



*Full Length Research Paper*

**Comparative Proximate Analyses of Raw and Cooked *Tetracarpidium conophorum* (African Walnut)  
Found in Awka, Anambra State, Nigeria**

\*Udedi, S.C., Ani, O.N., Anajekwu, B.N., Igwilo, I.O., Ononamadu, C.J., Adindu, C.S. and Okafor, U.M  
Department of Applied Biochemistry, Nnamdi Azikiwe University, Awka, Nigeria.

\*Corresponding author's email: [udedi2003@yahoo.com](mailto:udedi2003@yahoo.com)

Received: 22 August; Accepted 4 September, 2013.

**Abstract**

The proximate compositions of raw and cooked nuts of *Tetracarpidium conophorum* (African walnut) were quantitatively evaluated using the methods of the Association of Official Analytical Chemists (AOAC). The results of the study showed that the raw and cooked walnut contain 2.0% and 31.0% moisture and 19.39% and 15.90% carbohydrate respectively. They also contain crude protein of 23.01% and 28.00%, crude fat of 52.1% and 21.1%, crude fibre of 1.0% and 2.0% and ash of 2.0% for raw and cooked walnut respectively. The energy value for raw and cooked walnut was 638.5 and 365.5 Kcal respectively. The results revealed that the *T. conophorum* is rich in fat with moderate values of crude protein and carbohydrate while the ash and fiber content were shown to be very low. The study also revealed that *T. conophorum* can be an interesting source of nutrient with their potential use in food industries. It is suggested that *T. conophorum* is an excellent food material with a potential in combating nutritional insecurity in rural communities where they are found in abundance. It can also be useful for supplementation in school children feeding programme.

**Keywords:** *Tetracarpidium conophorum*, nutrition insecurity, raw and cooked walnuts, proximate analysis.

**INTRODUCTION.**

The African walnut, *Tetracarpidium conophorum* belongs to the family *Euphorbiaceas* (Edem *et al.*, 2009). It is a woody perennial climber found in the forest regions of Africa and India (Oke, 1995; Petrova, 1980). African Walnut, *Tetracarpidium conophorum* has a long history as food plant and is grown by peasant farmers across West African rain forest. The climber bears capsules which are greenish in colour when young and greenish-yellow when fully ripe. The walnut kernel consists of two bumpy lobes that look like abstract butterflies. The lobes are off white in colour and covered by a thin, light brown skin. They are particularly attached to each other while the kernel is enclosed in round or oblong shells that are brown or black in colour and they are hard. They contain four shelled seeds (Willis, 1966). The seeds take 4-6 months to mature (Akpuaka and Nwankwo (2000) no reference[s] and are found in the local markets between the months of June and September. In Nigeria, it is traditionally eaten as nut after boiling (Akpuaka and Nwankwor, 2000),

and it is found in Abak, Uyo, Etinan, Akamkpa, Akpabuyo, Lagos, Ibadan and some parts of Anambra state. *T. conophorum* plant is cultivated principally for the nuts which are cooked and consumed as snacks. The cooked nuts containing the edible seeds are common articles of trade in Nigeria. 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 alkaloids (Edem *et al.*, 2009). With the increased interest in the exploitation of less-common oilseeds, several studies have been done on *Tetracarpidium conophorum*. The folkloric use of the *T. conophorum* as an anti-microbial medicinal plant was validated by Ajaiyeoba *et al.* (2006). Adesioye (1991) reported on the impact of traditional processing on the nutrient and sensory qualities of the nut. Adebona *et al.*, (1988) developed a biscuit-like snack food from conophor nut, throwing some light on the functional significance of the oilseed.

Phytochemical analysis of African walnut indicates that it contains ingredients such as omega-3 fatty acids, and phytosterols that may reduce the risk of the cardiovascular diseases (Kalu, 2010). Ayodele (2003) reported the presence of oxalates, phytates and tannin in the raw *T. conophorum* nut. Oyenjuga (1997) reported on the amino acid and fatty acid components of the nut and on the use of its leaf juice for the treatment of prolonged and constant hiccups. Nwokolo (1987) also reported on the impact of traditional processing on the nutrient and sensory qualities of the nut. The chemical and functional characteristics of the *conophor* nut was reported by Enujiugha (2003). Edem *et al* (2009) reported on the proximate compositions, amino acids and heavy metal content of African walnut. Two isolectins, Agglutinin I and II were characterized from the seed extract (Animashaun, 1998).

The main objective of this study was to evaluate the proximate composition of the raw and cooked nuts of *Tetracarpidium conophorum* found in Anambra State as to determine its food value and suitability in combating food insecurity in our rural communities.

## MATERIALS AND METHODS

### Sample Collection and Preparation:

Mature nuts of the African walnut were purchased from bridgehead market in Onitsha, Anambra State, Nigeria. A portion of it was cooked.

The raw and cooked nuts were shelled and portions of the nuts were removed for moisture content determination while the rest of the seeds were dried in a hot air circulating oven at 65°C to a constant weight and then ground into fine powder using manual grinder. The powdered mass obtained was stored in an airtight container for further analysis.

### Proximate analysis:

Moisture content was determined by drying 3g of the fresh sample to constant weight in a hot air circulating oven at 100°C. Proximate

compositions which included percentage moisture, fat, crude protein, fibre and ash were determined according to the standard methods of the AOAC (1984).

The total percentage carbohydrate content was determined by the difference method as reported by Onyeike *et al* (1995). This method involved adding the total values of crude protein, crude fat, crude fibre, moisture and ash constituents of the sample and subtracting it from 100. The value obtained is the percentage carbohydrate constituent of the sample. The total energy value was calculated thus;

Total energy (Kcal) = 4 x (g protein + g carbohydrate) + 9 x (g lipid).

## RESULTS AND DISCUSSION

The results of the proximate compositions of *T.conophorum* in Table 1 indicate that %moisture, %carbohydrate, %crude protein, %crude fat and %crude fibre are 2.0% and 31.0%, 19.39% and 15.90%, 23.1% and 28.00%, 52.1% and 21.1% for raw and cooked African walnut respectively. The %ash is 2.0% in both raw and cooked walnuts. The nut is rich in protein, fat, carbohydrate with a low fiber and ash contents. It also has a high energy value. The moisture content was very low for raw walnut (2%) while the cooked walnut has a high value (31%).The low moisture content of the raw nut shows that it could be stored for a longtime without deterioration. This means that the raw nut has higher storage durability than the cooked nut. The raw nut crude fat (CFT) contents (52.1%) was higher than that of the cooked content (21.1%) and these values compared favourably with those of *Dacryodes macrophylla* (23.04%) and *Irvingia gabonensis*, 71.77%, (Okafor and Okolo, 1974) cited by Etukudo (2000). The high fat content in the nut could be a health risk factor as regular consumption of the nut beyond 100g/day may result in obesity (Hassan and Umar, 2006.). Low fat containing foods have been recommended to avoid problem of

obesity (Lintas, 1992). Apart from supplying essential fatty acids, dietary fat is a major source of energy and assists in the absorption of vitamins and the development of tissues (Zello, 2006)

**Table 1: Proximate composition and calorific value of African walnut (*Tetracarpidium conophorum*).**

Parameter(%)	Raw walnut	Cooked walnut
Moisture	2.0	31.0
Crude Protein	23.01	28.00
Crude Fat	52.1	21.1
Ash	2.0	2.0
Crude Fiber	1.0	2.0
Total carbohydrate	19.39	15.90
Total Energy (Kcal)	638.5	365.5

Crude fibre (CF) contents were low. Intake of dietary fibre has been reported to lower the serum cholesterol level, risk of coronary heart diseases as well as breast cancer (Ishida *et al*, 2000). With the dietary fiber for children being 19-25% (Recommended Dietary Allowance, RDA), walnut fruit may not be a good source of dietary fiber in human nutrition.

Both the raw and the cooked nuts have moderate amount of protein and carbohydrate with very low ash content. The results in Table 1 indicate that crude protein (CP) content of the cooked nut (28.0%) was higher than that found for the raw nut (23.01%). The high value suggests that the cooking process might have liberated nitrogen which determines the protein content or might have denatured some protein. These values are higher than the protein content of avocado (3.15%) as reported by Okeke and Elekwa (2006), but fall within the protein content range of 3.2 – 43.1% for fruits and nuts (Achinewhu *et al*, 1995.). Crude protein values obtained for other wild fruits such as *Irvingia gabonensis* (8.65%), *Dacryodes edulis* (4.47%), *Pentaclethra macrophylla* (28.40%) and *Treculia Africana*, 17.23%, (Okafor and Okolo, 1974) cited by Etukudo (2000) compared favourably with those found in this study. Any plant food that

provides more than 12% of its energy from protein is considered a good source of protein (Hassan and Umar 2006). Assuming complete absorption, the raw and cooked nuts meet this requirement by contributing about 23.01% and 28% of daily protein needs, respectively. Nitrogen free extract (NFE) or available carbohydrate contents of the raw nut was a little higher than that of the cooked nut. The values are higher than the value reported for *coula edulis* (6.50%) by Effiong *et al* (2010) but lower than the value of 75.18% reported for avocado by Okeke and Elekwa (2006). The result could also imply that the raw nut will provide more calorific (energy) value with respect to available carbohydrate than the cooked nut. The study revealed that *T. conophorum* nuts could be used to boost the carbohydrate and protein content of most food products sold in our markets.

The ash content, which is often regarded as an index of mineral content in biological mass, was quite low in both the raw and cooked nut. Though the raw and cooked nut values were not different from each other, the values in this study were lower than that of bush mango (*Irvingia gabonensis*) – 3.30% as reported by Vander Maesen *et al* (1994).

The calorific (energy) values of the raw nuts was higher than that of the cooked nut but both are low compared to 10,000kJ daily energy expenditure, and contribute only 63 and 37% of daily energy respectively, if only 100g of each fruit is consumed.

## CONCLUSION

Analysis of the raw and cooked walnut revealed the presence of nutritive substances which have important applications for the nutrition sciences. Walnuts are a healthy and tasty snack food. *T. conophorum* compared favourably with most popularly consumed fruits, such as banana, guava, mango and avocado based on their carbohydrate, crude protein, crude fat and energy contents and can therefore, be useful in fighting food and

nutrition insecurity. This suggests that the nut is of high nutritional value.

## REFERENCES

- Achinewhu, S. C., Ogbonna, C.C and Hart, A.D (1995). Chemical composition of indigenous wild herbs, spices, fruits, nuts and leafy vegetables used as food. *Plant Foods for Human Nutrition*. Pp 48-52.
- Adebona MB, (1988). Development of conophor nut - based cereal snack food 1-biscuit. *Journal of Food and Agriculture* 2:123-136.
- Adesioye, H.O., (1991). The effect of processing and storage on the chemical and sensory quality of conophor nut. *Nigeria Food Journal* , 9: 33-38.
- Akpuaka, M.U. and Nwankwor, E.(2000). Extraction, analysis and utilization of a drying-oil from *Tetracarpidium conophorum*. *Bioresour. Technol.*, 73: 195-196.
- Ajaiyeoba, E.O and D.A Fadare. (2006). Antimicrobial potential of extracts and fractions of the African walnut - *Tetracarpidium conophorum*. *African Journal of Biotechnology* 5 (22): 2322-2325.
- Animashaun T, Togun RA, Hughes CR, 1998.Characterization of isolectins in *Tetracarpidium conophorum* seed (Nigerian Walnut). *Glycoconjug Journal*; 11:299-303.
- AOAC (1984). Standard Official Methods of Analysis of the Association of Analytical Chemists. 14th edition, S.W. Williams (Ed), Washington DC. Pp. 121-123.
- Ayodele, O.B.,(2003). Nutrition in Nigeria Ibadan. 3<sup>rd</sup> ed. Catoon Publishers, USA. Pp 308-320.
- Berg J., Tymoczko J.L, Stryer L. (2002). *Biochemistry* (5th ed.). San Francisco: W.H. Freeman. ISBN 0-7167-4684-0. Pp.603
- Edem, C.A. Dosunmu, I. Miranda and I. Bassey Francesca, [2009]. Determination of proximate composition, ascorbic acid and heavy metal content of african walnut (*Tetracarpidium conophorum*). *Pakistani Journal of Nutrition*, 8: 225-226.
- Effiong, G. S.and Udo, I. F. (2010). Nutritive values of four indigenous wild fruits In southeastern Nigeria. *Electronic Journal of Environmental, Agricultural and Food Chemistry*, 9 (7): 1168-1176.
- Enujiugha V.N, Ayodele-Oni O, (2003). Evaluation of oil nutrient and antinutrients in lesser known underutilized oil seeds. *International Journal Food Science and Technology* 38:525-528.
- Etukudo, I. (2000). Forests: Our Devine Treasure. Dorand Publishers, Nigeria.Pp 238-241.
- Hassan, L. G. and Umar, K.J. 2(006). Nutritive value of Balsam Apple (*Momordica balsanina* L.) leaves. *Pakistani Journal of Nutrition* 5(6) 522 – 529.
- Ishida, H. H., Suzuno, N. Sugiyama, S. Innami, T. Todokoro and Mackawa, A (2000). Nutritional evaluation of chemical component of leaves, stalks and stems of sweet potatoes. *Food Chemistry*; **6:359 – 367**.
- Kalu, B. (2010). How walnut stops breast cancer, infertility, microbes. [wisehealthliving.blogspot.com](http://wisehealthliving.blogspot.com).
- Lintas, C. 1992. Nutritional aspects of fruits and vegetables consumption. Options[Mediterraneans] Pp 79 – 87.
- Monteiro, C. (2011). The big issue is ultra-processing. ‘Carbs’: The answer.

- [Commentary]/ World Nutrition. *Journal of the World Public Health Nutrition Association*; 2(2), 86-97.
- Nwokolo, E.A.,(1987). Composition and Availability of Nutrients in some Tropical Legumes. Ibadan Phacco Publishers, USA. 1st ed. Pp 56-58.
- Oke, O.L., (1995). Leaf Protein Research in Nigeria Ibadan. University of Ibadan Press, USA. Ed. 2<sup>nd</sup>. Pp 38-42.
- Okeke C. U. and Elekwa, I. (2006). Proximate and preliminary phytochemical analysis of Avacado pear. *Nigerian Journal of Botany*, 19 (1) 156 – 162.
- Onuorah, C. E.; Nzewi, D. C. and Abiodun, O. (2001). Proximate Composition, mineral content and physical/chemical characteristics of fresh, cooked and roasted local pear (*D. edulis*). NIFOJ. *Nigerian Food Journal*, **19:120 – 124**.
- Onyeike, E.N.; Olungwe, T. and Uwakwe, A. A.(1995). Effect of Heat Treatment and Defatting on the Proximate Composition of Some Nigerian Local Soup Thickeners. *Food Chemistry* 53: 173-175.
- Owusu-Apenten, R.K.( 2005). Introduction to Food Chemistry. Hardback Publisher, CRC PR INC.,ISBN: 13: 9780849317248. ISBN: 084931724X.
- Oyaizu M (1986). Studies on products of browning reactions: antioxidative activities of products of browning reaction prepared from glucosamine. *Japan Journal of Nutrition*; 44: 307-315.
- Oyenuga, V.A.,(1997). Nigeria Food and Feeding Stuffs Ibadan. University Press, Ibadan. Ed. 3<sup>rd</sup>. Pp. 47-49.
- Petrova, U.V.,(1980). Studies of Chemical Composition and Correlations between Chemical Characteristics in some Walnut Varieties. Naoka Publishing Co. Ltd., London. Pp. 98-110.
- Vander Maesen, L. G. N; Vander Burgt and Van mandenbach de Rooy, J. M. (1994). The Biodiversity of African Plants. Kluwer Academic Publishers, Dordrecht , Pp. 68-72
- Willis, J.C., (1966). A Dictionary of the Flowering Plants and Ferns, seventh ed. Cambridge University Press, Cambridge, 1108.
- Wilson, E. D. (1979). Principles of Nutrition. John Wiley and Sons, New York: 44-55, 85-99.
- Zello, G. A. (2006). Dietary Reference Intakes for the macronutrients and energy: considerations for physical activity. *Applied Physiology Nutrition Metals*. 31: 74 – 79.