

Proximate Analysis of Seed and Seed Coat (Kernel) of *Tetracarpidium conophorum* (Mull. Arg.) Hutch & Dalziel.): An Underutilized Woody Climber.

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Abstract: This study was carried out to determine the proximate composition and some mineral contents of the seed and the seed coat (kernel) of walnut using standard methods. The result of proximate analysis reveals the presence of crude protein (20.43%), 7.22%, moisture content (44.95%), 38.11%, Ash (2.17%) 0.82%, crude fibre (19.62%), 1.30% in seed and seed coat respectively. The mineral analysis indicated the presence of zinc (0.035mg/ml, 0.04mg/ml), copper (-0.0038mg/ml, 0.04mg/ml) calcium (12.26mg/ml, 105.90mg/ml), iron (0.15mg/ml, -0.27mg/ml), lead (0.198, mg/ml, 0.11mg/ml) and magnesium (30.28mg/ml, -0.13mg/ml) in seed and seed coat (Kernel) respectively. The results showed that the seed (cotyledon) of Walnut is a very good source of protein, minerals and dietary fiber. The seed coat (kernel) also contained high content of calcium which can be used as ingredient in animal feed formulation.

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1. Introduction

The ever increasing population growth threatens the health and welfare of many people of the world. It is in the public domain that not less than 450 million people worldwide are malnourished and this is attributed to protein deficiency. In the developing tropical countries in which Nigeria is one, protein deficiency is widely spread because diets generally are deficient in quality and quantity of protein. This is so because many people can no longer afford to buy conventional sources of protein such as egg, meat, fish, chicken and so on. Therefore, it is necessary for Government planners to search for additional sources of protein supplements which will be affordable to all and sundry.

Walnut is a 10-20ft long climbing plant of the Euphorbiaceae family (Edem et al 2009). It is widely distributed and consumed by the inhabitants of the Guinea zone of west and central Africa (Oyenuga, 1975) and found in the forest regions of Africa and India (Petrova, 1980, Oke, 1995).

Walnut is scientifically known as *Tetracarpidium conophorum* (Mull. Arg.) Hutch & Dalziel.). It is commonly referred to as Nigerian walnut. It is known as 'Okhue' or Okwe' in Edo State, Ekor; by the Efiks and Ibibios of Cross River and Akwa Ibom States of Nigeria, It is called "Ukpa", "Asala" and "Awusa" in the Eastern, western and northern Nigeria respectively and it is known as "kaso" or "ngark" in Cameroon (Dalziel, 1937 in Ayoola et al 2011). *T.conophorum* fruit is a dry nut, enclosed between two semispherical hard shells

joined together. Walnut is harvested from the wild and in recent times cultivated for the nuts which are cooked and taken as snacks (Oke, 1995). People usually experience a slightly bitter taste when they drink water immediately after eating the nuts. This could be as a result of the presence of chemical substances such as alkaloids (Edem et al, 2004). Though Walnut is generally acceptable in Nigeria, very little work has been done on the proximate analysis of the nut and the hard shell (kernel) of this plant. This study therefore elucidated some nutrient compositions of *Tetracarpidium conophorum* (Walnut).

2. Materials And Methods

Sample Collection

The walnut used was purchased from Obajoko market in Ila-Orangun, Ila-Orangun Local Government Area of Osun State. The fruits were broken and the seeds and seed coats were grounded/milled into fine particles separately prior to analysis. 50g of the finely grounded seed and seed coat of the sample were used for the analysis.

Proximate Analysis

Moisture content was determined by drying to constant weight at 60-80^oc in an oven, Ash content by ignition at 550^oc in a muffle furnace for 4hr, ether content by Soxhlet extraction with hexane solvent, protein by the Kjeldahl method and the crude fibre by the acid and alkaline digestive methods (AOAC. Standard Official Methods of Analysis of the association of analytical Chemists, 1980)

Mineral Analysis

The AOAC Methods (1980) was used for the determination of minerals in the test samples. (seed and seed coat (shell) zinc, copper, magnesium, calcium lead, and iron were determined by Atomic Absorption spectrophotometric method. These were carried out at the central science Laboratory, Obafemi Awolowo University, Ile-Ife, Osun State.

3. Results And Discussion

Based on the results of the proximate composition of seed and seed coat (shell) as shown in Table 1, the protein content 20.43%, 7.22%, Ash content 2.165%, -0.82%, crude fibre 19.62% 44.23%, moisture content 17.59%, 1.30%; The seed has local uses for food and is obviously a good source of protein. It can safely be fed to stock. This is similar to the findings of Edem, et al 2009 and Ayoola, et al, 2011. The seed of Walnut is rich in moisture content, high ether extract and very low ash content. In comparison; the seed coat is very rich in crude fibre, low protein content and ether content. The seed coat is a good source of dietary fibre. Adequate intake of crude fibre might have a helpful physiological role such as low incidence of colon cancer (Sanchez-Castillo et al, 2006).

Any plant food that provides more than 12% of its energy from protein is considered a good source of protein (Hassan and Umar 2006) the ash content, which is often regarded as an index of mineral content in biological mass, was low in both seed and kernel of Walnut.

Table 1: Proximate composition of seed and seed coat (Kernel) of Walnut

Composition %	Seed	Seed coat /kernel
Protein	20.43	7.22
Ash content	2.165	-0.82
Crude fibre	19.62	44.23
Moisture content	44.45	38.11
Ether extract	17.59	1.30

Mineral analysis of Walnut (seed and kernel)

The mineral analysis of seed and kernel of walnut showed that walnut seed was rich in magnesium 30.28mg/ml moderate in calcium 12.26mg/ml but low in zinc 0.04mg/ml, iron 0.15 mg/ml with no amount of copper 0.0mg/ml and lead 0.15mg/ml.

In walnut kernel (shell), calcium was higher compared to the seed (nut) 105.90 mg/ml. > 12.26 mg/ml. copper 0.04mg/ml was present in the kernel but absent in the seed. However, zinc content 0.04mg/ml was observed both in seed and seed coat (kernel) of walnut.

The result of mineral analysis of walnut seed and seed coat /kernel contains rich source of mineral elements. This result becomes so important when the usefulness of such minerals like zinc, copper, magnesium, calcium and iron in the body are considered.

Magnesium content was higher in seed than the seed coat of walnut. Magnesium activates many enzymatic systems responsible for calcium metabolism in bones and in the nerves electrical potential (Ishida et al., 2000) zinc content is similar both in seed and seed coat of walnut. Zinc stimulates the activity of vitamins, formation of red and white corpuscles (Claude and Paule, 1979), healthy function mg of the heart and normal growth (Elizabeth, 1994). It is also important for normal sexual development. Seed coat of walnut contains copper but absent in the nut /seed. The presence of copper may be responsible for the absorption of iron it is therefore often seen with iron naturally copper is important for cellular defence and protection of mucous membrane, anti-anaemic and essential for the formation of hemoglobin from iron (Claude and Paule, 1979).

Calcium content was higher in the seed coat (kernel) of walnut. Calcium is needed for the formation and maintenance of bones, the development of teeth and healthy gums. It is necessary for blood clotting, stabilizes. Many body functions and it though to assist in preventing bowel cancer (Attieh et al., 1999) .

Table 2: Mineral Analysis of Walnut seed and seed coat (Kernel/ shell)

Composition %	Seed	Seed coat /kernel
Zinc	0.04	0.04
Copper	-0.00	0.04
Magnesium	30.28	-0.13
Calcium	12.26	105.90
Lead	0.20	0.11
Iron	0.15	-0.27

4. Conclusion

Analysis of the seed and seed coat (kernel/shell) of walnut revealed the presence of nutritive substances which have important applications for the nutrition science. Walnuts are a healthy and tasty snack food and can therefore be useful in fighting food and nutrient deficiencies. This suggests that the nut and kernel are of high nutritional value.

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