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Proximate analysis of root bark of *Terminalia glaucescens*

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Abstract

The aim of this study is to determine the proximate composition of root bark of *Terminalia glaucescens*. Standard procedures were followed to analyze the composition. The caloric value was calculated from crude fat, crude fiber, moisture content, acid insoluble, water soluble and total ash value. The results revealed that root bark of*Terminalia glaucescens* contained crude fat (10.92±0.01%), crude fiber (2.02±0.02%), moisture content (5.82±0.06%), acid insoluble (0.46±0.02%), water soluble ash (3.05±0.01%) and total ash value (6.05±0.03%). This study concluded that the test contained root bark of *Terminalia glaucescens* highest percentage of fiber and low percentage of ash. Therefore is a good candidate as medicinal plant as it has been used in folk medicine.

Keywords: Ash, caloric value, fiber, medicinal plant, moisture

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Introduction

Medicinal plants have been in use for the eradication of human sufferings since ancient times. In light of their established therapeutic efficiency, the pharmaceutical industries started to use crude extracts of medicinal plants for manufacturing drugs (Ali and Azhar, 2000). The root bark of *Terminalia glaucescens* have been used in traditional medicine for treatment of dysentery, fever, diarrhea, wound, and tooth decay, ulcers, typhoid fever and various stomach related problems (Bulama *et al.*, 2014). *T. glaucescens* is flowering plant tree (angiosperm) belong to family Combretaceae. It is commonly found in West Africa especially in Savannah regions. The plant is the most important medicinal species of the genus *Terminalia*. It is abundant in Nigeria. The plant is commonly called Baushe (Hausa), Idi Odan (Yoruba), Edo (Igbo) while the local dilate where the plant was collected is called palma (Bura – Babur). The ash remaining following ignition of medicinal plant materials is determined by different methods which measure moisture content, total ash, acid – insoluble ash and water soluble ash (WHO, 1998). The moisture content is determination or measures the moisture content remains after air dried of the plant material. The total ash method is designed to measure the total amount of material remaining after ignition. This include both ‘physiological ash’, which is derived from the plant tissue itself, and ‘non – physiological ash’, which is the residue of the extraneous matter (e.g. sand and soil) adhering to the plant surface (WHO, 1998). Acid – insoluble ash is the residue obtained after boiling the total ash with dilute hydrochloric acid and igniting the remaining insoluble matter. This measures the amount of silica present, especially as sand and siliceous earth. Water – soluble ash is difference in weight between the total ash and the residue after treatment of the total ash with water (WHO, 1998). Several reports and literatures have reveal that *T. glaucescens* have been used in traditional medicine and it has pharmacological properties (Bulama *et al*., 2014). In Bura-Babur traditional Medicine, the root bark is used for treatment of dysentery, fever, diarrhea and powdered root bark is applied to wound (oral communication by traditional medical healer). Ndukwe *et al*. (2005) reported that *T. glaucescens*has antimicrobial properties and can be used as a chemotherapeutic agent. *T. glaucescens*is reported to having potential for oral infection treatment (Ndukwe*et. al.,* 2005). It is employed in local dental hygiene and found to show impressive activity against the broad spectrum of microorganisms (Taiwo *et al*., 1999).The plant is also reported to have traditional medicinal uses such as antimalaria, treatment of diarrhea and tooth decay (Ojo *et al*., 2006).Gill (1992) reported that the leaves are chewed for cough and throat, the decoction of the root is prescribed for diarrhea, dysentery and ulcers, is also used for enema. The root powder is used for wounds and syphilis and also chewed as chewing stick for cleaning teeth in south- western part of Nigeria (Ojo *et al*., 2006).The purpose of this study is to establish the amount or percentage of proximate composition of the root bark of *T. glaucescens* as it has been used in folk medicine.

Material and Methods

Collection, identification and preparation of plant materials.

The plant materials were collected from Hyera Road of Shaffa District, Hawul Local Government Area, Borno State of Nigeria. The plant was identified and the herbarium (voucher) specimen number UDUS/Bio/12/113 was prepared and deposited at the Herbarium of Botany Unit, Department of Biological Sciences, Usmanu Danfodiyo University, Sokoto, by A. M. Umar (Taxonomist). The root bark of the plant was air dried under shed, then pulverized into powder with the aid of pestle and mortar. The powder obtained from the plant was then sieved and stored in polythene bags until required for use (African pharmacopoeia, 1985)

Moisture content

Weight of nickel crucible was heated in oven and weighted on digital weigh balance for five times to get the constant weight, after gotten the constant weight 3g of pulverized plant material was added to the crucible and was weighed . The crucible containing plant material was heating and measured for several times to obtained the constant weight. Then the moisture weight was calculated followed by the moisture content in (mg/g) and in percentage (%) (WHO, 1998).

$$\%\text{moisture} = \frac{W_{\text{initial}} - W_{\text{dried}}}{W_{\text{initial}}} \text{ x } 100$$

Total ash value

3g of pulverized air – dried plant material, was accurately weighed, in a previously ignited and tare nickel crucible. Plant material was spread in an even layer and ignite it by gradually increasing the heat until it is white, indicating the absence of carbon. It was allowed to cool and weighed. Then the content of total ash value was calculated and recorded in (mg/g) and percentage (WHO, 1998).

$$\%\text{ Total Ash} = \frac{W_{\text{ash}}}{W_{\text{dry}}} \text{ x } 100$$

Water – soluble ash

To the crucible containing the total ash, 25ml of water was added and was boiled for 5 minutes. The insoluble matter was collected on an ashless filter – paper. The ashless filter – paper was transferred to nickel crucible and was ignited for 15 minutes at a temperature of less than 450^0C. The weight of residue was subtracted from the weight of total ash value in (mg). The content of water – soluble ash was calculated in mg/g of air – dried plant material (WHO, 1998).

$$\%\text{Water – Soluble Ash} = \frac{W_{\text{dry}} - W_{\text{ash}}}{W_{\text{dry}} - W_{\text{empty}}} \text{ X } 100$$

Acid insoluble ash

To the crucible containing the total ash, 25 ml of HCl acid was added (70g/l), was covered with watch – glass (beaker) and was boiled gently for 5 minutes. Rinse the watch – glass with 5 ml of hot water and was added this liquid to the crucible.The insoluble matter was collected on an ashless filter – paper and was washed with hot water until the filtrate is neutral. The insoluble matter was transferred to the original crucible, and was dry on a hot air sterilizing carbinet and ignited to constant weight. The residue was allowed to cool for 30 minutes, and then was weigh without delay. The acid - insoluble ash was calculated in (mg/g) and in percentage of air – dried plant material (AOAC, 2003).

$$\% \text{ Acid Insoluble Ash} = \frac{W_2 - W}{W_1 - W} \times 100$$

Determination of crude fat

Dry extraction method for fat the samples in desiccator and weighed again (Wt) determination was implied. It consisted of extracting dry sample with some organic solvent, since all the fat materials e.g. fats, phospholipids, sterols, fatty acids, carotenoids, pigments, chlorophyll etc. are extracted together therefore, the results are frequently referred to as crude fat. Fats were determined by intermittent soxhlet extraction apparatus. Crude fat was determined by ether extract method using Soxhlet apparatus. Approximately 1 g of moisture free sample was wrapped in filter paper, placed in fat free thimble and then introduced in the extraction tube. Weighed, cleaned and dried the receiving beaker was filled with petroleum ether and fitted into the apparatus. After 4-6 siphoning allow ether to evaporate and disconnect beaker before last siphoning. Transferred extract into clean glass dish with ether washing and evaporated ether on water bath. Then placed the dish in an oven at 105oC for 2 hrs and cooled in a desiccators (AOAC, 2003). The percent crude fat was determined by using the following formula:

$$\% \text{ Crude fat} = \frac{\text{Wt. of ether extract X100}}{\text{Wt. of Sample}}$$

Determination of crude fiber

A moisture free and ether extracted sample of crude fiber made of cellulose was first digested with dilute H_2SO_4 and then with dilute KOH solution. The undigested residue collected after digestion was ignited and loss in weight after ignition was registered as crude fiber.

Reagents

- Solution of sulphuric acid 7.1 ml, 96% per 1000 ml of distilled water
- Solution of Potassium hydroxide 12.5 g per 1000 ml of distilled water
- Acetone (foam suppresser)

Procedure

Weighed 0.153 g sample (W_0) weighed and transferred to porous crucible. Then placed the crucible into Dosi-fiber unit and kept he valve in “OFF” position. After that added 150 ml of preheated H_2SO_4 solution and some drops of foam-suppresser to each column. Then opened the cooling circuit and turned on the heating elements (power at 90%). When it started boiling, reduced the power at 30% and left it for 30 min. Valves were opened for drainage of acid and rinsed with distilled water thrice to completely ensure the removal of acid from sample. The same procedure was used for alkali digestion by using KOH instead of H_2SO_4. Air dried the sample in an oven at 150°C for 1 h. Then allowed the sample to cool in a desiccator and weighed (W_1). The sample andcrucible were placed in muffle furnace at 55^0C for 3-4 hours to cooled the samples in desiccator and weighed again (W_2) (AOAC, 2003)

Calculations were done by using the formula:

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

The proximate analysis revealed the moisture content of root bark of *Terminalia glaucescens* to be 5.82 ±0.06% (w/w). This result indicated high shelf life of the fresh plant hence long storage would lead to spoilage due to its susceptibility to microbial attack. This supports the practice of storage in dry form by users. Moisture content is among the most vital and mostly used measurement in the processing, preservation and storage of medicinal plant materials.

Total ash value of 6.05±0.03% dry matter was obtained as a result for root bark of *T. glaucescens.* Ash in medicinal plant contributes the residue remaining after all the moisture has been removed as well as the organic material (fat, protein, carbohydrates, vitamins, organic acid etc) have been incinerated at a temperature of about 450°C. Ash content is generally taken to be a measure of the mineral content of the original medicinal plant.

Crude fibre in medicinal plant or food is an indication of the level of non-digestible carbohydrate and lignin. The crude fibre obtained from root bark of *T. glaucescens* was 2.02±0.01%. This low level is considered appropriate, because it aids absorption of glucose and fat.

Results and Discussion

Table1: Proximate Composition of root bark of *Terminalia glaucescens*

Determinate	**Percentage Composition**
Moisture content	5.82 ± 0.06
Total Ash Value	6.05 ± 0.03
Water Soluble Ash	3.05 ± 0.01
Acid Insoluble Ash	0.46 ± 0.02
Crude Fat	10.92 ± 0.04
Crude Fiber	2.02 ± 0.01

Results are mean of triplicate determinations ± S

Although crude fibre enhances digestibility, its presence in high level can cause intestinal irritation, lower digestibility and decreased nutrient usage (Oladiji and Mih, 2005). Crude fibre is made up largely of cellulose together with a little lignin which is indigestible in human.

The crude fat content obtained from root bark of *T. glaucescens* was 10.92±0.01%. Fat provides very goodsources of energy and aids in transport of fat soluble vitamins, insulates and protects internal tissues and contributesto important cell processes (Jones *et al*., 1985, Pamela *et al*., 2005). It is good to add fat to most ofour diets, because many body functions depend on fats and enhance tissue development that is why the plant is used for the treatment of wood.

Acid – insoluble ash is the residue obtained after boiling the total ash with dilute hydrochloric acid and igniting the remaining insoluble matter. This measures the amount of silica present, especially as sand and siliceous earth (WHO, 1998). The acid insoluble ash obtained from root bark of *Terminalia glaucescens* was 0.46±0.02%, is low simply mean the plant may not adhere more with earth matters such as siliceous, sand etc.

Conclusion

Root bark of *Terminalia glaucescens* is good for oral treatment as it has been used in folk medicine since it has low proximate composition parameters and may be less toxic in terms of inorganic matters.

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