



Quantitative Study and Secondary Metabolites Determination of Aqueous and Methanolic Extracts of Two Varieties of Cola Nuts

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ABSTRACT

The qualitative phytochemical analysis revealed the presence of alkaloids, tannins, flavonoids, saponins, cardiac glycoside, glycoside, saponins glycosides, steroid, and volatile oil for both red and white cola nut with varying degree in their concentration, only anthraquinone was not detected. The quantitative analysis revealed that there was a significant difference at ($p < 0.05$) in saponins content of white cola nut when compared with red cola nut which has the highest percentage of saponins content (20.60%) than red cola nut with (10.80%). While no significant difference in the contents of alkaloid, flavonoids, tannins and glycosides. The alkaloids contents of red cola nut was higher (16.07%) when compared to white cola nut with (14.40%), while flavonoids contents of white cola nut was high (6.33%) compared to red cola nut with (5.60%), glycoside contents of white cola nut (6.76%) to that of red cola nut with (5.68%) and tannin content of white cola nut (1.18%) as compared with the red cola nut (1.12%). Conclusively this proved the scientific basis for the traditional uses of the plant extracts that have long being the knowledge for many years. It therefore recommended that further research study should be conduct on characterization of bioactive secondary metabolite of cola nut with a view of stabilizing the active ingredient so that they can be prevented from losing their potency.

Keywords: *Kola nut, white, red, quantitative, and qualitative*

INTRODUCTION

Kola is a genus of tropical trees belonging to the *Sterculiaceae* family. It comprises of about 125 species that grows as evergreen trees with moderate height of about 25 meters or as shrubs. The genus is indigenous to the tropical rain-forest of African region which are geographically located in evergreen lowland and forest in continental Africa [1]. Phytochemicals are compounds that occur naturally in plants. They contribute to the organoleptic properties of plants such as color, flavor and smell. In addition, they form part of a plant's natural defense mechanism against diseases [2]. A number of researchers have been reported medicinal values of phytochemicals constituent of plants to human health and disease prevention [3-6]. Kola nuts are a common sight in Nigerian markets, cities and villages. They are often sold by street vendors at bus and train depots. Many Nigerians consume kola nuts regularly, even daily, for cultural, medicinal and as a stimulant against sleep, among many other cited reasons.

Cola nitida and *Cola acuminata* are the most common *Cola* species used. These species are sources of caffeine in processing and pharmaceutical industries and often chewed by some ethnic's group settings as stimulants [7]. [8] Found out that in Nigeria, kola nut is being used in traditional medicine as stimulant, to prevent dysentery, headache and to suppress sleep and ameliorate fatigue. *Cola nitida* is eaten before food to encourage digestion and has been reported to have advantageous effect on the digestive organ especially the liver. Also it has been used as a form of antidepressant [9].

Traditional chewing sticks are commonly used especially by rural dwellers in maintaining oral hygiene [10] with about 80% - 90% of Nigerians using chewing sticks from a variety of plants [11]. The reasons can be attributed to culture, affordability, accessibility as well as the popular thought misguided belief that

natural medicines have no side effects [12].

The kola nut pod husk, which is a byproduct from processing the nut, is widely used for animal feeding because of its high nutritive content. Also, Chicken broilers fed with kola nut pod husk meal diets had an outstanding growth performance [13].

The daily consumption of Kola nuts among African natives of Nigeria, Cameroon, Niger and Ivory Coast has remained steadfast and on the rise, however, literature review have shown a consistent gap in scientific research to assess the biological effect of Kola nut consumption [14]. By considering the use of kola nut by people in Nigeria, who believe that kola nut, may prevent dental plaque if proper hygiene is maintained. Even though, the use of kola nut in its crude form has its own advantages but the need to identify the phytochemical constituents present in the nuts can help in determining the possible effects that the nuts may possess. Therefore the study aims to quantify and screen the phytochemical constituents of white and red kola nuts.

MATERIALS AND METHODS

SAMPLE COLLECTION AND PREPARATION OF EXTRACTS

Two varieties of Kola nuts were purchased at Shagon Goro area in Sokoto metropolis and transported to the laboratory for analysis. The nuts samples were washed with tap water, cut into pieces, and allowed to air dried in the laboratory, as well as kept in a container. One hundred (100g) of each white and red kola nuts were separately placed in a round bottom flask containing one liter each of water and methanol follow by mixing and agitation for six hours and allowed to stand for 24hours. The mixtures then filter by using Muslim cloth and concentrated into powder by subjecting to heat using hot plate; the powder dry

extracts were scrap off using spatula. The dried extracts obtained were use directly for qualitative phytochemical screening. The remaining extract was kept in a sterile plastic container for further use.

Determination of secondary metabolites by qualitative phytochemical analysis of extracts

Prepared extract of white and red cola nuts were subjected to phytochemical evaluation which were conducted to qualitatively determine the presence or absence of the following secondary metabolites. The following constituents Alkaloids, Tannins, Flavonoids, Anthraquinones, Glycosides, and Volatile oil were determined according to the method adopted by [15] and saponins using standard method described by [16], Cardiac glycoside and test for reducing sugars were determined by employing method described by [17] and Saponin glycosides [18].

Quantitative phytochemical Determination

Quantitative phytochemical Determination of total Alkaloid, total Saponins, totalTannins tests were conducted as described by [15] with some modifications. Determination of Total Flavonoid was

done by employing and modifying the method described by [18].

DATA ANALYSIS

Data generated from the quantitative analysis were subjected to statistical analysis using Statistical package for Social Science (SPSS) version 20. The mean value and standard error were calculated for quantitative phytochemical determination contents of Red and White cola nuts. In order to establish whether there is a significant difference between the white and red cola nut contents ANOVA was employ (P= 0.05). For qualitative phytochemical screening data were presented in tabular form and described using quantitative description.

RESULTS AND DISCUSSION

Qualitative phytochemical analysis of some selected secondary metabolites in red and white cola nut.

The study confirmed the presence of various secondary metabolites like alkaloids, tannins, flavonoids, saponins, cardiac glycoside, glycoside, saponins glycosides, steroid, and volatile oil in the kola nut. The qualitative and quantitative analysis carried out indicated the medicinal importance of cola nuts.

Table 1: Qualitative phytochemical analysis results of red and white cola nuts

Phytochemical Constituents	Aqueous extract		Methanol extract	
	Red	White	Red	White
Alkaloid	+++	+++	+	+
Tannin	++	++	++	++
Flavonoid	+	+	-	-
Saponin	+++	+++	++	++
Cardiac glycoside	+	+	+	+
Anthraquinone	-	-	-	-
Glycoside	++	++	++	++
Saponin glycoside	+++	+++	++	++
Steroid	++	++	+++	+++
Volatile oil	+	+	+	+

Key: +, ++, +++, -. Denotes slightly present, moderately present, present in high concentration and not detected

Table 2: Quantitative phytochemical contents of red and white cola nuts

Secondary Metabolites	White Kola nut	Red Kola nut
Alkaloids	14.40 ± 0.61	16.07 ± 0.29
Flavanoids	6.33±0.44	5.60±0.12
Tannins	1.18±0.03	1.12±0.01
Saponins	20.60 ± 0.31 ^a	10.80 ± 0.06 ^b
Glycosides	6.76±0.19	5.68±0.19

Values = Mean ± standard error of 3 replicates mean. Mean in a row with different superscript are significantly different (P< 0.05).

The results from the qualitative screening of some secondary metabolites in red and white cola nuts showed the present of alkaloids, saponin, and saponin glycosides at a high concentration for red and white cola nut in aqueous extracts while in methanol extract it showed trace alkaloids, moderate saponins and saponin glycoside. The result was not in consistence with the previous studies of [19] on Phytochemical Evaluation and Antibacterial Properties of Two Varieties of Kolanut (*Cola nitida*) in Nigeria which for example revealed that Alkaloids, tannins and saponin glycoside was not detected in methanol extracts and cardiac glycosides at all.

Present study showed moderate amount of tannins, glycosides, and steroids in red and white aqueous extracts and in methanol extracts, but steroids are in high concentration in methanol

extracts when compare to aqueous extracts. It further showed trace amount of cardiac glycosides, volatile oil for both red and white aqueous and methanol extracts; trace amount of flavonoids in aqueous extracts of kola was detected and absence in methanol extracts of red and white kola. Consequently anthraquinone was not detected for both aqueous and methanol extracts.

This is similar to the finding of [20] on some Niger Delta plants who observed the presence of tannins, alkaloids, saponin and saponin glycosides in large quantity. The presence of alkaloids and saponins might also explain the therapeutic properties of this plant, since alkaloid-containing plant has been used by humans since ancient times for therapeutic and recreational purposes, reported by [21].

The quantitative results shows that there was a significant

difference at ($p < 0.05$) in saponins content of white cola nut when compared with red cola nut which has the highest percentage of saponin content (20.60%) than red cola nut with (10.80%). While shows no significant difference in the contents of alkaloid, flavanoids, tannins and glycosides. The alkaloids contents of red cola nut was higher (16.07%) when compared to white cola nut with (14.40%), while flavanoids contents of white cola nut was high (6.33%) compared to red cola nut with (5.60%), glycoside contents of white cola nut (6.76%) to that of red cola nut with (5.68%) and tannin content of white cola nut (1.18%) as compared with the red cola nut (1.12%). The saponin result was in agreement with, while alkaloids, tannins and glycosides result disagree with the work reported by [17] who reported the significance differences for all the secondary metabolites investigated.

The differences may be due to difference in the source of the materials used. According to [22] plants may grow well in different situations but fails to produce the same content or constituents. Plant growth and development, and often the nature and quantity of secondary metabolites are affected by temperature, rainfall, length of day (quantity of light) and altitude. Light determine the amount of glycosides or alkaloids present in a plant. Also, continuous rain can lead to a loss of water-soluble substances from leaves and roots by leaching; this is known to apply to some plants producing alkaloids, glycosides and even volatile oils [22].

CONCLUSION

The important of Nigerian cola nut has trace back since the beginning of traditional medication but consequently that has not been tested scientifically for the development of drug production. The qualitative phytochemical and quantitative determination of white and red cola nut has revealed the presence of alkaloid, tannins, saponins, glycoside, Saponin glycoside, cardiac glycoside, steroids and volatile oil and their corresponding percentage contents proved the scientific basis for the traditional uses of the plant extracts that have long being the knowledge for many years, that are also useful in the detection of bioactive principles and subsequently may lead to drug discoveries and development.

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