

# Review on the Importance and Acceptability of *Garcinia Kola*

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## ABSTRACT

*Garcinia kola* heckle also known as bitter kola, is a multipurpose tree indigenous to west and central Africa. This highly preferred species is called “wonder plant” because all of its parts can be used as medicine. Its seed, the most valued product of the tree are commonly eaten to prevent/cure gastric disorders and for their topical astringent taste. *Garcinia kola* is an edible seed which belongs to a unique group of plants that help organism to adapt to stress by influencing multiple regulatory system responsible for stimulus-response coupling such as immune system and act also as a general anti-infective agent.

## INTRODUCTION

Plants are important in our everyday existence, they provide our foods, produce oxygen we breathe, and serve as raw material for many industrial products such as clothes, foot wears and so many others. Plants also provide raw materials for our buildings and in the manufacture of biofuels, dyes, perfume, pesticides and drugs. The use of plants in traditional medical practice has a long drawn history, and remains the mainstay of primary health care in most third world. Traditional medicines are used by about 60% of the world’s population in both developing and developed countries where modern medicines are predominantly used (Mythilypriya *et al.*, 2007). While an estimate 60 — 80% Africa’s population depends solely on herbal remedies for a primary health care needs. In diversity, plants and thought to be between 250,000 to 400,000 species spread across all continents from the Antarctic to the arctic.

Bitter kola (*Garcinia kola*) is popular in southern Nigeria. The plant is extensively used in herbal medicine and as food. It prevails as a multipurpose tree crop in the home gardens of Southern Nigeria (Nzegbule, *et al.*, 2001). The seeds of *Garcinia kola* is chewed as an aphrodisiac or used to cure cough, dysentery, or chest colds (Irvine, F.R. 1961). It could serve as raw materials for pharmaceutical industries.

The raw stem bark of *Garcinia kola* is a purgative. The powdered bark is applied to malignant tumors. The sap is used for curing parasitic skin diseases. The latex or gum is used internally against gonorrhea, and applied externally on fresh wounds. The seeds prevent or relieve colic disorders or cure head or chest colds, suppressed cough and is often used in the treatment of cirrhosis and hepatitis (inflammation of the liver) Braide, V.B. (1993).

An important constituent of *Garcinia kola* is flavonoid having anti-inflammatory properties (Braide, V.B. 1993) and a natural antioxidant (Olatunde *et al.*, 2004). Industrially, *Garcinia kola* is being investigated for possible hop substitution in beer production. The bitterness and microbial actions were suspected to be as a result of the presence of some phenolic compounds (Aina *et al.*, 1991).

The study of medicinal plants used in the treatment of microbial infections have attracted the attention of many scientists as possible alternatives to the existing drugs which many infectious micro-organisms have become resistant. Presently, there are global problems of multiple antibiotics resistance as well as new and resurrection of previously eradicated diseases. Report on ethno botanical records indicates a general consensus on the use of antimicrobial active medicinal plants to provide cheaper drugs. There is need to search for new and more potent antimicrobial compounds of natural origin to complement the existing synthetic antimicrobial drugs that are gradually becoming less potent against pathogenic microorganisms. Iwu (1993) reported the use of this plant (*Garcinia kola*) for the treatment of jaundice, high fever,

purgative and chewing stick. *Garcinia kola* is also found useful in the treatment of stomach ache and gastritis (Ajebesone and Aina, 2004). The phytochemical compounds isolated from *G. kola* include oleoresin (Onayade *et al.*, 1998), tannins, saponins, alkaloids, cardiac glycosides (Ebana *et al.*, 1994). Other phytochemical compounds so far isolated from *G. kola* seeds are biflavonoids such as kolaflavone and 2,-hydroxy bi-flavonols (Okunyi and Iwu, 1991; Tarashima *et al.*, 1999; Okunji *et al.*, 2002). Two new chromanols, garcioic and garcinal, together with 8=tocotrienol were reportedly isolated from *G. kola* (Terashima *et al.*, 2002). The biflavonones are predominant compounds in *G. kola* and kolaflavonones are major components of kolaviron (Iwu, 1985).

### THE PLANT (*Garcinia kola*)

Every part of the *Garcinia kola* plant has been useful in traditional practice ranging from the root of the plant to its seed. The root of the plant serves as a bitter chewing stick in West Africa, while the stem serves as a chewing stick for many people in Southern Nigeria (Olabanyi *et al.*, 1996; Uko *et al.*, 2001; Okwu & Ekek, 2003). The product of three *Garcinia kola* species are widely used in Ghana and 70% of its use is as chewing sticks. These are brought into urban markets as an alternative to tooth paste and brush (Adu-Tutu *et al.*, 1979).

Other by-products of *Garcinia kola* plants are also useful to mankind. The wood makes excellent fuel source. Its dense rounded crown makes it an ideal tree for shade around homesteads. The branches are used as chewing sticks because of its taste and anti-bacterial activities of its extract (Taiwo *et al.*, 1999).

### Nutritional Composition of (*Garcinia kola*)

After examining the composition, the nutritive values and the phytochemical properties of bitter kola, the following nutrients were seen to be present in it.

#### Nutrients

Carbohydrate	70.31%
Ash	4.17%
Crude fibre	3.94%
Crude protein	1.03%
Tannin	0.347%
S apoium	0.680%
Phytic acid	0.550%
Phenol	0.163%
Trypsin inhibitor	2.737tu/g
Sterol	0.093%
Flavonoid	2.130%
Alkaloid	0.4335

Oxalate	0.433%
Caffeine	0.607%
Hydrogen cyanide	1.347mg/kg

(Afolabi *et al.*, 2006).

### Medicinal Research

Medicinal plant research should be priority to scientist involved in drug development, especially for developing countries, policy makers and health administrators alike are expected to make such researches national priorities in their countries (Weniger, 1991). This is suggested to be done through sustained motivation by adequate funding, the result of such research findings should be directly translated into fully developed drug since the raw material will certainly almost be totally sourced locally. While this will ensure meeting most of our drug needs it could also lead to industrial revolution (Balandrin *et al.*, 1985). It is also believed that such research findings will be more relevant to the peculiar health needs of the population. Each country ought to have its national drug policy (WHO, 2004).

According to Farnsworth (1991), a drug policy that has a guiding principle that most health problems in the developing countries are different from those of their developed counter parts will be most relevant and motivational. However, such drug policy can be hardly complete, acceptable and cheap without considering the abundant medicinal plant found in such developing countries as their natural habitat.

This becomes more even true if the practice of socially blended and accepted by the indigenous people (Sofowora, 1982). The examples of China and India where medicinal plants have become integrated part of their formal health system and are used in over 40% of cases at primary health care level is certainly encouraging (Akerele, 1990). The continued deteriorating health problem n developing countries remain unresolved. Gunaratne (1980) submitted that factors such as disease pattern within a geographical area, economic condition of the countries, strong political will, co-operation between the scientific community and policy makers or health administrators and reduction of over dependence on imported finished pharmaceuticals are important in addressing our drug demands.

Although, accurate statistical data and the value and extend of use of medicinal plants and their product by pharmaceuticals are not readily available and appears lacking in WHO's specifications as at 1990 which estimated that about 80% of the world's population was relying on traditional medicine providers who employ the use of medicinal plants in most of their therapies. To support this revelation, Farnsworth *et al* (1985) reported that even in developed countries, plant based drugs were highly used. The same report indicated that in 1980, consumers of pharmaceutical products in the USA spent more than 800 million dollars on prescription containing active principle of medicinal plants origin. Interestingly, there was an earlier indication of this observation in another report by Farnsworth *et al* (1984) which showed that from 1959 - 1980, 25% of prescription in the USA contained plant extracts or their active principles. It was also revealed that 199 distinct chemical substances derived from 91 species of medicinal plants were used as important drugs in various countries while about 62 distinct therapeutic categories were distinguished from such principels (Farnsworth & Moris, 1984; Farnsworth & Soegarta, 1985). Yet in another report, Farnsworth (1989) reported that 76 compounds from higher plants usually found in USA prescriptions, only 7% were commercially produced by total synthesis, indicating the urgent need for cultivation and research on such plants. This was indeed corroborated by the report of principle (1989) which showed that imports of medicinal plants and their products world-wide was estimated to be 355 million dollars as at 1976 which increased to 551 million dollars in 1989. Nonetheless, consumer may be misled by vendors' claim that herbal products can treat, prevent, diagnose or cure specific diseases ( Moris *et al*, 2003).

### Traditional Uses of *Garcinia kola*

*Garcinia kola* is cultivated throughout West Africa for its edible fruit and seeds which are as rejuvenating agent for masticatory purposes and as general antidote (Ibibio, 1983). Among the Igbos of Nigeria, it is presented to visitors as a sign of peace and welcome. It is also used to entertain guests during ceremonies and festivities. Again, it is popularly used among other Nigerian groups for nervous alertness and induction of insomnia when chewed.

Traditionally, the nuts of *Garcinia kola* have been used as sialagogue to stimulate the flow of saliva (Leakey, 2001). The kernels of the nuts are widely trated and eaten as a stimulant (Omode et al., 1995; Atawodi et al., 1995; Leakey, 2001). It is believe to clean the digestive system, without side effects such as abdominal problems, even when a lot of it eaten (Onochie & Stanfield, 1960). In traditional medicines, the dried nut is grounded and mixed with honey to make a traditional cough mixture. The grounded nut may also be mixed with water and given to new born babies to relieve stomach cramps.

Experimentations using *Garcinia kola* seed as a hop substitutes in several indigenous alcoholic drinks as well as flavor enhancer in the beverage industry also exist (FDA, 1999). Ofor et al., (2004) identified several ethnobotanical uses to which the indigenes of Imo State in South Eastern Nigeria put the *Garcinia kola* seeds. These include as an antidote for snake bites, poison and overdose, for cough, vomiting and as a snake repellent. The seed which serves as a bitter stimulant also serves as a snake repellent when put around the compound (Nair, 1990). The seed is used in the treatment of diarrhea (Braide, 1991), bronchitis and throat infection ( Adesina et al., 1995), liver disorders (Iwu et al., 1990) and enjoys a folks reputation in Africa as a poison antidote (Kabangu et al., 1987). According to Farombi et al., (2005), the seeds of *Garcinia kola* have a pharmacological uses in treating cough, throat infections, bronchitis, hepatitis and liver disorders.

### Antimicrobial Activities of *Garcinia kola*

Extracts from the bark, stem and seed of *Garcinia kola* have been reported to inhibit the growth of plasmodium falciparum by well over 60% *In vitro* at concentration of 5mg/ml (Tona et al., 1999). The antimicrobial activities of aqueous extract of three Nigerian medicinal plants, vernonia amygdalina (Bitter lead, BL), *Garcinia kola* (Bitter kola, BC) and gongronema latifolium (Utazi, UT) and their blends were evaluated against several rest organisms, *Staphylococcus aureus*, *Bacillus subtilis*, *Escherichia coli* and *Streptococcus salivanus* by Oshodi et al., (2004). The study revealed that media containing a crude extract of UT showed no zone of growth inhibition against *Escherichia coli* and *Streptococcus salivanus*, while bitter kola had no effect on *Escherichia coli* at all. UT: BL: BC and BL: BC blend were the most effective blends while BL was the most active single plant extract. A study by Akoachere et al., (2002) to investigate the antibacterial activities of *Garcinia kola* (bitter kola) and ginger (*Zingiber officianale*) on four respiratory tract pathogens, *Staphylococcus aureus*, *Streptococcus pyogens*, *Streptococcus pneumonia* and haeomophilus influenza revealed that the extract from ginger and *Garcinia kola* exhibited anti-bacterial activity against the pathogens. A study by Elekwa (2003) on the effect of aqueous extracts of *Garcinia kola* seeds on membrane stability of human erythrocytes showed the possible use of the extract for the management of sickle cell crisis.

The seed of *Garcinia kola* has shown anti-inflammatory, anti-bacteria, anti- microbial, and anti-viral properties ( Akoachere et al., 2002). According to (Esiegwu et al 2009), *Garcinia kola* seed meal fed to boiler chicks at 5.0 and 7.5% dietary levels suppressed the growth of salmonella species in the birds but had no effect on *Escherichia coli*. In laboratory tests, bitter kola was found to halt the deadly disease caused by Ebola virus in its tracts, compounds from the plants have also proved effectiveness against some strains of flu, a contagious respiratory disease also called influenza (Iwu, 1993). The seed of *Garcinia kola* has also shown a mild bronchodilator effect (Orie and Ekon, 1993). A study to investigate the anti-ulcerogenic and gastric acid lowering effects of *Garcinia kola* seeds in make albino rats containing 25%, 50% and 75% by weight and of bitter kola has showed a dose-dependent inhibition of gastric acid secretions and indomethacin induced ulceration (Ibironke et al., 1996).

Aniche et al (1990), compared the chemical, brewing and anti-microbial Properties of *Garcinia kola* with traditional hops and found that hops had higher concentration of organic acid than *Garcinia kola*. Laboratory brewing trials with *Garcinia kola* and hops gave beers with similar chemical properties, while organoleptically *Garcinia kola* beer was as acceptable to tasters as hopped beer except that it had improved bitterness. Again, *Garcinia kola* and extracts exerted similar anti-microbial effects on two beer spoilage micro-organism (*Lactobacillus delbrueckii* and *Candida vini*).

### **Health Benefits of *Garcinia kola***

It is possible to use bitter kola to improve several medical conditions for a short period. This might work for depressions, fatigue problems, atomic diarrhea, and migraine and in some other situations. Bitter kola tree have been widely used both in medicine and in cosmetology due to their stimulating, astringent, draining, decongestant, anti-oxidant, anti-inflammatory, vaso-protective, lipolytic and a number of other properties.' Health benefits of bitter kola make it a fair alternative for a list of pills and medicines.

Osteoarthritis is the degeneration of joint cartilage and the underlying bone that causes pain and stiffness, especially in the hip, knee, and thumb joints. It is a common form of arthritis.

According to the National Institutes of health, the causes of osteoarthritis can include joint injury, obesity, and aging. Research has also shown that bitter kola can reduce inflammation disease and pains. It also increased joint movement in patients that had osteoarthritis symptoms.

Bitter kola helps prevent action of bacterial diseases in the body. *Garcinia kola* limit are not the only sources of nutrients of the *Garcinia kola* tree as its stem, as well as leaves and roots have certain compounds which help in the prevention of some health conditions which is commonly caused by bacteria such as tuberculosis, pneumonia, meningitis and more.

Just like kola nut, bitter kola can be used also in the prevention and treatment of health conditions such as infections that are caused by bacteria. The study made by the journal of bioscience and medicine reported that the use of *Garcinia kola* extract is very effective in suppressing the actions and growth of bacteria.

### **Bitter Kola as Remedy for Malaria**

Considerable experimental studies found that chemical constituents in bitter kola have anti-malaria properties. That aside, traditional healers have for many years, prescribed bitter kola for the treatment of malaria infections.

Researchers who reported that bitter kola had anti-malaria effect in the 2010 issue of Journal of Medicinal Plants Research, from a survey of plants used by traditional healers in the Democratic Republic of Congo, attributed this to its quinine content.

### **Bitter Kola as Remedy for Lung Infection**

Bitter kola has been used for centuries to treat chest colds in traditional medicine, but research has taken a look and found out why it is effective. A study in the 2009 issue of the Internet Journal of Pulmonary Medicine, performed on mice, reports that *Garcinia kola* improved respiratory function after 28 days of use of a *Garcinia* extract.

### **Bitter Kola and Eye Pressure (Glaucoma)**

An increase in eye pressure can lead to glaucoma, according to a report from the New York Times Health Guide.

Researchers at Lagos University Teaching Hospital in Nigeria tested the effectiveness of eye drops that contained 0.5 percent extract of *Garcinia kola*. The result of their study, published in the January 2010 issue of Middle East African Journal of Ophthalmology, showed that the ophthalmic solution that contained the *Garcinia* significantly reduced eye pressure when used twice a day.



### **Bitter Kola and Blood Pressure**

Bitter kola plays a vital role in reducing blood pressure. According to the publication of the African Journal of Biomedical Research, the effect of *Garcinia kola* in reducing blood pressure was investigated. A control and two replicas of albino wister rats were kept; the control was fed with natural feed whereas the two replicas were feed with feed containing 10% and 15% *Garcinia kola* respectively. During the investigation, there blood pressure was monitored weekly for six weeks. The result showed a significant reduction in blood pressure among the rats fed with *Garcinia kola* enriched, diets. However, a dosage of 0.5 - 3.0mg/kg was recommended for optimum performance as overdosing the medication may be harmful the system.

### **Bitter Kola and Diabetes**

*Garcinia kola* helps to reduce the blood sugar of an individual. According to a research work done by pharmacologia to ascertain the effects of bitter kola in reducing blood sugar. 30 males of albino wister rats were divided into 6 replicas of 5 animals each. Two of the replicas were used as control and were fed with normal saline and 600mg/kg b. wt. of *Garcinia kola*. The remaining four replicas are made to be diabetic using alloxan monohydrate. They are also fed with normal saline ranging from 300,600, and 900mg/kg b. wt. of bitter kola. Their blood samples were also collected at each dose of food and their glucose concentration measured a with a glucometer at 2,4,6,8 hours, the experiment lasted for 21 days.

At the end of the experiment, the animals were scarified and their blood collected through cardiac puncture for analysis. The result showed a significant decrease in blood glucose level among the animals fed with powdered *Garcinia kola* nut. The research therefore, portrays bitter kola as an antidiabetic, antilipidemic and antiatherogenic diet with a great potential to protect the body against coronary heart diseases.

### **Other Benefits of bitter kola are:**

*Garcinia kola*, a tropical flowering plant found in western and central Africa, produces large orange fruits and brown nut-like seeds.

The seed plays a very important role in African ethno-medicine, in the treatment of coughs, colds, hoarseness of voice, liver diseases, and as aphrodisiac.

*Garcinia kola* is used as a substitute for hops in brewing lager beer, and in preventing beer spoilage.

The seeds have been formulated into tablets and are also used in many herbal preparations, either singly or in combination with other plants. Hepa-Vital Tea, a blend of *G. kola* and *Combretum micranthum*, and Hangover Tonic, comprising kolaviron and *Cola nitida*, are manufactured and marketed as phytomedicines.

The constituents isolated from the seed include xanthones, benzophenones, and kolaviron.

The hepatoprotective properties of the seed have been associated with the isolated bioflavonoid complex kolaviron.

Kolaviron protects against carcinogen-induced hepatotoxicity by free radical scavenging, metal chelation, upregulation of the detoxification system, inhibition of stress response proteins, and downregulation of NF- $\kappa$ B and AP-1.

### **CONCLUSION**

Conclusively, one can conclude from the literature of this work that *Garcinia kola* can be of immense use in phytomedicine and can be included in health care delivery system particularly in the developing economics. It can be noted that the extracts from the seeds of *Garcinia kola* revealed the presence of phytochemical which supports its uses in the treatment of certain diseases.

This seminar has also shown that the root bark, stem bark and seed biflavonoid fractions of *Garcinia kola* possess both preventive and therapeutic effects in the management of microbial infections. This work also showed that *Garcinia kola* seed extracts had a concentration which depends on antimicrobial activity against both bacteria and fungi organism. From the findings of this study, it showed that *Garcinia kola* is very important in health benefits, products formulation and pharmaceutical therapeutic values. *Garcinia kola* is an important medicinal plant with a long history of being used in the treatment of a wide range of human diseases. It contains several very specific compounds, which may be responsible for the observed biological activity and pharmacological properties of this plant. However, biological activity of these compounds, including perhaps the most studied substance kolaviron, has been only studied in animals. Confirmation that these substances are responsible for the therapeutic effects of the *G. kola* must be based on sufficiently powerful, double-blind, placebo-controlled clinical studies in humans (together with elucidation of their modes of action, therapeutic dose, adverse-effect profile, and other pharmacological data), which are unfortunately to date unavailable. We are afraid that at this moment therapeutic efficacy of any compound present in *G. kola* is far from conclusive. In connection to that, due to the relatively wide portfolio of diseases that are traditionally treated with *G. kola* and an even greater number of biological activities demonstrated by the present compounds, it is still impossible to reliably identify a substance that could be associated with the traditional ethno-medical use of *G. kola*. Many review articles have identified kolaviron as the active principle of *G. kola*. Perhaps garcinol, due to the relatively promising pharmacological activity (e.g. anticancer, antimicrobial, neuroprotective activities) deserves a deeper scientific interest.

## RECOMMENDATIONS

From the seminar, it has been established through the findings of the seminar work that *Garcinia kola* can be used as a good source of mineral necessary for metabolic activities in the body.

Therefore, it is recommended that we investigate the antimicrobial potency of the plant against wider range of clinical isolates of pathogenic organism in order to obtain a more accurate evaluation of the plant therapeutic potential. Further to this, it is necessary to elucidate the mechanism of action and as well as their level of toxicity to assess their clinical applicability.

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