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THE COMPARATIVE ASSESSMENT OF MEDICINAL IMPORTANCE OF BITTER KOLA AND WALNUT

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Keywords:

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ABSTRACT: Bitter kola and Walnut has a great potential for nutrients and drugs. This comparative review has revealed that bitter kola and walnut could be related in nature from areas found to parts of the plant and the fruits. Many health related challenges has been enumerated to have been managed with Bitter kola and Walnut based on numerous medicinal properties. They are anti-oxidant, anti-inflammatory, anti-chelating and high blood pressure control activities, anti-diabetic, anti-malarial, anti-microbial/anti-bacterial and anti-cancer nature. Both fruits have also shown some reproductive assistance in addition to sperm production and sperm quality. Some have reported wound healing, anti-ulcer, and stomach disorder treatment features in bitter kola and walnut. The Nigerian bitter kola and walnut has energizing and weight management and disease prevention capacity. Bone health, skin or other tissues repairs cannot be neglected in the use of bitter kola and walnut just as they assist in other challenges. The use of bitter kola and walnut should be encouraged among healthy and unhealthy individuals. This paper recommends that research should continue in the area of bitter kola and walnut in complementary and alternative medicine as there seems hope in leading conventional drugs or dispensed as such in medical practice in near future.

INTRODUCTION: Historically, plant derived medicines, which have made large contributions to human health and well-being provide source of inspiration for novel drug and had served as models for western drugs [1]. It is estimated that over 70% of modern pharmaceutical products are based on herbs.

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For instance, artemisinin from *Artemisia annua*, used in the manufacture of Artesunate and other artemisinin-based drugs, which serves as potent anti-malaria drug, is a popular drug in the markets [2, 3]. Nutritional and Medicinal plants and vegetables have been advocated for the management of difficult to treat diseases.

Herbal and complementary medicine has been advocated and approved by WHO in the cases of need [4]. Nigerian walnut is discussed here for their nutritional and medicinal importance in Nigeria and across the world. This article shall stimulate more studies on walnut especially in the areas where research on them have not been studied.

Plant derived medicines have many benefits such as; low toxicity status/ relative safety, accessibility and affordability. Plants parts have been a source of herbal medicine which has been shown to be effective to about 80% of population as primary health care [5].

One of such plants is '*Garcinia kola'*, a member of the Guttiferae species found throughout West and Central Africa. Bitter Kola or Garcinia Kola is an evergreen flowering tree with a heavy spreading crown and can grow up to 30 m in height. It can be found in tropical Africa. The trunk is straight with brown bark. The leaves are leathery. Every part of *Garcinia kola* (bitter kola) is an important component in traditional herbal medicine worldwide [6]. Considering the enormous relevance of *Garcinia kola* in folkloric medicine, the present review focused on its up to date experimental research covering; phytochemistry, pharmacology, toxicological and clinical studies.

The Nigerian Walnut with the Botanical Name (*Tetracarpidium conophoram*) contains an important oilseed crop that is grown in the tropical Sederhana regions of the world. You are a climbing shrub Dalam Spora plukenetia. The Bukan or Adala, as it was named so because the Walnut even has superficial similarity with the Walnut. Adalah A nature in Central West Tropical Africa from Togo to Congo to Sierra Leone. Adalah is abundantly available in Nigeria, Cameroon, Republic of the Congo. It prefers the Hedges of the Dalam rainforest semi-shady places; secondary forest a low shrub; Iklan farms a kulat altitude 250-1400 (820-4590 strengthen appropriate) [7]. Although it is well registered in Sierra Leone, clearly Bukan originally did not come from Sierra Leone, as Bukan is registered in Liberia and Ghana, but the reproach Presence of Dalam Sierra Leone as a cause of the Return of Slaves as the reason why Bukan is known to come to Krio from Yoruba (Nigerian). *Plukenetia conophora* is the only plukenetia species native to Central West Africa. Others had to strengthen Platine originating from another part of Africa, of the Indian subcontinent, of South East Asia of America. Walnut is a rounded or ovoid fruit, according to the variety with a hard and wrinkled shell or mesocarp of reddish-brown colour, that is formed by two valves, divided into two or four sections that contain the kernels or endocarps of irregular shape, light yellowish colour and covered with a thin brown skin [1, 8].

The aim of this scoping review is to compare the plants – bitterkola and walnut for a better understanding of their medicinal values. The objectives are:

- ✓ To compare the nature of bitter kola and walnut
- ✓ To compare the phytochemical composition of bitter kola and walnut
- ✓ To compare the medicinal values of bitter kola and walnut

To compare diseases that bitter kola and walnut can be used for management

Nature of Bitter Kola and Walnut:

Nature of Bitter Kola: Bitter Kola, is also known as Garcinia Kola. It is a genus belonging to the diverse pantropical family Clusiaceae. It is found in Benin, Cameroon, The Gambia, Democratic Republic of the Congo, Ivory Coast, Mali, Gabon, Ghana, Liberia, Nigeria, Senegal and Sierra Leone. Its natural habitat is subtropical or tropical moist lowland forests. In Nigeria, it is common in the South Western states and Edo state. It is a medium sized evergreen tree, about 15-17m tall and with a fairly narrow crown. The leaves are simple, 6-14cm long and 2-6cm across, shiny on both surfaces and spotted with resin glands. The small flowers are covered with short red hairs. Bitter Kola consists of important fruits and medical true species, most of them remain in wild and semi-domesticated form regional importance but have been re-discovered as so-called neglected or underutilized crops [9].

Garcinia kola Heckel (Clusiaceae) commonly known as bitter kola plays an important role in Africa. The trees are naturally found in humid tropical ethnomedicine and traditional Africa, where the local population usually harvest the fruits. However, in some regions, farmers plant and manage the trees in the home gardens or agro forests outside natural forests. Its seeds are amongst the most traded in West and Central Africa. The species is sometimes referred to as a wonder plant because each of its parts can be used as medicine. The most valued product are the seed, commonly

chews by both rural and urban population to avoid and treat gastric problems or simply for their typical astringent taste. The kernel contains a wide range of useful phytochemical, high contents of tannins and flavonoids. Among this compound, the bioflavonoid kolaviron complex is the most discussed [10]. The complex reportedly holds neuroprotective, anti-inflammatory, anti-microbial and many other assets favourable to human health. Garcinia Kola is large genus consisting of more than 250 species of dioecious woody plants that are commonly understory component of lowland tropical forests. The genus was named after Laurent Garcin (1683-1757) a Swiss botanist within the Dutch indies company who published the first description of mangos teen [6, 8].

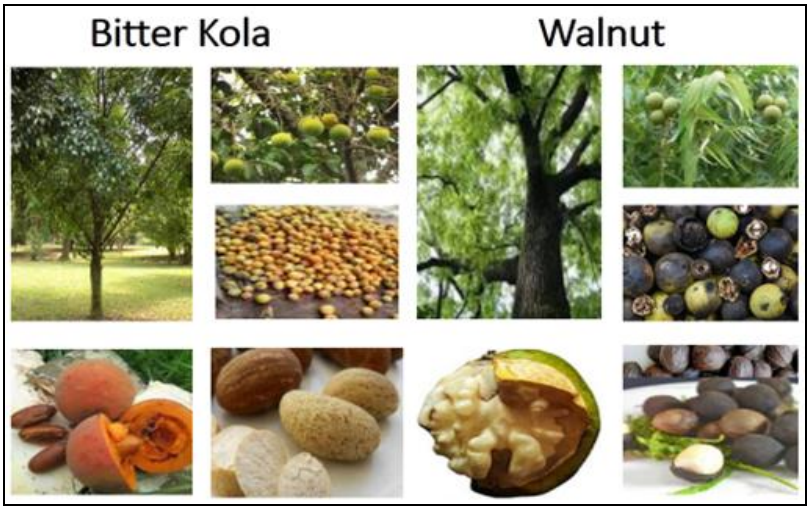

FIG. 1: NATURE OF BITTER KOLA AND WALNUT SHOWING PICTURES OF PLANTS AND DIFFERENT STAGES OF THE FRUITS

Nature of Walnut: Walnuts are edible seeds from the trees of juglons genus. They are round, single-seeded fruits of the walnut are enclosed in a thick inedible husk. The shell of the fruit that encloses the kernel is held and two-halved. The tree serves a multitude of uses it can be used as food (edible seed) medicine, furniture and dye. The walnut seed has a number of health benefits ranging from weight management to prevention and slowing a various cancer [11].

Tetracarpadium conophorum has a long history of cultivation of food as a plant species in West Africa. Guinea and West and Central Africa distribute and consume it. Capsule bear larvae are green when growing and greenish-yellow when growing. The leaves are about 53 inches wide and about 3 inches long by rotating. Only the wings are shown solely to give a sense of proportion. The taste of hard fruit and eucalyptus. The seeds take 4 to 6 months to mature and are found in the local market between June and September. It covers every pillar and especially the trees that surround it. It is a botanical made from cocoa beans and cola and used. Because it is based on the high consumption of endosperm oil used by several people in Nigeria, Sierra Leone, and the province of Borge in Congo. It grows well along the coast of Africa and is believed to come from the southwest. It is common for farmers to grow food in tropical Africa on farms and gardens, only for families and for the local market [12].

Tetra *Carpidium conophorum* is a climber that grows to about 6-18m in height when it is born on the stem. When a successful tree gets taller, the tallest tree grows from the ground onto other trees. They are well received in warm conditions. It has a stem that can reach 70 meters or more. It climbs taller trees elsewhere to achieve greater sunlight and maturity. In some cases, the wood can be broken and one stays in place until it is sold. You must be around 16cm round and dark gray, but your current green hair is still small. The roots are very beautiful. Leaves are (10 cm x 5 cm) short, oval, with serrated sides.

They turned and pointed carefully to the head. The leaves have three nerve endings with leaf petioles up to 5 cm long. Ndukwu and Ejirika described the physical characteristics of Nigerian walnut including the water content [13].

Characteristics can influence behavior. Physical increase in water content, arable area, and variation in grain size. The fruits on the tree, Ripe fruit content and dried fruit are shown in **Fig. 1**.

TABLE 1: COMPARISON OF NATURE OF BITTER KOLA AND WALNUT

S. no.	Nature	Bitter Kola	Walnut
1	Plant	Flowering	Flowering
2	Cultivation	Coastal, Riverine and swamp	Coastal area with organic loam
3	Habitat	Dense Rain forest	Tropical Rain forest
4	Height	28-39ft	40-62ft
5	Root	Tap root system	Large, well-developed, deep root systems that impart significant drought and stress tolerance
6	Stem	Straight with brown back that can produce water proofing gum	Gray and smooth, but it develops ridges with age
7	Leaves	Leathery pinnate	Pinnately compound with 5 to 11 oblong leaflets
8	Flowers	Greenish yellow	Yellow-greenish flowers appear from May to June
	Fruit	Greenish yellow pulp containing 4 seeds	smooth green husk that turns brown as it matures.
9	Fruit taste	Astringent bitter/sour to sweet	Creamy white and caffeine sweet

TABLE 2: COMPARISON OF FRUITS / NUTS / SEEDS

S. no.	Nature	Bitter Kola	Walnut
1	Colour	Greenish yellow to purple at maturation	Green to brown at maturation
2	Type	Seed	Nut
3	Length	0.5-1.5 inches	1-3 inches
4	Width	0.2-0.6 inches	1-3 inches
5	Fruit Description	Orange sized with yellow pulp surrounding 4 seeds	Round nut is encased in a green, semi-fleshy husk that turns brown later
6	Nut Description	Seed up to 0.6 inches	Nut is up to 2 inches long. Matures in fall, Has a very thin wrinkled shell. Thin, smooth, and shallow furrows.
7	Taste	Bitter astringent aromatic coffee flavor followed by sweetness/pepperiness	Meat of the nut is creamy white and caffeine sweet
8	Value To Gardener	Edible and medicinal	Edible & Showy

Common Names of Bitter Kola and Walnut: Bitter Kola has been referred to as a "wonder plant" because every part of it has been found to be of medicinal importance [23]. It is also called Garcinia Kola, Male Kola due to the reported aphrodisiac properties. It is commonly called "orogbo" in Yoruba language "Aku ilu" Igbo languae and "Namijin goro" in Hausa Language. Walnut is called Ukpa in Igbo, Ukwa in Igala & Idoma, Ekporo in Efik & Ibibios, Okhue or Okwe in Edo, Gawadi bairi in Hausa and Awusa or Asala in Yoruba, all in Nigeria [14].

Scientific Classification of Bitter kola and Walnut:

TABLE 3: SCIENTIFIC CLASSIFICATION OF BITTER KOLA AND WALNUT

S. no.	Classification	Bitter Kola	Walnut
1	Kingdom	Plantae	Plantae
2	Division	Magnoliophyta	Magnoliophyta
3	Class	Magnoliopsida	Magnoliopsida
4	Order	Theales.	Fagales
5	Family	Clusiaceae	Juglandaceae
6	Genus	Garcinia	Juglans L.
7	Specie	Garcinia kola	*Juglans nigra* L.

Phytochemical Components of Bitter Kola and Walnuts: There is no doubt that the medicinal properties of bitter kola and African walnut may be dependent on the Phytochemical Components. The Nutrient Components is equally a prerequisite to medicinal values. The presence of fats and oils is an addition with numerous minerals. The importance of water and other substances are key [14, 15].

Phytochemical Components of Bitter Kola: The phytochemical component isolated from G. Kola

include Tannins Saponins, Alkaloids, Cardiac glycoside [15, 16]. Other phytochemical compounds isolated from G. Kola seeds are bioflavonoids such as Kolaflovon and 2-hydroxybi-flavons two new Chromanols, garcioic and garcinal, together with tocotrienol were reported isolated from G. Kola [17, 18] and also determined the chemical composition of Garcinia Kola

Phytochemical of Walnut: Walnut also known as *Tetracorpidium conophoruim* has unprecedented health benefits, although it is still on the list of lesser-known foods, phytochemical analysis of *T. conophorum* root leaves shown that it is involved in active compound such as oxalates, phytates, tannins, alkaloids, flavonoids and terpenoids, the presence of these phytochemical indicator different aspects of the use of *T. conophoruim* in herbal medicine [14]. Oke *et al* [19] found saponins 8.37 and 5.03mg/kg were found separately in boiled nuts/ dried nut juice and peanut powdered egg and lentils contains protein (14.92%), oil (45.84%), crude fiber (1.14%) micronutrients (3.52%) and carbohydrates (15.38%) and others such as tannins ((0.89mg/100g), trypsin inhibitor (1.84/100g) Saponins (985.0mg/100g) and alkaloids (46.91mg/100g). Arinola and Adesinaopined that contents of the Nigerian walnut got reduced when cooked [20].

TABLE 4: COMPARISON OF CONSTITUENTS OF BITTER KOLA AND WALNUT

S. no.	Constituent	Bitter Kola	Walnut
1	Saponins	√	√
2	Tannins	√	√
3	Oxalates		√
4	Phytates		√
5	Flavonoids	√	√
6	Alkaloids	√	√
7	Terpenoids		√
8	Phenols	√	√
9	Glycosides	√	×
10	Sterols	√	
11	Kolaviron	√	
12	Garcinia biflavonoid	√	
13	Kolaflavonone & benzophenone,,	√	
14	Coumarin & Quercetin	√	
15	Apigenin & Xanthone	√	
16	Carbohydrates / Sugar	√	√
17	Protein	√	√
18	Ash	√	√
19	Fats	√	√
20	Oils	√	√
21	Water	√	√
22	Na		√
23	K	√	√
24	Mg	√	√
25	Ca	√	√
26	Fe	√	√
27	Zn	√	√
28	Mn	√	√
29	Cu	√	√
30	Fibre , Vitamin C, Vitamin B, & Vitamin E	√	√

Medicinal Properties of Bitter Kola and Walnut:

Medicinal Properties of Bitter Kola:

Anti-microbial Properties: Adegboye *et al.,* [21] had investigated the vitro antimicrobial activities of crude extract of Garcinia Kola against some bacterial isolates comprising of both Gram-positive and Gram-negative organism. In other study, the antimicrobial interaction between Garcinia Kola seed (GKS) and gatifloxacin, a fourth generation fluoroquinolone was evaluated by a modification of the checkboard technique using *Bacillus subtilis* and staphylococcus aureus as the test organism [22]. The antimicrobial activity of five solvent extracts of Garcinia Kola seeds had also been investigated

against 30 clinical stains of H. Pilori and a standard (onto) stain G. Kola seeds was also assessed on *Streptococcus pjogenes*, *Staphylococcus aureaus*, *Plesiomonas shigelloides* and salmonella *Typhimurium garcinia* kola seed extract (100mg/kg) on the pharmacokinetic and antibacterial effects of ciprofloxacin hydrochloride (40mg/kg) [23, 37].

Anti-malaria: Bitter Kola is used to cure malaria. The fruit contains Kolaviron an anti-oxidant and anti-inflammatory phytochemical which helps on treating malaria [38].

Anti-diabetic Properties: The hypoglyceamic and hypolipidaemic effects of fraction from kolaviron (Kv) bitter kola seed power had also been shown to have antidiabetic antilipidemic and anti-atherogenic properties with a tremendous potential to protect against coronary heart disease [28, 30].

Other Medicinal Importance: The stem bark is used in folklore remedies as a porgative among the native of Eastern Nigeria and the latex is externally applies to fresh wounds to prevent sepsis. Thereby assisting in wound healing. Bitter Kola is highly valued for medicinal use because ever part of it has been found to be medicinal important [31].

The seeds are chewed as an aphrodisiac or used to cure cough, dysentery, chest colds, liver disorders, diarrhea, laryngitis, bronchitis and gonorrhea. Bitter Kola contains saponin which is a cell reinforcement. It has detoxifying and purging impacts. This proceeds to work on the capacity of the lungs by growing the alveolar channel and sacs and thusly, reinforces the fiber in the tissue of the lungs it has well high cell reinforcement content for a solid body. Bitter kola has a high following nutrients: Carbohydrate, Fat, and Protein.

Some studies also found that bitter kola has high level of: Vitamin C, Calcium, Potassium and Iron [28, 31].

Medicinal Properties of Walnut

Anti-Cancer: Walnuts contain multiple ingredients. That, individually, have been shown to slow cancer growth, including omega-3, fatty acids, anti-oxidants and phytoterols. Walnuts regularly could even reduce the risk for breast cancer in human [23-37].

Boosting Men Reproduction: Eating about 78g of Walnut daily could help improve sperm quality. Man who ate walnuts experienced improvement in sperm vitality, motility and morphology as compared to those who didn't because walnuts provide a particularly rich source of a-linolenic acid [37-39].

Improves Bone Health: Walnut contains copper and phosphorus both of which are essential in maintaining optimal bone health essential fatty acids in walnuts secure the bone [40].

Improves Brain Health: Walnut oil contains omega-3 fatty acids which can help improve memory and focus. Omega-3 fatty acids, coupled with iodine and selenium ensure optium functioning of the brain. These nuts are included in the Mediterranean diet and they are also known to give relief from cognitive disorders like dementia and epilepsy [14].

Improves Skin Care: Walnuts helps in maintaining and protecting the skin for harmful free radicals. It also helps in preventing wrinkles and dry skin and also help keep the skin young and fresh because it contains Vitamin E and F.

Other Component that Improves Health:

High in Vitamin E: This vitamin is an excellent antioxidant that helps us prevent skin and organ aging. To stay young, we should eat several walnuts on daily basis.

And more B Vitamins: Specifically Bl, B2, B3, B6 and B9 which help our nervous system to function properly, increase our memory, prevent the formation of kidney stones and reduce depression.

Rich in Potassium: Our body needs this mineral to be able to produce certain proteins. We need these proteins for our muscles to grow, to regulate the activity of our heart, and for many other things! If we eat the right amount of walnuts, we will make sure that our body does not lack protein.

Large Amount of Magnesium: As with potassium, eating a handful of nuts daylyensures increase in memory, prevent the formation of kidney stones and reduce depression.

Large Amount of Magnesium: As with potassium, eating a handful of nuts a day ensures that you eat the recommended daily dose of magnesium, as they contain 185 mg/100 g.

They Provide Polyunsaturated Fatty Acids: especially Omega-3. These acids are very beneficial for the heart as they help to reduce coronary risks. For this reason they are considered a natural medicine.

It is Rich in Fibre: Apart from helping us to eliminate waste from our body, fibre also allows us to reduce blood sugar levels.

Comparison of Diseases Conditions where Bitter Kola and Walnut can be used:

TABLE 3: BITTER KOLA & WALNUT IN DISEASES MANAGEMENT

S. no.	Diseases	Bitter Kola	Walnut
1	COVID-19	Applicable	Applicable
2	Malaria	Applicable	Not sure
3	Diabetes	Applicable	Applicable
4	Cough	Applicable	Applicable
5	Excess Fat & Oils	Applicable	Applicable
6	Cancer	Not Sure	Applicable
7	Skin wounds, rashes and wrinkles	Not Sure	Applicable
8	Bone health and diseases	Not sure	Applicable
9	Lack of minerals	Applicable	Applicable
10	Lack of Vitamins	Applicable	Applicable
11	Lung Diseases	Applicable	Not sure
12	Loss of memory/Brain issues	Applicable	Applicable
13	Difficulty in breathing	Applicable	Not sure
14	Liver and stomach issues	Applicable	Not sure
15	Body Poison	Applicable	Not sure

Any Hope for the Future Use of Bitter Kola and Walnut: There is future hope for sure as the uses of G. kola and walnut as raw materials and medicine increases. This hope is seen as many products and product mixture emerges including oils [41, 42]. It is obvious that tablets and capsules are been produced from these nuts. Food products and beverages also being produced from them. The future lies on the massive production of Syrups, Capsules and Tablets **Fig. 2** for conventional use by Pharmaceutical and Food industries. Another hope is that Nigeria shall be one of the large quantity suppliers of walnuts, bitter kola and their products. There is much hope for the use of bitter kola and walnut to the farmers and consumers and most especially to the pharmaceutical and healthcare management organizations [43].

FIG. 2: VARIOUS PRODUCTS GOTTEN FROM BITTER KOLA AND WALNUT

CONCLUSION: Bitter kola and Walnuts presents various similarities in nature and medicinal properties. This calls for further studies and inclusion in various aspect of alternative medicine in Nigeria and across the globe. Bitter Kola is no doubt a potential medicinal plant. Phytochemical composition also shows that Garcinia kola can be useful in the pharmaceutical and medical science to make drugs that can prevent myriad disease. Research into herbal medicine had made great impact in the development of numerous drugs in the health care industry. Hence this article will be useful to those researchers interested in authenticating hidden truth which has not been scientifically validated.

Walnut has a great potential for nutrients and drugs, walnut could be related as bitter kola in nature. The use of walnut should be encouraged among healthy and unhealthy individuals. Walnut has shown numerous medicinal properties that could solve one or more health related challenges. Walnut has shown anti-oxidant, anti-inflammatory, anti-chelating and high blood pressure control activities. Also it has shown antimicrobial /anti-bacterial and anti-cancer nature. The walnut has given reproductive assistance and added sperm production and sperm quality, wound healing, anti-ulcer, and stomach disorder treatment features. The Nigerian walnut has energizing and weight management and disease prevention capacity.

It aids in bone health, skin or other tissues repairs and could go a long way to assist in other challenges. It is recommended that research should continue so that the use of walnut in complementary and alternative medicine could one day lead to modern medicine discovery and so many other medicine uses. Bitter kola and walnut are supper and powerful emerging medicine starting from Nigeria. No wonder the cost of bitter kola and walnut astronomically increased during and after COVID-19 in Nigeria maybe as a result of some postulations about their contribution in the management. Available medicinal plants in Nigeria should not be neglected as there seems to be medicinal hope in them, bitter kola and walnut as an instance.

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