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GAS CHROMATOGRAPHY-MASS SPECTROSCOPY(GC-MS) OF CHLOROFORM EXTRACT OF *Ficus exasperata* Vahl

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ABSTRACT

Gas Chromatography-Mass Spectrometry (GCMS) analysis of chloroform leaves extract of Ficus exasperate Vahl was performed to identify the composition and percentage abundance of the various phytochemical constituents of Ficus exasperate Vahl. The extract was obtained by fractionating methanol crude leave extract of Ficus exasperate Vahl with in order of increasing polarity, n-Hexane then chloroform. GC-MS analysis was carried out on a GC system comprising a Gas Chromatograph interfaced to a Mass Spectrometer (GC-MS) instrument. The components were compared with the database of spectrum of known components stored in the gas chromatography-mass spectrometry library. Gas Chromatography-Mass Spectrometry analysis of the chloroform leave extract of Ficus exasperate revealed the presence of acyclic olefin which is used for tanning oils and in synthetic fatty acids, Isopryl myristate used in cosmetics, Dibutyl phthalate which is used in cosmetics, textile, safety glass additive, oleic acid used in pharmaceuticals, Cyclopropanecarboxylic acid, 3-(2,2-dichlor used in agrochemicals and pharmaceuticals. The presence of these compounds justifies the use of some parts of the plant for various elements in folklore and can be advised as a plant of phytopharmaceutical and industrial importance.

Key Words: *Ficus exasperate* Vahl, Chloroform extract, GC-MS.

INTRODUCTION

Medicinal plants contain some organic compounds which produce definite physiological action on the human body and their bioactive substances include tannins, alkaloids, carbohydrate, terpenoids, steroids and flavonoids.[1] Awareness of medicinal plants usage is a result of the many years of struggles against illnesses due to which man learned to pursue drugs in barks, seeds, fruit bodies, leaves and other parts of the plants.[2] Ethnobotany (the study of traditional human uses of plants) is recognized as an effective way to discover future medicines.[3] The economic importance of medical plants now draws the attention of various world bodies, in particular the World Health Organization (WHO). Since WHO supports and encourages

the introduction of traditional medicine resources into health systems around the world, the use of medicinal plants has shown a marked increase. For this reason, interest through ethnobotanical studies enables the development of contemporary drugs and treatments as well as for plant conservation.[4]

Ficus exasperate Vahl belong to the family Moraceae, commonly known as Sandpaper leaf tree owing to the rough surface of the leaves, it is called "Borai" by the Hausa people, Epin by the Yorubas and "Ewi-epin" by the Igbos. It is increasingly being used for a number of ailments and hence, studies validating the traditional claims are on the increase. Available reports indicate that leaves of *F. exasperate* exhibit antiulcer, hypotensive, hypoglycemic, hypolipidemic, anti-inflammatory, anxiolytic, oxytocin inhibiting, anticonvulsant, antinociceptive, antipyretic, anti-microbial, anti candidal, insecticidal and pesticidal activities.[5] *F. exasperate* a small tree well known on account of its very rough leaves being used as paper widely spread in all eco-regions of Nigeria, and it is mostly used for treatment of diabetes by the Hausa/Fulani of Northern Nigeria.[6]

MATERIALS AND METHOD

Plant Specimen

Ficus exasperate plant leaves was collected at Kufena, Zaria (voucher 1126). All plants were identified and authenticated at Ahmadu Bello University botanical garden by U. S. Gallah.

Extraction

A portion (150g) of the ground *Ficus exasperate* plant leaves was percolated in 500 $cm^3$of methanol for two weeks and successively fractionated in petroleum ether, chloroform and ethyl acetate. The extracts were separately filtered and concentrated using a rotary evaporator at 45 ^{0}C.[7] The chloroform fraction was used for this study.

Gas Chromatography Mass-Spectroscopy Analysis

GC-MS analysis was carried out on a GC system comprising a Gas Chromatograph interfaced to a Mass Spectrometer (GC-MS) instrument; Schimadzu GCMS-QP2010, employing the following conditions:

Column Elite-1 fused silica capillary column (30×0.25 mm ID×1EM df, composed of 100% Dimethyl poly siloxane), operating in electron impact mode at 70 eV; helium (99.999%) as carrier gas at a constant flow of 1ml/ minute and a sample injection volume of 1 μl which was employed (split ratio of 10:1) injector temperature 250°C; ion-source temperature 280°C. The oven temperature was programmed from 110°C (isothermal for 2 minutes), with an increase of 10°C/minute, to 200°C, then 5°C/minute to 280°C, ending

with a 9 minutes isothermal at 280°C. Mass spectra were taken at 70 eV; a scan interval of 0.5 s and fragments from 40 to 550 Da. Total run time was 30 min. The compounds were then identified from the GC-MS peaks, using library data of the corresponding compounds. GC-MS was analyzed using electron impact ionization at 70 eV and data was evaluated using total ion count (TIC) for compound identification and quantification. The spectrums of the components were compared with the database of spectrum of known components stored in the GC-MS library using NISP Search. The relative % amount of each component was calculated by comparing its average peak area to the total areas. Measurement of peak areas and data processing were carried out by Turbo-Mass-OCPTVS-Demo SPL software.

RESULTS AND DISCUSSION

The chloroform leave extract of *Ficus exasperate* revealed several peaks which represents different compounds as shown in the total ion chromatogram by Gas Chromatography-Mass Spectrometry analysis (figure 1).

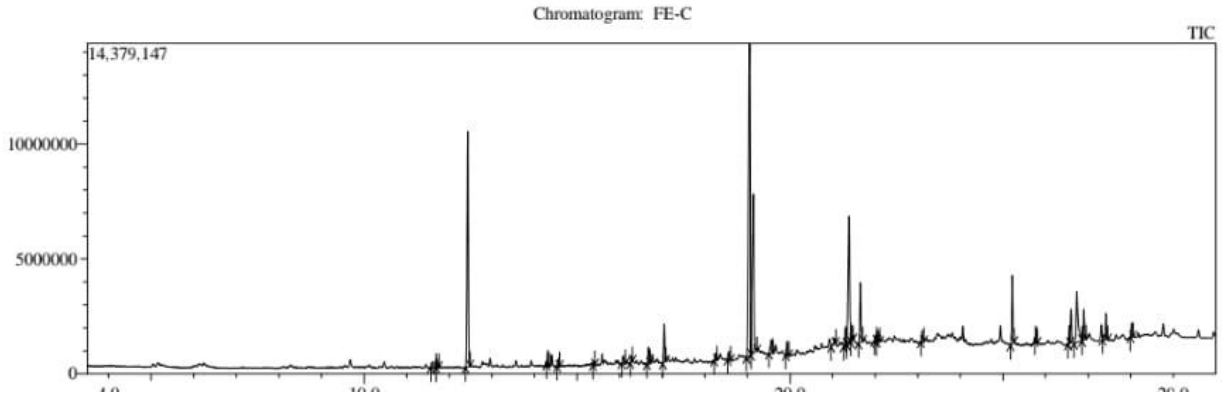
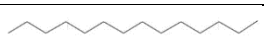
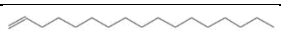
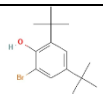
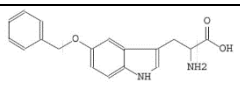
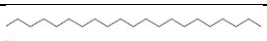
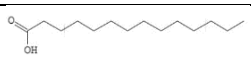
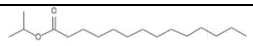
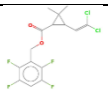
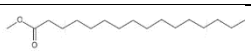
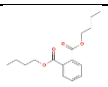
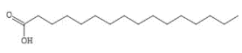
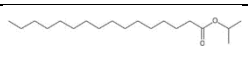
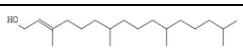


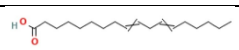
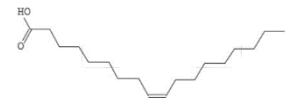
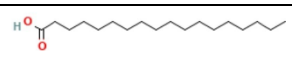
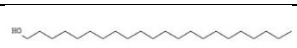
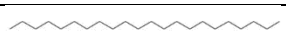
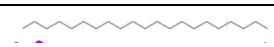
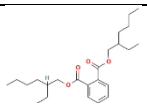
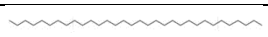
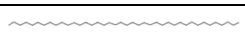
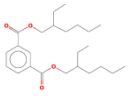
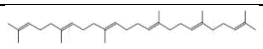
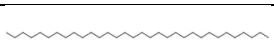
Fig. I Chromatogram of *Ficus exasperate* Vahl

The peaks in the chromatogram were integrated and were compared with the database of spectrum of known components stored in the Gas Chromatography-Mass Spectrometry library.

Gas Chromatography-Mass Spectrometry analysis of the chloroform leave extract of *Ficus exasperate* revealed the presence of compounds and their uses. (Table 1)

Table 1: Different compounds obtained from Gas Chromatography-Mass Spectrometry analysis of chloroform leaves extract of *Ficus exasperate* Vahl and some of their uses.

Peak	Retention Time	IUPAC Name	Chemical Structure	Nature and Uses
1	11.580	1-Tridecene		Acyclic olefin; Tanning oils, synthetic fatty acids.
2	11.708	Tetradecane		Liquid; Lubricants and greases, anti-freeze.
3	12.436	Dimethyl phthalate		Liquid; Ectoparasiticide, miticidal agent, propellant, cosmetics.
4	14.311	1-Heptadecene		Liquid; Fuels and fuel additives, plastic rubber products.
5	14.559	2-Bromo-4,6-di-tert-butylphenol		Solid; Medicine.
6	15.397	5-Benzyloxy-dl-trytophan		
7	16.087	Heneicosane		Wax; plant metabolite, volatile oil component
8	16.627	Tetradecanoic acid		Oil; Food additive
9	16.679	1-Nonadecene		Liquid;Plant metabolite, Bacterial metabolite.
10	17.049	Isopryl myristate		Liquid; Cosmetics
11	18.525	(2,3,5,6-Tetrafluorophenyl)methyl 3-(2,2-dic		Solid;Insecticide
12	18.564	Hexadecanoic acid, methyl ester		Crystalline solid;Standard for detection.
13	19.051	Dibutyl phthalate		Oil;Cosmetics, textile, safety glass additive.
14	19.138	n-Hexadecanoic acid		Oil;Cosmetics
15	19.563	9-Tricosene, (Z)-		Liquid; Insect attractant
16	19.930	Isopropyl palmitate		Liquis; Cosmetics
17	21.041	Phyltol		Liquid; Cosmetic, Drugs

18	21.304	9, 12-Octadecadienoic acid (Z,Z)-		Liquid; Food additives.
19	21.386	Oleic acid		Oil; Pharmaceutical, aerosol products.
20	21.440	13-Oxabicyclo[10.1.0]tridecane		Liquid; Basic organic chemical manufacturing.
21	21.652	Octadecanoic acid		Solid; Food additive.
22	22.007	Bchenic alcohol		
23	22.068	Docosane		Solid; Synthesis,temp sensing equipment.
24	23.105	Haneicosane		Solid; Additive
25	25.219	Bis(2-ethylhexyl)pthalate		Liquid; Plastilizer
26	25.775	Dotriacontane		Solid;Fuel additive.
27	26.560	Tetracontane		Solid.
28	26.736	Cyclopropanecarboxylic acid, 3-(2,2-dichlor		Liquid; Agrochemicals,pharmaceutical.
29	26.901	1,3-Benzenedicarboxylic acid, bis(2-ethylhe		Liquid; Automobile, pharmaceuticals.
30	27.418	Squalene		Liquid;Cosmetics, Pharmaceutical, Automobil.
31	28.023	Dotriacontane		Solid; Detergents.

1-Tridecne is an acyclic olefin with molecular formula $C_{13}H_{26}$ which is widely used for manufacturing chemicals, tanning oils, polymer products like plastic, detergent, adhesive and in synthetic fatty acids, Isopryl myristate is an ester used in cosmetics. It is a moisturizer with polar characteristics and topical medical preparations to ameliorate the skin absorbtion, it was formally an active ingredient in a non-prescriptive pediculicide rinse.

Dimethyl phthalate an ester with a molecular formula $C_{10}H_{10}O_4$ is a plasticizer with strong solubility with a variety cellulose resins, natural rubber and synthetic rubber, and vinyl resins. It has a good film-forming, adhesive and water proof, light and thermal stability are also high. It is often us which is used in cosmetics, textile,

safety glass additive, rocket propellants and insect repellants.[8]

Oleic acid is an acid with a chemical formula $C_{18}H_{34}$ O_2, it is used in pharmaceuticals in treatment of heart disease and reducing cholesterol and also for preventing cancer. It is also used in furnishing and cleaning care products.

Cyclopropanecarboxylic acid, 3-(2,2-dichlor is an ester with chemical formula $C_{10}H_{14}Cl_2O_2$ used in agrochemicals and pharmaceuticals.

CONCLUSION

Plants are natural reservoirs of several phytonutrients and compounds which are inevitable and essential to life in general. The phytochemical constituents of chloroform leave extract of *Ficus exasperate* leave revealed by Gas Chromatography-Mass Spectrometry analysis depicts its importance in folklore, phytopharmaceuticals, cosmetic and food industries (Figure 1).

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