ANALYSIS OF SELECTED NUTRITIONAL CONSTITUENTS OF *TACCAZEA APICULATA LEAVES.*

BY

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PRESENTED TO

DEPARTMENT OF BIOLOGY/CHEMISTRY

NIGER STATE COLLEGE OF EDUCATION, MINNA.

DECEMBER, 2014.

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APPROVAL PAGE

This project work has been read and approved as meeting the requirement for the award of Nigeria Certificate in Education (NCE).

Musah — 02/12/14

Project Supervisor — Date.

Mr Musah, Monday

H Yerima — 02/12/14

Mrs Habiba Yerima — Date

(Head of department)

Musah — 02/12/14

Project Co-ordinator — Date

Mr Musah Monday

DEDICATION.

We dedicate this research work to the Almighty God who has been the pillar of support and the tower of strength to us, also to our beloved parents for their immeasurable support throughout the course of our studies.

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Firstly, we give all Glory and honor to the Almighty God for the maximum guidance and protection towards our lives our profound gratitude also goes to our project supervisor, Mr. Musah Monday for his support, encouragement and guidance during the project work; we pray that all he desires would be granted by God (amen).

We can't help but express our sincere gratitude to Head of Chemistry Department Mrs Habiba Yerima, Mr Yohanna Audu the Lab Technologist of Food/Animal production Department, Federal University of Technology, Minna, Dr. Bello Yohanna Paiko and the entire staff of Chemistry Department, COE, Minna, you are all greatly appreciated.

Lastly, our appreciation goes to all our friends and well-wishers. Thank you for making our staying in the college a memorable one and the writing of this project a success. Thank you all and God bless you.

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ABSTRACT

A climber specie of a plant was collected. The analysis of the leaves shows that ash content is 14.50%, crude fiber is 18.48%, crude protein is 19.25%, minerals, fat and vitamin C is present. The present results showed that the plant posses nutrient that aid growing in both human and animals.

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A climber specie of a plant was collected. The analysis of the leaves shows that ash content is 14.50%, crude fiber is 18.48%, crude protein is 19.25%, minerals, fat and vitamin C is present. The present results showed that the plant posses nutrient that aid growing in both human and animals.

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the ability to paralyze the taste for sweet and bitter for seven (7) minutes when the freshly leaf is eaten and it has the ability to make someone sneeze when the fluid is snuffed. No available data on the plant leaves.

1.1.0 Aim

To determine the nutritional and anti-nutritional composition of the leaves of *Taccazea apiculata*.

Objective

A. To carryout proximate analysis

i. Moisture
ii. Ash
iii. Lipid/oil
iv. Crude protein
v. Carbohydrate
vi. Crude fibre

B. To determine the anti-nutrients

i. Saponins
ii. Tannins
iii. Phylate

iv. Alkaloids

v. Oxalate

1.1.2 JUSTIFICATION OF THE STUDY

In Niger state particularly in Gadako Village Bosso Local Government area of Niger State *Taccazea apiculata* is a traditional food mainly for low income earners it is virtually of no commercial importance and not much is known about it. This has created information gaps which have made the full usage of this plant by urban and rural dwellers unattractive. This has threatened it's collection and less research attention has been given to the plant in comparison to other plant like moringa and spinach. This work is therefore meant to bridge this gap.

1.1.3 Definition of Terms

i. Analysis: Is the process of breaking a complex substance into smaller parts to gain a better understanding of it.

ii. Nutrient: Is a chemical that an organism needs to live by and grow or it is any nourishing substance assimilated by an organism and required for growth, repair and normal metabolism.

iii. Constituent: Is a small localized object to which can be ascribed several physical properties such volume or mass.

iv. Content: Is the presentation of information for a purpose to an audience through a channel in a form.

1.1.4 Significance

This work is aimed at broadening and improving the knowledge of people on the nutritional contents of *Taccazea apiculata* leaf and it, importance to humans and animals.

1.1.5 Limitation

During these work, certain challenges were encountered which include, unavailability of some equipments and apparatus, like soxhlet apparatus, kjeldahl digester and furnace. For these reason the work or analysis was done at the food/animal production Federal University of Technology Minna. Therefore extra-expenses were made on transportation and others.

CHAPTER TWO

LITERATURE REVIEW

2.1 Plant details

There are numerous examples of plant that are used by human in everyday life. One of the most obvious uses of plant is food. There are more than twenty thousand (20,000) known species of edible plants in the world. These plants are grown all over the world in different regions and climate. Another very important use of plants is for medical purpose. Plant provides human with aromatic fragrances and with fibre for making clothes, rope, and paper e.t.c. There are many dyes and lubricants that are obtained from plants.(Philip, 1993).

The importance of herbs in diets, medicine and daily household life, as well as in practices of astrology, alchemy, and divination are all strong evidence of how important herbs were in the past (Ramiel, 2010).With such a wide variety of plants in the category it would be impossible to group the plants according to age, life cycle or habitat. Some of these plants are very primitive while others have been genetically engineered within the last few years (Ramiel, 2010).

However the fact that they each, in some ways can be applied for human uses is their unifying characters.

2.1.0 Proximate analysis

Proximate analysis is the partitioning in compound in feeds into six categories base on the chemical properties. These are: moisture, ash, crude protein, crude lipid, crude fibre and nitrogen free extract (Analytical Techniques in Aquaculture Research, 2012).

2.1.1 Moisture Content

Moisture content is one of the most commonly measured properties of food materials. It is important to a food scientist for numbers of different reasons.

Economics: the cost of many foods depends on the amount of water they contain- water is an inexpensive ingredient, and manufacturers often try to incorporate as much as possible in a food, without exceeding some maximum legal requirement.

Microbial stability: the propensity of micro organisms to grow in food depends on their water content. For these reason, many foods are dried below some critical moisture content.

Food quality: the texture, taste, appearance and stability of food depend on the amount of water they contain.

It is therefore important for food scientist to be able to reliably measure moisture contents (McClement, 2003).

The moisture content is determined by measuring the mass of a food before and after the water is removed by evaporation (onowuka, 2005).

2.1.2 Ash Content

Ashing is the process of mineralization for pre concentration of trace substance prior to chemical analysis. Ash is the name given to all non-aqueous residue that remains after a sample is burned, which consists mostly of metal oxides. It is the waste products of fire(James, 1998). Ash residue is generally taken to be a measure of mineral content of the original sample. In general, the mineral elements in food samples are usually small (less than 1% of the food) and vary depending on the type of sample being analyzed. Mineral elements are classified on the following basis;

Major elements whose composition (>0.01% or 100ppm): calcium phosphorus, chlorine, sulphur, manganese, selenium, vanadium and sodium.

Trace (<0.01% or 100ppm): arsenic, cupper, iron, nickel, tin, chromium, fluorine, manganese, selenium, vanadium, cobalt iodine molybdenum, silicon and zinc.

Non essential and toxic elements which includes; beryllium, lead cadmium, palladium, merary and thallium.

Determination of the ash and mineral content of the food is important for a number of reasons.

i. Nutritional labeling: the concentration and type of mineral presen tmust often be stipulated on the label of a food.

ii. Quality: the quality of much food depends on the concentration and the type of minerals. They contains including their taste, appearance, texture and stability.

iii. Microbiological stability: high mineral content are sometimes used to retard the growth of certain micro organisms.

iv. Nutrition: some minerals are essential to a healthy diet (e.g. calcium, phosphorus, potassium and sodium) whereas others can be toxic (e.g. lead, mercury, cadmium and aluminium).

v. Processing: it is also important to know the mineral content of food during processing because this affects the physico-chemical properties of food (Onwuka 2005 and James 1998).

2.1.3 Crude Protein

Proteins are polymers of amino-acid, general formular NHCHRC00H. These are distinguished from fats and carbohydrate in being the only macronutrient in food containing nitrogen. Twenty different types of amino acid occur naturally in protein. Proteins differ from each other according to the type, number and sequence of amino acids that make up the polypeptide backbone. As a result, they have different molecular structure, nutritional attribute and physicochemical properties. Proteins are important constituent of food for number of reasons;

I. They are the major structural component of many natural foods that determine the overall texture e.g. Tenderness of meat or fish product.

II. Isolated proteins are also used in foods as ingredient because of their unique functional properties i.e. their ability to provide desirable appearance, texture, or stability. Typically they are used as gelling agents, emulsifiers, foaming agents and thickeners.

III. Many food proteins are enzymes which are capable of enhancing the rate of certain biochemical processes that impact favorable or detrimental effect on the overall properties of food (McClement, 2003).

2.1.3.1 Amino Acid

Amino acid are biologically important organic compounds made from amino (-NH_2) and carboxylic acid (-C00H) functional groups, along with a side-chain specific to each amino.

2.1.4 Fat (Lipid)

Fats consist of a wide group of compound that is generally soluble in organic solvent but insoluble in water chemically, fats are triglycerides: trimesters of glycerol and any of several fatty acids. Fats may be either solid or liquid at room temperature, depending on their structure a composition. Although the word "oils", "fats" and "lipids" are all used to refer to fats, in reality, fat is a subset of lipid (onwuko, 2005). "Oils" is usually used to refer to fats that are liquids at normal room temperature, while, "fats" are solid at normal room temperature. "Lipids" is used to refer to both liquid and solid fats, along with other related substance.

The word "oil" is also used for any substance that does not mix with water and has a greasy feel, such as petroleum (or crude oil) Fats from a category of lipid, distinguished from other lipids by their chemical structure and physical properties. This category of methods is important for many forms of life. All fats are derived of fatty acid and glycerol, the molecule are called

triglycerides, which are trimesters of glycerol (anester being the molecules formed from the reaction of the carboxylic acid and an organic alcohol).

Glycerol + fatty acid → Triglyceride $3H_2O$.

They are an important part of the diet of most heterotrophy(including humans). Fats or lipids are broken down in the body by enzymes called lipases produced in the pancreas. Fats can be categorized into saturated fats and unsaturated fats. Unsaturated fats can be further divided into cis fat, which are the most common in nature, and Tran's fats, which are rare in nature but present in partially hydrogenated vegetable oils (Tauheed and Monika, 2013).

2.1.5 Crude Fibre

Sometimes refer to as roughage and roughages fibre is defined as a mineral made by plants that is not digested by human gastrointestinal tract. There are two types namely, soluble fibre and insoluble fibre.

Soluble fibre dissolves in water. It is readily fermented in the colon into gasses and other by products, and can be prebiotic and or viscous soluble fibre tends to show slow the movement of food through the system.

Insoluble fibre does not dissolve in water. It can be metabolically inert and provide bulking or prebiotic, metabolically fermenting in the large intestine. Bulking fibres absorb water as they move through the digestive system, easing defecation. Fermentable insoluble fibre mildly promote stool

regularly, although not to the extent that bulking fibres do, but they can be fibres tend to accelerate the movement of food through the system.

Chemically, fibre consist of non-starch polysaccharides such as arabinoxylans, cellulose, and many other plant components such as starch, resistant dextrin, milin, lignin, waxes, chitins, pectin beta-glucans and oligosaccharides (onwuka, 2005)

Advantage of consuming fibre are the production of healthful compounds during the fermentation of soluble fibre, and insoluble fibreability (via its passive hygroscopic properties) to increase bulk, soften stool, and shorten transit time through the intestinal tract (Tunglandand Meyer, 2002)

Disadvantages of a diet high in fibre are the potential for significant intestinal gas production and bloating. Constipation can occur in insufficient fluid is assumed with a high fibre (Tungland and meyer, 2002)

Crude fibre is usually determined using weendee's method where the sample is subjected to acid and alkali digestion, the resistant fraction of carbohydrate which does not under goes process is ignited the or organic matter gets oxidized leaving the inorganic residue or ash. Thus the difference in weight of the residue before and after ashing gives the weigth of the crude fibre in the feed sample (James, 1998).

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2.2 Anti-nutritional Factors.

Anti-nutritional factors (ANF) are plants secondary metabolite which reduces the nutrient utilization of plants or plant products used by human foods or animal feeds and they play a vital role in determining the use of plants for humans and animals. It is well known that plant contain anti-nutrient required fertilizers and pesticides and several natural occurring chemicals. Some of these chemicals are known as "secondary metabolite" and they have been shown to be biologically active. They include saponins, tannins, flavonoids, trypsin (protease) inhibitors, oxalates, phylates, haemagltinins (lectins), cyanogenic glycosides and cardiac glycoside (Josh, and Ghan, 2012)

2.2.1 Saponins

Saponins are glucosideswith a distinctive foaming characteristics. They are found in many plants, but their name is derived from the latin word sapo from soapwort plant (saponariaspp). They are either a chlorine steroid or triterpenoid attached via C_3 and other bond to a sugar side chain. Saponins are glysides with a polycyclic aglycone moiety of either steroid or triterpenoid attached to a carbohydrate. They are widely distributed in the plants, soyabean, chickpea, fababean, pea, lentil and peanuts are some of the different sources of saponins. Eryhroeytes lyses in saponins solution, therefore these compounds are toxic

when injected intravenously, saponins have effect on erythroeyteshaemolysis, reduction of blood and liver cholesterol, depression of growth rate, and bloat (ruminant), inhibition of smooth muscle activity, enzyme inhibition and reduction in nutrient absorption. Saponins have been reported to alter cell wall permeablility and therefore produce some toxic effect when ingested (njida and ikhimioya, 2012). The anti-nutritional effects of saponins have been mainly studied using alfalfa saponins. Saponins cause hyper-cholesterolemia by binding chollestrol, making it unavailable for absorption. Saponins from bulbostemmapaniculatum and pentapamax leschenaultia have also been demonstrated to have anti-spermal effects on human spermatozoa. They significantly inhibited acrosine activity of human sperms and the spermicidal effects was attributed to strong damages of the spermal plasma membrane (soetan and oyewole, 2009).

2.2.2 Tannin

Is known to form complexes with protein under certain PH conditions, the tendency of tannins to form complexes with proteins rather carbohydrate and other food polymers is attributed due to hydrogen bonding affinity of the caeboxyl oxygen of the peptide group. Tannins protein complexes are reported to be responsible for low protein digestibility, decrease

amino acid utilization and increased faecal nitrogen. These complexes may not be dissociated and may thus be excreted with the faeces (Jain, Kumar and pawa, 2009). They also cause decreased palability and reduced growth rate (Njidda and Ikhimioya, 2012).

2.2.3 Oxalate

Occur as end product of metabolism in a number of plant tissues. These plants may produce adverse effects when eaten in large minerals making them oxalic acid also binds calcium and other minerals making them nutritionally unavailable or forming harmful complexes.

Consumption of large doses of oxalic acid has been associated with kidney stone, corrosive gastroenteritis, shock, convulsion, low plasma calcium and urinary damage, with vegetarians of higher risk, especially woman who require radicals replacing one or more of the hydrogen atoms in the peptide ring, most containing greater amounts of calcium in their diet (Philips, 1993).

CHAPTER THREE

3.0 Sample collection

Leaves of *taccazea apiculata* were collected from different location in Gadako village in Bosso Local Government, in Niger State. The leaves were air dried for two weeks, after which they were grounded using pistle and mortar, the powdered was sieved to remove hard particles before been store in clean plastic container.

Materials	Reagents
Complete digestion block set	Sulphoric acid (H_2S0_4)
Weighing balance	Hydrochloric acid
Burette	Boric acid
Pipette	Sodium hydro-oxide (NaOH)
Pipette filler	Indicator(bromo cresol green &methy red)
Conical flask	Selenium tablet
Makahmps apparatus	Hydrogen tetraoxosulphate (v)
Hot plate	Hydrochloric acid
250ml conical flask	Ethanol
Fitter paper	Petroleum
Funnel	
Crucible	
Measureing cylinder	
Furnace	
Soxhlet apparatus	
Thimble	
Spatula	
Oven	
Petri-dish	

3.1.1 Crude Protein

This test was carried out to know the percentage of crude protein in the sample and was done using the method by (onwuka, (2005).

0.5 of sample was taken and added into the digestion tube were also 20ml of concentrated sulphuric acid added. One selenium tablet was added as catalyst. The content in the tube was heated at a temperature of 350^0c for 6 hours until a clear digest was achieved that is a clear solution. The solution was poured into a standard flask and made up to 100ml

Distillation

10ml of 2% boric acid was taken into 100ml conical flask and added with three drops of mixed indicator (bromocresol green and methyl red) and the color changes to pink which was then placed under the collecting sport. 10ml of digested sample was pipette into the open chamber of the makahmps apparatus then followed by 10ml of 40% NaOH. The mixture was forced to boil by the steam produced by the boiling water in the flat bottom flask. As the mixture

boil, a gas(ammonia) was evolve and condense by the condenser of the apparatus which was collected inform of liquid into the boric acid. As the ammonia is collected in the boric acid, the solution turn blue.

Titration

The distillate collected was titrated using 0.1m Hcl until an end point is reached by the color of the distillate changing to pink color which is the initial color of the boric acid and the mixed indicator.

Crude protein was calculated as

TVx0.04xMAxDFx100/wt of S

TV= titre value

0.014= nitrogen standard

MA= Molarity of acid

Wt of S= weight of sample.

3.1.2 Determination of Crude Fibre

This test was carried out to know the amount of fibre in sample.

The method was based on (A.O.A.C, 2002). 2g of defeated sample was weighed in a 250ml conical flask and added with 200ml 1.25% of H_2SO_4 using a measuring cylinder and boil for 30mins on a hot plate, after which it was filtered and the residue poured back into the same conical flask. 200ml of 1.25% of NaOH was added with

10% of Hcl and later ethanol. The residue was poured into a crucible and dried in the oven and weighed. After the weighing, the crucible and the content were further ashed using the furnace at 55^0c for 30mins.

Crude fibre was calculated as

A-Bx100/wt of S

A= weight of dry sample

B= weight of dry ashed sample

Wt of S= weight of sample boiled

3.1.3 Determination of Crude Ash

This test was carried out to know the percentage of inorganic compound of the sample, and method was according to (A.A.Ibitoye, 2005).

This was determined according to the method of (A.A.Ibitoye, 2005)

2g of sample was weighed into a crucible and ashedinto a murfule furnace about 550^0c for three hours. The crucible with its content was removed cooled and weighed to get ash weight.

Ash was calculated as

A/Bx100

A= weight of ash

B= weight of initial sample.

3.1.4 Crude Fat

This analysis is carried out to know the amount of fat in a given sample.

5g of the sample taken and introduced into the thimble which it was then corked with eotton wool. 200ml of petroleum ether was poured into the round bottom flask of the soxhlet apparatus and corked with soxhlet chamber. The corked sample in the thimble was introduced into the soxhlet and heated at 40-600^{0}c for three hours after which the extracted sample was removed and weighed.

Fat was calculated as

A-B/wtSx100

A= weight of fresh sample

B= weight of extracted sample

Wt of S= weight of initial sample

3.1.5 Determination of Moisture Content

This analysis is carried out to ascertain the amount of moisture in a given sample.

10g of sample was weighed into a Petri dish using a spatula. The weighed sample was loaded into the oven and dried at 105^0c until a constant weight was achieved. The sample was removed, cooled and weighed.

Moisture content was calculated as

A-B/Ax100

A= initial weight sample

B= weight of oven dry sample.

3.1.6 Determination of Vitamin C

5ml of sample extract was measured into 100ml conical flask and added with 10ml of 4% oxalic acid. The mixture was titrated with phenol until pink color developed which mark the end point. The titre value was taken and vitamin C was calculated as

0.5/volume1 x tv/volume2 x 100/2 x 100 = mg/100g

Volume1= volume of std

Volume2= volume of oxalic acid used

TV= titre value obtained.

CHAPTER FOUR

3.0 RESULT AN DISCUSSION

Table1.Proximate composition of *Taccazea apiculata*

Parameter	Percentage (%)
Moisture	13.00
Ash content	14.50
Crude protein	19.25
Crude fibre	18.48
Fat	2.48
Carbohydrate/ NFE	32.32

Table 2. Composition of the anti-nutritional factors in *Taccazea apiculata*

Anti-nutritional factors	Observation
Phytate	+
Saponins	++
Tannins	++
Oxalate	+

NOTE: + = minimally present

++ = moderately

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Table 3.Mineral content. Mg/ 100g

Composition of mineral component of *Taccazea apiculata*

Minerals	Composition (mg/100g)
Na	23.08
K	102.0
Ca	11.48
Mn	0.18
Fe	2.17

4.1**Discussion**

The nutrition importance of a given edible material depends on the nutrients and anti- nutritional constituents of the food (Aleto *et al*, 2004)

Taccazea apiculata as shown in the table 1 appear that crude protein has the highest value while fat was low; however moisture, ash, crude fibre and carbohydrate content have 13.00, 14.50, 18.48, 32.32 respectively.

From table 2,it can see that phytate and oxalate show very little amount(trace) while tannins and saponins are + (positive).

Table3. Shows that Mn is 0.18 and Fe 2.17 while Na is 23.08 and K is 102.0 as the high values

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CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

The result of the nutritional analysis of *Taccazea apiculata* suggest that the plant leaves sample contain some of the nutritional constituents required by the body for proper functioning, and it's consumption by human or animal could reduce malnutrition in the body.

5.2 RECOMMENDATION

Based on the research carried out, the analysis shows that carbohydrate, crude protein, facts and oil, crude fiber are all essential nutrient needed by the body for proper growth and development of both humans and animals.

I. Carbohydrate is required much by the body for energy.

II. Crude protein helps in building the body and also replacement of worn-out tissues.

III. Fats and oil which also help in providing energy and maintaining body temperature.

IV. Crude fiber is an important nutrient in human diet which helps in controlling the sugar level and also high level of blood in humans while in plant it helps to form part of the structure of the cell.

Therefore, it is recommended that in every diet provided for both human and animal, the above mentioned nutrient should be present.

IV. Crude fiber is an important nutrient in human diet which helps in controlling the sugar level and also high level of blood in humans while in plant it helps to form part of the structure of the cell.

Therefore, it is recommended that in every diet provided for both human and animal, the above mentioned nutrient should be present.

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