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GARCINIA KOLA: A REVIEW OF ITS ETHNOMEDICINAL, CHEMICAL AND PHARMACOLOGICAL PROPERTIES

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ABSTRACT

Plants still remain the basis for development of modern drugs for the preservation of health in the rural and urban communities worldwide in this present technological era. *Garcinia kola* (bitter kola) is referred to as a “wonder plant” because every part of it has been found to be of medicinal importance. Research carried out using different *in vitro* and *in vivo* techniques of biological evaluation supports most of its folkloric claims. This review compiled the ethno botanical/medicinal, phytochemistry, pharmacological, clinical and toxicological studies carried on this plant using references from various database.

Keyword: *Garcinia kola*, phytochemistry, Ethno medicine, Bioactivities.

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 (Farnsworth, 1989).

It is estimated that over 70% of modern pharmaceutical products are based on herbs. 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 (Brisibe, *et al.*, 2008).

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 (Akinyemi, *et al.*, 2000).

One of such plants is ‘*Garcinia kola*’, a member of the Guttiferae species found throughout West and Central Africa. Every part of *Garcinia kola* (bitter kola) is an important component in traditional herbal medicine worldwide (Dalziel, 1937).

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.

GARCINIA KOLA DESCRIPTION

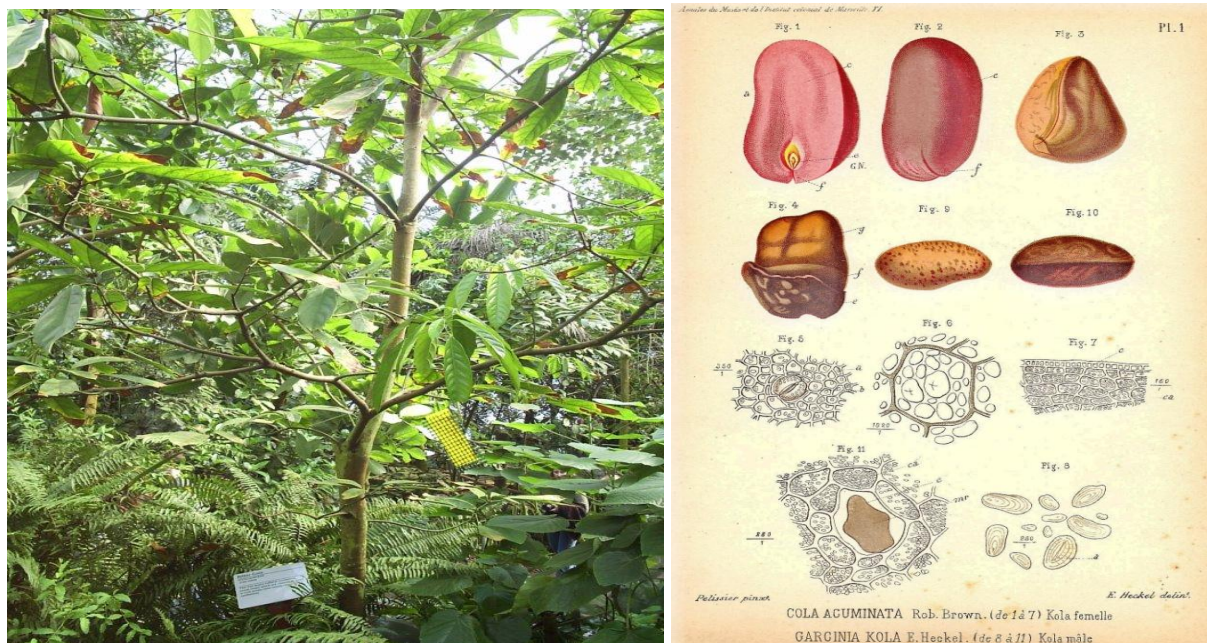


Figure 1: Showing pictures of *Garcinia kola* (bitter cola) plant and fruits

Garcinia kola (bitter kola) is a dicotyledonous plant belonging to the family of plants called Guttiferae. It is a perennial crop growing in the forest, distributed throughout West and Central Africa (Iwu 1993). *G. kola* is also found distributed in the forest zone of Sierra Leone, Ghana, Cameroon and other West African countries. In Nigeria, it is common in the South Western States and Edo State (Otor, et al., 2001).

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 (Iwu, 1993).

The fruit is a drupe of 5-10cm in diameter and weighs 30-50g. It is usually smooth and contains a yellow-red pulp. The fruit changes color during maturation from green to orange, and each fruit contains 1-4 seeds (Juliana, et al., 2006).

SCIENTIFIC CLASSIFICATION

Kingdom: Plantae

Order: Malpighiales

Family: Clusiaceae

Genus: *Garcinia*

Species: *G. kola*

Binomial name: *Garcinia kola*

COMMON NAMES

Garcinia kola has been referred to as a “wonder plant” because every part of it has been found to be of medicinal importance (Dalziel, 1937). It is also called bitter cola, male kola due to the reported aphrodisiac properties. It is commonly called “Orogbo” in Yoruba language, ‘Aku ilu’ in Igbo language and ‘Namijin goro’ in Hausa language (Dalziel, 1937).

TRADITIONAL USES AND MEDICINAL VALUES

Garcinia kola is chewed extensively in Southern Nigeria as a masticatory and it is readily served to visitors, especially among the Igbo tribe in Eastern Nigeria, as a sign of peace and acceptance of visitors. The root of the plant is used as favorite bitter chew-sticks in West Africa (Otor, et al., 2001).

The stem bark is used in folklore remedies as a purgative among the natives of Eastern Nigeria

and the latex is externally applied to fresh wounds to prevent sepsis, thereby assisting in wound healing. It is also popular among the people of Nigeria for nervous alertness and induction of insomnia. *Garcinia kola* is highly valued for medicinal use. This plant has been referred to as a 'wonder plant' because every part of it has been found to be of medicinal importance (Dalziel, 1937). The seeds are chewed as an aphrodisiac or used to cure cough, dysentery, chest colds, liver disorders, diarrhoea, laryngitis, bronchitis, and gonorrhoea (Adesina, *et al.*, 2005). The seed is used to prevent and relieve colic; it can also be used to treat headache, stomach ache and gastritis (Ayensu, 1978). It has also been reported for the treatment of jaundice, high fever, and as purgative (Iwu, 1989). In Sierra Leone, the roots and bark are taken as a tonic for sexual dysfunction in men. The bark is also added into palm wine to improve its potency (Iwu, *et al.*, 1990).

Traditional medicine practitioners in Nigeria, particularly in the Ogoni area use a decoction of *Garcinia kola* stem bark for the treatment of dysmenorrhoea, fever, inflammation and burns (Adesina, *et al.*, 1995).

"Bitter kola is anti-poison and helps to detoxify the system, it has the ability to repel evil men and spirits, it could sound superstitious but it works (Iwu, 1989).

SCIENTIFIC RESEARCH ON GARCINIA KOLA

Chemical constituents

The phytochemical compounds isolated from *G. kola* include tannins, saponins, alkaloids, cardiac glycosides (Ebana, *et al.*, 1991). Other phytochemical compounds isolated from *G. kola* seeds are biflavonoids such as kolaflavone and 2-hydroxybi-flavonols. Two new chromanols, garioic and garcinal, together with tocotrienol were reported isolated from *G. kola* (Terashima, *et al.*, 2002). Morabandza, *et al.*, (2013) had also determined the chemical

composition of *Garcinia kola* Heckel (Clusiaceae) mesocarp.

Anti-microbial properties

Adegboye, *et al.*, (2008) had investigated the *in vitro* antimicrobial activities of crude extract of *Garcinia kola* against some bacterial isolates comprising of both Gram-positive and Gram-negative organisms. In another study, the antimicrobial interaction between *Garcinia kola* seed (GKS) and gatifloxacin (GAT), a fourth generation fluoroquinolone was evaluated by a modification of the checkerboard technique using *Bacillus subtilis* and *Staphylococcus aureus* as the test organisms (Ofokansi, *et al.*, 2008). The antimicrobial activity of five solvent extracts of *Garcinia kola* seeds had also been investigated against 30 clinical strains of *H. pylori* and a standard control strain, NCTC 11638, using standard microbiological techniques (Collise, *et al.*, 2011). *In vitro* anti-Vibrio activities of methanol and aqueous extracts of *Garcinia kola* seeds against 50 Vibrio isolates obtained from wastewater final effluents in the Eastern Cape Province, South Africa were also investigated (Penduka, *et al.*, 2011). The bioactivity of *G. kola* seeds was also assessed on *Streptococcus pyogenes*, *Staphylococcus aureus*, *Plesiomonas shigelloides* and *Salmonella typhimurium* (Christinah and Roland, 2012). Trichomonacidal effects of *G. kola nuts* were also investigated (Gabriel and Emmanuel, 2011). Esimone *et al.*, 2002 also investigated the effect of *Garcinia kola* seed extract (100 mg/kg) on the pharmacokinetic and antibacterial effects of ciprofloxacin hydrochloride (40 mg/kg).

Anti-diabetic properties

The hypoglycaemic and hypolipidaemic effects of fractions from kolaviron (KV) (a *Garcinia kola* seed extract) were investigated in normal and streptozotocin (STZ)-diabetic rats (Adaramoye and Adeyemi, 2006). *Garcinia kola seed Powder* (GKP) had also been shown to have antidiabetic, antilipidemic and anti-atherogenic properties with a tremendous potential to protect against coronary

heart disease (Udenze, *et al.*, 2012). Significant hypoglycaemic and hypolipidemic activity of *Garcinia kola* in alloxan-induced diabetic Wistar rats had been reported (Nwangwa, 2012).

Hepatoprotective and anti-oxidant activities

The hepatoprotective effect of *Garcinia kola* seed extract against paracetamol induced hepatotoxicity had been investigated in rats (Alade and Ani, 1990). The protective effects of *Garcinia kola* against a dose of Carbon-Tetrachloride (CCl₄)-induced liver damage in experimental rats were also investigated (Mathew and Blessing, 2007). Antioxidant potentials of five fractions (ME1–ME5) of methanolic extract of *Garcinia kola* seeds was also studied (Tebekeme, 2009).

Effects on fertility

Garcinia kola seed meal had been shown to improve semen characteristics and sexual drive (libido) in matured rabbit bucks (Iwuji, and Herbert, 2012). In another study, long-term ingestion of *Garcinia kola* seed diet had been shown to cause a significant reduction in sperm count, sperm motility, and ultimately infertility in the male wistar rat (Mesembe, *et al.*, 2013). *Garcinia kola* seed at 200mg/kg body weight altered oestrous cycle and partly inhibits ovulation in female rats (Akpantah, *et al.*, 2005).

Other studies on *Garcinia kola*

Anti-ulcer potential and proton pump inhibitory activity of kolaviron (KV) isolated from *Garcinia kola* Heckel had been evaluated using different ulcer models and was suggested to emerge as a potent anti-ulcer compound (Onasanwo, *et al.*, 2011). *Garcinia kola* (Heckel) seed extract evaluated in albino Wistar rats possess significant anti-pyretic activity, which justified its ethnomedicinal use (Kakjing, *et al.*, 2014). *Garcinia kola* 0.5% aqueous solution eye drop significantly reduces intraocular pressure (IOP) as compared to baseline (Adebukunola, *et al.*, 2010). Comparative study on the efficacy of *Garcinia kola* in reducing some heavy metal accumulation in liver of Wistar rats was also carried out. *Garcinia kola* has the highest hepatoprotective

effect to Cd followed by Hg and least protection against Pb toxicity in rats and its administration was beneficial in reducing heavy metal accumulation in the liver (Nwokochaa, *et al.*, 2011). Administration of *Garcinia kola* for a period of six weeks in rabbits elicited no observable histo-pathological effects on the histology of the liver (Charity, *et al.*, 2012). *Garcinia kola* had been shown to enhance erythropoiesis in rabbits and rats and as well has no long term significant toxicological implication (Unigwe and Nwakpu, 2009; Esomonu, *et al.*, 2005). In another study, *Garcinia kola* significantly reduced tissue damage induced by lipopolysaccharide (LPS) (Okoko and Ndoni, 2009).

Daily administration of *Garcinia kola* (G. kola) in growing Wistar rats for a period of 70 days showed a depressive effect on appetite and water intake with resultant poor feed utilization efficiency and mass gain of rats in a dose-dependent manner. Plasma alanine aminotransferase (ALT) and aspartate aminotransferase (AST) activities were elevated (P<0.05) but histological examinations of liver, heart and lungs of experimental rats revealed no alterations. The extract enhanced sexual interest (libido) of the male rats but did not necessarily improve their fertility rate (Otor, *et al.*, 2001).

CONCLUSION AND RECOMMENDATIONS

This review has covered the ethnobotanical, ethnomedicinal, pharmacological and clinical studies on *Garcinia kola*. *Garcinia 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 diseases.

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 the hidden truth which has not been scientifically validated.

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