

Chemical evaluation and nutritive values of *Tetracarpidium conophorum* (Nigerian walnut) seeds.

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Abstract:

Sample of *Tetracarpidium conophorum* seeds (Nigerian walnut) was analysed for Proximate composition, Phytochemical composition, Vitamins and Mineral constituents. The result of proximate analysis shows that the raw seeds contained 41.5% moisture, 4.28% fat, 7.34% fibre, 21.65% protein, 5.27% Ash and 19.96% carbohydrate. The phytochemical screening and subsequent quantification revealed the presence of bioactive compounds. Tannin, 0.089mg/kg, Alkaloid, 2.380mg/kg and Gallic acid, 0.024mg/kg. There were no traces of saponin, flavonoids, cardiac glycosides, anthraquinones, ellagic acid and caffeinic acid. The mineral analysis revealed the constituents to be K, 6250mg/kg, Na, 4830mg/kg, Ca, 4337.5mg/kg, Mg, 1711.25mg/kg, Fe, 110mg/kg, Zn, 40.10mg/kg, Mn, 22.00mg/kg, Cu, 16.45mg/kg. Vitamin composition results showed that the seed contained Thiamine (B₁) 0.06µg/100g, Ascorbic acid (C) 4.15µg/100g, Riboflavin (B₂) 0.02µg/g, Niacin, 0.05µg/100g, Cyanocobalamin (B₁₂) ,0.12µg/100g. The results proved that *Tetracarpidium conophorum* seed is a food and could be a potential source of useful drugs formulation.

Key words : *Tetracarpidium conophorum*, *Coula edulis*, phytochemical, nutrient, seed.

Introduction:

Walnut, common name for small flowering plants are important for the nuts and timber most of them produce and for its representative genus. Walnut comprises such families as *Juglandaceae* (English walnut), *Euphorbiaceae* (African walnut) and *Olacaceae* (African walnut). Each family has its own peculiar characteristics but they have some things in common such as the nuts. *Juglandaceae* is mostly found in the Southeast Europe, to Japan and more widely in the New world. *Tetracarpidium conophorum* (family *Euphorbiaceae*) is found in Nigeria and Cameroon while *Coula edulis* (family *Olacaceae*) which is also referred to as African walnut is found in Congo, Gabon and Liberia.^[31] This report looked into the seed of *Tetracarpidium conophorum*.

Tetracarpidium conophorum is a climbing shrub 10-20ft long, it is known in the Southern Nigeria as ukpa (Igbo), Western Nigeria as awusa or asala (Yoruba). It is known in the littoral and the western Cameroon as *kaso or ngak*.^[7] It is found in Uyo, Akamkpa, Akpabuyo, Lagos, Kogi, Ajaawa-Ogbomoso and Ibadan. This plant is cultivated principally for the nuts which are cooked and consumed as snacks.^[20] It is contained in a pod which may house; one shelled nut (single), two shelled nut (double) and three shelled nut. The walnut shells could be black or brown from the plant. The nut is whitish upon cracking from the shell. The nut has a thin layer in between two halves (when a nut is divided into two equal parts) of nut. A bitter taste is usually observed upon drinking water immediately after eating the nuts. This could be attributed to the presence of chemical substances such as alkaloid. Ayodele^[3] reported the presence of oxalate,

phylates and tannin in the raw *Tetracarpidium conophorum* nuts. The proximate composition, ascorbic acid and heavy metal contents of the nut as earlier been reported.^[9] The amino acid and fatty acid components of the nut and the use of its leaf juice for the treatment of prolonged and constant hiccups has been reported.^[25] The impact of traditional processing on the nutrient and sensory qualities of the nut has been reported.^[14] The methods of processing the *Tetracarpidium conophorum* nuts has been reported.^[21] The use of *Tetracarpidium conophorum* seeds and processing waste in livestock feed formulation has been reported.^[19] Comparative studies of the level of toxicant in the seeds of *Terminalia latappa* (Indian Almond) and *coula edulis* (African walnut) and the lipid content of this seeds has also been reported.^[10] The proximate, mineral, antinutrient compositions and zinc bioavailability of some Nigerian wild seeds including *tetracarpidium conophorum* has been reported.^[12] Walnuts are considered to be an herb in Traditional Chinese medicine. They are said to tonify kidneys, strengthen the back and knees, moisten the intestines and move stool. It is believed to stop asthma and is prescribed to be taken between bouts of asthma, but not for acute asthma. It is used for elderly as a constipation cure.^[31] The bark is used in tea as laxative and chewed for toothache. It helps to prevent and control high blood pressure. Though the nuts are generally eaten in Nigeria, much work has not been reported on the proximate, vitamins and phytochemical compositions of the seeds within the locality and state covered in this report. Therefore, the objective of this work is to evaluate the proximate, mineral, vitamin and phytochemical

compositions of *Tetracarpidium conophorum* seed in order to ascertain its possible usefulness as food and in formulation of drug.

Materials and methods:

The seeds used for this study were extracted from the air-dried pods of the plant, collected from a farmland at Osupa-orire village in Ajaawa, Ogo-oluwa Local Government Area of Ogbomosho in Oyo State, Nigeria. The seeds were thoroughly washed and dried under room temperature for seven days before milling to a coarse powder and stored in an air tight bottle prior to analysis.

Proximate analysis:

Moisture content was determined by drying to constant weight at 60-80°C in an oven, ash content by ignition at 550°C in a muffle furnace for 4hr, oil content by soxhlet extraction with hexane as solvent, protein by the kjeldahl method, and crude fibre by the acid and alkaline digestive methods^[1] The carbohydrate content was estimated by difference, subtracting the sum of water, protein, fat, crude fibre and ash percentages from one hundred.

Phytochemical analysis:

The phytochemical screening was done on the sample using methods as described by ^{[27],[1]}. Alkaloids were extracted using a slightly modified method^[18] The dried sample was homogenized and the alkaloid extracted from 10g of the sample for 4h using 20% v/v acetic acid in ethanol. The extract was filtered to remove cellulose debris and then concentrated to about one quarter of the original volume. One percent NH₄ OH was added drop wise until a precipitate occurred. The crude alkaloid was dried to constant weight in an oven and the percentage alkaloid calculated.

Mineral analysis:

The AOAC method ^[1] was used for the determination of minerals in the test sample. Calcium, sodium, potassium, magnesium were determined by flame photometric method while iron, zinc, manganese, copper and chromium were determined by atomic absorption spectrophotometric method.

Vitamin analysis:

The composition of the water-soluble vitamins such as thiamine (B1), riboflavin (B2), niacin (B3), cyanocobalamin (B12) were determined by the method of scalar analyzer (2000) While ascorbic acid (vitamin C) content was determined by the method.^[1] The Bohmand Kocipai-Abyazan method ^[4] was used for the determination of tannins, while saponin was analyzed using that of Peng and Kobayashi.^[26]



Figure 1: Showing Walnut tree as a climber (Climbing Cocoa tree)

Result and conclusion:

Based on the results of the proximate composition of the seeds as shown in Table 1, the moisture content 41.5% ash content 5.27%, fat content 4.28%, crude fibre 7.34%, crude protein 21.65% and carbohydrate content 19.96%. The seed has local uses for food and is obviously a good source of protein. It can safely be fed to stock.

Table 1: Proximate analysis of the *Tetracarpidium conophorum* seed

Parameter	Composition (%)
Moisture content	41.5
Crude Fat content	4.28
Crude Protein content	21.65
Crude Fibre content	7.34
Ash content	5.27
Carbohydrate content	19.96

Table 2: The result for the mineral analysis is as follows ;6250.00mg/kg potassium(K), 4830.00mg/Kg sodium(Na),4337.5mg/kg Calcium(Ca),1711.25mg/kg magnesium(Mg), 110.00mg/kg iron(Fe), 40.10mg/kg zinc (Zn),22.00mg/kg manganese(Mn), 16.45mg/kg copper(Cu). *Tetracarpidium conophorum* is a good source of manganese and copper, two elements that are very useful to mankind. Manganese is used in the management of diabetes. ^[9]

Table 2: Mineral composition of the seed on a dry weight basis

Mineral	Concentration (mg/kg)
Potassium	6250.00
Sodium	4830.00
Calcium	4337.5
Magnesium	1711.25
Iron	110.00
Zinc	40.10
Manganese	22.00
Copper	16.45

Table 3: shows the phytonutrients present in the seed sample analyzed. The seed is rich in alkaloids, while tannins and gallic acid are present in minute quantity.

Table 3: Phytochemical screening of the seed

Constituent	Bioassay
Alkaloids	+++
Flavonoids	-ve
Cardiac glycosides	-ve
Saponin	-ve
Tannins	+++
Anthraquinones	-ve
Gallic acid	+
Ellagic acid	-ve
Caffeinic acid	-ve

KEY:

+ =present in a minute amount

++ =present in a moderate amount

+++ =present in an appreciable amount

Table 4: This shows the amount of phytochemical present in the seed

Constituent	Quantity w/w (mg/kg)
Alkaloids	2.380
Flavonoids	0.000
Cardiac glycosides	0.000
Saponins	0.000
Tannins	0.089
Anthraquinones	0.000
Gallic acid	0.024

Ellagic acid	0.000
Caffeinic acid	0.000

Results are mean of three determinations

Table 5: Shows the vitamin composition of the seed.

Table 5: Vitamin composition of the raw seed on a dry weight basis

Vitamin	Amount
Ascorbic acid (C) mg/100g	4.15
Tocopherol (E) µg/100g	122.57
Thiamine (B ₁) µg/100g	0.06
Riboflavin(B ₂) µg/100g	0.02
Niacin (B ₃) µg/100g	0.05
Pantothenic acid (B ₅) µg/100g	0.00
Pyridoxine(B ₆) µg/100g	0.00
Folic acid (B ₉) µg/100g	0.00
Cyanocobalamin (B ₁₂) µg/100g	0.12

As a result of the presence of ascorbic acid in the seed, the plant can be used in herbal medicine for the treatment of skin conditions, including eczema, pruritus, psoriasis and parasitic skin conditions (D'Amelio, 1999). This vitamin can also be used for the treatment of common cold and other diseases like prostate cancer (Okwu and Okwu, 2004; Okwu and Okeke, 2003). The presence of vitamin E in the seed supports its use in southern Nigeria ethnomedicine as a male fertility agent (Ajaiyeoba and Fadare, 2006). Other vitamins though in trace amount are essential for body metabolism. There is also an interesting ability of ascorbic acid as an antioxidant, to prevent or at least minimize the formation of carcinogenic substances from dietary material (Hunt et al, 1980). Deficiency of ascorbic acid is associated with pains in the joint and defect in skeletal calcification, anaemia, manifestation of scurvy haemorrhage from mucous membrane of the mouth and gastrointestinal track (Hunt et al, 1980). Walnut is used in treatment of indigestion, constipation and diarrhoea (Wolters, 2009). The seed is a good source of vitamins. Alkaloids are the most efficient plant substances used therapeutically. Pure isolated alkaloids and the synthetic derivatives are used as the basic medicinal agent because of their analgesic, antispasmodic and bacterial properties. This is why the seed is believed to stop asthma and is prescribed to be taken between bouts of asthma, but not for acute asthma, it is used for elderly as a constipation cure (Wikipedia, 2009). The presence of tannins in the seed of *Tetracarpidium conophorum* can support its strong use for healing of haemorrhoids, frost bite and varicose ulcers in herbal medicine (Igboko, 1983; Maduyi, 1983). The result of mineral composition clearly shows that *Tetracarpidium conophorum* seed contains rich source of mineral elements. This result become so important when the usefulness of such minerals like Ca, Mg, Na, K in the body are considered, However, the Na and K content of *Tetracarpidium conophorum* is an added advantage because of the direct relationship of Na intake with hypertension in human (Dahl, 1972). This may be the reason why the plant is used to prevent and control high blood pressure (James, 2009). 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 the mucous membrane, antianaemic and essential for the formation of haemoglobin from iron (Claude and Paule, 1979). The presence of manganese shows that the plant can be used to protect bone disease. [16] The activity of this element is noticed in the metabolism of food

incorporated into the bone. According to Claude and Paule (1979), manganese is necessary for the functioning of the pituitary gland, the pineal gland and the brain, it promotes hepatorenal function, combat anaemia and also essential for growth. The presence of zinc is an indication that the seed may have some effect on the nerve function and male fertility. It is important for normal sexual development, especially for the development of testes and ovaries, it is also essential for reproduction. Zinc stimulates the activity of vitamins, formation of red and white corpuscles (Claude and Paule, 1979), healthy functioning of the heart and normal growth (Elizabeth, 1994).

Conclusion:

The present study has shown the proximate, vitamins, minerals and phytochemical compositions of *Tetracarpidium conophorum* (Nigerian walnut) seed. This partly shows the use of this seed in herbal medicine. As a rich source of alkaloids, coupled with the presence of the essential vitamins and minerals, *T. conophorum* can be seen as a potential source of useful food and drugs. The presence of tannin supports its anti-inflammatory property. This also proves that the seed may be helpful in asthma, rheumatoid and arthritis. High content of ascorbic acid also indicates that the plant can be used to prevent or at least minimize the formation of carcinogenic substances from dietary material. Further studies has to be carried out to isolate, characterize and elucidate the structure of the bioactive compounds from the seed for industrial drug formulation.

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Figure2: Showing Walnut seed housed in the pod of various sizes: single & double



Figure 3: Showing Walnut seed released from the pod but covered by the shell



Figure 4: Showing Walnut seeds released from the shell



Figure 5 : showing Walnut cut into two halves with a thin layer in the middle



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