QUANTITATIVE AND QUALITATIVE PHYTOCHEMICALS AND PROXIMATE ANALYSIS OF ALOE VERA (*Aloe barbadensis miller*)

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ABSTRACT

The aim of this research study was to analyze qualitatively and quantitatively Proximate and Phytochemical composition of *Aloe barbadensis*. The Proximate composition involves the moisture content, crude protein, crude fibre, crude fat, ash content and carbohydrate. Phytochemicals determined were Saponins, Glycosides, Cardiac glycoside, Saponin glycoside, Alkaloids, Balsams, Volatile oil, Anthraquinone, Tannin, Steroid and Flavonoids. *Aloe barbadensis* was found to be rich in Carbohydrate (78.88%), so it can be used as a good source of Carborhydrate. The Protein and Lipid content were found to be relatively low (0.613 and 3.5% respectively). But *Aloe barbadensis* can still be used as a source of Protein and Fat. It was also discovered that Phytochemicals are present in quantities of 31.067 g/100 g, 10.67 g/100 g, 25.66 g/100 g and 0.060 g/100 g for Alkaloids, Saponins, Tannins and Glycosides respectively. This is an indication of cosmetic and medicinal value of *Aloe barbadensis*. The Sample was also found to be a rich source of minerals. Sodium and Potassium content (10.00 and 55.00 PPM), respectively indicate the tendency of *A. barbadensis* to be able to regulate or control the osmotic balance of the body fluid as well as body pHs. *Aloe barbadensis* is also found to be rich in Phosphorus (5.69 Mg/kg), which is essential for bone formation. Magnesium (1.0 Mg/kg) is also present, which could help to lower the blood pressure. The overall data suggest that *A. barbadensis* has some Nutritional and Medicinal Properties.

Keywords: *Aloe barbadensis*, Phytochemicals, Proximate analysis.

1.0 INTRODUCTION

The name Aloe vera (*Aloe Barbadensis Miller*) was derived from the Arabic word "alloeh" meaning shining bitter substance while vera is a Latin word meaning true. Aloe vera belongs to the family Liliaceae. It's one of the oldest and most applied medicinal plants. It has been used externally to treat skin and internal disease. It's a cactus-like plant although it is related to garlic, onion and asparagus specie (Barcoft, 2003).

Aloe vera is a stem-less or very short stemmed plant growing from 30-100 cm tall spreading by offsets. The leaves are thick and fleshy green to gray green in color. With some varieties showing white flecks on their upper and lower stem surface (Yates, 2002). Leaves are Lancelot and thick with serrated margin (Bourdreau and Beland, 2000).

2.0 MATERIALS AND METHODS

2.1 Study Area

The research was conducted in Sokoto State which is located in the north-western region of Nigeria. The state shares its borders with Niger republic to the north, Katsina state to the east, Zamfara state to the southeast, Kebbi state to the south and Benin Republic to the west. Rain starts late and ends early with mean annual rainfall ranging between 500 mm and 1,300 mm. The average annual temperature is 28.4^0C though this vary from season to season, the temperature are highest on average in April, at around 33.2^0C. The lowest average temperature in the year occurs in January when it is around 24.5^0C. The relative humidity is about 20-49% in January which often rises to 60-80% in July.

2.2 Collection of Samples.

The whole fresh plant of Aloe vera (*Aloe barbadensis Miller*) was collected from the biological garden of Usmanu Danfodiyo university, Sokoto. The plant was identified and authenticated in the herbarium of Department of Biological Sciences, Usmanu Danfodiyo University, Sokoto.

2.3 Plant Extraction and Concentration Formulation

Fresh sample of Aloe vera leaf was cut into small pieces; 50g of the sample was weighed on weighing balance, the weighed sample (i.e. 50g in weight) was grinded using sterile blinder, the grinded sample was soaked into 100 ml of distilled water for 24 hours. The aqueous plant extract concentration was filtered using fine muslin cloth. The filterate obtained was 100% extract concentration. Standard procedures described by Sofowora (1993), Trease and Evans (1989) and Harbone (1973) were used for the identification of the phytochemicals in the extract of Aloe *barbadensis* miller of biological garden (UDUS). The chemicals in which their absence or presence is detected include phytochemicals such as Alkaloids, Tannins, Saponins, Flavonoids, Anthraquinones, Glycosides, e.t.c.

2.4 Qualitative Phytochemical Screening

2.4.1 Determination of alkaloids content

About 2ml of each extract was stirred with 2ml of 10% hydrochloric acid. 1ml was treated with a few drops of Wagner's reagent and second 1ml portion was treated similarly with Mayers

reagent. Turbidity of the resulting precipitate was taken as evidence for the presence of alkaloids (Harbone, 1973).

2.4.2 Determination of cardiac glycoside (keller-killiani's test)

To one of the herb extract, 2ml of 3.5% ferric chloride solution was added and allowed to stand for one minute. 2ml of concentrated H_2SO_4 was carefully poured down the wall of the tube so as to form a lower layer. A reddish brown ring at the interface indicated the presence of cardiac glycoside.

2.4.3 Determination of flavanoid

3ml of the filtrate were added to 1ml of 10% sodium hydroxide (NaOH); a yellow colour formed, this indicates the presence of flavanoid compounds (El-Olemyl *et al.*,1994; Harbone, 1998).

2.4.4 Determination of tannin content

5% ferric chloride FeCl3 solution was added drop by drop to 2-3ml of the extract and the colour produced was noted. Condensed tannins usually give a dark green color; hydrolysable tannins give blue-black color (Harbone, 1998; Trease and Evans, 1978).

2.4.5 Determination of saponin content

5 ml of aqueous extract was shaken vigorously with 5 ml of distilled water in a test tube and warmed. The formation of stable foam was taken as an indication for the presence of saponins (Harbone, 1998).

2.4.6 Determination of glycosides

2.5ml of 50% H_2SO_4 was added to 5cm^3 of the extract in a test tube. The mixture was heated in boiling water for 15minutes. Cooled and neutralized with 10% NaOH, 5ml of Fehling's solution was added and the mixture was boiled. A brick- red precipitate was observed which indicates the presence of glycosides (Harbone, 1973).

2.4.7 Determination of steroids

0.5g of the extract was dissolved in 2ml of chloroform, it was then filtered, 2ml of concentrated sulphuric acid was carefully added to form lower layer. A reddish-brown color at the interphase indicates the presence of steroidal ring (Harbone, 1973).

2.4.8 Determination of saponin glycosides

2.5ml of Fehling's solution A and B were added to 2.5ml of the extract. A bluish green precipitate showed the presence of saponin glycosides (El-Olemyl *et al.*, 1994).

2.4.9 Determination of balsams

The extract was mixed with equal volume of 90% ethanol. 2 drops of alcoholic ferric chloride solution were added to the mixture. A dark green color indicates the presence of balsams (El-Olemyl *et al.*, 1994).

2.4.10 Determination of anthraquinones

0.5g of the extract was shaken with 10ml benzene, and 5ml of 10% ammonia solution was added. The mixture was shaken and the presence of a pink, red, or violent color in the ammonical (lower) phase indicates the presence of anthraquinones.

2.4.11 Determination of volatile oils

1 ml of the extract was mixed with dilute hydrochloric acid (HCL). A white precipitate was formed which indicated the presence of volatile oils (Evans, 1980).

2.5 Quantitative Determination of Phytochemicals.

After qualitative analysis of Aloe vera, the quantitative analysis of the present group of phytochemical constituents was determined.

For the quantitative determination, the plant extract was dried at room temperature and then crushed into powder using laboratory sterile mortar and pestle. The dried powdered extract was then used in the determination of the quantity of the phytochemicals present in the plant.

2.5.1 Determination of alkaloid

Alkaloid was determined using method as reported by Trease and Evans (1978).

Five grams of powdered plant sample were extracted with 100 ml of methanolic water (1:1 v:v). Mixture and solvent evaporated. The resultant residue was mixed with 20 ml of 0.0025M H_2SO_4 and partitioned with ether to remove unwanted materials. The aqueous fraction was basified with strong NH_3 solution and then extracted with excess chloroform to obtain the alkaloid fraction or separated by filtration. The chloroform extraction was repeated several times and the extract was concentrated to dryness. The alkaloid was weighed and the percentage was calculated with reference to initial weight of powder.

$$\% \text{ Alkaloid} = \frac{\text{Weight of alkaloid residue}}{\text{Weight of sample}} \times 100$$

2.5.2 Determination of tannins

Tannins were determined by method of Trease and Evans (1978).

Powdered sample (0.1) was put into a 100 cm^3 conical flask and 50 cm^3 volumetric flasks. The residue was washed several times and the combined solution made up with distilled water to 0, 1, 2, 3, 4 and 5 cm^3 standard tannic acid and 10 cm^3 of Na_2CO_3 solution were added and made to volume with distilled water. The flask was allowed to stand for 20 minutes after which optical density was measured at 760 nm. The calibration curve was plotted from which the concentration of tannic acid in the sample was extrapolated.

2.5.3 Determination of saponins

Saponins were measured using method of El-Olemyl *et al.* (1994)

From powdered plant extract, five (5) grams were placed in 250 ml flask containing 30 ml of 50% alcohol. The mixture was boiled under reflux for 30 minutes and was immediately filtered while hot through coarse filter paper.

Two grams (2g) of charcoal were added; the content was boiled and filtered while hot. The extract was cooled (some saponins may be separated) and equal volume of acetone was added to complete the precipitation of saponins. The separated saponins were collected by decantation and dissolved in the least amount of boiling 95% alcohol and filtered while hot to remove any insoluble matter.

The filtrate was allowed to cool at room temperature thereby resulting in the precipitation of saponins. The separated saponins were collected by decantation and suspended in about 2 ml of alcohol and filtered. The filter paper was immediately transferred to a desiccator containing anhydrous calcium chloride and the saponins were left to dry. They were weighed with reference of extract used.

$$\% \text{ saponin} = \frac{W_2 - W_1}{5g} \times 100$$

2.5.4 Determination of glycosides

Glycosides were determined using spectrometric method of El-Olemyl *et al.* (1994).

One gram (1g) of the extract was extracted in 10 ml of 70% alcohol and mixture was filtered. From the filtrate, eight milliliters (8 ml) of the mixture was added to 8 ml of 12.5% lead acetate (to precipitate resins, tannins and pigments). The mixture was shaken well, completed to another volume (100 ml) with distilled water and filtered. The filtrate (50 ml) was pipette into another 100 ml volumetric flask and 8 ml of 4.7 % disodium hydrogen phosphate (Na_2HPO_4) solution (to precipitate excess lead) was added. The mixture was made up to the volume with distilled water and mixed. The mixture was then filtered through a Whatman No. Filter paper. Baljet reagent (10 ml) was added to 10 ml purified filtrate. A blank sample of 10 ml of distilled water was also added to ml Baljet reagent. The two were allowed to stand for one hour (maximum time for color development). The intensity of the color was read at 495 nm using spectrophotometer against a blank (20 ml distilled water). The color was stable for several hours.

The percentage of total glycosides was calculated digitoxins by simply using E^1cm 1% of given digitoxins (=170).

$$\% \text{ glycosides} = \frac{A}{17} \times 100 \times g\%$$

Where A = Absorbance of the colour at 495 nm.

2.6 Proximate Analysis

The samples were brought to the Agric Chemical Laboratory of Usmanu Danfodiyo University. The Aloe vera was visually inspected. Defective tubers were manually removed and discarded. Hence, only matured healthy Aloe vera was selected. The fresh Aloe vera was chopped and labelled as sample A and various tests were carried out to evaluate the following:
Crude moisture, Crude protein, Crude lipid, Crude ash, Crude fibre, Crude carbohydrate, Mineral analysis.

2.6.1 Determination of crude moisture

Two grams of the samples were added to the empty moisture dish and placed in an air oven. The two samples were dried in the hot air drying oven at 110^0C for 24hours. The samples were then kept in a desiccator and allowed to cool after which the crucible with the dry samples were then weighed and returned to the oven for further 24hours to make sure that the drying was completed. The weights were taken again, for each sample (Bakare, 1985). The moisture was determined using the following formula:

$$\% = \text{Moisture} = \frac{W_1 - W_2}{W_1 - W_0} \times 100$$

Where;

W_0= weight of empty dish

W_1= weight of fresh sample

W_2= weight of dry sample

2.6.2 Determination of crude protein

To estimate crude protein, it involves the determination of total nitrogen. The amount of crude protein was obtained by multiplying the nitrogen content by a factor of 6.25.

2.6.3 Determination of nitrogen

The determination of total nitrogen was done by the micro-kjeldahl's procedure.

Exactly 0.5grm of each sample was weighed and placed in a dry 500ml micro-kjeldahl's flask to which 20ml of distilled water were added. The flask was swirled for a few minutes and then allowed to stand for 30 minutes. One (1) tablet of mercury catalyst and 10ml of concentrated H_2SO_4 were added through a pipette. The flask was heated continuously at low heat on the digestion stand. When the water has been removed and frothing has ceased, the heats were increased until the digests were cleared. The mixture was boiled so that the H_2SO_4 condenses about half way up to the neck of the flask. The flask was allowed to cool and 50ml of water was added to the flask slowly then 10ml of aliquot of digest were added into the distillation apparatus. The distillation flask was then attached to the distillation. The condenser was kept cool below 30^0C allowing sufficient cold water to flow through and regulate heat to minimize frothing and prevent suck back. Thereafter 40ml distillate was collected and the distillation was stopped. Nitrogen was determined in the distillate by titration with 0.001(M) molar standard HCL using a 25ml burette graduated at 0.1ml intervals, the color change at the end point were from green to pink. Then percentages of nitrogen content in the sample were calculated using the below formula:

$$N\% = \frac{TV \times 0.01 \times 0.014 \times 50 \times 100}{0.5 \times 10}$$

Where

N%= percentage of nitrogen

TV= titration value

0.01= molar standard of HCL

0.014= Nitrogen concentration
50= distilled water
10= m/g of aliquot0.5= weight of sample

2.6.4 DETERFMINATION OF CRUDE LIPID

A cleaned and dried round bottom flask was weighed W_1. 2g each of the dried samples were placed into a thimble and finally placed into a soxhlet extractor. A quantity petroleum spirit was added into the soxhlet extractor. The extraction went on for 6hours, then the apparatus set up was disconnected and the round bottom flask was dried for 10minutes and cooled in a desiccator and reweighed W_2. The difference in weight was used to calculate the percentage of lipid (Oyeleke, 1984).

2.6.5 Determination of crude fibre

Two grams of the grounded samples were weighed and put into 1litre control flask. Then 200ml of H_2SO_4 were added and boiled gently for 30minutes using cooling fingers to maintain a constant volume. It was then filtered through a poplin cloth, stretched over 9cm Buchner funnel and mixed well with hot distilled water. The two samples were taken back into the flask with spatula and 100ml of boiling 1.25% NaOH were added. It was boiled gently to maintain a constant volume. Thereafter, it was filtered through a poplin cloth. The residue were washed thoroughly with hot distilled water and rinsed once with 10% HCL and twice with industrial methylated ether (BP40-60^{0}C) and allowed to dry. The residue were kept overnight at 105^{o}C in the oven, and was cooled in a desiccator. The two samples were weighed again and ashes at 55^{0}C for 90 minutes in a muttle, furnace cooled and weighed again.

Formula:
% fibre = Dry weight – Ash weight x 100

2.6.7 Determination of carbohydrates

The nitrogen free extraction (NFE) referred to as soluble carbohydrate was not determined directly but obtained as a difference between crude protein, sum of crude ash, lipid and crude fibre (Bakare, 1984).

Formula:
NFE = 100% - (%Ash + %crude lipid + Crude fibre + %Crude protein)

2.7 Mineral Analysis

The mineral elements determined in this study were sodium (Na), potassium (K), Calcium (Ca), Magnesium (Mg), Phosphorus (P), using EDTA method.

2.7.1 Sodium and potassiun estimation

Potassium and sodium were obtained by using the flame photometer. The flame photometer was set up by inserting appropriate filter usually by 768mu for K and 589mu wavelengths for Na respectively. This instrument was set to 100 transmittance by taking 2-10ppm of K and Na

solution, the standard curve was prepared by plotting transmittance reading against concentration of standard K and Na solution.

2.7.2 Calcium and magnesium determination

Calcium and Magnesium were determined by EDTA methods. Calcium was obtained by pipetting 2ml aliquots of the samples solution into filtration flask. Three drops each of KCN, NH_3, OH and Triethanolalamine were added together with 0.3g of Murexide and they were then filtrated with EDTA solution to the end point from pink to purple.

Formula:

$$\% Ca = \frac{TV \times 0.01}{20ml} \times 1000$$

Where
%Ca = percentage of calcium
TV = Titre volume of calcium
0.01 = standard EDTA concentration
1000= unit measurement
20 = Aliquot sample

Formula:

$$\%Mg = \frac{TV \times 0.01}{20} \times 100$$

2.7.3 Phosphorus determination

Phosphorus (P) was determined using spectrophotometer. Then 2ml of the sample was pipette into a 50ml volumetrically flask. Then 45ml of distilled water and 2ml of ammonium molybdate solution were added and mixed properly. After that, 1ml of 5NCl, 2HO dilute solutions were added and mixed again, after 5minutes the measure was taken on the electro photometer at 660mu wavelength.

Formula:

$$P = \frac{Abs \times CF \times DF \times DF}{\text{Atomic weight of phosphorus}}$$

Where
CF = Absorbent reading of the spectrophotometer
DF = Conversion factor
CF = 0.61
DF = 25

3.0 RESULTS AND DISCUSSION

3.1 RESULT

3.1.2 Qualitative Phytochemical Analysis

The result of Qualitative evaluation of the phytochemical constituents of fresh leaf gel extract of *Aloe barbadensis* obtained from Biological Garden UDUS was conducted against aqueous solvent. The results revealed the presence of Alkaloids, Tannins, Saponins, Glycosides, Cardiac glycosides, Saponin glycosides and Flavanoids. Alkaloid and Flavanoid were detected in moderate amounts, whereas Steroid, Balsam, Anthraquinones and Volatile oil were not detected. The result of this analysis is summarized in table 1.

3.1.3 QUANTITATIVE PHYTOCHEMICAL ANALYSIS

The Result of the quantitative analysis on the phytochemical constituents is presented in table 2. The result showed high content of alkaloids (31.067 mg %), followed by the concentration of tannins (25.66 mg %), followed by saponins (10.67 mg %) and low concentration of glycosides (0.006 g %).

3.1.4 PROXIMATE ANALYSIS

The Result for proximate analysis of the *A. barbadensis* leaf extract in table 4 shows that carbohydrate has the highest percentage content (78.88%), followed by moisture (10.51%), fiber (6.00%), lipid (3.5%), protein (0.63%), and then ash (0.5%) in descending order.

3.1.5 MINERAL ANALYSIS

Result of mineral constituents on the Aloe vera leaf extract is shown in table 5. Six minerals were detected with potassium having the highest content (55.00 mg/kg), followed by sodium (10.00 mg/kg), Phosphorous (5.69 mg/kg), magnesium (1.00 mg/kg), calcium (0.45 mg/kg) and the least is nitrogen (0.01 mg/kg).

4.1 DISCUSSION

The presence of alkaloid, saponins, glycosides, cardiac glycosides, saponin glycoside, tannins and flavanoids coupled with the absence of steroid, balsam, anthraquinones and volatile oils in *Aloe barbadensis* was the same when compared with the result of similar analysis obtained in *Aloe tororoana* (a variety of *Aloe barbadensis)* using the same aqueous extract (Andama *et al.*, 2014).

The phytochemicals present in the Aloe vera leaf extract of biological garden Usmanu Danfodiyo University, Sokoto have been shown to possess medicinal activity as well as physiological activity as stated in previous chapter. This result unveils that Aloe vera in biological garden UDUS can be a potential source of useful compound that can be used as lead to synthesize new antimicrobial drugs and the result also shows the vast medicinal, nutritional, therapeutic and cosmetology potential the extract of Aloe vera leaf could offer. The presence of these phytochemicals justifies the traditional medicinal uses of this plant by the local

communities. These bioactive compounds present in Aloe vera play a great role in its medicinal, therapeutic, nutritional and cosmetological activities.

Alkaloids were detected in the analysis as indicated in table 2. Alkaloids are used as analgesics, stimulants, anesthetic, hallucinogens, and antibacterial agents (Balbaa, 2006).

Flavanoids were also detected in this study and in trace amount. This indicates the possible application of the leaf extract for medicinal use. Flavanoids were found to reduce bleeding tendency and have effect on the permeability of the capillaries (Balbaa, 2006). Recent studies have shown that Flavanoids are also used to inhibit anti-inflammatory effect, cancer risk, heart disease risk, HIV-I integrase and HIV-I protease enzymes which are responsible for HIV replication (Dangoggo *et al.,* 2002). Flavanoids in *A. barbadensis* extracts are large compounds occurring ubiquitously in food plants. They at times occur as glycosides and contain several Phenolic hydroxyl groups on their ring structure. Some flavonoids are antioxidants and have been proved to exhibit a wide range of biological activities like antimicrobial, anti-inflammatory, antiangionic, analgesic, anti-allergic, cytostatic and antioxidant properties (Hodek *et al.,* 2002). Saponins were among the phytochemicals detected in the study. Saponins play great role as dietary and food ingredients. They are also used as emulsifiers, sweeteners, and insecticides (Dangoggo *et al.,* 2002).

Tannins and Glycosides have specifically been reported to have antibacterial potential (Dangoggo *et al.,* 2002). The basic character of tannins gives them the ability to react with protein to form stable water in soluble compound. It was further suggested that the consumption of tannins-containing beverages is encouraged as it is believed to cure or prevent variety of diseases. Glycosides are nonreducing substances, they are compound that are composed of two parts, the non sugar part of the molecule called aglycone components of glycoside are reported to posses strong antibacterial activities (Balbaa, 2006).

Cardiac glycosides were also detected in this analysis. Cardiac glycosides have long served as the main medical treatment to congestive heart failure and cardiac arrhythmia. Saponin glycosides are plant glycosides possessing a property of forming soapy lather therefore they are largely used as detergents and in other cosmetic product (Anon, 2018).

Alkaloids level (31.07 mg %), is a secondary metabolite compound observed in the extract of *Aloe barbadensis* has the biological property of toxicity against cells of foreign organisms. Its activities have been widely studied for their potential use in the elimination and reduction of human cancer cell lines (Nobori *et al.,* 1994). Alkaloids which are one of the largest groups of phytochemicals in plants have amazing effects on humans and this has led to the development of powerful pain killer medications (Kam and Liew, 2002). Saponin concentration up to (10.67 g/100 g) found to be present in *Aloe barbadensis* extracts and has been found to support the usefulness of this plant in managing inflammation which revealed the inhibitory effect of saponins on inflamed cells (Just *et al.,* 1998). The quantity of alkaloid and Saponin found in *Aloe barbadensis* is relatively high compared with values obtained from other parts of Nigeria (2.471 mg%) and (5.651mg%) respectively (Adesuyi *et al.,* 2011), whereas in UDUS we have 31.07 mg% and 10.67 mg% respectively.

Glycosides (0.06 g/100 g), and Tannins (25.66 mg%) are found to be present in *A. barbadensis*. Glycosides and Tannins are believed to have antimicrobial potential and they also play a great role in curing a variety of diseases such as heart arrhythmia, anti-inflammatory effect and heart congestion. Both compounds found in *A. barbadensis* like Saponins, Alkaloids, Tannins and Glycosides are known to be biologically active and therefore aid in the anti microbial activities of the plant (Igbinosa *et al.,* 2009).

The proximate constituent of *A. barbadensis* shows a high carbohydrate content (78.80%), which makes the plant a good source of Carbohydrate. Carbohydrates provide readily accessible fuel for physical performance and regulate nerve tissue (Whitney and Rolfes, 2005). The occurrence of carbohydrate as the highest parameter in this study is similar to that of Haque *et al.,* (2013) and Adesuyi *et al.,* (2011) who reported (56.27 and 73.08%) carbohydrate content in *A. barbadensis* respectively.

Moisture content determination is one of the most fundamental and important analytical procedure. Average moisture content (10.51%) was the second highest Parameter noted. Too much of moisture in any sample has been proved to cause caking especially in flour and can also determine the Storage/Shelve life and the viability of microorganisms growth (Adeyeye and Ayejuyo, 2000). The percentage of crude fibre (6.0%) which is the third highest parameter noted, this implies that the plant can serve as a source of dietary fibre (Agostoni *et al.,* 2001) and can be employed in the treatment of diabetes, obesity and gastrointestinal tract diseases. It's also an indication that it contains a proportion of Cellulose, Hemicellulose and Lignin (Saldanha, 2003). This finding agrees with Adeseyi *et al.,* (2011) who found fiber to be the third highest parameter in the same plant species in his study.

The fourth highest parameter was found to be crude fat (Lipid) content (3.5%), which are universally stored forms of energy in living organisms. They are major structural elements of biological membranes as phospholipids and sterols (Nelson and Cox, 2008). The percentage of lipid is relatively high compared to 1.83% and 0.27% as reported by Haque *et al.* (2014) and Adesiyi *et al.* (2011) respectively.

The lowest parameter in this study is average ash content (0.5%). Average ash content (0.5%) is a reflection of the mineral contents preserved in the leaves. Minerals are essential for the proper functioning of tissues and act as second messengers in some biochemical cascade mechanisms as reported by Anitia *et al.* (2006). Average amount of crude protein (0.6%) have been reported to serve as enzymatic catalyst, mediate cell responses, control growth and cell differentiation (Whitney and Rolfes, 2005). The percentage of ash content and protein in this study are relatively low compared to values obtained from *A. barbadensis* in other studies: 2.36% and 4.73% respectively as reported by Adesiyi *et al.* (2011) and 19.50% and 10.50% respectively reported by Haque *et al.* (2014).

The high potassium (55.00 mg/kg) and magnesium (1.00 mg/kg) detected in this study indicates the ability of *A. barbadensis* to help lower blood pressure as reported by Otsuki *et al.* (2010). The high sodium content (10.00 mg/kg) and calcium (0.45 mg/kg) in *A. barbadensis* indicates its importance in the formation of bones and teeth as well as muscle contraction aided

by calcium (Anon, 2018). The high value of phosphorus content (5.69 mg/kg) in this study which is very vital in bone formation indicates the importance of the *A. barbadensis* in our body system.

5.0 TABLES

Table 1: Qualitative Phytochemical constituent of *A. barbadensis* Leaf Extract

S/N	PHYTOCHEMICALS	QUALITATIVE RESULT
1	Alkaloid	++
2	Glycosides	+
3	Cardiac glycoside	+
4	Saponin glycoside	+
5	Tannins	+
6	Saponin	+
7	Flavonoid	++
8	Steroid	N.D
9	Balsam	N.D
10	Anthraquinones	N.D
11	Volatile Oils	N.D

KEY

+ Trace or small amount ++ Moderate amount

+++ Large or high amount N.D Not detected

Table 2:Quantitative Phytochemical Constituents of *A. barbadensis* Leaf Extract.

S/N	PHYTOCHEMICALS	QUANTITATIVE VALUE (g/100g)
1.	Alkaloid	31.067
2	Saponin	10.67
3	Tannins	25.66
4	Glycosides	0.060

Table 3. Proximate (Nutritional) constituents of *A. barbadensis* Leaf Extract.

S/N	PARAMETERS	PERCENTAGE %
1	Carbohydrate	78.88
2	Ash	0.5
3	Fibre	6
4	Lipid	3.5
5	Moisture	10.51
6	Protein	0.613

Table 4: Mineral Composition (mg/kg) of *A. barbadensis* Leaf Extract.

S/N	MINERALS	AMOUNT (Mg/kg)
1	Sodium	10.00
2	Potassium	55.00
3	Magnesium	1.00
4	Calcium	0.45
5	Phosphorus	5.69
6	Nitrogen	0.0098

6 CONCLUSION

The analysis carried out on *Aloe barbadensis* indicates its phytochemical (Both qualitative and quantitative) and Nutritional (Proximate) composition of the plant.

This study has revealed the presence of many secondary metabolites in the leaves of *A. barbadensis.* It was further confirmed that the plant extracts could be used for the treatment of various infections and malfunctions in the body. The high concentration of alkaloids and moderate concentration of Tannins and Saponins and low concentration of Glycosides in the plant have therefore justified the widespread usage of the plant in traditional medicine.

The high contents of Carbohydrate and crude fibre and lipid with a little bit of Protein; The nutritional and medicinal plant constituents could therefore, be used as a reason for use of the plant as an important dietary source of nutrients in a food based approach for combating micronutrient deficiency. The mineral analysis indicates that *A. barbadensis* contain macro/major elements which are needed in high quantity in meals with potassium being the highest; Sodium and Magnesium were also found to be abundant in this plant. These are all good indications of high nutritive value.

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