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MEDICINAL EVALUATION OF AFRICAN SATINWOOD (*D.benthamianus)* EXTRACT FOR ORAL HEALTH

O. A. Ajayi and B. O. Alawode.

Department of Science Laboratory Technology,
Abraham Adesanya Polytechnic, Ijebu Igbo, Ogun State.
*Corresponding author's email: otobiajayi@gmail.com

ABSTRACT

The use of wood sticks for brushing teeth continues to be an important tool in many Afro-Asian communities particularly in the western part of Africa. The plants used are very carefully selected and a great number of these plant species have related medicinal properties that may be antibacterial. Therefore, this research work on African satinwood (*Distemonanthus benthamianus*) commonly known as 'orin aayan' in the western part of Nigeria was done to analyze its efficacy as an active oral wash through analysis of its chemical composition using a gas chromatography-mass spectrometer. The gas chromatography mass spectrometry (GC-MS) analysis of the Ethanol extract of the *Distemonanthus benthamianus* chew sticks was carried out using standard methods. The results obtained revealed that the chew stick contains ten different compounds out of which a few (Benzoic acid, ethyl ester, Decanoic acid, ethyl ester, Octanoic acid ethyl ester) were reported to be antifungal, antibacterial and anti-inflammatory.. Benzene (1-pentylhepthyl) has also been reported as a pain reliever. The chemical composition of the ethanol extract *Distemonanthus benthamianus* showed that they can be a potential source of drugs for toothache and decay as well as flavoring agents in the production of commercial herbal toothpaste. Evidently, from the analysis, this plant is a rich source of bioactive compounds and may be used in developing value-added products and other industrial applications to extract their health and oral benefits.

Keywords: *D.benthamianus*, Health, Medicinal, Oral.

INTRODUCTION

Chew sticks have been used for centuries all over Africa as a means to clean teeth. Chew sticks are natural toothbrushes made from frayed sticks. [1] They are commonly used as oral hygiene tools in various parts of the world. The choice of stick depends largely on traditional preference rather than clinical effectiveness. The plants used are very carefully selected for such properties as foaminess, hardness, or bitterness and certain species are more popular than others. A great number of these plant species have related medicinal properties that may be antibacterial.[2] African Satinwood (*Distemonanthus benthamianus*) is a tree distributed in tropical Africa, high forests of West Africa, mainly in Cameroon, Ghana, and Nigeria. It belongs to the family Leguminosae. [3] It is commonly called 'orin anyan' in the south-western part of Nigeria. It is used in traditional African medicine to treat bacterial, fungal, and viral infections. (Ngulefack *et al*., 2005), and it is used as a chew stick for oral dental hygiene**.** [4]

Today, chewing sticks are still used in many developing countries like Nigeria because of religion, tradition, availability, low cost and simplicity. The World Health Organization also encourages their use. The Year 2000 Consensus Report on oral hygiene states that the act of

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chewing sticks may have a role to play in the promotion of oral hygiene, and that evaluation of their effectiveness warrants further research.[5]. Therefore, this research work on African satinwood is carried out to analyze its efficacy as an active oral wash through analysis of its chemical composition in order to justify its wide use in the treatment of sore gums, toothache and dental caries.

MATERIALS AND METHODS

Sample collection

Sticks of *Distemonanthus benthamianus* were purchased from Ijebu-Igbo and authenticated by a botanist in the Department of Science Laboratory Technology of Abraham Adesanya Polytechnic, Ijebu Igbo, Ogun state. The sticks were air dried and ground into powder. The powder sample was transferred into soxhlet extractor where the extraction with ethanol was carried out for a period of 7 hours. The extract was transferred to a storage bottle and kept in a refrigerator prior the analysis.

Gas Chromatography Mass Spectrometer (GC-MS) Analysis

The GCMS analysis of the Ethanol extract of the *Distemonanthus benthamianus* chew sticks was carried out in the laboratory by using GC Model 7890A and MS Model was 5975 ms D. The column used is HP-5 capillary column (30m, 0.32mm, 0.25N. The injection volume is (1.0N/L). Helium was used as the carrier gas with a flow rate of 1.8mL/min in a split less mode. An aliquot of 2µL of ethanol solution of the sample was injected into the column with the injector temperature at 250^{o}C. GC oven temperature started at 90^{o}C initially then 3^{o}C per min at it was raised to 180^{o}C for 10^{o}C/min without holding. The injector and detector temperatures were set as 280^{o}C and 300^{o}C respectively. The mass spectrum of the compounds was obtained by simple ionization monitoring (SIM) for a total running time of 38 minutes.

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RESULTS AND DISCUSSION

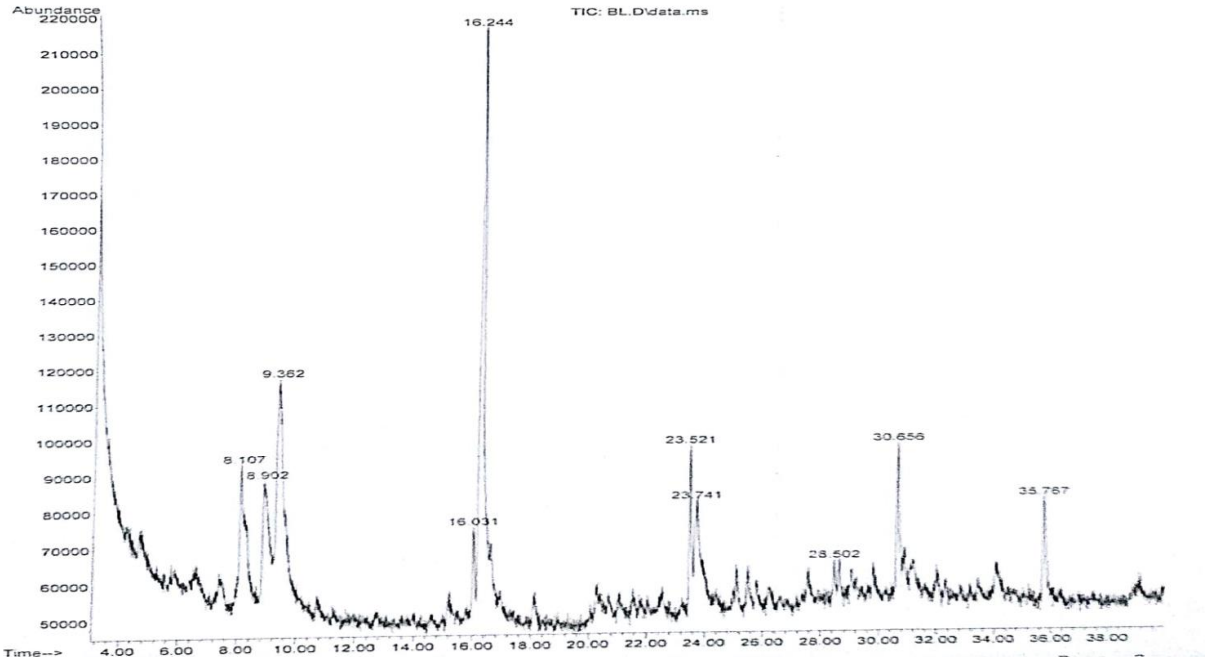

Figure 1: GC-MS Spectra of ethanolic extract of *Distemonanthus benthamianus*

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Table 1: Components Identified in The Ethanolic Extract of *Distemonanthus benthamianus* Sticks

S/N	Retention time (min)	Name of compound	Molecular formula	Molecular weight(g/mol)	Peak area %
1	8.107	Bicyclo (2.2.1) heptan-2-one, 1,7,7-trimethyl-	$C_{10}H_{16}O$	152	6.67
2	8.902	Benzoic acid, ethyl ester	$C_9H_{10}O_2$	150	5.19
3	9.362	Octanoic acid ethyl ester	$C_{10}H_{20}O_2$	172	6.69
4	16.031	1- hexadecanol	$C_{16}H_{34}O$	240	4.57
5	16.244	Decanoic acid, ethyl ester	$C_{12}H_{24}O_2$	200	47.89
6	23.521	9-Octadecene	$C_{18}H_{36}$	252	8.80
7	23.741	Docosanoic acid, ethyl ester	$C_{12}H_{24}O_2$	363	3.01
8	28.502	Benzene, (1- pentylheptyl)	$C_{18}H_{30}$	246	1.50
9	30.656	1-Octadecene	$C_{18}H_{36}$	252	8.35

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10	35.767	5- Clorovaleric acid, 2-formyl-4-6 dichlorophenyl	$C_{10}H_{12}Cl_2O_3$	308	7.33

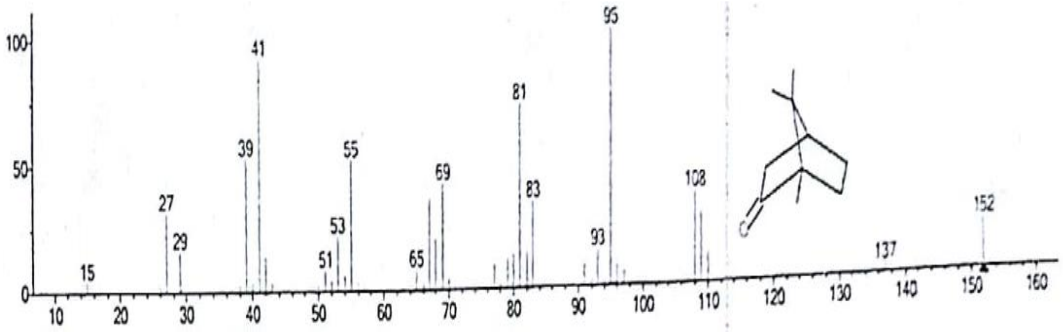

Figure 2: Bicyclo (2.2.1) heptan-2-one, 1,7,7, -trimethyl-

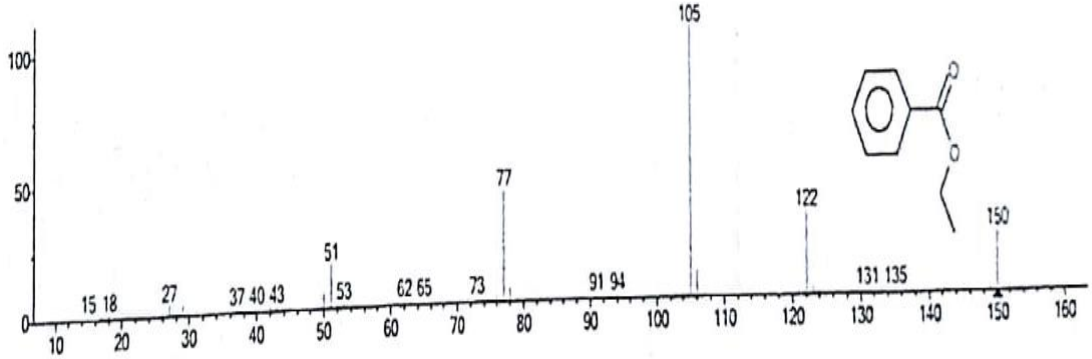

Figure 3: Benzoic acid, ethyl ester

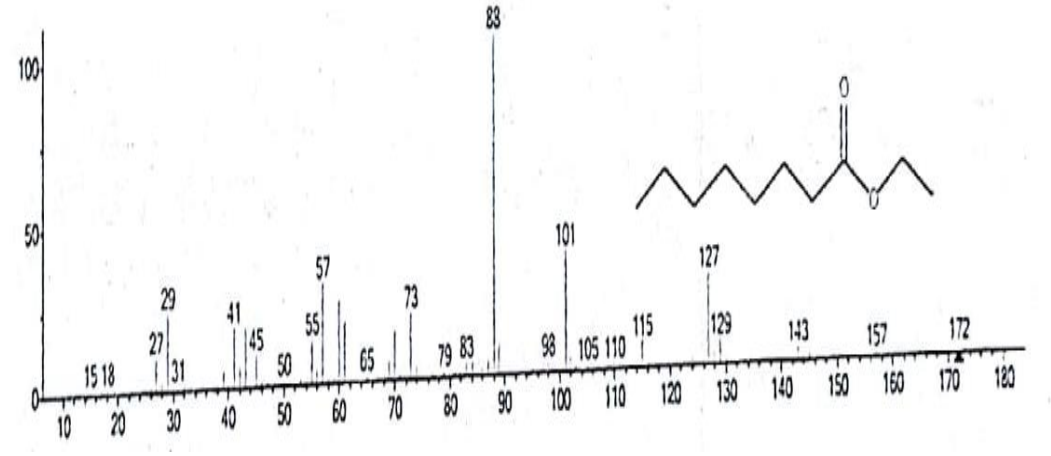

Figure 4: Octanoic acid, ethyl ester

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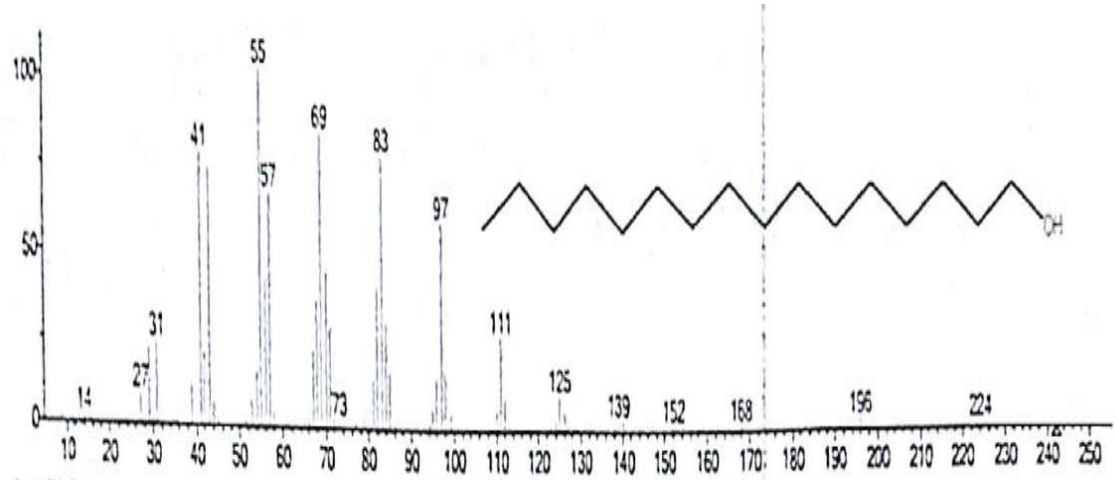

Figure 5: 1- Hexadecanol

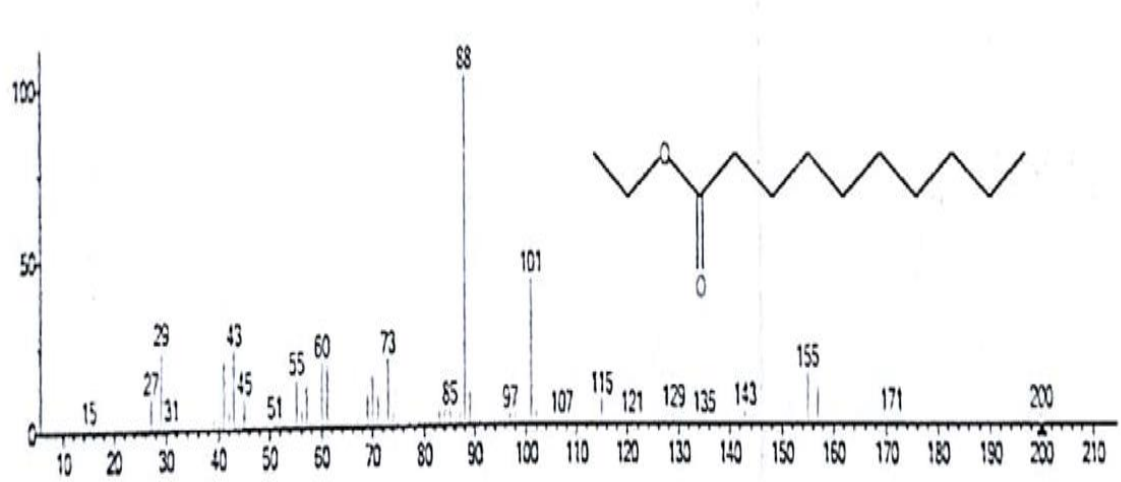

Figure 6: Decanoic acid, ethyl ester

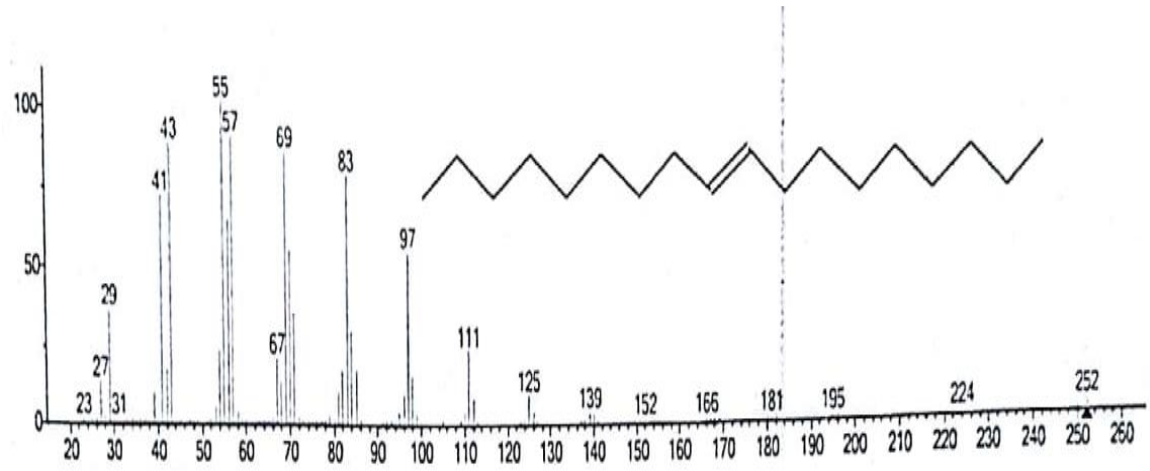

Figure 7: 9- Octadecene (E)-

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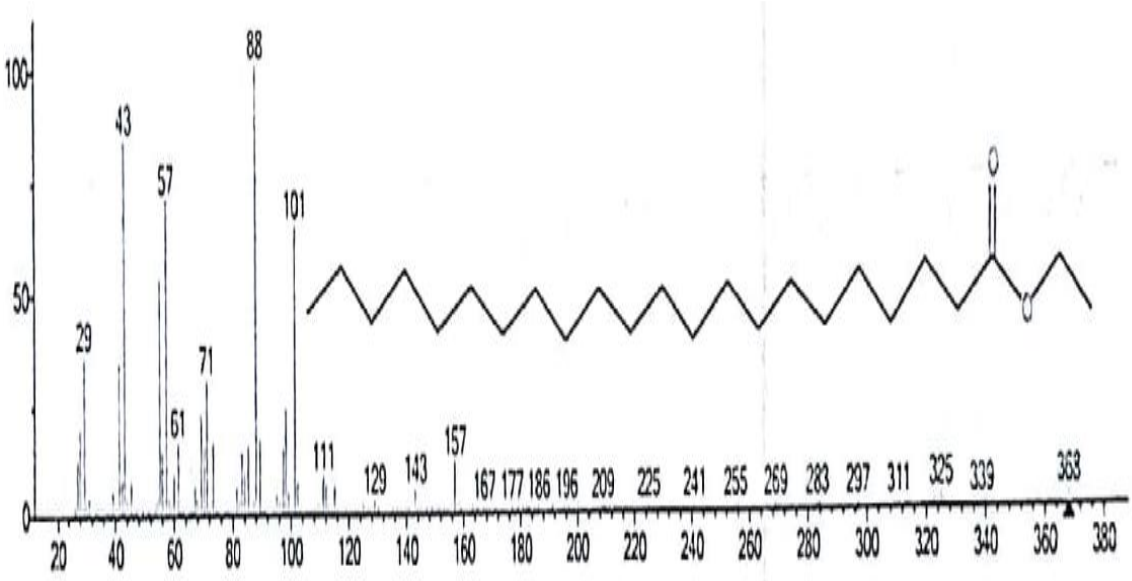

Figure 8: Docosanoic acid, ethyl ester

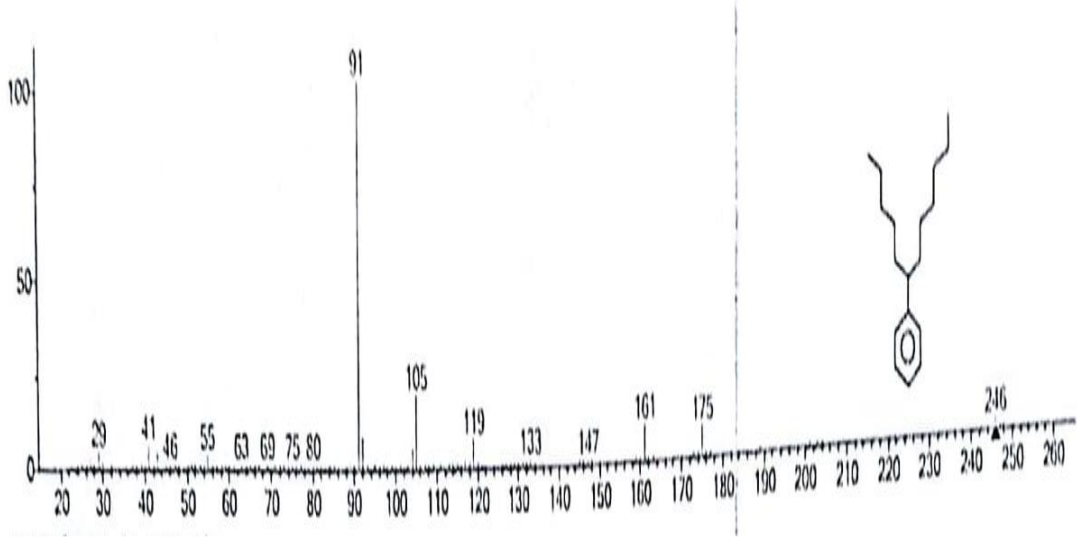

Figure 9: Benzene (1- pentylheptyl)

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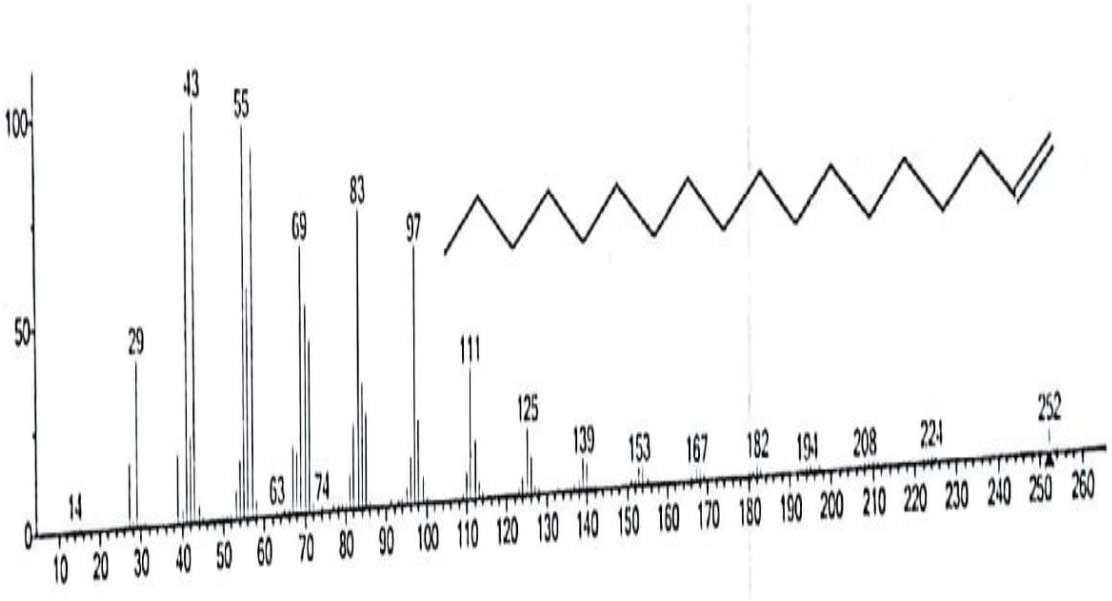

Figure 10: 1- Octadecene

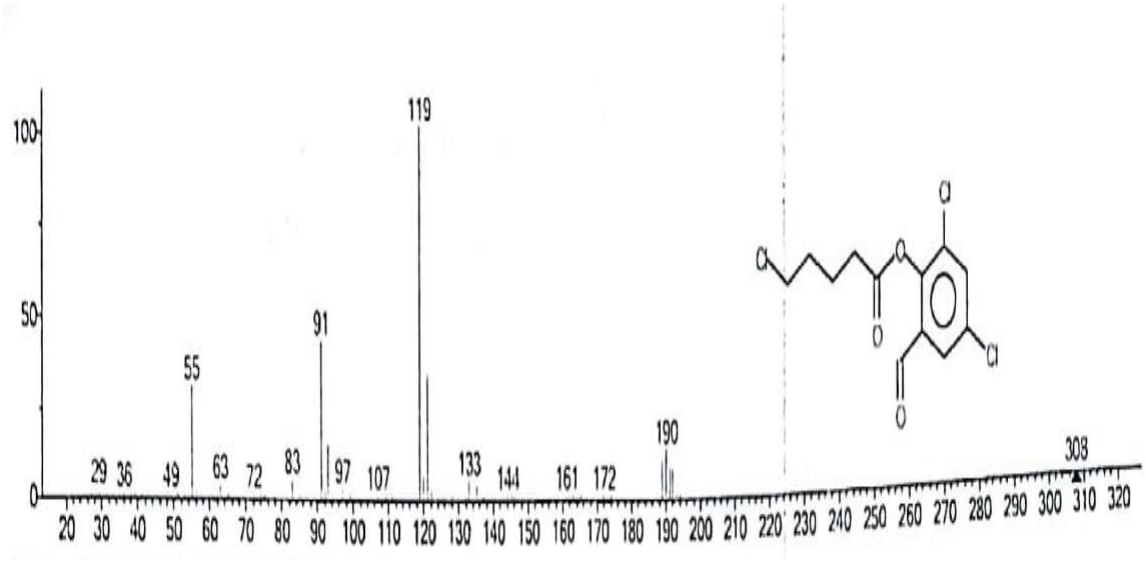

Figure 11: 5- Clorovaleric acid, 2-formyl-4,6, -dichlorophenyl ester

Discussion

The GC-MS analysis of *D. benthamianus* revealed that the identified compounds possess many biological properties. Decanoic acid, ethyl ester which is the major constituent among the ten compounds determined at retention time of 16.244 minutes was observed to have anti-carcinogenic potential, good antibacterial and ability to form biofilms. [6] Also, Benzoic acid, ethyl ester determined at retention time 8.902 is a commonly used antimicrobial preservative in food and beverages, especially in carbonated beverages.[7] 1-Hexadecanol determined at retention time 16.031 minutes is used as an

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emulsifier in pharmaceutical industries and also used for treatment of eczema.[8]. 9- Octadecene and 1-octadecene determined at retention time 23.521 and 30.656 minutes are used as the primary solvent due to its high boiling point and nanocrystal synthesis (120–320 °C) respectively. Benzene (1-pentylhepthyl) at retention time 28.502 minutes is used to relieve pain, alleviate cold and flu symptoms and also used as decongestants. [9].

Octanoic acid is taken as a dietary supplement. There are some studies that show the use of octanoic acid in weight management by burning excess calories in the body. It is also used as part of a ketogenic diet to treat children with intractable epilepsy. Octanoic acid also works as an antioxidant for skin and also boosts the antioxidants in skin products. Furthermore, Docosanoic acid, ethyl ester, Octanoic acid, ethyl ester, Bicyclo (2.2.1) heptan-2-one, 1,7,7 – trimethyl, 5- Clorovaleric acid, 2- formyl-4,6-dichlorophenyl ester determined at retention time of 23.741 minutes, 9.362 minutes, 8.107 minutes and 35.767 minutes respectively are all used in pharmaceutical industries because they possess antibacterial, antifungal, anti-inflammatory and antioxidant properties.[10].

CONCLUSION

The GC-MS analysis of ethanolic extract of *D. benthamianus* showed a highly complex profile which contains absolutely ten components mainly Decanoic acid, ethyl ester, Bicyclo (2.2.1) hepta-2-one, 1,7,7-rimethyl-, Benzoic acid, ethyl ester, Octanoic acid ethyl ester,

1-hexadecanol, 9- Octadecene (E)-, Docosanoic acid, ethyl ester, Benzene (1-penthylhepthyl)-, 1-Octadecene etc. which are useful as antibacterial, antifungal, anti-inflammatory, anticarcinogenic and antioxidant agents. The chemical composition of the ethanol extract *Distemonanthus benthamianus* showed that they can be a potential source of drugs for tooth ache and decay as well as flavouring agents. Evidently, this plant is a rich source of bioactive compounds and may be used in developing value added products and other industrial applications to extract out their health and oral benefits. The obtained compounds have antimicrobial potential along with antioxidant properties and may play an important role in drug development, health supplements. The plant also has a potential to be used as an export item after futher analysis and medicinal evaluation.

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