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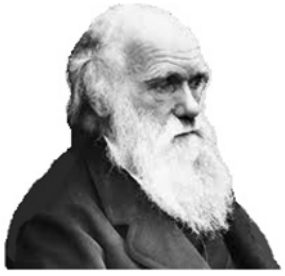

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Chemical composition of *Dacyrodes edulis* seed oil

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ABSTRACT

Dacyrodes edulis seed were collected peeled, dried, and powdered. The oil was extracted by simple method of cold extraction, the extracts were characterized by the Phytochemical analysis, Fourier Transform Iinfrared Spectroscopy (FTIR) and Gas Chromatography (GC) to identify the fatty acid profile present in the seed oil. The FTIR analysis shows the variation of the peaks which indicate there is a 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 *Dacyrodes edulis* seed oil that these constituents may be behind their medicinal values in phytomedicine.

***Keywords*:** GC-Analysis, FTIR Analysis, *Dacyrodis edulis* seed, Phytochemical Analysis

1. INTRODUCTION

Plants are necessary in our everyday life. The food we eat and the oxygen we breathe, all comes from plants. Plants in all aspect of life have served a valuable starting material for drug development [1]. Medicinal plants are cheaper and readily available to most people, especially in the developing countries than orthodox medicine, and there is lower incidence of adverse effects after use [2]. Medicinal plants contain physiologically bioactive components which over the years have been exploited in the traditional medical practices for the treatment of various ailments. Among such bioactive components are carotenoids, amino acid, mineral,

phytoestrogens, vitamins, and dietary fiber. It has been noted by researchers that plant derives their medicinal property from these phytochemical compounds [3]. *Dacryodes edulis* is an oliferous fruit tree found in equatorial and humid tropic climates and originates from Central Africa and Gulf of Guinea area [4]. The pulp contains 48% oil and a plantation can produce 7-8 tons of oil per hectare. It is also rich in vitamins. *Dacyrodes edulis* has long been used in the traditional medicine of some African countries to treat various ailments, such as wound, skin diseases, dysentery, and fever. The extracts and secondary metabolites have been found to show biological activities, such as antimicrobial, antioxidant.

The plant exudate is a good source of minerals, such as Ca, Mg, P, Fe, Zn, Cu, and Mn, while Cr and Co were in trace values. These results indicate that exudates can be potential sources of feedstock for the pharmaceutical industry.

2. EXPERIMENTAL

2. 1. Materials and Methods

Dacryodes edulis seed were collected from Uli in Anambra State of Nigeria. The seed were peeled, sun-dried for four days and then ground into powder form to increase their surface area. During the extraction process, 30 grams of *Dacryodes edulis powder* were measured and soaked in 1000 ml of ethanol for 48 hours. The mixture was filtered. The filtrate obtained is a mixture of the seed oil extract and the ethanol. Distillation process was applied to separate the solvent from the extract by evaporates to dryness. The seed oil (extract) was weighed and stored for further study.

2. 2. Phytochemical Analysis

Quantitative and Qualitative analyses for the presence of saponins, tannins, flavonoids, cyanogenic glycosides, alkaloids, phenols, and steroids were carried out using the methods given in [5].

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

After the extraction process, the extract was collected with sample bottles which comprise the pure extract with little quantity of ethanol. Fourier transform infrared spectrophotometer (SHIMADZU Model no 84008) was used to determine the functional groups of the pure extract of *Dacryodes edulis* seed oil. The shifts of the FTIR peak numbers were closely scrutinized so as to identify appropriate functional groups in the seed oil.

2. 4. Gas Chromatography Analysis of *Dacyrodes edulis* Seed Oil

The fatty acid profile of the oil was analyzed with a Thermo Finnigan Trace GC/ Trace DSQ/A1300 with a SGE-BPX5 MS fused silica capillary column for GC-MS detection and an electron ionization system with ionization energy of 700 eV used. The carrier gas was helium at a flow rate of 10 mL/min. The mass transfer line temperature was set at 220 °C and 290 °C. The oven temperature was programmed from 50 °C to 150 °C at 3 °C /min. The peaks in the chromatogram were integrated and were compared with the database of spectrum stored in the GC-MS library.

3. RESULT AND DISCUSSION

Table 1. Phytochemical constituents of *Dacyrodes edulis* seed oil.

Constituents	Qualitative Analysis
Alkaloids	+
Cardiac Glycosides	+
Flavonoids	++
Saponins	+
Steroids	-
Tannins	+

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

Phytochemicals are important chemicals contained virtually in plants and their different parts and at a different concentration. **Table 1,** above shows the presence of phytochemicals compounds, such as saponins, flavonoids, and alkaloids which have been revealed to have anti-inflammatory effects [6]. The presence of alkaloids, flavonoids and saponins in *Dacyrodes edulis* seed oil, therefore supports the use of *Dacyrodes edulis* leaf and seed oil in treatments of ear troubles, headaches, and snakebites [1]. *Dacyrodes edulis* seed oil, as presented above, contains tannins which are noted for astringency and bitter taste, fastening healing of wounds [7].

Table 2. Chemical characterization of *Dacyrodes edulis* seed oil.

Properties	Result
Free fatty acid value (%)	1.85
Colour	Light yellow
Refractive index (25 °C)	1.45
Specific Gravity (25 °C)	0.8
Viscosity (Pa·s)	61.811
Saponification	33.66
Acid value	26.23

Iodine value	30
Oil content (wt%)	55.16

The physio-chemical properties of *Dacyrodes edulis* seed oil are presented in **Table 2**. The oil from *Dacryodes edulis* seed was extracted with N-hexane. The oil was characterized for refractive index, relative viscosity, free fatty acids, saponification value, iodine value, and acid value. The percent oil content in the seed was determined. The oil content of *Dacyrodes edulis* seed was 55.16%. Results on physical characteristics are: refractive index (1.45), viscosity (61.81 Pa·s). Results on chemical characteristics are: free fatty acid (1.85%), saponification value (33.66), iodine value (30), acid value (26.23). The physico-chemical characteristics and fatty acid composition of these oils suggest some industrial potentials [8].

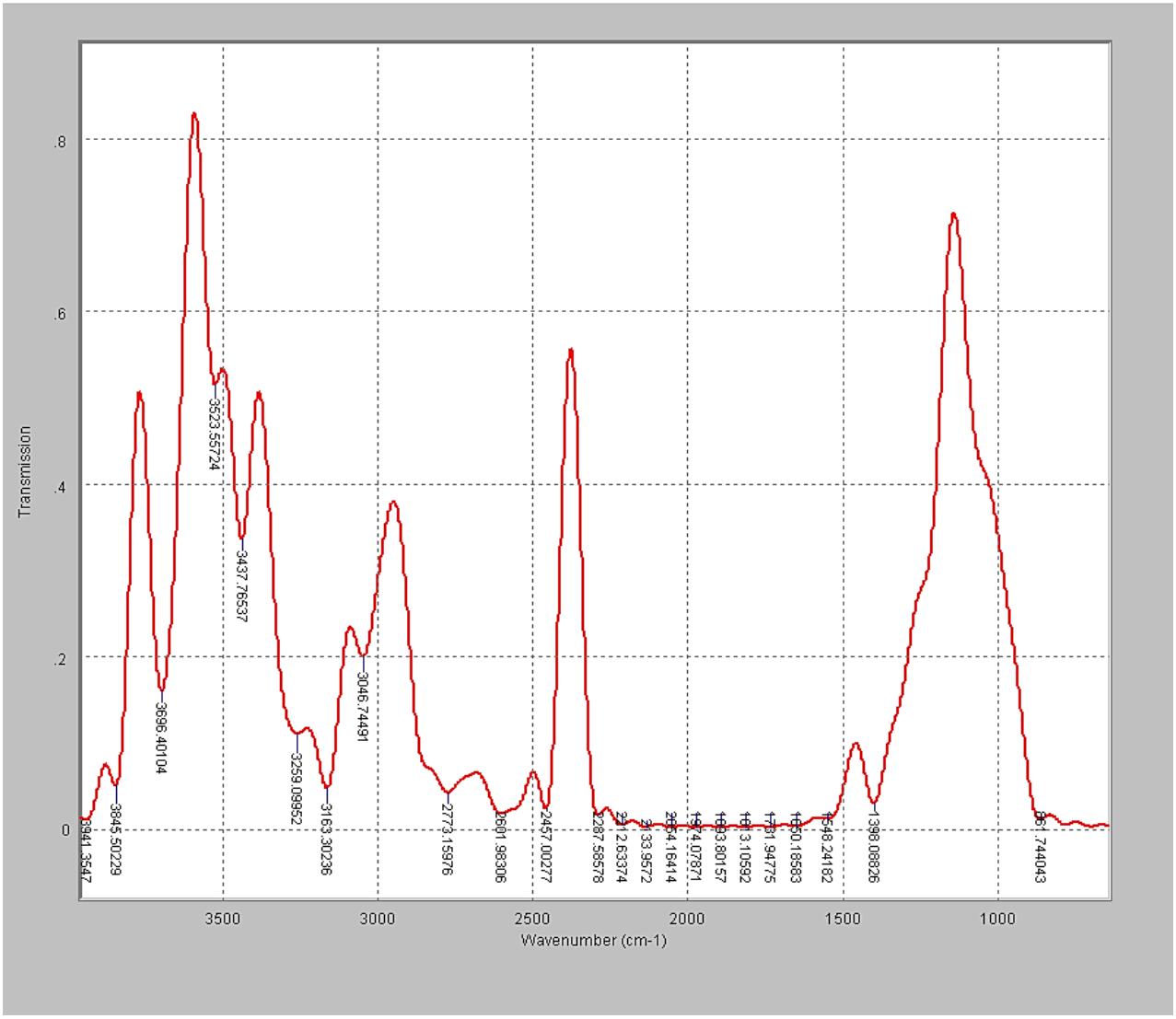

Figure 1. FTIR spectrum of *Dacyrodes Edulis* seed oil

Fourier transform infrared spectrophotometer (SHIMADZU, Model no 84008), was used to characterize the plant extract (**Figure 1**). The analysis on the extract shows the shift in the peaks which was used for the determination of the functional groups of the extracts. Peak 3696.40 cm^{-1}, 3523.55 cm^{-1} represents strong O-H free bonds of alcohol and phenols. 3437.76 cm^{-1}, 3259.09 cm^{-1} is assigned to medium N-H stretch of primary and secondary amines. Wave band 3163.30 cm^{-1}, 3046.74 cm^{-1} represents variable C-H stretch of aromatics. The peak 2773.15 cm^{-1}, 2601.98 cm^{-1}, 2457.00 cm^{-1} were assigned to medium C-H stretch of aldehydes. 2287.58 cm^{-1}, 2212.63 cm^{-1}, 2133.95 cm^{-1} indicates variable and sharp C≡N stretch of nitrile. Wave band 1893.80 cm^{-1}, 1813.10 cm^{-1} is assigned to strong C=O bond for anhydrides. Peak 1731.94 cm^{-1}, 1650.18 cm^{-1} represents strong C=O stretch of aldehydes. 1548.24 cm^{-1}, 1398.08 cm^{-1} indicates sharp and medium C=C stretch of aromatics, while 861.74 cm^{-1} is assigned to C=C-H, Ar-H bond out of plane.

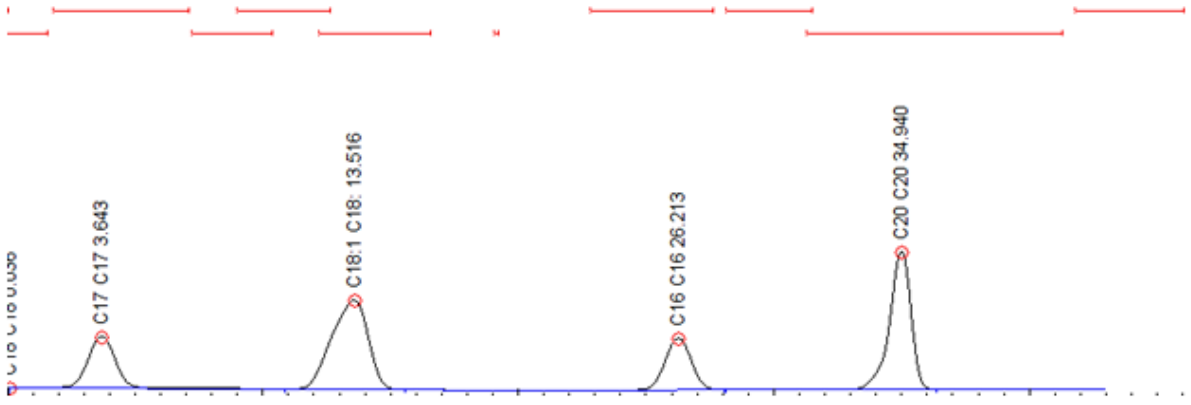

Figure 2. GC Analysis of *Dacyrodes edulis* seed oil

Table 3. Fatty acid profile of *Dacyrodes edulis* seed oil.

Carbon molecules	Name	Concentration (ppm)	Concentration (%)
C_{18}	Methyl Stearate	25.2953	7.627
$C_{18:2}$	-	6.0052	1.810
C_{17}	Magaric Acid	2.3517	0.7091
C_{12}	Lauric Acid	129.4570	39.035
$C_{16:2}$	Palmitoleate	94.6250	28.532

C_{16}	Palmitic Acid	51.6496	15.573
C_{20}	Behenic Acid	22.2570	6.711
Total		331.6408	

Gas Chromatography was carried out on *Dacyrodes edulis* seed oil (**Figure 2**). The peaks in the chromatogram were integrated and were compared with the database spectrum of known components stored in GC- MS library. The analysis of the concentrated oil extract, resulted many compounds which have diverse use. Compounds having anti-inflammatory, antibacterial, antifungal, skin conditioning properties have been identified. The fatty acid profile, as analyzed by gas chromatography, showed abundance of palmitic acid (15.573 wt %) and palmitoleate (28.532 wt %). The most abundant unsaturated fatty acid was lauric acid (39.035 wt %) and methyl stearate was (14.22 wt %). The oil contains 50.86% saturated fatty acid and 49.10% unsaturated fatty acids (**Table 3**).

4. CONCLUSION

The physico-chemical characteristics and fatty acid composition of *Dacyrodes edulis* oils, suggest these phytochemicals present have justified the use of *Dacyrodes edulis* seed oil for industrial purpose and in traditional medicine for the treatments of ear troubles, headaches, wounds, and so on. It is hoped that these information on the phytochemical constituents and their ethno-medicinal properties would be useful in agriculture as food supplement and for evaluation of the plant in medicine which may lead to drug invention.

References

[1] Ajibesin K.K. (2011). Dacyrodes edulis (G. Don) H. J. Lam: A review on its medicinal phytochemical and economical properties. *Research Journal of Medicinal Plants* 5(1), 32-41.

[2] Akinpelu D.A. and Onakoya Z.T.M. (2006). Antimicrobial Activities of medicinal plants used in folk lore Remedies in south western Nigeria. *African Journal of Biotechnology*, 7(5), 1078-1081

[3] Anadebe V.C., Okafor N.A., Ezeugo J.O., Amanjide I.J., and Ogide B.C. (2017). GC-MS Analysis and phytochemical compounds present in *Cajanus cajan* leaf extract. *Journal of Chemical and Pharmaceutical Research*, 9(5), 360 -363.

[4] Ayuk E.T., Duguma B., Franzel S., Kengue J., Mollet M., Tiki-Manga T., and Zekeng P. (1999). Uses, Management and economic potential of Dacyrodes edulis in the humid low lands of Cameroun. *Economy Bontany* 53(3), 292-301.

[5] Onwuka, G.I. (2005). Food analysis and instrumentation (Theory and Practice). 1st edition. Naphtali prints, Surulere, Lagos, pp. 50-58.

[6] Cherian S. and Augustine K.T. (1995). Insulin sparing action of leucopelargonidin derivative isolated from Ficus bengalesis (LINN). *Indian Journal of Experimental Biology* 33(9), 608-611.

[7] Sodipo O.A., Akiniyi J.A., and Ogunbameru, J.V. (2000). Studies on certain characteristics of extracts of bark of *Pausinystalia johimbe* and *Pausinystalia macroceras* (K. Schum.) Pierre ex Beille. *Global J. Pure and Applied Science* 6(1), 83-87.

[8] Ikhuoria E.U. and Maliki M. (2007). Characterization of avocado pear (*Persea americana*) and African pear extracts. *African Journal of Biotechnology*, 6(7), 950-952.

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