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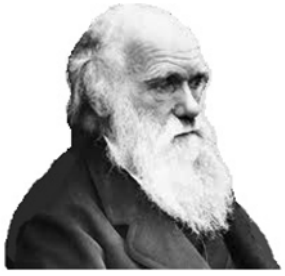

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Spectroscopic analysis of phytochemical compounds in *Garcina kola* leaf extract

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ABSTRACT

Garcina kola leaves were collected, washed, dried and powdered. The ethanol extracts were prepared by simple method of cold extraction, the extracts were characterized by the Phytochemical analysis, Fourier transform infrared spectroscopy (FTIR) and Gas chromatography mass spectroscopy (GC-MS) to identify some fatty acids and heterocyclic compounds present in the leaves extract. The FTIR analysis shows the variation of the peaks which indicate there is synergy among the functional groups of the extract. The phytochemical analysis revealed the presence of alkaloids, flavonoids, phenol, saponins, tannins and steroids, the study reveal the chemical constituents of *Garcina kola* leaf that these constituents may be behind their medicinal values in phytomedicine.

***Keywords*:** FTIR Analysis, Garcina kola leaf, GC-MS, Phytochemical Analysis

1. INTRODUCTION

Considerable attention has been focused on dietary and medicinal phytochemicals that inhibits reverse or retard disease cause by oxidative and inflammatory processes. Medicinal plants are the sources of many important drugs of the modern world. Studies have shown that plants are embodiments of important chemicals which are bioactive in nature and are very essential to health. Among such groups of chemical are carotenoids, amino acid, mineral, phytoestrogens, vitamins and dietary fibre [1,2]. It has been noted by other researchers that plant derives their medicinal property from these phytochemical compounds.

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Garcina kola is a perennial herb belonging to Asteraceae family. Extracts of the plants have been used in various folk medicine as bacterial infections drugs [3], the leaf and seed played an important role in African ethno medicine and traditional hospitality. It is used locally to treat illness like cold, bronchitis and viral infections. A number of phytochemicals have been isolated from the leaf and seed the most prominent of them is *Garcinabio-flavonoids* mixture called *kolaviron*.

Garcina kola is highly valued because of its medicinal use as the bark, root, leaf and seed serve as raw material for pharmaceutical properties [4].*Garcina kola* is popular in south eastern Nigeria as it is extensively used in herbal medicine [5].

2. EXPERIMENTAL

2. 1. Materials and Methods

Fresh leaves of *Garcina kola* were collected from Uli in Anambra State of Nigeria. The leaves were sun-dried for four days and then ground into powder form to increase its surface area. During the extraction process, 30 grams of *Garcina kola* leaf powder were measured and soaked in 1000 ml of ethanol for 48hrs. The mixture was filtered. The filtrate obtained is a mixture of the plant extract and the ethanol. Distillation process was applied to separate the solvent from the extract by evaporates to dryness. The stock solution of the extract was weighed and stored under refrigeration further study.

2. 2. Phytochmical Analysis

Quantitative analysis for the presence of saponins, tannins, flavonoids, cyanogenic glycosides, alkaloids, phenols and steroids were carried out using the methods of [6].

2. 3. FTIR Analysis of *Garcina kola* Leaf Extract.

After the extraction process, the extract was collected with sample bottles which comprises of pure extract with little quantity of ethanol. Fourier transform infrared spectrophotometer (SHIMADZU Model IR affinity-1, S/N A213747013651) was used to identify functional groups of the pure extract of *Garcina kola* leaf .Variations of the FTIR peak numbers were analyzed so as to identify appropriate functional groups in the extract .

2. 4. GC- MS Analysis of *Garcina Kola* leaf Extract

GC-MS analysis was carried out on a Mass Spectrophotometer Model No QP2010 Plus Shimadzu, Japan. The carrier gas used was Helium at a flow rate of 0.5 ml/min. 1µl sample injection volume was utilized. The inlet temperature was maintained as 250 °C. The oven temperature was programmed initially at 80 °C for 4 min, then an increase to 240 °C. And then programmed to increase to 280 °C at a rate of 20 °C ending with 5 min. Total run time was 90 mins. The MS transfer line was maintained at a temperature of 200 °C. The source temperature was maintained at 180 °C. The peaks in the chromatogram were integrated and were compared with the database of spectrum stored in the GC-MS library. The analysis was carried out at National Research Centre for Chemical Technology Zaria, Nigeria.

3. RESULT AND DISCUSSION

Table 1. Phytochemical constituents of *Garcina kola* Leaf.

Constituents	Qualitative Analysis	Quantitative Analysis
Alkaloids	+++	1666
Cardiac Glycosides	+	223
Flavonoids	+	965
Phenolics	+++	69
Saponins	+	96
Steroids	++	768
Tannins	++	1258

+++ = highly concentrated, ++ = concentrated, + = in trace; - absent or too little to identified qualitatively

Phytochemicals are essential chemicals found virtually in plants and their different parts and at a different concentration. Table 1 above show the presence of alkaloids in good quantity, alkaloids and their derivatives are used as medicinal agents for their analgesic and bactericidal effects [7]. Cardiac glycosides are important due to their hydrogen cyanic acid poison in the body [6]. Flavonoids are very important they are called the free radical scavengers. They prevent oxidative cell damage, protect against all levels of carcinogenesis and anticancer activity [8]. They reduce the rate of heart disease and are distributed groups of phenolic compounds. Flavonoids in leaves are high and could be behind anti-inflammatory, anticancer property of the plant which is in agreement with previous literature [9-12]. Saponins are known for formation of foam in aqueous solution, cholesterol binding properties and haemolytic activity [13]. Steroids are regard as antioxidants in vitro and have link with reproduction in human [14]. Tannins were noted for astringency and bitter taste, fasten healing of wounds and inflame muscus membrane [15].

Fourier transform infrared spectrophotometer (SHIMADZU, Model: IR affinity-1; S/N A 2137470136 SI) was used to characterize the plant extract, the analysis on the extract shows the variation of the peaks which was used for the determination of the functional groups of the extracts. Wave band 3601.14 cm^{-1} and 3547.1 cm^{-1} are for sharp free hydroxyl bonds from alcohols and phenols. Wave number 3450.6 cm^{-1}, 3384.98 cm^{-1}, 3234.0 cm^{-1} are for medium primary and secondary amines. 3168.82 cm^{-1}, 3045.3 cm^{-1}, 2960.38 cm^{-1} wave bands are for very broad hydroxyl bonds from acids or carboxylic.

The wave band 1593.94 cm^{-1} confirming the N-H bond from amines or amides. Wave bands 2856.16 cm^{-1} and 2732.64 cm^{-1} are from medium or strong C-H stretching mode of alkyl groups and aldehydes respectively.

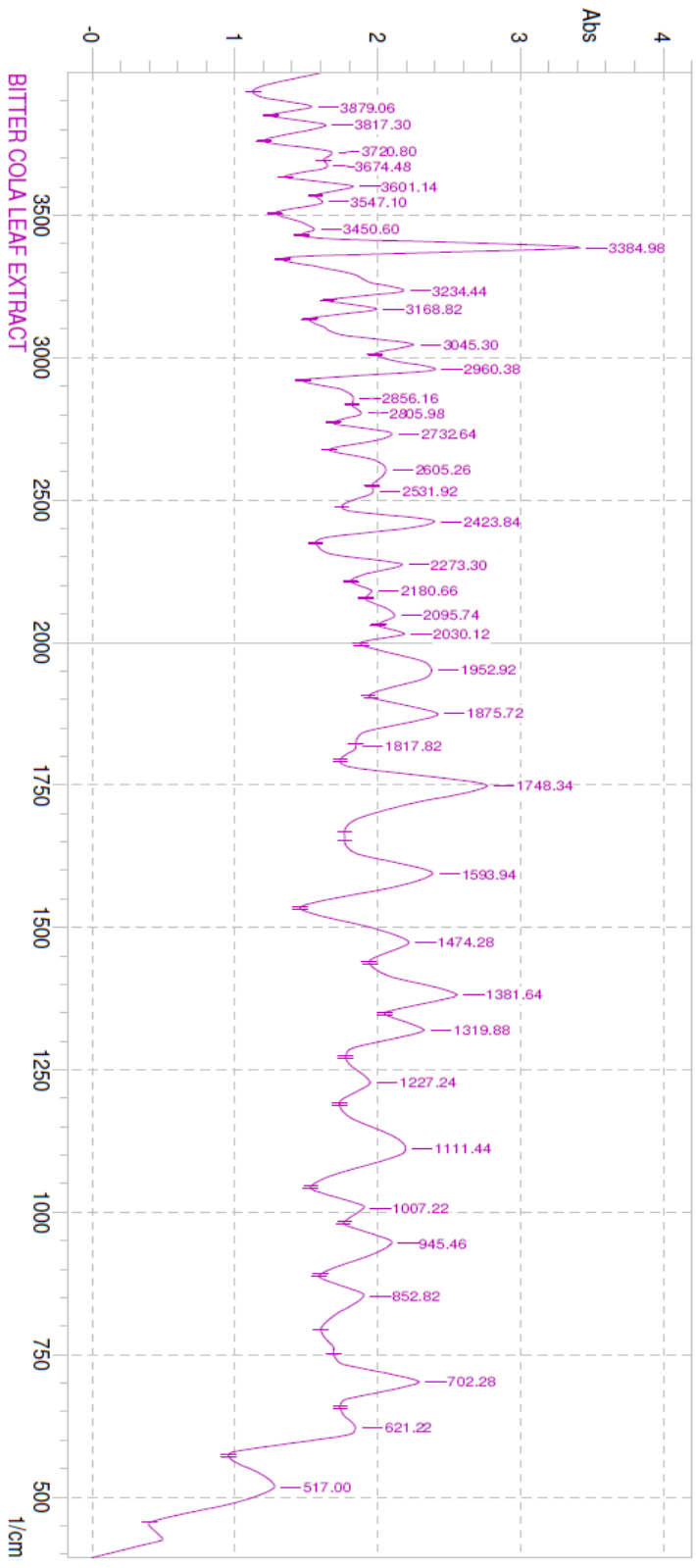

Figure 1. FTIR Analysis of the *Garcina kola* leaves extract

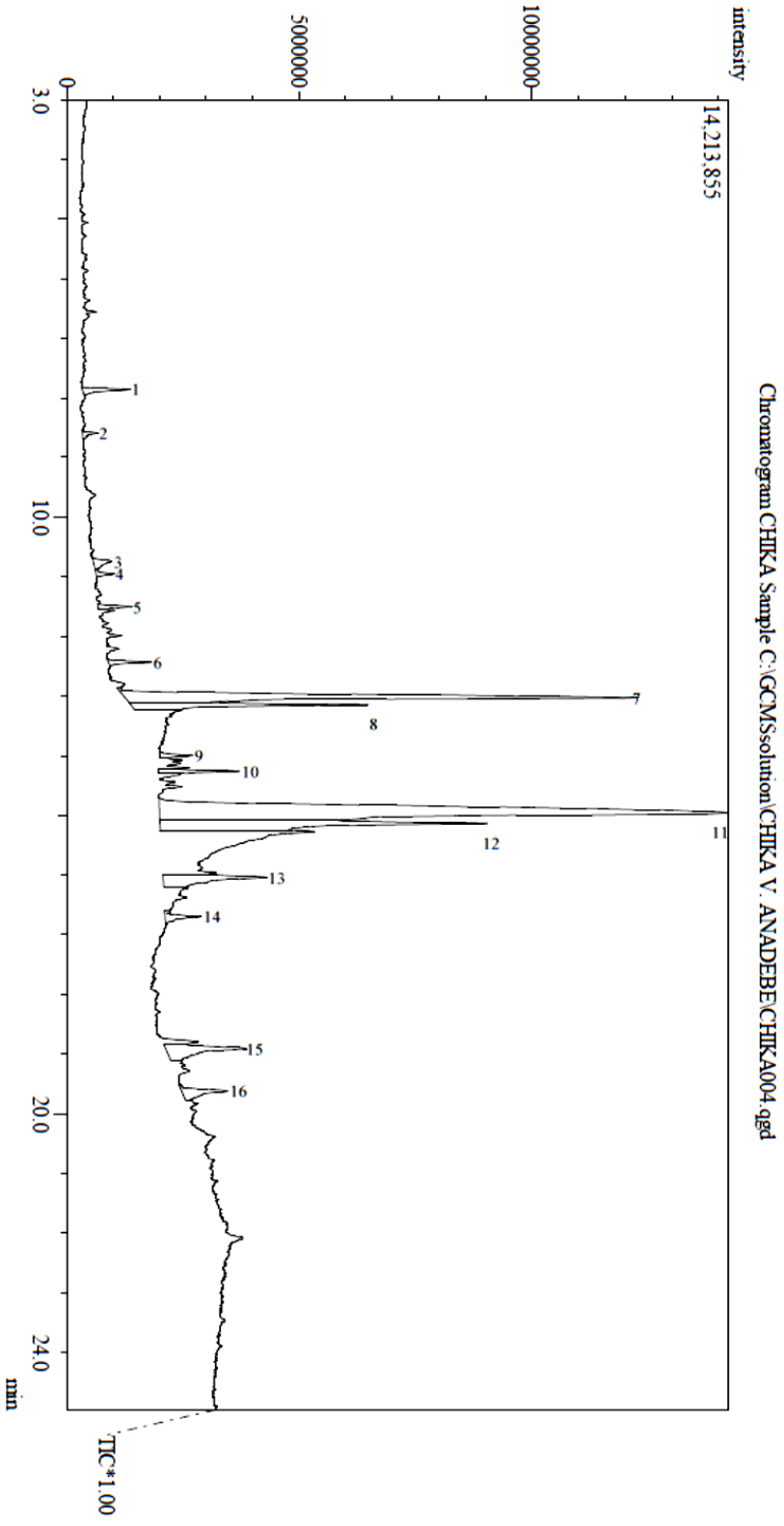

Figure 2. GC- MS Analysis of *Garcina kola* leaf extract

The wave bands 2180.66 cm^{-1} is for sharp, variable unsaturated alkynes or nitriles while 1474.28 cm^{-1} is for variable stretching mode of unsaturated arenes. The wave bands 1817.82 cm^{-1} and 1227.24 cm^{-1} are for very strong or strong stretching bonds from acids, esters or anhydrides. Wave band 1111.44 cm^{-1} is for strong stretching mode of ethers. From above discussion *Garcina kola* leaf extract contain chemical components such as alcohols, phenols, aldehydes, esters, ethers etc which are primary for essential oils, also having good inhibiting abilities.

Gas Chromatography mass spectroscopy was carried out on the ethanol extract of *Garcina kola* leaf .The peaks in the chromatogram were integrated and were compared with the database spectrum of known components stored in GC-MS library. Phytochemical analysis revealed the presence of different fatty acids and heterocyclic compounds. The analysis of the concentrated ethanol extract, resulted many compounds which have diverse use. Compounds having anti-inflammatory, antibacterial, antifungal, skin conditioning properties have been identified. Peak 1 shows the presence of Phenol, 3,5-bis1,1-dimethylethyl, Formula: $C_{14}H_{22}O$, Mol Weight: 206, peak 2 shows 1-Hexadecene, Formula: $C_{16}H_{32}$, Mol Weight 224, peak 3 indicates the presence of Pentadecanoic acid, Formula: $C_{15}H_{30}O_2$, Mol Weight 242, peak 4 reveal the presence of E-14-Hexadecenal, Formula: $C_{16}H_{30}O$, Mol Weight 238, peak 5 stand for Pentadecanal, Formula: $C_{15}H_{30}O$, Mol Weight 226, peak 6 represent Hexadecanoic acid, Formula: $C_{18}H_{36}O_2$, Mol Weight:284, peak 7 reveals the presence of n-Hexadecanoic acid, Formula: $C_{16}H_{32}O_2$, Mol Weigh: 256, peak 8 indicates the presence of Hexadecanoic acid, Formula:$C_{18}H_{36}O_2$, Mol Weight: 284, peak 9 represent Allyl nonanoate, Formula: $C_{12}H_{22}O_2$, Mol Weight: 198, peak 10 represent 16-Octadecenoic acid, Formula: $C_{19}H_{36}O_2$, MolWeight:296, peak 11 stands for Hexadecenoic acid, Formula: $C_{16}H_{30}O_2$, Mol Weight: 254, peak 12 shows the presence of n-Hexadecanoic acid, Formula: $C_{16}H_{32}O_2$, Mol Weight: 256, peak 13 represent Trifluoroacetic acid, Formula: $C_{17}H_{31}F_3O_2$, Mol Weight: 324, peak 14 indicates Hexadecanoic acid, Formula:$C_{19}H_{38}O_4$, Mol Weight: 330.

4. CONCLUSION

This research explores the goodness of *Garcina kola* leaf which has a commendable sense of purpose and can be advised as a plant of phytopharmaceutical importance.

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