



## GC-MS bioactive compounds in *Ocimum gratissimum* methanol and hexane extracts a comparative study

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### Abstract

Bioactive compounds in medicinal plants are very important because they are the active ingredients in the plant. Therefore this work is aimed at determining the bioactive compounds in methanol and n-hexane extracts of *Ocimum gratissimum* using gas chromatography mass spectrometry (GC-MS). The leaves of *Ocimum gratissimum* were dried and grounded and extracted with methanol and n-hexane separately. The extract was concentrated to a dark paste, which was later subjected to GC-MS analysis. Results revealed the presence of many compounds for example octacosane with peak number 47 retention time RT 22.521 and % area of 7.82, other extracts of Medicinal importance are 2,6,10,14,18,22-tetracosahexaene RT 24.584 area % 5.51 and peak number 55, erythro-9,10-dibropentacosane with a peak number 52 RT 24.142 and % area 3.30, heneicosane has a peak number 43, RT 22.024 and % area 5.45, 2-methyloctacosane has a peak number 36 RT 20.069 and area % of 5.57.

**Keywords:**GC-MS; *Ocimum Gratissimum*; Peak Number; Retention Time and % Area

### 1. Introduction

*Ocimum gratissimum* belongs to the group of plants known as spices. It is a plant that is used majorly as a spice in traditional cooking. The plant is an erect small plumb with many barnacles usually not more than 1 m high [1]. It is of the family Labiatea, genus *Ocimum* and species *gratissimum* [2]. In Nigeria, it is *Efinrin* in Yoruba, *Diadoyalin* Hausa and *Nchuanwu* in Igbo, *Ocimum gratissimum* is used in cooking soups, stews, and pepper soup. [3].

It is used as a medicine or as adjuvant in other Medicinal plants. It is use in the treatment of diarrhea, skin infection, bronchitis, headache and fever [2,4,5,6].

This research work sought to detect the bioactive in *Ocimumgratissimum* extracts using gas chromatography mass spectrometry and comparing with the bioactive in n-hexane extract.

### 2. Material and methods

#### 2.1. Chemicals

Methanol and n-hexane were purchased from a local chemical store in Yenagoa, Bayelsa State and they are of analytical grade.

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## 2.2. Preparation of Plant Extract

The leaves of *Ocimum gratissimum* were collected fresh, shade-dried and powdered. About 337.5g of the powdered plant material was taken in amber coloured extraction bottle and soaked with 900ml of methanol. This was then subjected to extraction with methanol for 3 days. The extract was later filtered through Whatman no.1 filter paper and evaporated using rotary evaporator to form a thick dark paste. This was stored in the refrigerator for further use.

## 2.3. Gas chromatography- mass spectrophotometry analysis (GC-MS Analysis)

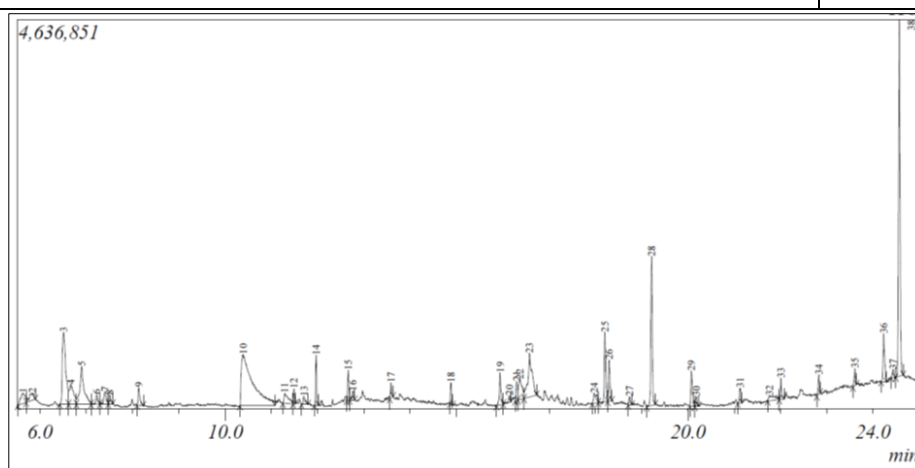
The main phytochemicals in *Ocimum gratissimum* extract were identified by the GC-MS detection system (GC-MS QP2010SE Shimadzu Japan) according to standard operational procedures and manual.

## 3. Results

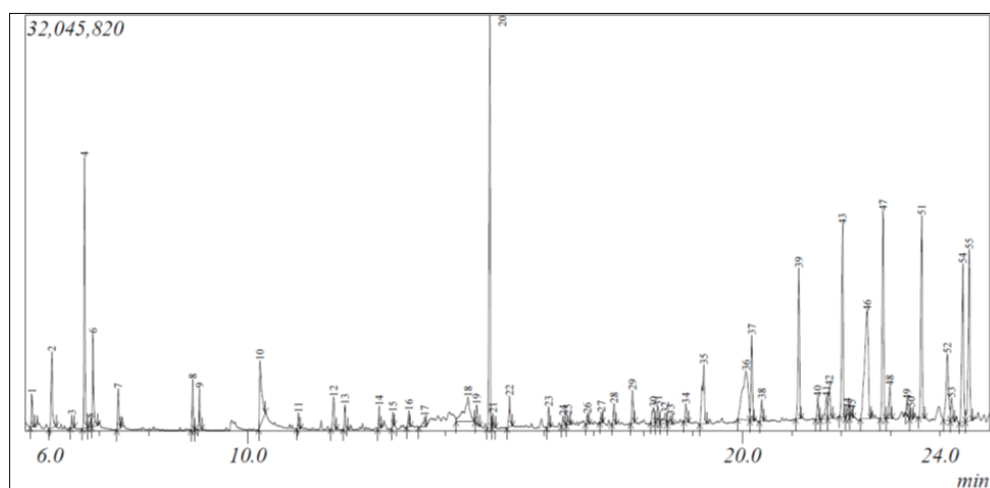
**Table 1** Bioactives detected in GC-MS analysis of Methanolic Extracts of *Ocimum gratissimum* extract

Peak no	Name of compound	Retention time	Area %
1	2-methyl-2,5-cyclohexadiene-1-carboxylic acid	5.619	1.51
2	2-pinene	5.833	1.12
3	Methyl cyclooctane	6.509	8.15
4	2,4,6-trimethyl octane	6.665	2.74
5	1-methyl-2-(1-methylethyl)-benzene	6.899	5.13
6	2-trimethylsilyloxy-1,3-butadiene	7.223	0.61
7	Gamma terpinene	7.406	1.06
8	1-methyl-4-(1-methylethenyl)-cyclohexanol	7.505	0.51
9	3-methyl-2-[tertbutyldimethylsilyl]oxy-1-cyano-2-butene	8.133	1.01
10	5-methyl-2-(1-methylethyl)-phenol	10.391	18.97
11	3,5-diethyl-2-propylpyridine	11.283	1.45
12	Capaene	11.489	0.58
13	1-bromo-2-methyl-decane	11.702	0.50
14	Caryophyllene	11.966	1.64
15	Naphthalene	12.659	1.17
16	Azulene	12.757	0.50
17	11,11-dimethyl-spiro[2,9]dodeca-3,7-diene	13.584	0.57
18	2,4-diisopropyl-1,1-dimethyl cyclohexane	14.879	0.69
19	Z,Z-2,15-octadecadien-1-ol acetate	15.942	1.63
20	Phytol acetate	16.144	0.41
21	Stigmastan-7-one	16.299	0.92
22	Gamma sitosterol	16.368	2.35
23	Methyldihydrochaulmoograte	16.578	5.93
24	1-Adamantylmethylmethoxyacetate	17.976	0.98
25	Trans phytol	18.207	3.15
26	5-pregnen-3-beta-ol-20-one formate	18.297	1.95

27	3-beta-acetoxy-5-bisnor cholenic acid	18.740	0.39
28	Tetradecyl oxirane	19.215	7.09
29	p-isopropyl benzaldehyde 2,4 dinitrophenylhydrazond	20.077	1.86
30	Pentadecane	20.184	0.46
31	Tetratetracontand	21.128	0.63
32	2,7-diphenyl-1,6-dioxopyridazino[4,5;2',3']pyrrole[4'.5'-d]pyridazine	21.758	1.01
33	2-methyloctacosane	22.010	0.93
34	Heneicosane	22.830	0.77
35	7-hexyleicosane	23.608	0.68
36	3-tert-butyl-N-(4-dimethylamino)benzylidene-1-phenyl-1H-pyrazole-5-carbohydrazide	24.232	2.54
37	Tritetracontane	24.434	0.39
38	Squalene	24.570	18



**Figure 1** GC–MS chromatogram for bioactives in methanolic extract of *Ocimumgratissimum*



**Figure 2** GC–MS chromatogram for bioactives in n-hexane extract of *Ocimumgratissimum*

**Table 2** Bioactive detected in GC-MS analysis of n-hexane Extracts of *Ocimumgratissimum* extract

Peak no	Name of compound	Retention time	Area %
1	4-methyl-1-(1-methylethyl)-hex-2-ene	5.636	0.65
2	Cyclohexylphosphonous dichloride	6.040	1.94
3	7-methyl-3-methylene-1,6-octadiene	6.443	0.29
4	Octamethylcyclotetrasiloxan	6.702	5.57
5	Alpha terpenine	6.825	0.23
6	1-methyl-4-(1-methylethyl)benzene	6.870	2.32
7	1,4-cyclohexadiene	7.382	0.96
8	Decamethylcyclopentasiloxan	8.885	1.01
9	2-tetradecene-1-ol	9.024	0.84
10	5-methyl-2-(1-methylethyl)phenol	10.250	3.00
11	Dodecamethylcyclohexasiloxane	11.024	0.32
12	Cholestan-2-one oxime	11.735	1.00
13	Caryophyllene	11.964	0.54
14	Decahydro-4a-methyl-1-methylene-7-(1-methylethenyl)-naphthalene	12.656	0.46
15	1,1,3,3,5,5,7,7,9,9,11,11-dodecamethylhexasiloxane	12.934	0.28
16	Bis [2-(trimethylsilyl)ethyl] malonate	13.258	0.38
17	Butyl-6,9,12-hexadecatrienoate	13.578	0.43
18	2,5-ditertbutyl-1,2,5-thiadiazolidine 1,1 dioxide	14.453	2.84
19	2,5-bis(trimethylsiloxy)-benzoic acid	14.629	0.45
20	Cyclohexylmethylhexylester	14.891	0.29
21	2,6-bis (1-methylpropyl)-phenol	14.960	0.32
22	4-isopropylbenzoic acid ethyl ester	15.293	0.85
23	Octadecamethylcyclononasiloxane	16.085	0.46
24	2,3,3,4,7-pentamethyl-2,3-dihydrobenzofuran	16.378	0.28
25	Cyclopentane-1-carboxamide	16.472	0.29
26	Cyclohexylmethylhexylester	16.866	0.24
27	1-(2,6,6-trimethyl-1-cyclohexynyl)-1-pentene-3-one	17.149	0.20
28	Dodecamethylcyclohexasiloxane	17.405	0.57
29	4-methoxy-2H-quinolone	17.778	0.93
30	3,7,11,15-tetramethyl phytol	18.205	0.67
31	6-tertbutyl-2,4-dimethylphenoltrifluoroacetate ester	18.291	0.50
32	Diethylbutoxy(2-ethylhexyloxy) silane	18.442	0.51
33	Dimethylhexyloxyheptyloxysilane	18.547	0.28
34	2,6-bis(trimethylsilyl)-oxyl benzoic acid	18.857	0.51
35	3,7,11,15-tetramethyl-2-hexadecen-1-ol	19.218	2.74

36	2-methyloctacosane	20.069	5.57
37	Heneicosane	20.189	2.37
38	Octadecamethylcyclononasiloxane	20.390	0.61
39	Heneicosane	21.140	4.22
40	Pregna-4,6-diene-3,20-dione	21.524	0.66
41	1,2-dibromodecane	21.702	0.97
42	Dodecamethylcyclohexasiloxane	21.758	1.11
43	Henicosane	22.024	5.45
44	Bis(2-ethylhexyl)phthalate	22.120	0.38
45	1,5-diisopropyl-2,3-dimethylcyclohexane	22.208	0.22
46	Octacosane	22.521	7.82
47	n-octacosane	22.844	6.01
48	2,6-bis(trimethylsilyl)oxylbenzoic acid	22.978	0.96
49	2-methyloctacosane	23.326	0.33
50	Pentacosane	23.408	0.27
51	Octacosane	23.624	5.80
52	Erythro-9,10-dibropentacosane	24.142	3.30
53	2-phenyl-1,3-dioxan-5-yl stearate	24.229	0.84
54	Octacosane	24.456	5.51
55	2,6,10,14,18,22-tetracosahexaene	24.584	5.51

#### 4. Discussion

The GC-MS bioactive compounds in *Ocimum gratissimum* n-hexane extract are 55 compounds corresponding to 55 peaks. The gas chromatography mass spectrometry bioactive compounds in *Ocimum gratissimum* methanolic extract are 38 compounds corresponding to 38 peaks.

Many bioactive compounds that are Medicinal are found in *Ocimum gratissimum* extracted with methanol. These results are shown in fig 1 and table 1, bioactive compounds with an area % greater than or equal to 3 are considered highly concentrated and are bolded in the tabular results. The most concentrated bioactive in the methanolic extract of *Ocimum gratissimum* was 5-methyl-2-(1-methylethyl)-phenol with a RT of 10.391, peak number 10 and % area of 18.97. this was closely followed by squalene with peak number 38 RT of 24.570 and % area of 18. Squalene is a precursor of cholesterol, bile acids and hormones [7,8]. Other compounds that are also found in high concentration are Tetradecyl oxirane peak number 28 RT 19.215 and area % 7.09, trans phytol peak number 25 RT 18.207 and area % 3.15, Methylhydrochaulmoograte peak number 23 RT 16.578 and area % 5.93, 1-methyl-2-(1-methylethyl)-benzene, peak number 5 RT 6.899 and area % 5.13, Methyl cyclooctane, has a peak number 3 RT 6.509 and % area of 8.15.

The n-hexane extract of *Ocimum gratissimum* also contain many bioactive most abundant is octacosane with peak number 47 RT 22.521 and % area of 7.82, other extracts of Medicinal importance are 2,6,10,14,18,22-tetracosahexaene RT 24.584 area % 5.51 and peak number 55, erythro-9,10-dibropentacosane with a peak number 52 RT 24.142 and % area 3.30, heneicosane has a peak number 43, RT 22.024 and % area 5.45, 2-methyloctacosane has a peak number 36 RT 20.069 and area % of 5.57, 5-methyl-2-(1-methylethyl) phenol with peak number 10 RT 10.250 and area % 3.00, finally octamethylcyclotetrasiloxane has a peak number of 4 RT 6.702 and area % of 5.57 [9].

Apart from these highly concentrated bioactive compounds in methanol and n-hexane extracts with % area greater than 3, there are also bioactive compounds that are low in concentration which also contribute to the Medicinal and spicy value of *Ocimum gratissimum*. Therefore all these compounds contributed to the medicinally acclaimed properties of *Ocimum gratissimum*.

## 5. Conclusion

This work revealed that methanolic extract of *Ocimum gratissimum* contains numerous biocompounds that are responsible for the therapeutic claims of *Ocimum gratissimu*. Hence isolation and testing of each active compound is needed.

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## Compliance with ethical standards

### *Disclosure of conflict of interest*

No conflict of interest.

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