Irish Journal of Environment and Earth Sciences
Irish J. Env. E. Sci.
Volume: 10; Issue: 02,
March- April, 2026
ISSN: 2383 – 6345
Impact Factor: 6.23

Advance Scholars Publication Published by International Institute of Advance Scholars Development
https://aspjournals.net/Journals/index.php/ijees

THE NUTRACEUTICAL POTENTIALS AND TOXICANT CAPACITY OF THE WHITE SHELL OF COMMON COLA NUT *(COLA NITIDA)*

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DOI: https://doi.org/10.5281/zenodo.19911509

Keywords
Neutraceutical, potentials, toxicants, white shell, Cola nitida.

Abstract: *The Proximate minerals, vitamins and toxicants capacity of the white shell of common cola nuts (cola nitida) were investigated. The aim of this research is to assess the possible nutritional benefits and risk associated with the possible utilisation of the unutilised portion of the crop and thereby establishing the possibility of its involvement in economic enhancing and sustainability. The results obtained reveals, the presence of all the proximate components (moisture, 75.67%; Ash; 4.99%, Ether extract: 3.24%, crude protein: 7.00%, Crude fibre: 1.66%, Carbohydrate 83.12% and Caloric value: 389.62%). The minerals show an increasing order of Zn (3.05) < Cu (3.15) < Mn (7.38) < Na (12.22) < Fe (43.34) < Mg (182.87) < P (238.00) < Ca (271.82) < K (401.82) mg/100g. Vitamins A and C (0.099) and (65.95) mg/100g respectively. While the toxicant levels show HCN (11.56) < Tannins (30.84) < Oxalate (130.00) mg/ 100g. Phytate was not detected in the sample. Based on the obtained information, this sample can be considered as highly nutritious with low risk profile and may be considered in feedstuff formula after appropriate processing.*

INTRODUCTION

Kolanut belongs to the member of plant family sterculianceae. The trees are about 20-40ft tall. The trees bear white and yellow flowers with purplish spot on them Cola leaf is ovate shape, pointy at both end and long with a leathery texture. The fruit is star shaped with each fruit bearing about a dozen of square or round shape bitter cola seeds within whitish seed shells. This seeds which is actually the cola nut smells like rose and when put in the mouth, the seed (nut) initially taste bitter but gradually sweetens on chewing (Jayeola, 2001). These seeds are often eaten as snacks especially among the elderly either individually or a group setting and used ceremonially in Nigeria (Adeniye, 2004). The plant has about 125 species of trees native to the tropical rain forest of Africa. Of these two species are particularly very common among the Yorubas of the South-western Nigeria. These are *Cola nitida* and *Cola acuminate*. Cola nut contains large amount of caffeine and the bromine and are used as stimulant or for mental alertness and also as breath freshners (Jayeola, 2001). Eleyimi et al (2006) also reported the possible use of cola nut for the production of soft drink.

In recent years, the focus of scientific (food, animal, crops, chemical and biological) researchers have been shifted to many underutilised, unutilized, and even unknown plants or parts of plants in order to complement

available knowledge in an attempt to achieve higher efficiency for social, economic and health development and sustainability.

Uzama and Rabiu (2014), investigated and reported appreciable levels of proximate, antioxidant and antibacterial chemicals in *Oldenlandia herbecea*. The effect of roasting on some physiochemical properties of *Cassia Sieberiana* seeds (an unknown African plant) was reported by Olapade *et al,* (2012). Abasiekong and Abasiekong (2019) reported the seasonal variations of nutrients and anti-nutrients factors of *Eremomastax polysperma*. While the minerals and proximate estimation of the stems and leaves of *Andrographis paniculata* (king of bitters) were reported by Abasiekong and Osabor (2017). These were all efforts to obtain information that can enhance the use of these new and unutilised plants to complement advancement in science and technology for the sustenance and development of nature.

Despite the wealth of information available about cola nut, little or no information is available for the cola nut shell. The cola nut fruit like the cocoa fruit is made up of three parts; the Exocarp which is the hard green cover that is generally discarded the Mesocarp which is the white soft shell with sweet rosy smell attached to the nut within the outer shell, also disposed as waste. And the Endocarp which is the nut itself that is generally eaten as snack.

The purpose of this research therefore is to investigate and understand the nutritional and toxicant properties of this shell (Mesocarp) to establish where it could fit in either the food industry (additives, flavour or food supplements) or life stock feed industries.

Materials and Method

Sample collection and preparation

The cola nut samples used for this research were obtain from Ikot Ekpene food market (Urua Otor), packed in polythene bag and taken to the laboratory where it was washed and with a knife the exocarp was cut open to obtain the seed covered with the white fluffy shell. The shell was simply detached from the seed and out into small pieces slowly oven dried at about 50°C-55°C for over 12hours. At constant weight, the sample was allowed to cool and then crushed to powder and packed in airtight container for analysis.

Analytical procedure

Proximate analysis:

Crude protein (Total nitrogen % x 6.25) was estimated using the Kedjahl method (AOAC 1984) of determining the total nitrogen. Ash by the incineration of 2g of the sample in a muffle furnace maintained at 550°C for about 2hours and moisture estimated by weighing 10g of the sample in a crucible placed in an oven maintained at 105°C until constant weight was obtained. Crude fat, by ether extract using Soxhlet extraction and crude fiber by acid digestion (AOAC 2000). Finally, to determine the total soluble carbohydrate, the method based on difference was used which involves total carbohydrate = 100% DM - (crude protein + crude fibre + crude fat + total ash) % and energy value Kcal/kg was calculated by multiplying the values obtained for carbohydrate, protein and fat by 4, 4 and 9 respectively and adding up the values. All the analysis were carried out in triplicate and reported in percentage.

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Mineral analysis

The samples were digested by wet digestion method using a combination of perchloric acid nitric acid and sulphuric acid (AOAC 2000).

The elements Ca, Mg, Cu, Zn, Mn and Fe were determined using the Atomic Absorption spectro photometer. K and Na were determined by the flame photometer while P was determined by the colorimetric method using vanadium molybdate. All the determinations were done in triplicates.

Determination of Vitamin A using Colorimetric method (C. S. James, 1984)

1g of ground sample was taken into a beaker 10mls of chloroform was added to extract the vitamin A using pasture pipette the chloroform layer was taken in another test tube this was tested with antimony dichloride reagent to develop a blue colour read at 620m against chloroform/SbCI3.

Determination of Vitamin C using Titrimetric method

Trichloroactic acid (TCA) solution 6g/100ml H_2SO_4. 250ml was slowly divided in 500ml of cold distilled water in a liter flask and brought to a final volume. 12ml H_2SO_4 650ml of Conc H_2SO_4 was added to 300ml of cool distilled water in a litre flask, cool and brought to final volume or 1 litre with distilled water.

2,4 dinitrophenyl-hydrazine reagent (2g/100ml) 10g of 2,4 dinitrophenyl-hydrazine was dissolved in 4.5M H_2SO_4 and diluted to a final volume of 500ml this was allowed to stand in a refrigerator overnight, and then filtered.

Anti-nutrient analysis:

HCN content was estimated using the alkaline titration method as approved by AOAC. (1984).

Tannin estimation was done using the method of Burn (1971).

Determination of phytate was by the method of (Mecance and Widdowson, 1953).

Estimation of total oxalate was done using the method of Dye (1977).

Result and Discussion

Results:

The results obtained in these analyses are presented in table 1-4 below.

Table 1; result of proximate analysis

Parameters	Concentration (%)
Moisture	75.67
Ash	4.99
Crude fibre	1.66
Crude protein	7.00
Ether extract	3.24
Carbohydrate	83.12
Caloric value (cal)	398.61

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Table 2; Mineral content of sample

Minerals	Concentration Mg/100g
Ca	271.82
Mg	182.87
K	401.82
Na	12.22
P	323.00
Cu	3.15
Zn	3.05
Fe	43.34
Mn	7.38

Table 3: Vitamins levels in sample

Vitamins	level mg/100g
A	0.099
C	65.95

Table 4: Toxicant levels in cola nut shell

Toxicant	level
Hydrogen Cyanides	11.56
Oxalates	130.00
Tannins	30.84
Phytates	Not detected

Discussion

The result of the proximate composition of the cola nut shell as shown in Table 1 indicates highest value 389.61 calorie for caloric value, then 83.12% carbohydrate followed by 75.67% moisture, 7.00% crude protein, 4.99% ash, 3.24% crude fat, and the least value 1.66% was recorded for crude fibre. The moisture, carbohydrate and caloric values are higher than the values of moisture and carbohydrate obtained by Umoh (1998) for the seeds. While the ash and crude fat are lower than that reported by Umoh (1998) for the seed. The crude protein showed the same value 7.00% with that of the seed. The high level of water, carbohydrate and energy can make this sample a high source of energy and substrate for many synthetic path way and can sustain the energy requirement for humans and animals.

The minerals occur in the following increasing order. Zn (3.05) < Cu (3.15) < Mn (7.38) < Na (12.22) < Fe (43.33) < Mg (182.87) < P (232.00) < Ca (271.82) < K (401.82). The presence of high level of Mg, Ca, P, and K can make the sample to be relevant for the development and maintenance of bones and teeth as they are known for their structural roles. The Ca (271.82) is higher than 67.07 and 127.40 recorded for Cola nitida and garcino cola seeds (Odebunmi et al., 2010).

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The vitamin results in Table 3 shows that vitamin C is higher (65.95mg/100g) than vitamin A (0.099mg/100g). Both vitamins are good health booster. The vitamin C (65.95mg/100g) is higher than the values (46.81 mg/100g) reported by Abasiekong and Effiong (2012) for cola nitida seed but lower than 74.89mg/100g recorded for Buchholzia coriaceae . It can be used as a good immune booster and vitamin C contains anti-viral and anti-bacterial properties preventing infection and getting nd of unwanted toxics cursed by free radicals during oxidation processes.

The toxicant content showed in Table 4 indicates the highest level in oxalate (130.00mg/100g), tannins (30.84mg/100g) and the least of the toxicants is (HCN 11.56). phytate was not dictated in the sample. These values are high compared to 0.58mg/100g HCN for nitida seeds and lethal dose of 5-6mg/100g (Bolhus, 1955).

Oxalate here is higher than the lethal dose (2-5mg/100g) Oke (1997). Tannin is also higher than 9.15mg/ 100g reported for the seed. This tannin level can show toxicity by coagulating protein in food and rendering it unavailable for its consumer. While HCN also inhibit the activities of vitamin K dependent on carbohydrate of the liver.

Conclusion

The result of this analysis shows that the white cola nut shell has a high value of nutritional properties such as the proximate, mineral and vitamins. The high level of carbohydrate and calories cannot be over emphasized thus, this plant can be of immense benefit to the food technologist, nutritionist, animal scientist and other stake holders in food and pharmaceutical industries. However, heat and processing procedures must be applied to control or reduce the levels of the toxicant.

Recommendation

I. This part of the cola nut plant should not be wasted.

II. Its high K, P and Ca components can enhance its inclusion in antihypertensive and bone building/maintenance diets.

III. Its high moisture content will enhance spoilage and reduce its shelf life, thus preservative techniques need be applied.

IV. The anti-nutrient levels found here are quite safe, making this sample risk free.

V. The high carbohydrate and caloric value encourages its application in the bulk of animal feed.

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