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Proximate and Mineral Analysis of *Tetracarpidium conoforum* (Wall nut) Root Bark Extract

Philip A. Oviawe[a], Osaro Iyekowa[a]*, Osamuyi H. Uwumarongie[b], Oghomwen T. Michael[c] and Ruth O. Oghomwen[d]

[a] Department of Chemistry, Faculty of Physical Sciences University of Benin, Benin City, Nigeria

[b] Department of Pharmacognosy, Faculty of Pharmacy, University of Benin, Benin City, Nigeria.

[c] Department of Science Laboratory Technology, Faculty of Life Sciences, University of Benin, Benin City, Nigeria.

[d] Department of Physical Science Laboratory Technology, Auchi Polytechic, Auchi, Edo State, Nigeria

*Corresponding Author: osaro.iyekowa@uniben.edu

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Abstract

Tetracarpidium conoforum (African wall nut) have been used as a major medicinal and nutritional plant in Nigeria. It is part of the materials used traditionally in Edo State of Nigeria for bone fracture treatment. This research is conducted as a preliminary study to investigate the proximate and essential mineral composition of the root bark of the Africa wall nut. The proximate composition was determined according to standard methods and elemental analysis by Atomic Absorption Spectrophotometry (AAS) and Flame photometer. Proximate composition revealed a moisture content of 11.22%, ash 11.28%, fibre content 33.87%, crude protein 23.12%, and fat 6.10%. Elemental analysis indicated the presence of calcium, magnesium, potassium, sodium and copper in varying percentages. Findings from this study, the root bark indicated the highest proportion for calcium (29.40 mg/kg) which explains its applications in by traditional herbal practitioners in bone fracture treatment and setting.

1. Introduction

Medicinal plants are currently in considerable significance view due to their special attributes as a large source of therapeutic phytochemicals that may lead to the development of novel drugs [1].All over the world, the use of medicinal plants has gained increasing relevance especially in the area of nutrition, medicine and other services to humanity. This relevance is attributed majorly to the presence of secondary metabolites or bioactive chemical constituents in plants that contain certain properties which play physiological functions in living system. *Tetracarpidium conoforum* (African wall nut), family- *Euphorbiaceae* is an important medicinal plant which play significant role in nutrition and traditional applications in Nigeria [2]. It is commonly called walnut and locally 'Okhue' in Bini, 'Ukpa' Igbo and 'Ewusa' in Yoruba. *Tetracarpidium conoforum* plant is a large deciduous tree attaining a height of 25-35m with a trunk up to 2m in diameter and broad crown. It is draught demanding specie requiring full sun to grow well [3]. The plant is widely cultivated for the production of nuts and is used as delicacies [4] The fruit of the walnut tree is a fleshy green drupe in which the nut is encased. The kernel of the nut is protected by a corrugated wood shell. The seed is large, with a relatively thin shell and edible with rich flavor [5]. Walnuts seed are known for their content of omega-3-fatty acids, which are good in maintaining a healthy heart as they have low saturated fats. The seeds have potentials health benefits in the area of memory and cognitive

function and promotes brain health [6]. Walnut seed contains melatonin a hormone used in the body to regulate sleep and it is a powerful anti-oxidant that ward off free radical that is responsible for the development of cancer cells [7]. The African walnut seeds also contain allergic acids that neutralize cancer-causing substances [8]. Walnut seed contains melatonin a hormone used in the body to regulate sleep. Melatonin is a powerful anti-oxidant that fights free radical that is responsible for the development of cancer cells [7]. Black walnut seeds also contain allergic acids that neutralize cancer-causing substances [8]. Ogbonna *et al.* [9] also reported that the root of walnut is a potential source of useful drug formulation due to the fact that it contains important bioactive components. The proximate composition, ascorbic acid, fatty acid profile, amino acid and heavy metal contents of the nut, seeds and leaves have been investigated [10]. This research thus focuses on the proximate and mineral analysis of the wall nut root bark.

2.0. Materials and Methods

2.1. Sample collection and treatment

The roots of *Tetracarpidium Conophorum* were collected from its natural habitat in Ova community, Egor Local Government Area of Edo State. The plant sample was identified and authenticated in the Department of Plant and Biotechnology, University of Benin, Benin City, Edo State, Nigeria. The roots were washed in running tap water immediately and air dried for for 24 hours. The root bark was carefully peeled off with a sharp knife and blended with an electric blender. The powder root bark were then used for the proximate analysis and the determination of mineral composition.

2.2. Proximate Analysis. The proximate composition of the wall nut root bark was analyzed following standard methods [11] crude fat by Soxhlet method, moisture by vacuum oven, crude protein by Kjeldahl method and ash by ignition. The carbohydrate content was calculated by subtracting the values of all the other proximate analysis from 100 [11].

2.3. Mineral Element Determination: 1 g of the sample (powdered wall nut root bark) was digested with concentrated HNO_3 and $HClO_4$. The sample was then filtered and made up to 50 ml with distilled water [11].The metal concentrations were determined using an Atomic Absorption Spectrophotometer (Buck Scientific model 210) and a Flame Spectrophotometer (Sherwood, model 410).The mineral elements investigated were Zn, Ca, Mg, K, Na, and Cu

3.0. Results and discussion

3.1. Proximate analysis

The results of the proximate analysis of *Tetracarpidium conoforum* root bark are shown in Table 1.

Table 1: Results of proximate composition of *Tetracarpidium conoforum* root bark

Parameter	Value (%)
Moisture content	11.22
Ash content	11.28
Crude fibre	33.87
Crude fat	6.10
Protein	23.12

The moisture content obtained for the wall nut root bark was 11.22%. Higher values of 41.02% and 43.10% have been obtained respectively for the leaves and root extract by Ogbonna [9]. Shelf life and storage time for extracts, drug formulations and other natural product materials are usually

influenced and determined by moisture content. In this study, the moisture content is lower than the values obtained for the leaves and whole root extracts by other authors. Low moisture content have been inferred to inhibit microbial growth [12]. The ash content of a sample is an indication of the level of minerals present [13]. The value of ash content, 11.28% (Table1) obtained in this work was different and higher than that obtained for the root of wall nut by Ogbonna [9]. However, the seed extract indicated a lower ash content of 2.86% [6] when compared to the root bark as obtained in this research. The crude fibre content was 33.87%, a higher value than 7.43% obtained for the whole part of the root by Ogbonna [9]. More so, the protein content (23.12%) was also higher than 20.64% obtained for the whole root. Thus, the high amount of protein content obtained in this work suggests that the root bark contain essential amino acid and may be used to supplement drugs and other dietary sources.

3.2. Mineral Element Determination

The results of mineral elements determination are shown in Table 2.

Table 2: Mineral elements detected in *T. conoforum* root bark

Mineral element	Content (mg/kg)
Na	**1.42**
Ca	**29.40**
Mg	**0.28**
Zn	**0.11**
K	**14.02**
Cu	**0.002**

Amongst these minerals, the concentration of calcium was the highest (29.40 mg/kg) while copper (0.002 mg/kg) was the least detected. Sodium, calcium, magnesium, zinc, potassium and copper values were all higher for both the leaves and whole root extracts than the root bark used in this study [9]. This suggests that more of the mineral elements and compositions are more in the leaves and whole root part of wall nut than the root bark. The presence of calcium in high quantity in the respective parts of the plant indicates the plant usefulness in the traditional treatment of bone fracture due to the usefulness of calcium in bone tissue development and ossification [2]. In addition, the presence of sodium (1.42 mg/kg) in low quantity suggests the plant can be used in controlling high blood pressure. Potassium had a concentration of 14.02 mg/kg and it plays a role in many body functions including lowering of blood pressure, transmission of nerve signals, muscle contractions and fluid balance.

4.0 Conclusion

Tetracarpidium conoforum root bark contain essential minerals required for nutritional and medicinal purposes, and the high calcium content of the root bark suggest its physiological role in bone healing, tissue growth and this findings corroborates the use of the root bark for bone setting by herbal traditional practitioners.

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Conflict of interest

The authors declare no conflict of interest.

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