Research Journal of Chemical and Environmental Sciences
Res J. Chem. Environ. Sci. Vol 7 [4] August 2019: 29-33
Online ISSN 2321-1040
CODEN: RJCEA2 [USA]

Website: www.aelsindia.com/rjces.htm

RJCES

ORIGINAL ARTICLE

Phytochemical screening and estimation of fractions contained in each component of cashew nut (*Anacardium occidentale*)

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ABSTRACT
The demand for cashew (Anacardium occidentale) is high in the world market because of various applications both at home and industries. Cashew nut was cracked manually and relative proportions by weight of each component are determined. The study revealed that cashew nut shells (CNS), cashew nut kernel (CNK) and cashew nut testa (CNT) are 65.50, 29.02 and 1.80 % respectively. Soxhlet extraction of cashew nut shell liquid (CNSL)and defatted cashew nut shell (DCNS) was carried out to determine the relative components of the sample. The phytochemical analysis shows the presence of bioactive compounds such as, tannin, alkaloid, saponin and soluble carbohydratein CNSL.
Keywords: *cashew nut shell liquid, defatted cashew nut shell, phytochemical analysis, soxhlet extraction and saponin.*

Received 13.05.2019 Accepted 31.07.2019

INTRODUCTION

The cash tree (*Anacardium occidentale* L) originated from Brazili and later spread to countries such as India, Mozambique and Portugal to prevent coastal erosion. It was used for feeding elephants but the nut failed to digest and it was later removed. In the nineteenth century, because of its economic value, growing of cashew extends to other countries namely: Sri Lanka, Philippines, South Africa, Mozambique Tanzania and Nigeria [1,2]. The manual processing of cashew nut started in India in the twentieth century and exported to America and Europe. While it was processed in East Africa for domestic uses rather than exportation[1,3].

The seeds are consumed orally to cure impotency and as aphrodisiac [4–6]. Cashew nuts have various health advantages as they are significant sources of iron (essential for red blood cell function and enzyme activity), magnesium (promotes energy release and bone growth), phosphorus (builds bones and teeth) and zinc (essential to digestion and metabolism). In addition, the nuts contain significant amounts of phytochemicals with antioxidant properties that protect the human body from cancer and heart disease [7].

The three major cashew products sold in the world market are cashew nuts (CN), cashew nut kernels (CNK) and cashew nut shell liquid (CNSL). The CNK and CNS are used for diet and industrial as well as medical application [2].

Approximately 60 and 40 percents of cashew kernels are consumed as snacks and confectionery correspondingly. The cashew competes in the same market as other edible nuts including almonds, hazels, walnuts, pecans, macadamias, pistachios and peanuts [2].

Cashew nutshell liquid (CNSL) is an extract from the nutshell of the cashew nut. Comprising a mixture of chemicals. The seed is also called kernel and classified it as dicotyledons plants. The solid part of CNSL is utilized in the brake lining industry as friction particles while the liquid is used in varnishes, waterproof, laminating resins, foundry chemicals, plasticizers as well as insecticides [8–10].The hot-oil and roasting technique are used locally for extraction of CNSL [9].

The processing of cashew nut yields important by products which increases its value. The liquid inside the shell (CNSL) signifies 15 percent of the gross weight and has some medicinal and industrial uses. CNSL is enclosed within the tinny honeycomb structure and soft outer skin of the nut as well as harder inner shell. The CNSL content of raw nut varies from 15 to 25 percent, according to Lubi [9] and Telascrea[11]

CNSL is a raw material used in the production of phenolic resin and friction powder in the automotive company [5].

In Nigeria, cashew nut shell (CNS) is considered as an agricultural waste and is often disposed but at times used as fuel, after removing the kernel. Recently, research revealed that CNS contains valuable constituents that are transformable to useable products, useful to both man and his animals [11].

Phytochemicals are chemical compounds produced by plants. They are commonly found in fruits, vegetables, nuts, legumes, and grains. It has been revealed that consumption of fruits, vegetables, herbs and spices are of great benefits. These plants have a wide variety of biologically active compounds known as phytochemicals)[5].

According to World Health Organization (WHO) over 80 % of the world populace used traditional medicine for primary health care needs. Medicinal plants contain secondary metabolites that provides curative and biological properties for the treatment of aliments. It is used as an active ingredient in drugs. The medicinal value of plant contains some chemical substances that produces a specific physiological action on the human body [4,12]. The most important of these bioactive compounds of plants are alkaloids, flavonoid, saponin, tannin and phenolic compounds. The phytochemical research specializes on the pharmacologically effective data from research on plants for discovery of new drugs [13] . Since cashew nut shell is regarded as a waste there is need to investigate the percentage by weight of each components in the nut, valuable substances in defatted cashew nut shell liquid and bioactive compounds present in the cashew nut shell in order to assess its economic importance either medicinal or industrial uses.

MATERIAL AND METHODS

The reagents used are n-hexane, ethanol solution, iron(III) chloride, sulphuric acid, aqueous ammonia, distilled water, formaldehyde, HCl, calcium hydroxide, sodium hydroxide, concentrated H_2SO_4, $CuSO_4$, benzene, acetic anhydride, chloroform, alpha-napthol and acetone. They are analytical grade obtained from Kogi State University (KSU) Laboratory, Anyigba.

Sample collection and preparation

Cashew nuts (*Anacardium occidentale)* were bought at Anyigba market and identified in the Botany laboratory, in KSU. A floatation test was carried out on the cashew nuts to collect the sunken ones from the floats. The sunken ones were further subjected to the float test until all the floats were removed from the sample. The sunken nuts were collected and washed properly, then dried in the sun for a week. After which the nuts were collected for grading.

The cashew nuts were separated into two groups, A (big nut) and B (small nut), weighted and splited into halves with a manual cashew cutter. A cashew picker was used to remove the kernel and the testa from the shell. These three components were separated and weighed in triplicates and their relative proportions of the components of the cashew nut were calculated [14].The shell was defatted using a standard method reported by Salehdeen et al.[15].

Soxhlet extraction of cashew nut shell liquid (CNSL)

The Cashew nut extraction was carried out in soxhlet extractor with n-hexane. About 80g of the coarse kernel sample was wrapped in a serviette and tied with a clean white thread, fixed in the chamber of the Soxhlet extractor and extracted with 400ml n-hexane for 12hrs at 68 ^oC. The extract was concentrated in a rotary evaporator and subjected to phytochemical test [16].

Extraction of soluble extractives from defatted cashew nut shell (DCNS)

Approximately 40 g of the DCNS was weighed separately into four different serviettes. They were wrapped neatly with a white thread. About 1L of 80 % ethanol was poured into the desiccator ensuring that the samples were completely immersed in the solvent. The samples were allowed to stand in the solvent for 24 hours. The whole extraction process was carried out with a change of solvent after every 24 hours.The samples were dried and the weight was taken, they were placed in a Soxhlet extractor and about 80 % ethanol solution was poured into the round bottomed flask. The extraction was allowed to stay for a period of 12 hours then allowed to cool and was decanted. The process was repeated for various sets and intervals [15].

Phytochemical analysis

The phytochemical screening of the plant extract was investigated to determine the presence of active components using standard methods as reported in previous work. The active ingredients determined were as follows: Soluble carbohydrate [15], tannin, alkaloid and saponin [12].

Statistical Analysis

The one way analysis of variance, regression analysis, mean, and standard deviation of the data generated were determined using Statistical Package for Social Sciences (SPSS), for 20, at a significance of $p < 0.05$.

RESULTS AND DISCUSSION

Table 1: Relative proportions of the components of the cashew nut shell (CNS)

Sample (Cashew)	Mean weight of components (g)	% relative weight of components of the sample
CN	2508± 0.01	100
CNS	1650± 0.01	65.50
CNK	728± 0.02	29.02
CNT	45.20± 0.04	1.80

CN= Cashew nut, CNS= Cashew nut shell, CNK= Cashew nut kernel

The CNS, CNK and CNT constitute 65.50, 29.02 and 1.80 % (Table 1) of cashew nut correspondingly; these values agreed with results presented by Salehdeen *et al*. [15].
and USEPA[17] hence, cashew testa contained the least component of the cashew nut.

Table 2: Result of soxhlet extraction of cashew nut shell liquid (CNSL)

Sample (Cashew)	Mean weight of components (g)	% relative weight of components of the sample
CNS	615 ± 0.01	100
CNSL	193 ± 0.01	31.38
DCNS	422 ± 0.03	68.62

CNS= Cashew nut shell, CNSL= Cashew nut kernel, DNSL= Defatted cashew nut shell.
The CNSL and DCNS (Table 2) oil extract weighted 193g and 422g contained 31.38 % and 68.62 % of oil respectively. The value percentage oil in CNSL is within USEPA accepted value of 30-35% [15,17] but higher percentage of oil was recorded in DCNS.

Table 3: Estimation of the proportion of defatted and alcohol extracted cashew nut shell in defatted cashew nut shell.

Sample (Cashew)	Mean weight of components (g)	% relative weight of components of the sample
DCNS	44.7 ± 0.01	100
DAECNS	37.1± 0.02	83

DCNS= Defatted cashew nut shell, DAECNS= Defatted and alcohol extracted cashew nut shell

The percentage of extract observed in DCNS and DAECNS (Table 3) are 100 and 83 correspondingly. The extract recovered in DAECNS was less than 100% probably due to effect of alcohol on the defatted shell [15].

Table 4. Result of phytochemical analysis of Cashew nut shell ((*Anacardium occidentale)*

Phytoconstituents	n-Hexane Extract
Soluble Carbohydrate	**+**
Tannin	**+**
Alkaloid	**+**
Saponin	**+**

The n-hexane extract of the cashew nut shell (Table 4) shows presence of alkaloids,tannins, saponins and soluble carbohydrates as documented by Omoboyowa et al.[18] and Salehdeen et al. [15]. These observed bio-active ingredients show that cashew nut shell has medicinal value [12,19]. The alkaloids and sponins in *Anacardium occidentale* in other plants have been reported tohave cytotoxic and pharmacological properties, hence, used as antimicrobial agents [16]. Furthermore, flavonoids are biologic antioxidant that protect cell against damaging effect of peroxyl radicals, reactive oxygen, hydroxyl radicals among others[16]. Also, carbohydrate is source of energy to human and its of health importance [20]. Starch extracted from the carbohydrate may be a source of polymeric resins [21].

CONCLUSION

The result revealed the percentage of oil extracted by weight of each component (testa, shell and kernel) and the phytochemical results showed the presence of bio-active compounds found in plant foods such as

cruciferous vegetable, garlic among others that enhance proper functioning of liver and prevent cancer risk.In addition, it is a raw material in the production of resin and brake lining. Therefore, cashew nut is not a waste but rather as nut of high economic value.

ACKNOWLEDGEMENT
The authors are sincerely grateful to all staff of laboratory Department Pure and Industrial Chemistry, Faculty of Sciences, KSU for their assistance.

CONFLICT OF INTEREST
The authors declare no conflict of interest.

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Mohammed U. Salehdeen, Abdulrazaq Yahaya, and Yakubu, M.R.. Phytochemical screening and estimation of fractions contained in each component of cashew nut (*Anacardium occidentale*) . Res. J. Chem. Env. Sci. Vol 7 [4] August 2019. 29-33

