Nigeria is gifted, particularly outside of the traditional locales where they are located and consumed, might be partially attributed to the lack of knowledge about the specific nutrients in such foods. In the state of Anambra, the most popular types of beans have not had their proximate composition well examined.

1.3 Aims and Objective of the Study

The aim of this study is the determination of proximate and phytochemical composition of three species of beans sold in Uli

Specific objectives are to:

determine the proximate composition of three species of beans sold in Uli, determine the qualitative phytochemical constituents of extracts from three species of beans sold in Uli and determine the quantitative phytochemical constituents of three species of beans sold in Uli.

1.4 Scope of Study

This work will determine and compare the proximate nutritional and phytochemical composition of three species of beans: Potiskum (black eyed pea), Ife-brown (brown beans), and Aloka sold in Uli using AOAC, (2005) method.

1.5 Significance of Study

The findings from this study will aid in identifying the nutritional value of the widely consumed species of Potiskum (black-eyed pea), Ife-brown (brown beans), and Aloka beans, which will help fight malnutrition and other food-related diseases as well as contribute to the rural areas' food security system. It will also act as a guide to suggest the best bean types among the three species studied with greater nutritional contents.

The findings will help improve the incomplete information on the nutritional profiles of several locally grown bean types.

2.0 MATERIAL AND METHODS

2.1 Equipment / Apparatus

Weighing balance, testube, pipette, heating mantle, separation funnel, beakers, distillation apparatus, soxlet apparatus, colorimeter, Whatman filter paper, electric blender, reagents used includes: Sodium hydroxide, hydrochloric acid, ammonia solution, sulphuric acid, glacial acetic acid, chloroform, acetic anhydride, copper sulphate and sodium sulphate.

2.2 Sample Collection

A total of three species of beans sold in Uli was obtained from the main market. These varieties are: potiskum (black eyed pea), Ife-brown (brown beans), and Aloka beans.

2.3 Sample Treatment

The five hundred grammes of each sample was manually picked clear of debris, damaged seeds, and stones before examination. At room temperature, any remaining moisture will evaporation until completely dry. The powdered dry samples will then be kept in polythene bags after being

sieved through a 2mm mesh sieve and ground into powder using a food processor. The proximate analysis was conducted using the powdered material.

2.4 PROXIMATE ANALYSIS

2.4.1 Moisture content determination

The AOAC (2005) method no. 945.38 was used. 2g of the sample was weigh into clean, dry and pre weighed crucibles. The crucibles and their contents was dry in the moisture extraction oven at 110^0C for 4 hours. The samples was cool in desiccators and reweighed. The samples was dried in the oven until a constant weight is obtained.

$$\% \text{ Moisture content} = \frac{\text{Initial weight} - \text{weight of oven sample} \times 100}{\text{Initial weight of sample}}$$

2.4.2 Crude fat determination

The 920.39A method (AOAC, 2005) was applied. A filter paper was used to weigh 5g of the ground, air-dried sample before it is properly packaged and placed in the sample holder of the soxhlet extraction device. The entire apparatus was put together, a clean, dry, and accurately weighed soxhlet extraction flask was half filled with N-hexane, and the flask was placed on the heating mantle and heated at 600C.

Three hours was spent extracting the fat. The extraction flask will then be taken out and the sample holder was unplugged.

The percentage fat contained was determined thus:

$$\% \text{ Crude fat} = \frac{\text{weight of flask + oil} - \text{weight of empty flask} \times 100}{\text{Initial weight of sample}}$$

2.4.3 Crude fiber determination

he AOAC, 2005, Method No. 942.05 was applied. In a 250 ml beaker with 200 ml of 0.125M tetraoxosulphate iv acid (sulfuric acid), 2g of the defatted sample was weighed. The combination was heated to 700C in a steam bath for two hours, after which it was allowed to cool. Over a Buckner funnel, the cooled mixture was filtered with a muslin towel. The residue was placed in a beaker with 200 ml of potassium hydroxide after being washed three times with hot water to eliminate the acid. For two hours, the mixture was heated as previously over a steam bath. The residue was washed three times in hot water after the solution has been filtered. The final residue was collected and dried at 1200C to a consistent weight in a clean, pre-weighed crucible. The dried sample was placed in a crucible and heated in a muffle furnace to 5500°C for 30 minutes, rendering the sample white ash. The percentage of fibre was determined as follows:

$$\% \text{ Crude fibre} = \frac{\text{weight of oven dried sample} - \text{weight of ash} \times 100}{\text{Initial weight of sample}}$$

2.4.4 Crude protein determination

Method no. 955.04C called the Kjeldahl method was used (AOAC, 2005). This method was divided into three namely, digestion, distillation and titration.

2.4.5 Digestion: For digestion. 0.1 grammes of ground sample was weighed into a clean, dried Kjeldahl flask. This flask will then be filled with concentrated H2SO4 acid, 0.1 grammes of copper tetraoxosulphate IV crystals, 0.5 grammes of sodium tetraoxosulphate IV crystals, and some glass beads as anti-bumping agents. The Kjeldahl flask was moved, along with its contents, to the digesting chamber in a fume cupboard, where it was digested. The digesting process proceeded with the digestion flask rotating continuously until the sample's colour changed (from black to bright blue). To facilitate cooling, the digestion flask was taken out of the digesting chamber. The digest was prepared in distilled water up to 100ml and rapidly agitated to achieve homogeneity.

2.4.6 Distillation: Using a pipette, 20 ml of the homogeneous digest solution was put into a distillation flask. Then gently pour 20 ml of a 40% sodium hydroxide solution down the side of the flask using a funnel.

Two drops of methyl red indicator will then be added to 50 ml of a 2% boric acid solution that has been pipetted into a receiving flask. The distillation apparatus was designed such that the condenser is linked to the receiving flask by a glass tube and is constantly supplied with cold water from the tap to keep it cool. Additionally, the glass tube's tip was submerged in boric acid. The distillation apparatus is heated on a heating mantle for 35 minutes, or until the pink boric acid solution becomes blue and the distillate increases the volume to around 100 ml.

2.4.7 Titration: The distillate was titrated ten millilitres against 0.1N hydrochloric acid until the end point is colourless. To check for any traces of nitrogen in the blank, a blank solution will also be titrated. A recording of every titre volume was made. This is how the proportion of crude protein was determined: %Crude protein = % Nitrogen X 6.25

2.4.8 Ash content determination: The AOAC method No. 942.05 from 2005 was applied. 5g of the sample was weighed into the crucibles after they are cleaned, dried, and placed on an electronic balance. Until consistent weights are achieved, the samples was dried in the oven.

The samples will then be placed into the muffle furnace with a pair of tongs and ash for 4 hours at 5500C to produce white ash. After being taken out of the furnace and cooled in desiccators, the sample was reweighed. Following are the steps for calculating the percentage of ash:

$$\% \text{ Ash Content} = \frac{\text{Weight of Ash X 100}}{\text{Weight of sample (after oven drying)}}$$

2.4.9 Carbohydrate content determination

The carbohydrate content of the sample was obtained by difference, that is, as the difference between the total summations of percentage moisture, fat, fibre, protein, ash and 100

% Carbohydrate= 100 – (% moisture + % fat + % protein + % fibre + % ash)

2.5 Phytochemical analysis

2.5.1 Extraction of plant material

The aqoueus and ethanol extract of the plant was prepared by soaking 100 g of the ground sample of leaf in 500 ml of water. The experimental set-up was left for 24 h at room temperature and thereafter filtered using Whatman No 1 filter paper. The extract was then concentrated to 50 ml of the original volume of the ex-tract and stored in an airtight container in a refrigerator at 40 C until when needed.

2.5.2 QUALITATIVE PHYTOCHEMICAL SCREENING

Phytochemical screening of the extract was carried out by a procedure that was based on those earlier reports by Banso and Adeyemo, (2016 and Stankovic, 2011) so as to detect the presence of saponins, tannins, alkaloids, flavonoids, triterpenoids, steroids, glycosides, anthraquinones, coumarin, saponins, reducing sugars in the selected plant extracts.

2.5.3 Test for tannins

Each powdered sample was individually cooked for five minutes in a water bath with 20 cc of distilled water, then immediately filtered. A few drops (2–3) of 10% ferric chloride were added to 1 ml of cold filtrate after it had been distilled to 5 ml with distilled water, and the mixture was then checked for precipitate development and colour changes. To establish the presence of tannins, the reaction mixture was examined for a brownish green or blue-black colouring.

2.5.4 Perform a saponin test

Each powdered sample weighed 1g, and it was individually cooked in a bottle bath for 10 minutes with 10 ml of distilled water. While still heated, the mixture was filtered, then let to cool. Then, the further tests were run.

2.5.4.1 A demonstration of frothing was performed by diluting 2.5 ml of filtrate to 10 ml with distilled water and aggressively shaking the mixture for two minutes. The creation of a froth that remained stable for a few minutes indicated the presence of saponin in the filtrate.

2.5.4.2 Demonstration of emulsifying characteristics: After dilution of 2.5 ml of filtrate to 10 ml with distilled water (above) and vigorous shaking for a few minutes, an emulsion that was reasonably stable was formed, indicating the presence of saponins.

2.5.5 Perform a steroid test

2.5.5.1 Each part of the powdered material, weighing about 0.2 g each, was dissolved in 2 cc of chloroform.To create a layer, 0.2 ml of concentrated H_2SO_4 was carefully applied. The deoxy-

sugar properties of cadenolides are visible at the layer interface as a reddish-brown hue, which denotes the presence of steroids.

2.5.5.2 A 0.5 g ethanolic extract of the sample and 2 ml of concentrated H2SO4 were combined with 2 ml of acetic anhydride. In certain samples, the transition from violet to blue or green indicates the presence of steroids.

2.5.6 Alkaloids test

Each powdered sample, weighing 1 g, was individually boiled in water and then acidified on a steam bath with 5 ml of 1% HCL. The resulting solution was filtered, and 2 ml of the filtrate was treated individually in various test tubes with a few drops of each of the following chemicals before being viewed.

2.5.6.1: Mayer's Test: Filtrates were subjected to the potassium mercuric iodide-based Mayer's Reagent treatment. Alkaloids were present in the extract because a creamy white precipitate formed.

2.5.6.2: Wagner's test was performed using filtrates and Wagner's reagent (iodine in potassium iodide). Alkaloids were thought to be present in the extract if a brown or reddish-brown precipitate formed.

2.5.6.3: Dragendorff's Test: Filtrates were treated with the potassium bismuth iodide solution in dragendorff's reagent, and the formation of an orange-brown precipitate was taken as proof that there were alkaloids in the extract. 2.5.6.4 Hager's Test: Filtrates were subjected to the Hager's Reagent (a saturated picric acid solution), and the appearance of a yellow-colored precipitate was taken as proof that the extract contained alkaloids.

2.57 Check for cardiac glycosides in 2.5.7

2.5.7.1: Two millilitres of glacial acetic acid containing one drop of ferric chloride solution were added to five millilitres of each extract. With 1 cc of concentrated sulfuric acid, this was underplayed. Cardenolides' deoxysugar properties were visible at the contact as a brown ring. Below the ring, a violet ring could show up, and in the acetic acid layer, a greenish ring might develop.

2.5.7.2: In separate test tubes, 1 ml of the filtrate was mixed with 10 ml of 50% H_2SO_4 and heated for 15 minutes before Fehling's solution was added. The mixtures were then boiled. The presence of glycosides was revealed by a brick-red precipitate.

2.5.8: Check for free anthraquinones

0.5 g of the powdered dry seeds from each sample were combined with 5ml of chloroform. After shaking for five minutes, the resultant liquid was filtered. Following that, an equal amount of

10% ammonia solution was shaken with the filter. The presence of free anthraquinones was suggested by the appearance of a brilliant pink hue in the aqueous layer.

2.5.9: Check for mixed anthraquinones

Each sample was pulverised, and 1 g of it was heated in 10% hydrochloric acid for 5 minutes. Filtering the mixture while it was still hot and letting the filtrate cool. A clean pipette was used to transfer the chloroform layer into a clean, dry test tube after the filtrate had been partitioned against an equivalent amount of chloroform.

2.6.0 Perform a flavonoid test

2.6.0.1 Each sample was independently prepared as 1 g of powder, boiled in 20 ml of water, and then filtered. A portion of the filtrate was mixed with 5 ml of diluted ammonia solution and then with concentrated H2SO4. The presence of flavonoids was indicated by a yellow hue.

2.6.0.2 10 ml of distilled water and 1 g of each sample's powdered dried seeds were cooked together for 5 minutes before being filtered while still hot. small amounts of 20% sodium hydroxide solution. To 1 ml of the cooled filtrate, a few drops of a 20% sodium hydroxide solution were added. When acid was added, the yellow coloration changed to a colourless solution, signifying the presence of flavonoids.

2.6.1: Check for terpenoids

2 ml of chloroform were added to 5 ml of each extract. Then, to create a layer, 3 ml of concentrated H2SO4 was added. Terpenoids were detected by a reddish-brown precipitate coloration that developed at the contact.

2.6.2 Phlobatannin testing

The presence of phlobatannins was determined by the formation of a red precipitate after boiling an aqueous extract of each plant sample with 1% aqueous hydrochloric acid.

2.6.3 Perform a carotenoids test

10 ml of chloroform and 1 g of each sample were extracted in a test tube with vigorous shaking. After filtering the mixture, 85% sulfuric acid was added. The presence of carotenoids was shown at the contact by a blue coloration.

Phenolics 2.6.4

Each sample's powdered dried seeds weighed 0.5 g, and they were cooked in 10 ml of distilled water for 5 minutes before being filtered while still hot.A solution of ferric chloride in 1 ml was then added. The development of brown or blue-black colouring suggested the presence of phenol.

2.6.5 Check for reduced sugar levels.

10 ml of distilled water were added to each sample, which weighed about 1 g, in the test tube. The mixture then boiled for 5 minutes. The combination was heated, filtered, and then allowed to cool. In a test tube, 5 ml of the Fehling's solution (A and B) mixture was added to 2 ml of the filtrate, and the resulting liquid was then heated for 2 minutes. Brick red precipitate at the test tube's bottom revealed the presence of reducing sugar.

2.7 QUANTITATIVE PHYTOCHEMICAL

2.7.1 Determination of Alkaloids (Harbone method, 2010)

20ml of 20% acetic acid in ethanol was added to 5g of the sample, which was then weighed into a 250ml beaker. The mixture was then covered and let to stand for 4 hours at room temperature. The filtrate was boiled to one-fourth of the original volume after being filtered with filter paper. Until the precipitate was fully formed, 5ml of concentrated ammonium hydroxide was added drop by drop. Use the pre-weighed filter paper to filter after that. The dried alkaloid is what is left on the filter paper after it has been dried in an oven at 80oC. Calculated as a percentage of the sample's weight, the alkaloid content was expressed. After that, the formula was used to compute.

$$\%\ \text{weight of alkaloid} = \frac{(\text{Weight of filter paper with residue}) - (\text{Weight of filter paper})}{\text{Weight of the sample analyzed}} \times \underline{100}$$

2.7.2 Determination of Tannins by Titration (Person method, 2004)

100 ml of either hexane or petroleum ether was added to 10g of the material in a conical flask, which was then covered for 24 hours. After filtering, the sample was let to stand for 15 minutes to let the solvent evaporate. A second extraction was performed by soaking 100 ml of 1% acetic acid in ethanol for 4 hours. The filtrate was then collected once the sample had been filtered.

To precipitate the alkaloids, 25 ml of ammonium hydroxide was added to the filtrate. To eliminate part of the ammonium hydroxide that was still in solution, the alkaloid was cooked on an electric hot plate. After measuring the remaining volume, 5ml of it was removed, and 20ml of ethanol was added to it. It was titrated with 0.IM NaOH using 1ml of phenolphthalyne as indicator until a pink end point is reached. Tannin content was calculated in percentage (C1V1 = C2V2) molarity

2.7.3 Determination of Saponins (AOAC MEHOD, 2005)

A thimble was used to weigh 10 grammes of the pulverised material before transferring it to the soxhlet extractor chamber with a condenser and flask. The flask contained 250 ml of methanol. Thesaponin was completely extracted by heating the flask over a heating mantle for an additional hour of extraction. The saponin and a small amount of methanol were left in the flask after the thimble and its contents were removed and the methanol was recovered. The remaining methanol

was then evaporated in an oven at a temperature of 70°C while the object was held in a slanting posture. The flask and its contents were weighed, and the amount of saponin extracted was determined by comparing the weights of the flask plus saponin with the flask alone.

$$\% \text{ Saponin} = \frac{(\text{Weight of beaker} + \text{sample}) - (\text{Weight of empty beaker}) \times 100}{\text{Weight of sample analyzed}}$$

2.7.4 Determination of Flavonoids (AOAC, 2005)

10g of the plant sample was put in a beaker with 100ml of 80% aqueous methanol at room temperature. The whole solution was filtered through what man filter paper. The filtrate was later transferred into a crucible and evaporated into dryness over a water bath and weighed to a constant weight.

$$\% \text{ Flavonoids} = \frac{(\text{Weight of crucible} + \text{residue}) - (\text{Weight of crucible}) \times 100}{\text{Weight of sample analyzed}}$$

2.7.5 Determination of phytate (AOAC METHOD, 2005)

20g of the sample was weighed into 250ml conical flasks. The sample was soaked in 100ml of 2% concentrated HCL for 3 hours, the sample was then filtered. 50ml of the filtrate was placed in 250ml beaker and 100ml distilled water added to the sample. 10ml of 0.3% ammonium thiocynate solution was added as indicator and titrated with standard iron (111) chloride solution.

$$\% \text{ Phytic acid} = \frac{\text{Titre Value} \times 0.00195 \times 1.19}{\text{Sample analyzed}} \times 100$$

2.8 MINERAL ELEMENT ANALYSIS

DIGESTION OF SAMPLE

The dry ash extraction method, which is defined by AOAC (2010), was used to determine the mineral contents of the test samples. Twenty (20) grammes of the samples was burned to ash (as in ash determination), the resultant ash was dissolved in one hundred millilitres of diluted hydrochloric acid (1MHCL), and the acid will then be diluted to one hundred millilitres using distilled water. The various mineral analyses will utilise the solution.

Analysis of Magnesium In a 250 ml conical flask, precisely 10 ml of the sample filtrate was pipetted in, and then 25 ml of ammonia buffer solution was added and thoroughly mixed.

Then a pinch of Erichrome black T indicator was added and titrated with 0.02N of EDTA until the colour of the solution changed from wine-red to blue colour.

$$\textbf{Magnessium (mg/100g)} = \frac{(\text{Tv} \times 0.2432 \times 1000)}{\text{Vol of sample used}}$$

Determination of Iron: Exactly 5 millilitres of the sample was pipette into a test tube, along with 1 millilitre each of 2.5% hydroquinol and 1.5 millilitres of acetate buffer. Finally, 1 millilitre each of 0.1% pyridine was added, and everything was thoroughly mixed. Water that has been diluted was used to make up the volume of solution and was thoroughly mixed. The colour was let up to 24 hours to develop, the absorbance was measured at 530 nm with a spectrophotometer, and the concentration in mg/100 g was determined using the formula below:

$$\textbf{Iron (mg/100g)} = \frac{\text{Concentration (ppm)} \times \text{Dilution factor}}{\text{Wt.of Sample}} \times 1000$$

Calcium Determination: The EDTA complex isometric titration was used to determine the calcium level of the test sample. The masking agents, hydroxytannin, hydrochlorate, and potassium cyanide was put in panels to a conical flask along with twenty (20) ml of each extract. Next, twenty (20) ml of ammonia buffer (pH 10.0) was added. After adding a little amount of the indicator ferrochrome black, the mixture was vigorously mixed. It was compared to a 0.02N EDTA solution for titration. The reading was recorded and a constant blue colour was seen. The formulas below was used to determine the calcium content.

$$\textbf{Calcium (mg/100g)} = \frac{(\text{Tv} \times 0.4008 \times 1000)}{\text{Vol of sample used}}$$

Potassium (K)

The concentrations of potassium (ppm) was analysed using UV- spectrophotometer at a wavelength of 766.5 nm, and the concentration in mg/100 g was calculated using the following equation:

$$\text{Potassium } \textbf{(mg/100g)} = \frac{\text{Concentration (ppm)} \times \text{Dilution factor}}{\text{Wt of Sample}} \times 1000$$

Sodium (Na)

The concentrations of sodium (ppm) wasanalysed using atomic absorption spectrophotometer at a wavelength of 243nm and the concentration in mg/100 g was calculated using the following equation:

$$\textbf{Sodium (mg/100g)} = \frac{\text{Concentration (ppm)} \times \text{Dilution factor}}{\text{Wt.of Sample}} \times 1000$$

Phosphorus (P): A 100 ml volumetric flask was filled with a 10 ml sample solution. Ammonia and nitric acid (1:2) was used to neutralise the solution. Vanadate molybdate reagent was added and diluted to the proper volume in twenty (20) ml. The absorbance at 470 nm in the ultra violet area was measured after it has been allowed to stand for ten minutes, and the mineral content in mg/100 g was computed using the formula below:

$$\textbf{Phosphorus (mg/100g)} = \frac{\text{Concentration (ppm) x Dilution factor}}{\text{Wt.of Sample}} \times 100$$

3.0 RESULTS AND DISCUSSION

3.1 QUALITATIVE PHYTOCHEMICALS

The result of the qualitative phytochemical composition of the ethanolic extracts of the different bean species sold in Uli is shown in table 1.

Table 1: Qualitative phytochemical composition of bean species

PHYTOCHEMICALS	Potiskum beans	Aloka beans	Iron beans
SAPONIN	+++	+++	-
FLAVONOID	+++	++	+
ALKALOID	-	-	-
TANNIN	+	+	-
STEROIDS	-	-	+
TERPENIODS	+++	+++	-
GLYCOSIDES	++	+	-
PHENOL	-	-	+

Key

+++ = Present in high concentration

+ = Present in moderate concentration

++ = Slightly or sparingly present

- = Absent.

3.2 PROXIMATE COMPOSITION

The results of the proximate analysis of three varieties of beans sold in Uli are presented in Table 2. The beans varieties had a large amount of protein and large amount of carbohydrate. The crude protein was found to be 17.68 and 20.83% with the iron beans seeds having the higher amount. The ash and moisture content was found to range from 4.0 to 8.00 and 5.50 to 9.50%, respectively, with the iron beans also having the higher amount. The fiber and carbohydrate

content was found to range from 7.50 to 12.50% and 40.17 to 51.35%, respectively, with the iron bean seeds having the higher amount of fiber and lowest amount of carbohydrate.

Table 2: MEAN NUTRITONAL CONTENT OF BEANS IN PERCENTAGE (%)

Parameters (%)	Potiskum beans	Aloka beans	Iron beans
Moisture content	4.00	8.00	6.00
Ash content	9.50	5.50	9.50
Fats and oil	8.00	10.00	11.00
Protein content	17.68	18.80	20.83
Crude fibre content	10.00	10.00	12.50
Carbohydrates content	50.82	47.69	40.17

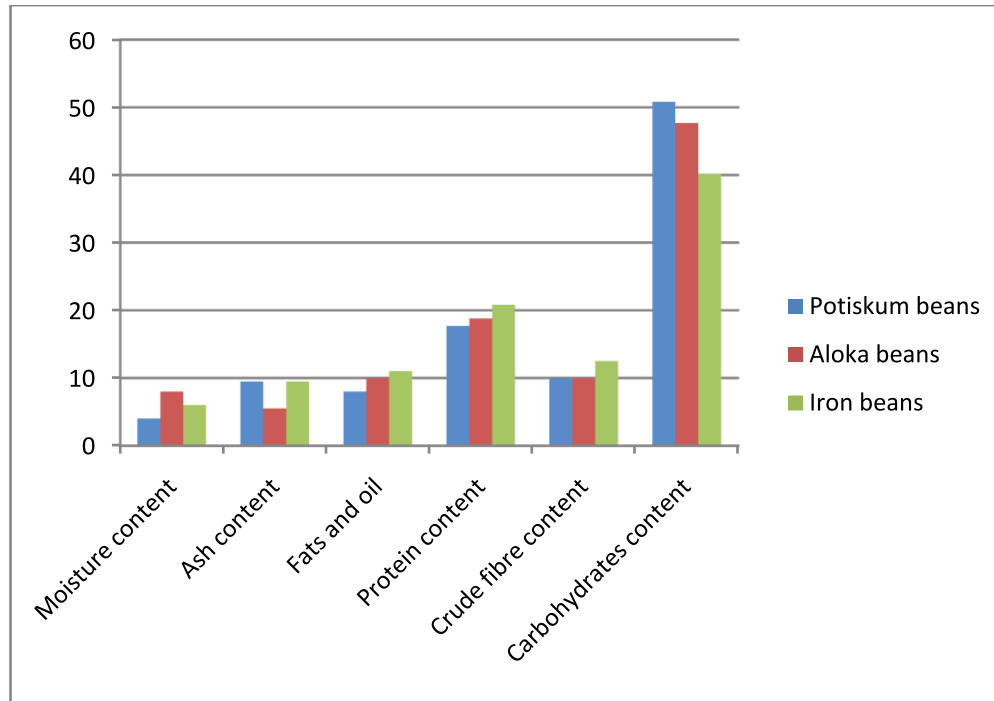

Fig 1: MEAN NUTRITONAL CONTENT OF BEANS IN PERCENTAGE (%)

3.3 Mineral composition

The concentrations (mg/100 g) of the elements determined in the seeds are as shown in Table 3. Calcium was the most abundant element in the seeds. It was found to be 124.25 to 300.60 mg/100 g. The least was found to be potassium which was 0.25 to 5.20 mg/100 g. Other elements analyzed were magnesium 85.12 to 158 mg/100 g and phosphorus 2.70 to 8.50 mg/100 g respectively

Table 3: MEAN MINERAL COMPOSITION OF BEANS (mg/100g)

Parameters (mg/100g)	Potiskum beans	Aloka beans	Iron beans
Magnesium	158.08	87.55	85.12
Calcium	300.60	168.34	124.25
Phosphorus	2.70	8.40	5.48
Potassium	0.25	1.15	3.10

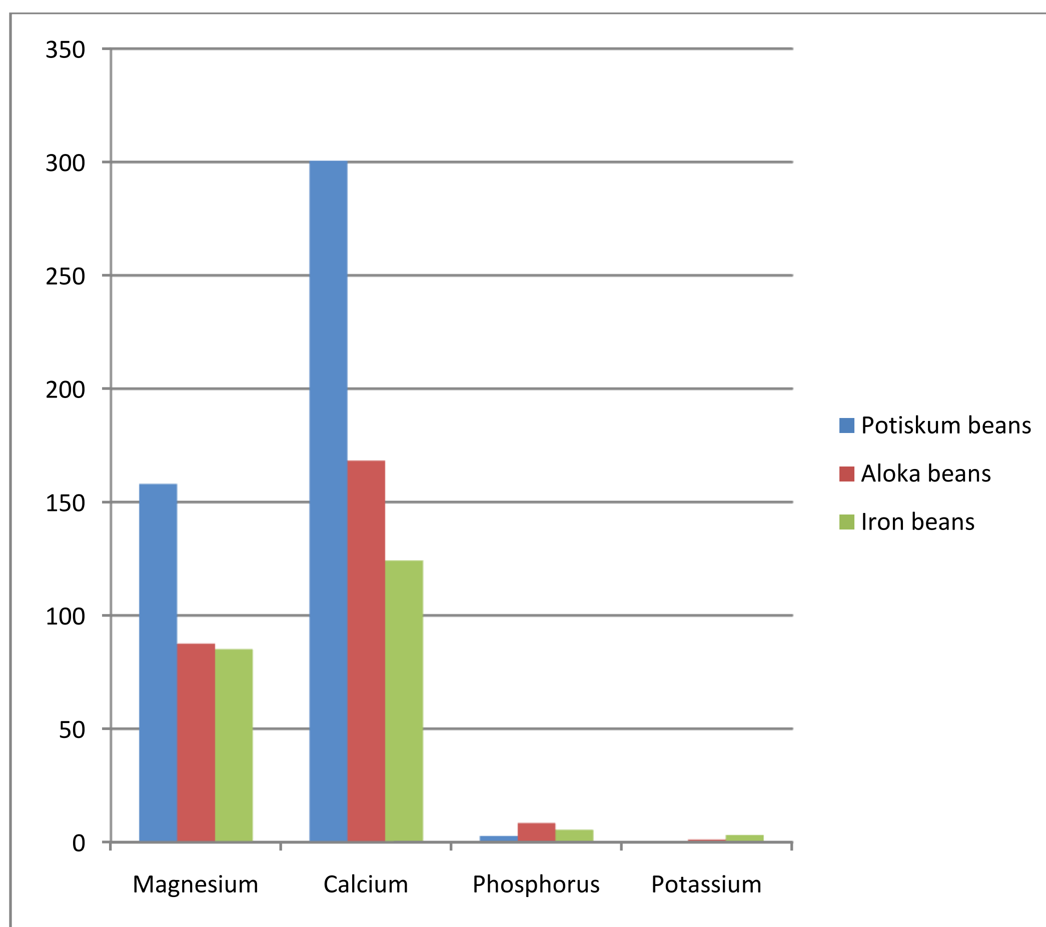

Fig 2: MEAN MINERAL COMPOSITION OF BEANS (mg/100g)

4.0 DISCUSSION

The current study found that extracts of three bean species (potiskum, Aloka, and Iron beans) sold in Uli contained phytochemicals such as alkaloids, glycosides, saponins, flavonoids, phenols, tannins, and terpenoids. A similar finding was made by Rajendran and Sundararajan

(2011). Eleazu et al. (2012) also showed that beanseed contains alkaloid (++). These phytoconstituents were found in C. lanatus seed extract, indicating that the plant has antibacterial and antioxidant capabilities. According to the findings of this investigation, saponin was also discovered in bean seeds. Red blood cells can precipitate and coagulate as a result of saponins. These herbs are used to heal wounds and control bleeding (Okwu, 2011). They have the ability to froth and permeabilize cell membranes. Their surfactant qualities account for their soapy appearance. According to Njoku and Akumefula (2007), tannins contain astringent qualities that speed up the healing of wounds and irritated mucous membranes.

When compared to the findings of a related study by Hassan et al. (2008), tannin was shown to be highly prevalent in the study. High levels of tannin in both studies demonstrated that they have biological properties including those that are anti-apoptotic, anti-aging, anti-carcinogenic, anti-inflammatory, anti-atherosclerotic, cardiovascular-protective, and improve endothelial function, as well as those that inhibit angiogenesis and cell proliferation activities (Egba et al., 2012). According to the findings of this study and when compared to results from previous studies like Sakarkar and Deshmukh, 2011 and Yaro et al., (2007) flavonoid was also somewhat present (++).The type of beanseed utilised in this investigation may be to blame for this variance. In addition to its anti-inflammatory, antioxidant, antiviral, and anti-carcinogenic capabilities, flavonoids have protective effects.

Table 2 displays the approximate composition of the examined seeds. The four bean kinds that were examined ranged between 4.00 and 8.00% in terms of moisture content, with potiskum beans having the greatest value. Compared to brown seeds, white seeds may be kept in storage for a longer time due to their reduced moisture content. Seeds with a high water/moisture content are more vulnerable to bacterial and fungal assault. Brown seeds may also be kept in storage for a very long time because their moisture content isn't as high. The figure for brown seeds is within the range of 5 to 8% provided by Yagodin (2014).

Beans types ranged between 16 and 18% crude protein, with iron bean seeds having the highest value. This range of numbers falls between the 15–30% range provided by Tobin and Carpenter (2018). Cowpeas are abundant in protein. Dietary proteins are necessary for the synthesis of new cells, the repair of damaged tissues, the production of enzymes, hormones, antibodies, and other compounds vital to the body's development, growth, and defence (Cheesebrough, 2017), as well as the management of protein energy malnutrition (Omoruyi et al., 2014). The iron bean seeds had a greater crude fibre content than the other seeds, with values of 13.54 and 14.15%. The diet's appropriate fibre content has a significant impact on the gastrointestinal tract's (GIT) metabolism and is associated to haemorrhoids, diverticular disease, and appendicitis (Gibney, 1989). Additionally, fibre lowers intercolonic pressure and delays the absorption of glucose into the blood, lowering the risk of colon cancer (Gibney, 1989). This acquired range of values is within the 13–19% range noted by Gibney (1989).

The cowpea varieties' respective lipid contents were found to be 2.13 and 2.42%, with brown seeds having the greater value. Beans has shown to be low in their lipid content (Davidson et al., 1975). “Lipids provide strong energy and transports fat soluble vitamins like vitamins A, D, E

and K" (Ologhobo, 1988). "The range of values obtained falls within the range 2.01 to 2.88%" reported by Ologhobo and Fetuga (1988).
The ash contents analyzed was found to be 4.50 and 9.50% with iron beans seeds having the higher value. This range of values obtained falls within the ranges given by Ologhobo and Fetuga (1988) and Yeshajahu (1991) as 4.1 to 4.77 and 2.8 to 4.9%, respectively. With these ranges of values, it means that small amount of inorganic compounds are present in the cowpea varieties.
"The carbohydrate content analyzed was found to be 40.00 and 51.07% with the Ife brown beans seeds having the higher value. Carbohydrates are good sources of energy, they are stored as glycogen which is the reservoir for glucose" (Freedland and Briggs, 1977).
The elemental composition of the seeds is as shown in Table 2. Calcium and magnesium were the most abundant and was significantly higher than other elements analyzed and potassium was the least. Potassium is necessary for maintaining healthy neuronal stimulation, controlling water balance, and maintaining the normal muscular function of the heart. The equilibrium between acids and bases is also preserved. Deficiency causes nausea, lack of appetite, and physical weakness. Potassium is abundant in cowpeas.
"Numerous physiological and biochemical processes, including neuromuscular excitability, blood coagulation, secretory processes, membrane integrity, transport of neurotransmitters across plasma membranes, bone mineralization, and preservation of strong teeth are regulated by calcium ions" (Dutcher and Fiela, 1967; Cheesebrough, 1987). "The white beans had a greater salt content per 100 g, with 78.15 mg and 84.65 mg, respectively. There was a substantial difference between the two cowpea types at p0.05. The concentration of magnesium was found to be 189.91 and 195.33 mg/100 g with white beans having the higher value. This range of value falls within the range reported by Ologhobo (1986) which is 148 to 220 mg per 100 g of sample. Cowpeas are good sources of magnesium" (Thelma and Klein, 1966).

"Magnesium is a component of bones and teeth as well as an enzyme activator" (Laestch, 1979; Murray *et al.,* 1990). According to Harrison and Hoare (1980) and Guthrie (1989), "it also takes involved in the growth metabolism of protein, lipid, carbohydrate, and nucleic acid".
The cowpea varieties' phosphorus concentrations, which were determined to be the lowest of the other elements, ranged between 0.20 and 0.60 mg/100 g, with brown seeds having the greater value. Similar to the findings of Holland *et al.* (2011) study, there was no change at $p>0.05$.

5.0 CONCLUSION
According to the findings of the present study, Uli's beanseed is nutritionally rich in lipids, fibre, ash, and protein. Aloka and potiskum were inferior to iron beans nutritionally in terms of proximate component content. The investigation revealed that the protein, fibre, and

carbohydrate contents of the various bean kinds significantly varied from one another, but the lipid and ash concentrations did not. The elemental analysis revealed considerable variations in the cowpea types' potassium, calcium, magnesium, and phosphorus concentrations. In summary, whereas white cowpeas have a greater protein, calcium, potassium, and zinc content than iron beans, brown cowpeas have a higher carbohydrate and fibre content and magnesium. The results of the current study are substantial and have the potential to make a real difference in reducing food shortages in Sub-Saharan Africa by encouraging the cultivation and consumption of common beans and pigeon peas.

RECOMMENDATIONS

The four variations should be taken into consideration in the diet, according to the aforementioned information. People who take one over the other should make an effort to consume both to make up for some of the nutrients that are lost in one. Brown cowpeas have more protein, which is essential for growth, thus those who often only eat white cowpeas because they are less costly than brown cowpeas should attempt to do so sometimes.

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