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The Nutritive Value and Health Benefit of African Walnut

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ABSTRACT
The use of medicinal plants to cure many ailments has been a tradition in different parts of the world. African walnut belongs to the family Euphorbiaceae. It is an edible seed that is widely cultivated for its delicacy. All parts of the plant have been used ethnomedically. This article reviewed the ethnomedicinal, nutritional, phytochemical and some pharmacological activities of African walnut, because medicinal plants are our hope in achieving sustainable global statutory of health for all and a last resort in healthcare management in African countries. This review reveals previous findings and other pharmacological benefits of the African walnut towards its potential as food and drug development. The Nigeria Walnut (Tetracarpidiumconophorum) is a climber crop species that help in poverty reduction through improvement of the purchasing power of families and their standard of living. However, the challenges facing its year round availability have not been fully documented and data related to its contributions to livelihoods of rural farmers and it nutritional value is not readily available to the populace. Therefore, this paper reviewed the monetary contribution of African Walnut, its potential roles in poverty reduction, commitment to national advancement and value added exports from Nigeria, hence the investigation is expected to bridge some of this gap. giving an overview of the present information encompassing the economic commitment of Walnut, it nutritional and medicinal values in Nigeria.

Keywords: Nutritive ,Value , Health , and Benefit of African Walnut

I. INTRODUCTION

- African walnut Tetracarpidiumconophorum (also called Plukenetiaconophora) belong to the family of Euphorbiaceae and is found in South east and south west Nigeria and Cameroon. Walnut (Tetracarpidiumconophorum) is an important crop that is cultivated throughout the world's temperate regions for its edible nuts [1] African walnut is a climbing shrub 10-20 ft. long, it is known in the Southern Nigeria asukpa (Igbo), Western Nigeria as awusa or asala (Yoruba). It is known in the littoral and the Western Cameroon as kaso or ngak. They are usually planted under an indigenous tree that can provide strong support for the heavy weight of the climber when fully established on the crown of the tree, and in cases where they cannot be harvested manually; they are left for full maturation after which the pod falls off by itself and are picked, removed from the rotten pods, washed and sold in the market. This paper aims to examine the usefulness of African walnut to the people and to determine the important and benefit of the walnut to the body . African Walnuts naturally contain minerals like thiamine, riboflavin, folic acid, cyanocobalamin (vitamins B1, B2, B3, B5, B6, B9, B12, C and E), niacin, manganese, l-arginine, pyridoxine, selenium, melatonin, ascorbic acid, pantothenic acid, tocopherol, ellagic acid, polyphenols, omega-3 fatty acids and oleic acid [3].

African walnut, like many plants in Africa and other parts of the world has been proven to have decorative, nutritive, medicinal, agricultural and industrial values over the years. Conophor plants are cultivated principally for the nuts which are usually cooked and consumed as snacks[5].

Tetracapridiumconophurum contained in a pod which may house; one shelled nut (single), two shelled nut (double) and three shelled nut (triple). The walnut shells could be black or brown from the plant. The nut is whitish upon cracking from the shell. The nut has a thin layer in between two halves (when a nut is divided into two equal parts) of nut. The seed (subglobose) is about 2.5cm long and has wooly materials that attach the nut to the shell when cracked open. 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[2].

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STORAGE AND SELECTION OF AFRICAN WALNUT

The most important thing is that this valuable plant African walnut should be well selected and stored. Rubbery or shriveled shelled nuts should be avoided as this is an indication of age.

Shelled nuts should be brittle and snap easily. Nuts which grow on the summer side of the plant will have a darker skin and a richer flavour (more photosynthetic activity). It is best to buy unshelled nuts and store them in the refrigerator for 2 to 3 months or freeze up to 1 year, they can quickly turn rancid on storage, due to the high oil content of the nuts. Reported that Food materials are usually processed in order to improve palatability and reduce toxicity and as a means of preservation. Processing methods such as thermal processing, refrigeration, freezing, and fermentation have been applied to various food materials to achieve these purposes.

Shelled nuts are commercially available, packaged nuts are often treated with ethylene gas, fumigated with methyl bromide,dipped in hot lye or a solution of glycerine and sodium carbonate to loosen their skins and then rinsed in citric acid. Shelled walnuts should be kept refrigerated in an airtight container, and may be frozen up to a year. Walnut, African walnut oil is an excellent, albeit expensive oil and can be used to dress salads.

FUNGUS DAMAGE AND CONTROL OF AFRICAN WALNUT SHELL

Fungus damage to African walnut may be traced to three general causes:

(a) Lack of suitable protective measures when storing.

(b) Improper seasoning, storing, or handling of the raw material produced from the African walnut.

(c) Failure to take ordinary simple precautions in using the final product. The incidence and development of molds, decay, and stains caused by fungi depend heavily on temperature and moisture conditions.

MEDICINAL VALUE OF AFRICAN WALNUT

Tetracarpidiumconophorumis among the list of lesser known foodstuff recently in order to unravel the numerous benefits of the different parts of the plant more researches are being conducted regularly. One of the important benefits is its medicinal value. Previous and present reports have shown that all the parts of the walnut (leaves, bark, root s, hull, and nuts) possess antimicrobial effect especially the leaves. However, polar solvents and soxhlet extracted extracts revealed more antimicrobial activity than the aqueous extract. Such organisms include (Staphylococcus aureus, Bacillus subtilis Gram negative (Pseudomonas aeruginosa and Escherichia coli) as well as fungi (Candida albicans) and mold. (Aspergillusflavus) strains. Their susceptibility was concentration-dependent. This justifies why the plant parts are used for the treatment of various ailments. Reported on the amino acid and fatty components of the nut and on the use of its leaf juice for the treatment of prolonged and constant hiccups. The edible nut or kernel is used to strengthen the kidney functions, and therefore used to strengthen the lumber region of the back, the legs and organs. It is commonly combined with other kidney tonics to enhance this action. Also, walnuts are said to be beneficial to the brain since the brain is believed to be controlled by the kidney function. Reported that African walnut has been known to possess antioxidant property which is as a result of its constituent bioactive polyphenols. There is evidence that phenolic substances act as antioxidant by preventing the oxidation of LDL-lipoprotein, platelet aggregation, and damage of red blood cells; this explains the reason that made the nut to be listed among the plant foods that are of great health benefit to human body.

MALE FERTILITY ACTIVITY

On the effects of the aqueous extract of the seed of African walnut and the effect of pro viron (as standard) on the hormonal parameters of male guinea pigs. The claims of the use of the seeds of this plant by traditional medicine practitioners as a male fertility agent were supported. In their study, they compared the effects of the seeds of African walnut and proviron. Using standard testing methods, they observed that the aqueous extracts of African walnut seeds (100-400mg/ml) caused a statistically significant increase in the level of testosterone of male guinea pigs. These effects were dose and time specific. The optimum effect on testosterone level under dose dependent study (4.70 +0.45) mg/mL was obtained at 300mg/mL of African walnut after 7 days treatment. The effect of African walnut seed powder as dietary supple-mentation on the reproductive indices in male African catfish gariepinus) brood stocks. Fifteen outdoor concrete tanks consisting of triplicates for each treatment group were used. Triplicate groups of male C. gariepinuswere fed with four diets supplemented African walnut seed powder respectively, a control diet without African walnut seed powder 2 times a day of 3% of body weight for 70 days. Male C.

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gariepinus brood stocks were randomly distributed with density of 10 fish into 15 outdoor concrete tanks. At the end of 70 day experiment, fish fed experimental diets showed significantly improved gonadosomatic index and reproductive indices over the control treatment.

The seeds of African walnut could enhance the production of reproductive hormones and may be used in the formulation of useful fertility drugs. In their research, they investigated the effects of African walnut seeds on the hormone and sperm profile of male albino rats. Forty eight albino rats of about twelve weeks weighing between 130 -180g each were divided into four groups (A, B, C and D) with twelve rabbits in each group. The test extracts were incorporated unto the feed of the rats. Group A served as the control (without test substance) while groups B, C and D were fed with 4, 8 and 12g/kg body weight (Bw) of the test substance for a period of 63 days. The results revealed that there was significant difference ($P < 0.05$) in the serum level of follicle stimulating hormone (FSH) and luteinizing hormone (LH) of the rats between the different treatment groups. Results of semen quality showed that there were significant differences ($p<0.05$) in the sperm count, sperm morphology, sperm viability and semen pH among rats between the different groups.

NUTRITIONAL VALUE

Ogunsua and Adebona [2016] have reported on the high nutritional potential of the nut. According to Dosunumu et al. (2015) the nuts of African walnut are good sources of ascorbic acid and 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. Also reported on the impact of traditional processing on the nutrient and sensory qualities of the nut. Reported on the methods of processing the African walnut nuts while, reported on the use of African walnut seeds and processing waste in livestock feed formulation.

According to Edem et al., 2009 reported the proximate composition, ascorbic acid and heavy metal content of (African walnut) Tetracarpidiumconophorum 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 African walnut 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 that African walnut nut is not polluted with heavy metals since the concentrations of the heavy metals were all below WHOpermissible limits.

In research carried out by Kaur and Pramanik (2012) in the biodegradation of tiger prawn shell by lactic acid fermentation, Lactobacillus plantarum was found to be more efficient in term of % degradation. Detail investigation on biodegradation was done to study the efficiency of Lactobacillus plantarum for demineralization of tiger prawn shell waste. The fermentation experiments was carried out using 150, 200, 250 and 300 micron particle size of shell waste and 8% inoculation as the starter culture up to 5days.

INDUSTRIAL VALUE

Besides the nutritional, medicinal, agricultural etc. benefits of African walnut, several industrial benefits have been reported as well. The oil from the nut has been reported to be used in the formulation of wood varnish, stand oil and vulcanized oil. Akpuaka and Nwankwor (2013) reported that heating of the oil with powdered Sulphur at a high temperature of about 150-160°C for 30 minutes gave rise to the production of vulcanized oil. Also, wood vanish was made from boiled conophor oil with other additives.

RESEARCH METHODOLOGY

As much is needed to be known by the researcher about the research work, the research methodology that will be employed in the course of this study is experimental method. In this method the researcher will construct practical work with the result obtained.

PREPARATION OF AFRICA WALNUT

Boiling requires cooking the unshelled fruits in water for a while and draining off before serving. Similarly the unshelled fruits can be baked or roasted in an oven. To cook in soups, the partially boiled fruits are shelled, milled into a paste and cooked as usual using an egusi soup recipe.

NUTRITIONAL DATA BASED ON 100G OF SHELLED WALNUT KERNELS

Calories	-	315kcal
Carbohydrates	-	13.14g
Protein	-	24.01

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Fats	-	17.39
Fibre	-	5.99
Vitamins:	-	C, E, B6, B7, thiamin, folate
Minerals:	-	Calcium, Potassium, Magnesium, Copper, Iron, Zinc, Sodium
Fatty Acids	-	Omega 3 & 6.

3.4HEALTH USE/BENEFITS

There are so many claims about the health benefits of African walnuts, some of which have been scientifically proven. However, I am more drawn towards the impressive nutritional profile of the fruit especially the amount of essential fatty acids and anti-oxidants it possesses. For this reason, I am of the opinion that this fruit should feature regularly in my diet, and I am exploring ways of achieving this aim. In my opinion, it is a super fruit/super food and we should be eating more of it [4].

African walnuts (botanical name tetracarpidiumconophorum) are fruits of a woody perennial climber plant, found mostly in the dense rain-forest of Africa. (Some also found in India). Locally referred to as asala, ewusa/awusa (Yoruba) ekporo in the Efik dialect and ukpa in Igbo.

Description: The fruits come in a hard kernel casing which releases a whitish round nut when cracked open. The shell colour often black but can be any shade of gray.

The entire plant including leaves and roots have nutritional and medicinal properties, for which it is cultivate. The fruits (which are basically a type of nut) are the most commonly used part of the plant, significantly used for food and also to extract its oil which has a very high value especially in medicine and pharmaceutical.

TASTE

The fruit has a firm and crunchy texture with no overpowering flavours. But upon drinking water after consumption, one may experience an unusual bitter taste/sensation in the mouth. This is believed to be attributed to the presence of some variants of chemical alkaloids, tannins or phytochemicals. This however has no toxicity and of no danger to human consumption.

DESCRIPTION OF BOTANICALTETRACARPIDIUMCONOPHORUM (AFRICAN WALNUT)

The African walnut plant was originally classified by Hutchinson and Dalziel (1928). It is described to be synonymous with Pleukenetiaconophora.

Table 1: Classification of African Walnut (Tetracarpidiumconophorum)

Kingdom	Plantae- Plants
Sub-kingdom	Tracheobionta - Vascular plants
Super division	Spermatophyta - Seed plants
Division	Magnoliophyta - Flowering plants
Class	MagnoliopsidaDicotyledons
Subclass	Rosidae
Order	Euphobiales
Family	Euphobiaceae - Spurge family
Genus	TetracarpidiumPax – Tetracarpidium
Species	Tetracarpidiumconophorum (Mull. Arg.) Hutch. &Dalziel

Source: Field Survey, 2023

The freshly harvested nuts are greenish in colour and contains between two to four round seeds per pod. The seed is made up of two cotyledons and enclosed in hard brown shell-like case within the pods. The seed which is referred to as walnut is hard and the cotyledons are yellowish-white in colour a bitter after taste is observed upon drinking water immediately after consumption and this has often been attributed to the presence of alkaloids in the nut although phenols are capable of conferring such characteristic. The seeds take about 14 days to germinate, while the young plant takes 4-6 months to mature. The plant is usually planted near big trees (such as cocoa) which give it strong support while it climbs and covers the crown of the tree. The nuts are found in local markets between the months of June and September.

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Table 2: Ethnobotanical uses of African walnut

Use	Part of plant
As pain relieve for tooth aches, abdominal pains as a beverage and tonic	Decoctions of leaves and nut kernel
Treatment of malaria and general fever	Bark of stem, leaves and nut kernel
As fertility agent (to increase sperm count)	Root, nut kernel
Treatment of constipation and abdominal Nuts kernel, leaves cramps, diabetes	Nuts kernel, leaves
Control of asthma	Roots, bark
Control chronic cough	
Treatment of dysentery, syphilis and thrush	Leaves, roots
Reduction of high blood pressure	Roots
Diarrhoea treatment	Leaves
Cancer	Leaves, nut kernel

Source: Field Survey, 2023

The scientific bases for the uses (Table 3) are yet to be fully researched and properly documented. It will be quite necessary to identify the key bioactive compounds responsible for the variouspharmacological effects as listed above and their bioavailability as well.

Table 3: Proposed uses of African walnut (Tetracarpidiumconophorum) based on research findings

Industry	Uses	Part of plant
Food and Nutrition	Conophor butter, chips, dices and grits for incorporation into chocolate products	Nuts
	Salad dressings	Nut oil
	Biscuits	Nut flour
Agriculture	Protein source in livestock feed	Nut cake
	Manure in farms	Decaying nut cakes
	Forest conservation	Conophor plant
Paint	Wood vanish, stand oil, soap and vulcanized oil for rubber and leather substitutes	Nut oil
Pharmaceutica	Antimicrobial agent	Leave extracts

Source: Field Survey, 2023

SURVEY OF PREVIOUS RESEARCH WORKS ON AFRICAN WALNUT

Over the years, the African walnut has gained popularity and has become a plant of interest to scientists in the field of nutrition, pharmacy/medicine, engineering, and agriculture in Nigeria and parts of west and central Africa.. Following basic research findings, the various components of the plant including the nuts are used in different ways in various industries 3). Although there is continuous increase in the research conducted on African walnut, only very little has been directed towards scaling up the production through farming as well as postharvest storage and shelf life to maintain its' availability throughout the year.

PROCESSING METHODS AND EFFECTS ON WALNUTNUTRIENTS

Malnutrition results from lack of food especially those with good nutritional quality. The presence of anti-nutrients such as phytates and oxalates, are factor that limits the quality of plant based diets. These anti-nutrients and other toxic substances affect the bioavailability of beneficial nutrients and sometimes cause direct harm to the consumer. This necessitates the need to develop ways of entirely removing them or at least reducing their impact to the barest minimum. Food processing involves subjecting it to controlled conditions which invariably transforms certain properties such as colour and taste/flavour. This may also affect the level and quantity of nutrientscontained in the plant food. Protein structures often contained in generally undergo both structural and chemical modifications during processing. This can lead to epitope destruction or

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modification which invariably will increase or decrease the allergen city of the plant food.

NUTRITIVE VALUE AND BENEFIT OF AFRICAN WALNUT

1. R**ich Source of Vitamins and Minerals:** African walnut contains vitamins such as vitamin E,B6,B7, thiamin, folate and also a rich source of magnesium which is highly needed by the body daily.
2. **Presence of Omega 3 & 6 Fatty Acid:** African walnut also contains a lot of omega 3 and 6 fatty acid that is very vital for the body for disease prevention, blood clothing, cell growth, and immune infection.
3. **Prevent Heart Disease:** The nuts according to recent research carried out in USA prevents heart disease (conary heart disease)it is said to contains amino acid 1-arginine that helps persons with heart disease, lower the risk of sudden cardiac death and supports healthful cholesterol level. It's also contains very powerful antioxidant such as flavonolmorin,quinonejuglone, and tannin tellimagrandin that are rare in most foods we eat, this effective antioxidant helps. control heart of age related deterioration.
4. **Helpful for Brain:** Like I said before African walnut contains omega 3 fats, vitamin E and folate which is highly needed by the brain as its supports the area of memory, enhance cognitive functions, and increase inferential reasoning in adults.
5. **Prevent Cancer:** Consuming African walnuts regularly can also prevent cancer as it contains cancer fighting propertiessuch as phytosterols, omega 3 fatty acid, antioxidant that helps to reduce the risk of prostrate and breast cancer in humans.
6. **Prevent Diabetes:** According to various research conducted, people that are obese and with type 2 diabetes should include walnut as an essential part of their diet as it lower the risk of type 2 diabetes.
7. **Improve Fertility in Men:** Daily intake of African Walnut according to my recent findings, also help to improve the quality of sperm in men, including vitality, motility and morphology.
8. **Good Hair Food:** African walnut very high in vitamin, contains vitamin B7 (biotin) that helps to reduce hair fall, strengthen the hair, and improve the hair growth, so that makes it a good hair food.
9. **Helps in Weight Control:** Walnut is also helpful in terms of maintaining your ideal weight, as it contains proteins, fiber, and omega 3 that helps provide satiety.
10. **Medicinal Purpose:** walnuts are also considered to be traditional herb in Chinese, as it is use to toxify kidneys, stop asthma, used for elderly ones to cure constipation, and finally the bark is used in tea as laxative and chewed for toothache.

II. SUMMARY OF FINDINGS,CONCLUSION AND RECOMMENDATIONS

SUMMARY OF FINDINGS

The use of medicinal plants to cure many ailments has been a tradition in different parts of the world. Tetracarpidiumconophorum (African walnut) belongs to the family Euphorbiaceae. It is an edible seed that is widely cultivated for its delicacy. All parts of the plant have been used ethnomedically. This article reviewed the ethnomedicinal, nutritional, phytochemical and some pharmacological activities of T. conophorum, because medicinal plants are our hope in achieving sustainable global statutory of health for all and a last resort in healthcare management in African countries. This review reveals previous findings and other pharmacological benefits of the African walnut towards its potential as food and drug development.

CONCLUSION

The African walnut (T. conophorum) should be explored for the production of walnut flour and cake for diet-based (diabetes, hypertensive) patients because of its great potential. The production, propagation and cultivation should be extended to other parts of Nigeria and Africa, which could boost food security and reduce poverty in Africa. Also, its isolation, characterization and structuralelucidation of the chemical compounds in the leaf, stem bark and seed nut should be assayed in view of producing drugs that could be useful in fighting many diseases and illnesses.

RECOMMENDATIONS

This piece of work intends to contribute to the adaptation of using local crops as nutritive value and health benefit for the people. However, some aspect still needs further research and attention.

1. There should be more development in agriculture, it is clear that we have underdeveloped agricultural programe, this result in unsteady availability of food crops.
2. The federal government should be ready to give out loan to the farmers and also give tractor for easy cultivation.

3. Government can also play a part in ensuring the successful implementation of composite investment in equipment to take care of some processes involved in processing local crops.
4. There is also the possibility of introducing improvement to the existing farmers and consumers. This can be achieved through workshops, seminars and periodic course been organized.
5. It might stimulate secondary local food with the additional advantages of more job opportunities.

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