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Determination of Proximate Composition, Ascorbic Acid and Heavy Metal Content of African Walnut (*Tetracarpidium conophorum*)

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Abstract: The proximate composition, ascorbic acid and heavy metal content of (African walnut) *Tetracarpidium conophorum* were evaluated using chemical analysis. The result of the proximate composition showed the following; moisture (48.70%), carbohydrate (53.20%), crude protein (35.22%), crude fat (6.21%), crude fiber (3.34%) and ash (2.03%).It also contained 53.50mg/100ml of ascorbic acid. The heavy metal concentrations in the fruit is Fe (0.064ppm), Mn (0.012ppm), Cr (0.001ppm), Ni (0.005ppm) while the concentrations of Hg, Pb and Cd were not detected. The results revealed that the *T. conophorum* is rich in ascorbic acid and carbohydrate with moderate valves of crude protein while the ash content was shown to be very low. This result shows that *T. conophorum* nut is not polluted with heavy metals since the concentrations of the heavy metals were all below WHO permissible limits. This nut is therefore shown to be safe for public consumption.

Key words: African walnut, proximate composition, ascorbic acid, heavy metals

Introduction

Tetracarpidium conophorum, known as 'Ekporo' by the Efiks and Ibibios of Cross River and Akwa Ibom states in Nigeria is a woody perennial climber that belongs to the family Euphorbiacea. Its common name is African walnut. It is found in the forest regions of Africa and India (Oke, 1995; Petrova, 1980). In Nigeria it is found in Abak, Uyo, Etinan, Akamkpa Akpabuyo, Lagos and Ibadan. *T. conophorum* plant is cultivated principally for the nuts which are cooked and consumed as snacks (Oke, 1995). 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. Ayodele (2003) reported the presence of oxalates, phylates and tannin in the raw *T. conophorum* nuts. Though *T. conophorum* nuts are generally eaten in Nigeria, very little work has been done on the proximate composition and heavy metal content of this nut. Oyenuga (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. Okpero (2001) reported on the methods of processing the *T. conophorum* nuts while Okafor (1988) reported on the use of *T. conophorum* seeds and processing waste in livestock feed formulation. This work is aimed at assessing the proximate composition and ascorbic acid content of African walnut with the view of knowing its chemical composition. The heavy metal content of the nut will also be determined in order to ascertain the effect of its consumption on health.

Materials and Methods

Sample collection: The *T. conophorum* nut used in this study were obtained from a private plantation in Ikot Ekong, Akpabuyo L.G.A. South East of the University of Calabar, Calabar in Cross River State. Thirty (30) nuts of *T. conophorum* (African walnut) were obtained from the plantation in six polythene bags and transported to the laboratory within few hours of harvesting. The samples were analyzed in composite.

Sample preparation: The nuts were washed with deionized distilled water and wiped with kitchen tissue. The nuts were then chopped into pieces using a knife with steel blade. Portions were taken for moisture and ascorbic acid content determination.

The rest of the nuts were dried in a hot air circulating oven (Gallenkamp DV 330) at 65°C to a constant weight for 18-24h. The dried samples were ground using an electric blender with steel blades and stored in screw-capped bottles at 4-6°C.

Analysis: Moisture content was determined by drying about 3g of the fresh sample to constant weight in a hot air circulating oven at 100°C. Proximate composition which included percentage moisture, fat, crude protein, fibre and ash were determined according to the standard method of the AOAC (1984). Total carbohydrate was calculated by difference obtained after subtracting the protein, ash, fat and fibre contents from the total dry mass. Ascorbic acid was determined by titrating ascorbic acid extract prepared from 30g of the fresh sample against N-bromosuccunmide by the method of Haddad (1977). The determination of Ni, Fe, Cr, Mn, Hg,

Table 1: Proximate composition (g/100g, dry sample) and ascorbic acid content of African walnut (tetracarpidium conophorum)

Parameter	Composition
Moisture (%)	48.70
Crude fat (%)	6.21
Crude protein (%)	35.22
Carbohydrate (%)	53.20
Ash (%)	2.03
Crude fibre (%)	3.34
Ascorbic acid(mg/100)	53.50

Table 2: Heavy metal concentration of Tetracarpidium conophorum nut (ppm)

Parameter	Composition (ppm)
Fe	0.064
Mn	0.012
Cr	0.001
Ni	0.005
Hg	-
Pb	-
Cd	-

Cd and Pb was done using an atomic absorption spectrophotometer (AAS) (Pye Unicam 2900), according to the procedure of the AOAC (1984).

Results and Discussion

Table 1 shows the proximate composition and ascorbic acid content of *T.conophorum*. The moisture content was shown to be 48.7%, carbohydrate 53.20%, crude protein 35.22%, crude fat 6.21%, crude fiber 3.34% and ash 2.03% while Ascorbic acid content was 53.50mg/100ml. The result reveals that the nut of *T. conophorum* is very rich in ascorbic acid and carbohydrate while it has a moderate amount of protein with a very low ash content. The study revealed that *T. conophorum* nuts could be used to boost the ascorbic acid, carbohydrate and protein content of most food products sold in our markets. The low moisture content of the fruit shows that it could be stored for sometime without going bad.

Table 2 shows the heavy metal concentrations in *T. conophorum* nut. From the result (Table 2), the concentrations of the heavy metals is Fe (0.064ppm), Mn (0.012ppm) Cr (0.001ppm), Ni (0.005ppm). The concentration of Hg, Pb and Cd were not detected. The study revealed that Fe has the highest concentration of (0.064) followed by Mn (0.012) and Ni (0.005). Cr has the lowest concentration of 0.001 in the nut. This result shows that *T. conophorum* nut is not polluted with heavy metals as all the concentrations of the metals determined are below WHO (1991) permissible limits. It has been revealed by this study that the metals investigated do not pose health hazard to consumers as they are below the WHO permissible limits.

Conclusion: This study has shown that nuts of *T. conophorum* are good sources of ascorbic acid and carbohydrate and moderate sources of protein. The heavy metal content of the nut is also shown to be below WHO permissible limit which makes the nut safe for public consumption without any fear of heavy metal pollution.

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