Section A-Research paper

Gas Chromatography and Mass Spectroscopy (GC-MS) Profiling of the Staple Vegetable *Momordica Charantia L.*

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ABSTRACT

Momordica charantia L. is a member of the family cucurbitaceae. It is commonly known as bitter guard because of its bitter taste. Bitter guard is distributed in tropical and subtropical regions of the world, widely grown and consumed vegetable in Asia. A knowledge of the chemical constituents of plants is desirable not only for the discovery of therapeutic agents, also such information may be of great value in disclosing new sources of economic phytocompounds for the synthesis of complex chemical substances and for discovering the actual significance of folkloric remedies. GC-MS analysis showed Fifty compounds in ethanol extract of *Momordica charantia*, Octadecanoic acid was identified as the major compound.

Keywords: *Momordica charantia*, GC-MS, phytocompounds.

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INTRODUCTION

Bitter gourd (*Momordica charantia*) is one of the most popular vegetable in South Asia, which belongs to the family cucurbitaceae. It is regarded as one of the world's major vegetable crops and has great economic importance. Bitter gourd grows in tropical and subtropical areas, including parts of East Africa, Asia, Caribbean, and South America, where it is used not only as a food but also as a medicine. Furthermore, Indians have traditionally used the leaves and fruits

as a medicine to treat diabetes, colic and to heal skin sores and wounds. It is reported to be a good source of phenolic compounds, which possess potent antioxidant activity (Aminah and Anna, 2011).

Gas chromatography and mass spectroscopy has a very wide field of applications. It is mainly used in the area of separation and analysis of multi component mixtures such as essential oils, hydrocarbons and solvents (Kadhim *et al*., 2009). In recent years GC-MS studies have been increasingly applied for the analysis of medicinal plants as this technique has proved to be a valuable method for the analysis of non-polar components and volatile essential oil, fatty acids, lipids and alkaloids (Hussein *et al.*, 2016). It is widely used in pure and applied sciences like Chemistry, Polymers, Nanotechnology and Biotechnology (Alon and Amirav 2006) .

MATERIALS AND METHODS

SYSTEMATIC POSITION

Momordica charantia

Kingdom	:	Plantae
Division	:	Magnoliophyta
Class	:	Magnoliopsida
Order	:	Cucurbitales
Family	:	Cucurbitaceae
Genus	:	*Momordica*
Species	:	*Charantia*
English name	:	Bitter Guard
Tamil name	:	Paavakkai

Sample collection and solvent extraction

The selected *Momordica charantia* plant was cultivated in the kitchen garden. The plant was dehydrated under shade condition and pulverized into fine powder and filtered through a mesh. It was used to study GC-MS. The extraction was made using ethanol solvent.

Gas chromatography-Mass spectrometry (GC-MS) analysis

GC -MS (QP-ultra-2010, Shimadzu, Japan) analysis was carried out for fatty acid methyl esters using SH-Rxi- 5Sil MS (30m,0.25mm, 0.25 µm Columns (low- polarity phase; Cross bond 1,4 -bis (Dimethylsiloxy) phenylene dimethyl polysiloxane) with electron impact (EI) ionization. Helium was used as a carrier gas at 1.5ml min-1. In GC, injection temperature was maintained at 280^{o}C.

The oven temperature profile was at initial temperature with 70^{o}C hold 1 min, increase 5^{o}C/min up to 255^{o}C and hold 3min, further increase 5^{o}C/min up to 300^{o}C holding time 5 minutes. The total programme time was 54 minutes. The split ratio was 1:10 and the column flow parameter was 1ml/min. In MS, ion source temperature was 230^{o}C and interface temperature was 280^{o}C in scan mode with m/z detection from 35-850 Da.

RESULT & DISCUSSION

Table:1 Gas Chromatography-Mass spectrometry (GC-MS) analysis in *Momordica charantia* using ethanol extract

Peak#	R. Time	Area%	Height	A/H	MW	Name
1	5.249	3.90	438347	10.97	92	Glycerin
2	11.696	0.89	106300	10.35	146	Ethyl(dimethyl)isopropoxysilane

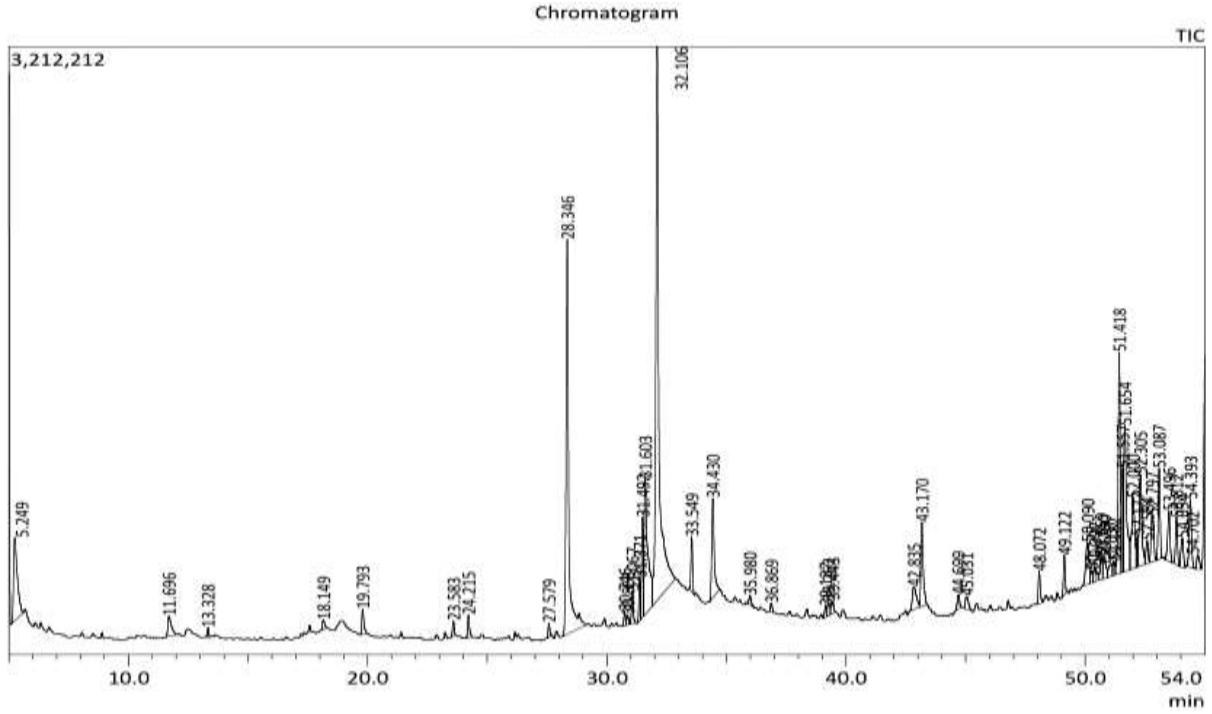
3	13.328	0.16	48715	4.16	444	Cyclohexasiloxane, dodecamethyl-
4	18.149	0.26	49045	6.56	162	.beta.-D-Glucopyranose, 1,6-anhydro-
5	19.793	0.66	132610	6.14	200	Dodecanoic acid
6	23.583	0.32	81085	4.89	168	Cyclohexanone, 2-pentyl-
7	24.215	0.54	120190	5.55	242	Pentadecanoic acid
8	27.579	0.26	73951	4.39	270	Hexadecanoic acid, methyl ester
9	28.346	13.10	2080386	7.76	242	Pentadecanoic acid
10	30.746	0.29	75277	4.70	294	9,12-Octadecadienoic acid (Z,Z)-, methyl ester
11	30.868	0.22	51886	5.12	226	Methyl 12-oxo-9-dodecenoate
12	31.067	0.70	171947	5.05	292	Phytol
13	31.371	0.83	226142	4.51	298	Methyl stearate
14	31.492	2.30	527891	5.36	280	Linoelaidic acid
15	31.603	6.22	713532	10.74	210	7-Tetradecenal, (Z)-
16	32.106	22.77	2918185	9.62	284	Octadecanoic acid
17	33.549	1.11	288026	4.74	292	Methyl .gamma.-linolenate
18	34.430	3.13	523817	7.36	278	Gamolenic acid
19	35.980	0.27	50830	6.50	238	3,7-Dimethyl-1-octyl

						methylphosphonofluorida
20	36.869	0.21	48175	5.49	283	Octadecanamide
21	39.137	0.29	57227	6.28	368	Hexanoic acid, octadecyl ester
22	39.262	0.38	73622	6.28	312	Glycidyl palmitate
23	39.443	0.38	66743	6.98	330	Hexadecanoic acid, 2-hydroxy-1-(hydroxymethy
24	42.835	1.14	119589	11.72	356	Stearic acid-TMS
25	43.170	2.40	443317	6.68	358	Octadecanoic acid, 2,3-dihydroxypropyl ester
26	44.699	0.40	75011	6.50	222	2,6,10-Dodecatrien-1-ol, 3,7,11-trimethyl-
27	45.031	0.53	70104	9.31	204	Bicyclo[7.2.0]undec-4-ene, 4,11,11-trimethyl-8-
28	48.072	0.78	170670	5.66	416	.gamma.-Tocopherol
29	49.122	0.84	210310	4.90	430	dl-.alpha.-Tocopherol
30	50.090	1.70	221840	9.47	396	Ergosterol
31	50.275	0.31	66610	5.80	402	Docosapentaenoic acid-TMS
32	50.397	0.43	85404	6.21	342	Methyl cis-4,7,10,13,16,19-Docosahexaenoate
33	50.669	0.63	120880	6.42	322	Methyl cis-11,14-Icosadienoate
34	50.790	0.81	107745	9.22	458	Cholesterol-TMS

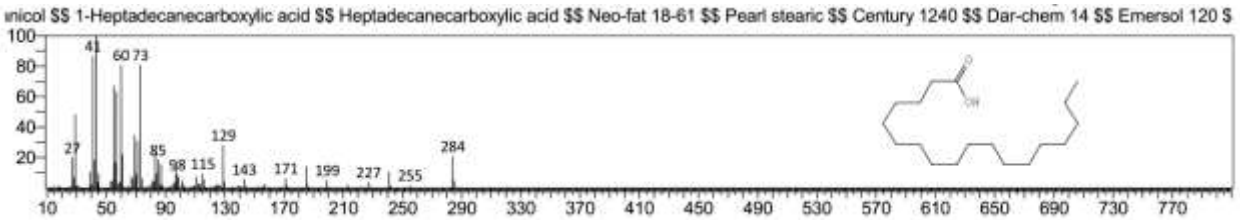
35	51.037	0.55	65910	10.36	294	Methyl linolelaidate
36	51.182	0.36	75732	5.94	374	Eicosapentaenoic acid-TMS
37	51.418	5.64	1163719	5.98	412	Stigmasterol
38	51.557	2.23	545525	5.04	406	3-Oxatricyclo[20.8.0.0(7,16)]triaconta-1(22),7(1
39	51.654	5.29	770278	8.47	414	.beta.-Sitosterol
40	52.000	2.86	372504	9.48	302	Androst-5-en-3-ol, 4,4-dimethyl-, (3.beta.)-
41	52.177	0.75	163790	5.63	316	Methyl cis-5,8,11,14,17-Eicosapentaenoate
42	52.305	2.82	481106	7.23	398	Ergosta-5,22-dien-3-ol, (3.beta.,22E)-
43	52.584	0.64	121181	6.47	468	9,19-Cycloergost-24(28)-en-3-ol, 4,14-dimethyl-
44	52.797	1.61	246114	8.04	396	7,22-Ergostadienone
45	53.087	2.18	479533	5.60	468	9,19-Cycloergost-24(28)-en-3-ol, 4,14-dimethyl-
46	53.496	1.48	265766	6.84	410	4,22-Stigmastadiene-3-one
47	53.812	1.14	249763	5.61	384	Cholest-4-en-3-one
48	54.054	0.89	154221	7.13	342	Methyl cis-4,7,10,13,16,19-

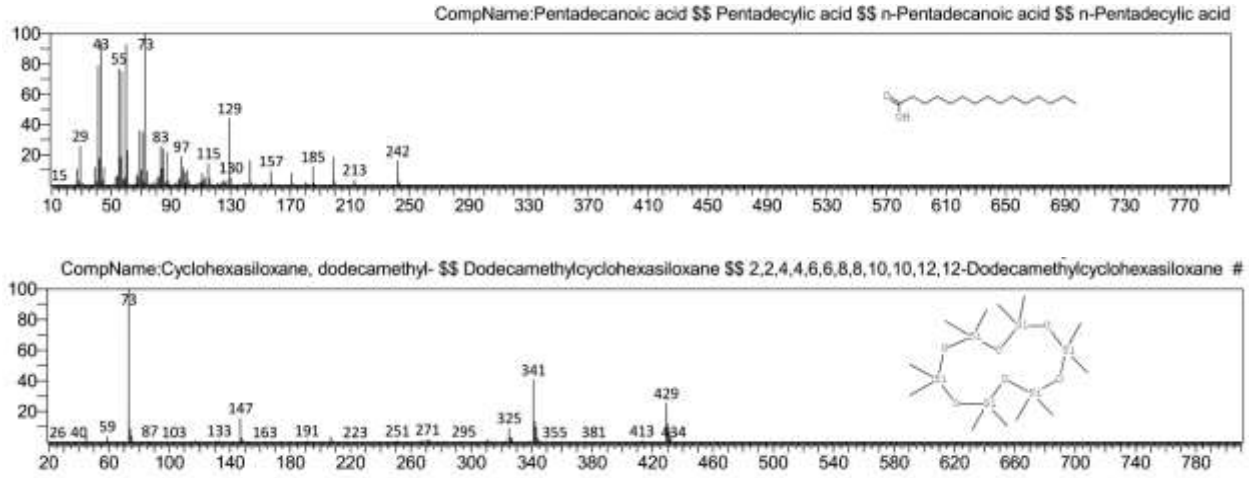
						Docosahexaenoate
49	54.393	1.93	357077	6.67	426	9,19-Cyclolanost-24-en-3-ol, (3.beta.)-
50	54.702	0.47	75374	5.60	350	Methyl cis-13,16-Docosadienate

Figure I. Gas Chromatography-Mass spectrometry (GC-MS) analysis of *Momordica charantia* using ethanol extract



*X-axis - The retention time, *Y-axis - Concentration of sample *min - minutes, *TIC-Total Ion Chromatogram





Bioactive compounds determination by Gas chromatography – Mass spectrometry (GC-MS) analysis of *Momordica charantia* using ethanol extract

The results on GC-MS analysis using ethanol extract of *Momordica charantia* with their retention time was showed in Table – I and Figure - I

Fifty compounds were detected in ethanol extract of *Momordica charantia.* In retention time 32.106 min, the compound Octadecanoic acid occurred with highest peak area of 22.77% which has the molecular weight 284. The compound Pentadecanoic acid showed the medium peak area of 13.10 % at retention time 28.346 min with 242 molecular weights. In retention time13.328 min, the compound Cyclohexasiloxane, dodecamethyl- was observed with lowest peak area 0.16 % which has molecular weight 444.

Aanjamma *et al* (2017) discussed that the compound Ergosterol used to treat irritation to skin, eyes and respiratory tracts and used for hypercalcemia lead to calcium deposits in the soft tissues and in particular the kidneys. Sitosterol used to reduce benign prostatic hyperplasia and blood cholesterollevels. Octadecatrienoic acid used to hypercholesterolemic, cancer preventive, hepatoprotective. Due to the presence of these compounds, it has been

commercialized by the natural product industries as a coadjutant in the treatment of various ailments.

CONCLUSION

This study revealed that the presence of numerous compounds that have been identified in the ethanol extracts of *Momordica charantia* which are the major compound of potential medical properties. Future studies in conventional and alternative medicine apart from its use as part of day to day vegetable in Asian cuisine.

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REFERENCE

Aminah, A and Anna, PK 2011, 'Influence of ripening stages on physiochemical characteristics and antioxidant properties of bitter gourd', *Int. Food. Res. J,* 18 (3), 863-868.

Kadhim, MJ, Sosa, AA and Hameed IH 2016, 'Evaluation of anti-bacterial activity and bioactive chemical analysis of Ocimum basilicum using Fourier transform infrared (FT-IR) and gas chromatography-mass spectrometry (GC-MS) techniques', International Journal of Pharmacognosy and Phytochemical Research, 8(6),127-146.

Alon, T and Amirav A 2006, 'Isotope abundance analysis methods and software for improved sample identification with supersonic gas chromatography/mass spectrometry', Rapid Commun Mass Spectrom, 20, 2579-2588.

Hussein, AO, Mohammed, GJ, Hadi, MY and Hameed, IH 2016, 'Phytochemical screening

of methanolic dried galls extract of Quercus infectoria using gas chromatography-mass spectrometry (GC-MS) and Fourier transform-infrared (FT-IR)', *Journal of Pharmacognosy and Phytotherapy*, 8(3),49-59.

Anjamma M, Lakshmi Bhavani |N 2017, 'GC-MS analysis pf Momordica charantia and momordica dioica fruit and root methanolic extracts' International journal of pharmacognosy and phytochemical research 9(6),808-813.