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Research Article

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Comparative Proximate Analysis of Walnut Kernel (*Tetracarpidium conophorum*)

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Abstract This research investigates the proximate compositions of raw and cooked walnut kernel sample to achieve standard methods were adopted. The proximate compositions of both of the samples were carbohydrates, moisture, ash, crude fat, crude proteins and crude fibre for the raw sample were 77.06%, 4.12%, 2.27%, 5.53%, 4.88% and 6.14% while, for the cooked sample 76.91%, 6.41%, 2.20%, 3.67% 3.56% and 7.25% respectively. Protein contents were found to be (4.88%) and (3.56%) for the raw and cooked samples therefore, walnut could be considered as a good source of proteins, high protein foods are excellent addition to vegetarian.

Keywords: Kernel, proximate, raw, cooked

Introduction

The African walnut, *Tetracarpidium conophorum* belongs to the family euphorbiaceas [1]. It is a woody perennial climber found in the forest regions of Africa and India [2]. 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, the seeds take 4-6 months to mature [3] no reference(s) are found in the local markets between the months of June and September. In Nigeria, it is traditionally eaten as nut after boiling [3]. *Tetracarpidium 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 [1]. In the recent times there have been an increase in the use of walnut kernel in snacks formulation but studies on proximate analysis is scanty, hence, the proximate analysis of raw and cooked walnut kernel will add value to the existing scientific literature. The aim of this research is to carryout proximate analysis of raw and cooked walnut kernel samples. This research work revealed proximate compositions found of walnut kernel.

Materials and Methods

Sample Collection, Identification and preparation

Materials and reagents such as vaccum oven, crucible, weighing balance, heating mantle, muffle furnance, desicator, concentrated sulphuric acid, sodium hydroxide solution, kjeldahl tablets were used among others. Walnut kernel sample was purchased at Gamboru market, Maiduguri, Borno state, Nigeria and identified by a plant Taxonomist at the Department of Biological Sciences, University of Maiduguri. It was pulverized into fine powder and subjected to further analysis in the research laboratory, Chemistry Department, University of Maiduguri.

Proximate Content Analysis

The samples were analyzed for moisture, ash, fat, crude protein, crude fibre and carbohydrates according to A.O.A.C method (1990) 15th edition [8].

Determination of Moisture Content

The dry matter content of the sample was determined by weighing 5g of sample into petri dish while placed in hot oven at 105^{o}C for 5 hours. Then removed and placed it in desiccator to cool, after cooling it was reweighed. The moisture content was calculated using the formula:

$$\frac{w3-w1}{w2-w1} \times 100$$

Where:

W_1: Weight in grammes of empty petri dish
W_2: Weight of petri dish with sample in grammes before oven dried
W_3: Weight of petri dish with sample in grammes after oven dried

Crude Protein

Crude protein content was analysed using Keljedal tablets and 2 g of sample was weighed into a digestion tube and 2 Keldedahl tablets were added, 10 ml of concentrated sulphuric acid (Conc. H_2SO_4) was added onto the tube and digested at 420 ^{o}C for 3 hours. After cooling, 80ml of distilled water was added into digested solution. About 50ml of 40% caustic soda (NaOH) was added onto 50 ml of digested and diluted solution and then placed on heating section of the distillation chamber, 30ml of 4% boric acid, bromocresol green and methyl red as an indicator were put onto conical flask and placed underneath the distillation chamber for collection of ammonia, the solution changed from orange to green colour. About 0.1 normal solution of hydrochloric acid (HCl) was weighed into burette. It was titrated until the colour changes from green to pink. The burette reading was taken. The crude protein was calculated using the formula:

$$\%CP = \frac{(\mathrm{A} - \mathrm{B}) \times \mathrm{N} \times \mathrm{F} \times 6.25 \times 100}{\text{mg of Samples}}$$

Where:

A: ml of acid used for titrating the sample
B: ml of acid used for titrating blank sample (0)
N: Normality of acid used for titration
F: Factor =14.007
6.25: is constant
100: conversion to percentage

Crude Fibre

Crude fibre was determined by weighing 2g of samples, it was placed in a flat bottom flask and 50ml of tri-chloroacetic acid reagent (T.C.A) was added the mixture was boiled and refluxed for 40minutes. The flask was removed and cooled to room temperature. Filter paper was used to filter the residue. The residue obtained was washed 4 times with hot water and once with petroleum ether then the filter paper and the sample were folded

together and dried at 60ºC in an oven for 24 hours. It was reweighed and then ashed at 650ºC and then cooled and reweighed again. Crude fibre was determined using the formula:

$$\%CF = \frac{Differenceinweight}{WeightofsampleonDmbasis} \times 100$$

Ether Extract (FAT)

The ether extract was determined by using soxhlet apparatus, 2g of the feed sample was weighed into a thimble and 200ml of petroleum ether was measured with measuring cylinder, the solution was put into round or flat bottom flask and was heated at 45ºC for 2 hours. The collecting flask was removed, and cooled into dessicator for 15 minutes and percentage fat sample was determined using the formula:

$$\%Fat = \frac{Weightoffat}{Weightofsample} \times 100$$

Ash

Ash was determined 2g of sample was weighed into crucible and dried at 105ºC for 24 hours, then cooled in the dessicator for 15 minutes and re-weighed, it was then charred at 650ºC in muffle furnace for 2 hours. Then cooled in desicator for 15 minutes and re-weighed. It was determined using the formula:

$$\%ASH = \frac{Lossinweight}{Initialweight} \times 100$$

Carbohydrate

Percentage carbohydrate was determined by computing indirectly by difference using the formular:

%Carbohydrate = 100 – (%MC + %ASH + %CP + %CF)

Result

Table 1: The results of the proximate analysis of raw and cooked walnut kernel

S/No	Proximate	Raw (%)	Cooked (%)
1	Carbohydrates	77.06	76.91
2	Moisture	4.12	6.41
3	Ash	2.27	2.20
4	Crude fats	5.53	3.67
5	Crude proteins	4.88	3.56
6	Crude fibre	6.14	7.25

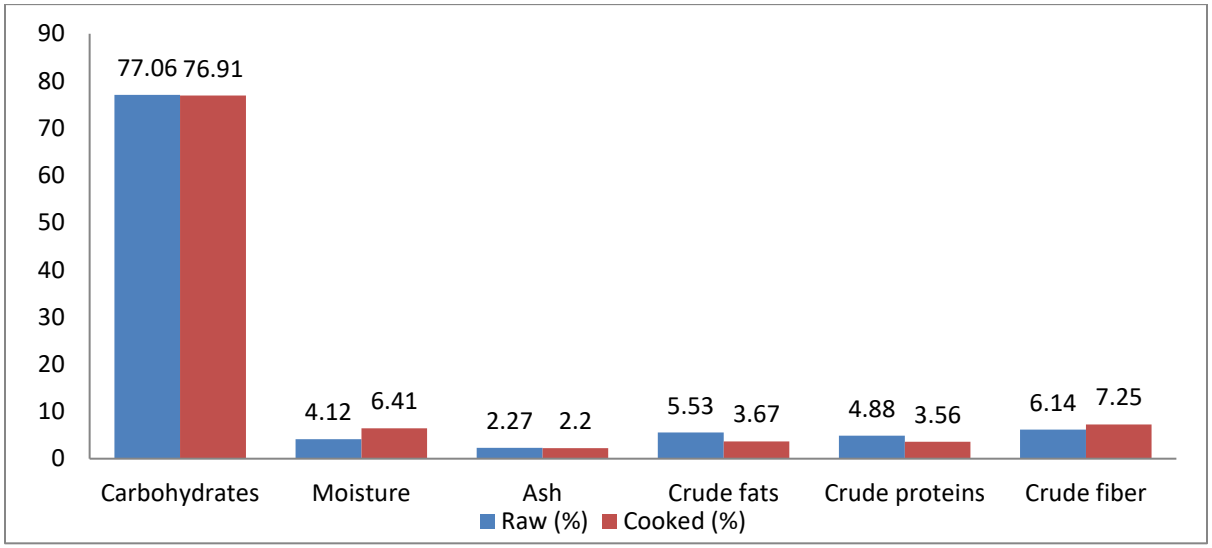

Figure 1: Bar Representation of the proximate analysis of raw and cooked walnut kernel samples

Discussion

The result of the proximate analysis of raw and cooked walnut kernel revealed that percentage carbohydrates, moisture, ash, crude fat, crude proteins, and crude fibre for the raw sample were 77.06%,4.12%, 2.27%, 5.53%, 4.88% and 6.14% while, for the cooked sample 76.91%, 6.41%, 2.20%, 3.67% 3.56% and 7.25% respectively. The kernel is very rich in carbohydrates (77.06%) and (76.91%), the value of raw sample is closer to the cooked sample though carbohydrates was much higher than all the contents analyzed.

Protein contents were found to be (4.88%) and (3.56%) for the raw and cooked samples respectively therefore, walnut could be considered as a good source of proteins, high protein foods are excellent addition to vegetarian. Plant proteins still remain a veritable source of food nutrient for less privilege population in developing countries including Nigeria where cost of animal protein is beyond their per capital income [4].

Fat contents were (5.53%) and (3.56%). Fats of walnut are not only taste great but are rich source of healthy mono-saturated fats and an excellent source of omega-3-fatty acid [5].

Crude fibre contents are moderate (6.14 %) and (7.24%). Intake of dietary fiber has been also reported to lower the serum cholesterol level, risk of coronary heart diseases as well as breast cancer [6]. Due to the reasonable amount of carbohydrates and protein in this plant, it may be considered as a good source of energy given food to alleviate malnutrition in the world, especially in developing countries (Sheriff *et al*., 2018). Ash contents were very minute compared to the other contents analyzed.

Conclusion

The result proved that *Tetracarpidium conophorum* kernel is a good source of carbohydrate and fat, and therefore could be served a potential source of energy given food.

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