PROXIMATE ANALYSIS OF PTEROCARPUS ERINACEUS (AFRICAN ROSE WOOD OR AFRICAN GUM-ILHA)

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NOVEMBER, 2013

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D/SLT/11/17685

A PROJECT SUBMITTED TO THE DEPARTMENT OF SCIENCE LABORATORY TECHNOLOGY SCHOOL OF APPLIED SCIENCE NUHU BAMALLI POLYTECHNIC ZARIA.

IN PARTIAL FULFILMENT FOR THE AWARD OF NATIONAL DIPLOMA IN SCIENCE LABORATORY TECHNOLOGY.

NOVEMBER, 2013

DECLARATION

I hereby declare that this research work has been solely conducted by me under the guidance and Supervision of Malama Hauwa Isah of the Department of Science Laboratory Technology, Nuhu Bamalli Polytechnic Zaria and it has never been presented before by any student either in ND or HND level to the department.

CHIOMA UMEZURIKE
D/SLT/11/17685

Date

CERTIFICATION

This is to certify that this project is an outcome of a research study, carried out by CHIOMA UMEZURIKE D/SLT/11/17685 and has been prepared according to the rules governing the presentation of the project in Nuhu Bamalli Polytechnic, Zaria.

Malama Hauwa Isah **(Project Supervisor)**	**Date**
Malam Ahmad Garba **(Project coordinator)**	**Date**
Mal. Muhammad T. Sidi **(Head of Department)**	**Date**

DEDICATION

This project is dedicated to Almighty God who spare my life in good health.

ACKNOWLEDGEMENT

My outmost appreciation goes to God Almighty who gave me grace and courage in the face of challenges, made it possible to withstand all odds and enable me to put forth the research. I wish to sincerely appreciate Mallama Hauwa Isah, despite her tight schedule and time constraints, intuitively read and effected corrections by making constructive critism.

My heartbeats with a tremendous vibrancy in order not to the academic build up given to me by lecturers like Mallam Ahmad Garba (coordinator), Mr. Vincent and other lecturers that time and space will permit to mention.

I wish to sincerely appreciate the sacrificial role played by my lovely Brother and Sister Dr. Ikechukwu Umezurike, Mrs. Doris N. Anyamkpa for their love, care, financial and moral support, patience, tolerance and cooperation without which my study would not have been possible, I love them more and more.

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ABSTRACT

Plants are excellent sources of food nutrients needed by man and his animals for survival, the proportions to which each of the food nutrient occurs in each plant is uncertained. A method of assessing the levels or concentrations of ash, moisture, lipid, crude fibre, crude protein, and carbohydrate in the leaves of in pterocarpus erinaceus (African Rose wood-uha) has been drawn by means of proximate analysis using some analytical grade reagents and apparatus following the described methods of AOAC (1990). Based on the results obtained, the percentage compositions of moisture, ash, lipid, crude protein, crude fibre and carbohydrate contents were: 16.00, 14.00, 21.00 28.56, 10.00 and 10.44% respectively. These food nutrients are of great importance to our bodies and are within the recommended values by WHO/FDA/FAO. It has been recommended that pterocarpus erinaceus leaves should form part of our daily meals and more research should be encouraged on the phytonutrients, dietary minerals or heavy metals as well as antimicrobial activity of the plant leaves.

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CHAPTER ONE

1.0 INTRODUCTION

The tree African rosewood (Uda) is scientifically as Pterocarpus erinaceus, a member of the family leguminsae or papilionoideae in the genus ptero carpus. It is a native to sahalian region of West African, from whence species were transinitted to Europe by the great enterprising mango park. This species of plant is cultivated in Senegal and is geographically distributed in Benin, Burkina faco, Cameroom, Centra-Bissau, Niger, Nigeria, Senegal, Sierra Leone, Sudan and Tago. The Tree is used for fuel wood, for medicinal purposes, as a wood working material and as a nitrogen fixing plant that helps to improve nutrient depleted in farmland (Von may dell, 1986).

The moisture content entails the proportion of water and the length of time the food substance can stay without being spoiled by insects or micro-organisms. The ash content entails the proportion, levels or the amount of dietary minerals/elements present in the food. The protein content gives the total protein present in the food. The lipid content gives the proportion either fats or oil present in the food. The dietary fibre gives the amount of roughades which would stimulate digestion in the intestine the carbohydrate content gives the total of all carbohydrates present in the food substance (AOAC, 1990).

1.1 Aims and objectives of the study

This project aims and objectives are to determine the moisture, Ash, Carbohydrates, Lipid, Protein and dietary fibre content of African rosewood (Uha) by proeimate Analysis, and to spell out the uses of African rosewood (Uha) to life.

1.2 Statement of problem and Justification of the study

Plants prove to be the source of humans and animals nutrients but the proportions or concentrations/levels to which each of the nutrient occur is uncertained. In other to be sured or curtained whether each nutrient is within the normal composition parameters or same how adulterated, it is justifiable for the pesearcher to carry out the proximate analysis and assay the truth of the matter.

1.3 Scope of the study

This project is only concerned with proximate analysis of African rosewood (Uha) leaves.

1.4 The significance of the study

This project is of importance to life because it enable the consumer of the this plant leaves see the values or uses of the African rosewood (uha) and to those that are not using this plant leaves as part of their meals to have insight of it uses.

1.5 Research questions

This project is going to look into the followings:

i. Literature review on the plant

ii. Botanical description of African rosewood (uha)

iii. Botanical classification of African rosewood (uha)

iv. Uses of African rosewood (uha)

v. Proximate analysis.

CHAPTER TWO

2.0 LITERATURE REVIEW

Plants have form the basis of food and traditional medicines which have been used for thousands of years. These make it that techniques or knowledge of assessing the nutrient contents in each plant is essential to life so that one would be curtained of the concentration of each nutrient and the values to his/her life. In developing countries where food items and or thodox medicines are quite expensive, the use of some plant/shrubs in food preparation and traditional medicines are widely practiced so that the incidence of food scarcity and the rate of infections diseases are checked or being controlled for a better living standard. The proximate analysis, antimicrobial, and phytochemical screnning of food nutrients and broactive compounds (phyto nutrients) are vital so as to maintain genuine information on the food nutrients and the active compounds (World Health Organization, 2003).

Pterocarpus erinaceus (African rosewood-uha) is a deciduous legume tree of African savannahs and dry forests famous for producing one of the finest woods (plants) in its native region. It also produces leafy fidder high in protein, which makes an excellent, animal fedd crucial for the survival litestock during dry season (Hutchirison et al, 1958). The foliage of African rosewood (uha) is a nutritious

fudder for farm animals and mali has an active market for this which is in high demand by sheep farmers for fudder (Hutchinson et al, 1958).

Medicinal uses of pterocarpus plant include the use of the leaves as a febrifuge, the bark for tooth and mouth troubles and bark resin as astringent for severe diarrhea and dysentery. The grated root is mixed with tobacco and sinoked in a pipe as a cough remedy. It has also been found useful in the treatment of fever (Sandrine, 2006). The leaves appear to have some propellent property. Tenda tribe of Senegal/Guinea use them to protert their graneries against termites. The flower attracts bees. The tree may have value for producing honey. The value of the fruits as food is not reported but the fruit of the similar or closely related P.Santalinoids is said to be edible if cooked and intoxication if not. Similarly, the seeds are reported to induce intoxication (Sandrine, 2006).

2.1 Botanical description of African rosewood (P.erinaceus)

Pterocarpus erinaceus is a medium sized, generally deciduous tree 12-15m tall, bole often of pour form, strongly fluted and gnarted, with numerous plank like buttresses; bark surface finely scaly fissured, brown-blackish, inner bark thin, producing red sap when cut, crown dense, domed; branchlets often lenticelied, indumentums of simple , usually short and adpressed hairs. The leaves alternate and up to 30cm long, inflorescence paniculate and bracts; the flowers bisexual and

irregular. The fruit is a compressed indehiscent pod, green when young and up to 7.5cm diameter, with a thickened central, usually woody or corky seed-bearing portion with 1-3 (4) seeds. The seeds are kidney-shaped, usually narrowed and curve, testabrown to blackish (Burkill, 1985).

2.2 Botanical classification of pterocarpus species

According to Wikipedia.org (2013), African rosewood is classified scientifically as follows:

Kingdom – Plantae

Division – Angiospermae

Class – Eudicotyledon

Order – Fabales

Family – Fabaceae/Leguminosa/Papilionoideae

Sub-family – Fabaideae

Genus – Pterocarpus

Species – P. erinaceus

Tribe – Dalbergieae

wit

Common Names: African rosewood, African gum, African teak, Senegal rosewood.

Hausa – Madubiya

Igbo – Uha

Yaruba – Osun dudu

2.3 Uses *of pterocarpus erinaceus species*

2.3.1 Food use

The leaves are edible, seeds also edible but need to be cooked property to avoid emetic or intoxicating effects. The foliage and immature pods are sometimes cut down at the end of the dry season as fudder to feed cattle and sold in markets in the dry season for fattering sheep, goats, cattle and horses. A quality nector is obtained from the African gum tree (Booth and Wickens, 1988).

2.3.2 Medicinal use

The leaves are used in abortifacient mixtures and as a fibr fuge. The bark is used for my worm of scalp, dressing for chronic ulcers, blennorrhagia and in a gargle for tooth and mouth troubles. Bark and resin are used for urethral discharge and as an astringent for severe diarrhea and dysentery. The grated root is mixed with tobacco and smoked in a pipe as a cough remedy (Booth and wickens, 1988).

2.3.3 Timber use

The wood has a handsome fine-grained appearance and once seasoned maintains shape very well-used for external construction, furniture including cabinets and stools. Also used in carpentry for doors, window frames, decorative parrelling, parquet flooring.

2.3.4 Training and Dyeing processes

The gum or resin sap dries to blood-red resin called kind i.e drayon-blood gum or gumkine. The parts of the plants are used in dyeing cotton. The dyestuff is pulrerized and mixed with water, the cloth is dipped and dried and shea oil or palm oil rubbed into produce a dark purple colour. Bark is sometimes used in tanning (Soerianegara and Lemmens, 1993).

2.3.5 Services

The plant is used for nodulating and probably nitrogen fixing. The plant is considerable potential as an ornamental as copious racemes of bright yellow flowers completely cover the tree during dry season, they fall to create a golden carpet berieath the trees and new leaves quickly follow to restore the shade (Soerianegara and lemmens, 1993).

CHAPTER THREE

3.0 MATERIALS AND METHOD

3.1 Material used

- Sample of African rosewood
- Muffle furnace/Ash burner
- Crucible dishes
- Oven
- Soxhlet apparatus
- Measuring cyhnder
- Beakers (100cm^3 and 250-500cm^3 capacity)
- *Distilled/Deionized water*
- Concentrated sulphuric acid
- Potassium/sodium suphate
- Copper sulphate
- Digital/Analytical weighing balance
- Kjeldahl apparatus/modified kjeldahl set up
- Hot-plate/heating mantle
- Spatulas
- Buckner funnel and flask

- Filter paper
- Titeration apparatus
- Methyl red indicator
- Boric acid
- Sodium hydroxide pelletlcrystal

3.2 Method

3.2.1 Collection of Sample

The sample of African rosewood (uha) was obtained from Sabon Gari market, zaria from from the sellers and was brought to chemistry Laboratory, Nuhu Bamalli Polytechnic, Zaria for the experiments.

3.2.2 Pre-treatment of sample

The sample of African rosewood was washed with distilted water and was shade dried in the Laboratory and Finally pounded into powder using pestle and mortar ready for the proximate analysis.

3.3 Proximate Analysis

This refers to the determination of the major constituents of feed and it is used to assess if a feed is within its normal composition parameters or some how been

adulterated. This method partitioned nutrients in feed into 6 components: water, ash, crude protein other extract, crude fidre and NFE.

3.3.1 Moisture determination

Moisture is determined by the loss in weight that occurs when a sample is dried to a constant weight in an oven. About 2g of a feed sample is weighed into a silica dish previously dried and weighed. The drying and weighing continues until a constant weight is achieved.

$$\%\text{Moisture} = \frac{\text{Wt of sample + dish before drying} - \text{Wt of sample + dish after drying}}{\text{Wt of Sample taken}} \times 100$$

Since the water content of feed varied very widely, ingredients and feed are usually compared for their nutrient content on moisture free or dry matter (DM) basis

$$\%\ DM = 100 - \%\ \text{Moisture}$$

3.3.2 Ether extract

The ether extract of a feed represents the fat and oil in the feed. Soxhlet apparatus is the equipment used for the determination of ether extract. It consist of 3 major components.

1. An extractor: Comprising the thimble which holds the sample.

ii. Condenser: For cooling and condensing the ether vapour.

iii. 250ml flask

Procedure: about 150ml of an annydrous diethyl ether (petroleunm ether) of boiling point of 40 – 60^{0}c is placed in the flask. 2-5g of the sample is weighed into a thimble and the thimble is pluggeet with cotton wool. The thimble with content is placed into the extractor; the ether in the flask is then heated. As the ether vapour reaches the condenser through the side arm of the extractor. It condenses to liquid form and drop back into the sample in the thimble, the ether soluble substances are dissolved and are carried into solution through the siphon tube back into the flask. The extraction continues for atleast 4 hours. The thimble is removed and most of the solvent is distilled from the flask into the extractor. The flask is then disconnected and placed in an oven at 65^{0}c for 4 hours, cool in desiccators and weighed.

$$\%\text{Ether extract} = \frac{\text{Wt of flask + extract – tare Wt of Flask x 100}}{\text{Wt of sample}}$$

3.3.3 Crude fibre

The organic residue left after sequential extraction of feed with ether can be used to determine the crude fibre, however if a fresh sample is used, the fat in it could be extracted by adding petroleum ether, stir, allow it to settle and decant. Do this three times. The fat-free material is then transferred into a flask/beaker and

200mls of pre-heated 1.25% H_2SO_4 is added and the solution gently boiled for about 30 minutes, maintaining constant volume of acid by the addition of hot water. The buckner flask funnel fitted with what man filter is pre-heated by pouring hot water into the funnel. The boiled acid sample mixture is then filtered hot through the funnel under sufficient suction. The residure is then washed several times with boiling water (until the residue is neutral to litmus paper) and transferred back into the beaker. Then 200mls of pre-heated 1.25% Na_2SO_4 is added and boiled for another 30 minutes. Filter under suction and wash thoroughly with hot water and twice with ethanol. The residue is dried at 65 ^{0}c for about 24 hours and weighed. The residues transferred into a crucible and placed in muffle furnace (400-6000c) and ash for hours, then cool in desiccators and weigh.

$$\% \text{ crude fibre} = \frac{\text{Dry wt of residue before ashing} - \text{wt of residue after ashing} \times 100}{\text{Wt of sample}}$$

3.3.4 Crude protein

Crude protein is determined by measuring the nitrogen content of the multiphying it by a factor of 6.25. this factor is based on the fact that most protein contains 16% nitrogen. Crude protein is determined by kieldahl method. The method involves: Digestion, Distillation and Titration.

i. **Digestion:** weigh about 2g of the sample into kjeldahl flask and add 25mls of concentrated sulphunric acid, 0.5g of copper sulphate, 5g of sodium sulphate and aspeck of selenium tablet. Apply heat in a fume cupboard slowly at first to prevent frotling continue to digest for 45 minutes until the digesta becomes clear pace given, leave until completely cool and rapidly add 100mls of distilled water. Ririse the digestion flask 2-3 times and add thennsing to the bulk.

ii. **Distillation:** Markhem distillation apparatus is used for distillation steam and allow it to boil. Add 10mls of sodium hydroxide from the measuring cylinder so that ammonia is not lost. Distill into 50mls of 2% boric acid containing screened methyl red indicator.

iii. **Titration:** The alkaline ammonium borate formed is titrated directly with O.IN HCL. The titre value which is the volume of acid used is reconded. The volume of acid used is fitted into the formular which becomes

$$\% N = \frac{14 \times VA \times 0.1 \times w}{1000 \times 100} \times 100$$

VA = Volume of acid used

W = Weight of sample

% crude protein = % N x 6.25

3.3.5 Ash

Ash is the Inorganic residue obtained by burning of the organic matter of feedstuff at 400-600^{0}c in muffle furnance for 4 hours. 2g of the sample is weighed into a pre-heated crucible. The crucible is placed into muffle furnance at 400-6000c for 4 hours or until whitish-grey as is obtained. The crucible is then place in the desiccators and weighed.

$$\%Ash = \frac{\text{wt of crucible Ash-wt of crucible}}{\text{Wt of sample}}$$

3.3.6 Nitrogen free extract (NFE)- carbohydrates (AOAC, 1990)

NFE is determined by mathematical calculation. It is obtained by subtracting the sum of percentages of all the nutrients already determined from 100.

% NFE = 100 – (%moisture + %CF + %CP + %EE + %ASH)

NFE represents soluble carbohydrates and other digestible and easily utilizable non-nitrogereons substances in feed.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Results

Table 1: Results for the proximate analysis of African rosewood (uha) leave.

Parameter or Nutreient	Value
Moisture content (%)	16.00
Ash content (%)	14.00
Lipid content (%)	21.00
Crude Protein content (%)	28.56
Crude fibre content (%)	10.00
Carbohydrate content	15.44

Above in table 1 is the result for the proximate analysis of African rosewood (uha) leaves with crude protein being high followed by lipid, moisture, carbohydrate, ash and the least being crude fibre.

4.2 Discussion

Based on the resuts in table 1, the misture content was found to be 16.00%. this shows that the dry form of the leaves can be stored for a long period of time without being spoiled than when it is fresh. The ash content was found to be **14.00%**. This entails that the level of mineral contents in leaves which could be of

biological importance or toxic to life. The lipid content was found to be 21.00%. This shows that remarkable oil can be extracted from the leaves of this plant that can be used for other products apart from its uses in the body.

The crude protein was found to be 28.56%. This shows that more protein can be obtained when one feed on the leaves of African rosewood (uha). This protein value is in agreement with the reported statement that is used for fatering of animals and as nitrogen. Fixer according to Brooth and wichens (1988) and soerianegera and lemmens (1993). The crude fibre was found to be 10.00% which is least but can also add to lining or smoothing of intestine during digestion and reducing the fat that might disturb the intestine. The carbohydrate content was found to be 15.44%. This shows that one feeding on the leaves of African rosewood (uha) also gain energy that add to the calorie.

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATION

5.1 Conclusion

Plants are good source of food for man and his animals. The proportion to which each of the class of food nutrients is present in some plants are yet to be known. African rosewood (uha) leaves have been analysed by proximate analysis and the propution of each food nutrient has been found to be reasonably enough for body use or need. Crude protein has been discovered to be in high quality followed by lipid, moisture, carbohydrate ash and least being crude fibre. The proportion of protein content made the leaves a good folder for ruminant animals. This means that even humans can also derive high protein content of this feed, a part of other nutrients.

5.2 Recommendation

Based on the literature reviews and the results of this project, the following were recommended.

i. More research should be encouraged on the phytochemical analysis of the plant leaves.

ii. More research should be encouraged on the dietary minerals of heavy metals of the leaves.

iii. Antimcorobial activity of the leaves extract should be encouraged and.

iv. Toxicity study of the plant leaves should be carried out.

It is important to know the nutrients compositions of what one feed on in order to assess the concentration of each nutrient, whether it is within the normal compositional parameters or somehow been adulterated, so our state of health be curtained. The method of assaying the macro nutrients is by proximate analysis.

Plants constitute the energy source for humans and animals. This makes it that researchers/scientists have to embark into identification and dertmination of the food composition and chemical constituents as well as their effectiveness in the treatment and caring of diseases. As such, this project is going to look for the food values or macro nutrient compositions of African rosewood or African gum called uha la Igbo (Nigeria).

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Appendix 1

Results and calculations for the proximate analysis of African rosewood (uha) leaves.

1. Moisture content.

Weight of empty crucible = 12.30g

Weight of crucible + sample = 17.30g

Weight of crucible +sample after 1hour = 16.90g

Weight of crucible + sample after 2hours = 16.70g

Weight of crucible + sample after 3hours = 16.50g

Weight of crucible + sample after 4hours = 16.50g

$\frac{16.50+16.50}{2} = 16.50g$

$$\% \text{ of moisture} = \frac{17.30 - 16.50}{17.30 - 12.30} \times \frac{100}{1} = \frac{0.50}{500} \times \frac{100}{1} = 16.00\%$$

2. Ash Content

Weight of empty crucible = 10.30g

Weight of crucible + sample before Ashing = 15.30g

Weight of crucible + sample after Ashing = 14.60g

$$\% \text{ of Ash} = \frac{15.30 - 14.60}{15.30 - 10.30} \times \frac{100}{1} = \frac{0.70}{5.00} \times \frac{100}{1} = 14.00\%$$

3. **Lipid content**

Weight of empty flask = 106.70g

Weight of flask + oil Extraction = 108.80g

Weight of sample used = 10.00g

$$\% \text{ of lipid} = \frac{108 - 80 - 106.70}{10.00} \times \frac{100}{1} = \frac{2.10}{10} \times \frac{100}{1} = 21.00\%$$

4. **Crude protein content**

Titre values of 0.1mHd

Trials	1st	2nd	3rd
Final	6.50	6.60	6.50
Initial	0.00	0.00	0.00
Volume	6.50	6.60	6.50

Average titre

$$= \frac{6.50 + 6.60 + 6.50 cm^3}{3} = \frac{19.60}{3}$$

$$= 6.53 cm^3$$

$$\% \text{ of Nitrogen (N)} = \left[\frac{14 \times 6.53 \times 0.1 \times 100}{1000 \times 10 \times 2}\right] \times \frac{100}{1}$$

$$= \frac{91422}{20000} = 4.57\%$$

% of crude protein = 6.25 x 4.57 %

= 28.56%

5. **Crude fibre content**

Weight of Residue before Ashing = 1.80g

Weight of Residue after Ashing = 1.50g

Weight of sample used = 3.00g

$$\% \text{ of crude fibre} = \frac{1.80 - 1.50}{3.00} \times \frac{100}{1} = \frac{0.30}{3} \times \frac{100}{1}$$

$$= 10.00\%$$

6. **Carbohydrote content**

% Carbohydrate = 100 – (Moisture + Ash + Lipid + C. protein + C. fibre) %

= 100 – (16.00 + 14.00 + 21.00 + 28.56 + 5.00) %

= (100 – 84.56) %

= 15.44%