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Research Article

GAS CHROMATOGRAPHY MASS SPECTROSCOPIC (GCMS) ANALYSIS OF SOME BIOACTIVE COMPOUNDS FORM FIVE MEDICINALLY RELEVANT WILD EDIBLE PLANTS.

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ABSTRACT

The aim of present investigation was to analyze the bioactive compound from the five different medicinally important wild edible plants. These plants were *Bauhinia recemosa* Lam., *Caryota urens* L, *Commelina benghalensis* L, *Garcinia indica* (Du Petit-Thou.) Choisy. and *Gmelina arborea* Roxb.. Through GCMS study different compound analyzed from these plants. Majority of the compounds were belonging to acid group. Common compound in all these plants was hexadecanoic acid.

Keywords: Bioactive compounds, GCMS analysis, Wild edible plants.

INTRODUCTION

The biological activity of volatile compounds is dependent on the synergistic or additive effects of the constituent types present at different concentrations. Volatile components from aromatic plants can cause a number of positive or negative interactions (Vokou et al.,2003). Defense, communication or protection against extreme environmental conditions may be the reasons for these emissions of volatile compounds (Niinemets *et al*., 2004).

All volatile organic compounds emitted from plants can originate from biogenic and or anthropogenic sources. Many plants emit substantial amounts of phytogenic volatile organic compounds which include Alkanes, Alkenes, Alcohols, Aldehydes, Ethers, Esters and Carboxylic acids (Ciganek *et al*., 2007; Battino *et al.,* 2007).

MATERIALS AND METHODS

Plant material

The five different plants viz. *Bauhinia recemosa* Lam., *Caryota urens* L, *Commelina benghalensis* L, *Garcinia indica* (Du Petit-Thou.) Choisy. and *Gmelina arborea* Roxb.. were collected from the Kolhapur district of Maharashtra, India.

Preparation of extract

The Sample of five different plant parts like fruits of *Caryota urens, Gmelina arborea & Bauhinia recemosa* while leaves of *Commelina benghalensis* and *Garcinia indica* were used for preparation of extract. These plant parts were dried and Pulverized to powder in a mechanical grinder. Required quantity of the plant sample was weighted, transferred to flask, treated with the Methanol until the powder was fully immersed, incubated over night and filtered through a Whatmann No.41 filter paper. Filtrate is then concentrated till dry residue was remained. After weighing the residue, respective amount of methanol was added to make the final solution. Centrifugation was also done if needed incase of non clearance solution. These solutions were further used for GC-MS for analysis.

GC-MS/MS analysis of bioactive compounds from wild plants

The methanolic extract obtained from five wild edible plants were subjected to Gas Chromatography and Mass Spectroscopy for the determination of bioactive volatile compounds. Some of the important features are summarized below.

GC-MS analysis of the samples were carried out using Shimadzu Make QP-2010 with non polar 60 M RTX 5MS Column. Helium was used as the carrier gas and the temperature programming was set with initial oven temperature at 40^{0}C and held for 3 min and the final temperature of the oven was 480^{0}C with rate at 10^{0}C [min.sup.-1]. A 2 µL sample was injected with splitless mode. Mass spectra was recorded over 35-650 amu range with electron impact ionization energy 70 eV. The total running time for a sample is 45 min. The chemical components from the methanolic extarcts of plants were identified by comparing the retention times of chromatographic peaks using Quadra pole detector with NIST Library to relative retention indices. Quantitative determinations were made by relating respective peak areas to TIC areas from the GC-MS.

RESULTS AND DISCUSSION

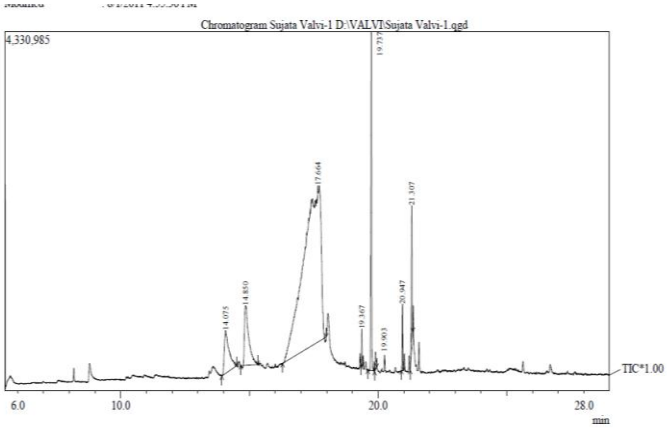

Fig. 1:GC-MS chromatogram of methanolic extract of Fruits of *Bauhinia recemosa* Lam.

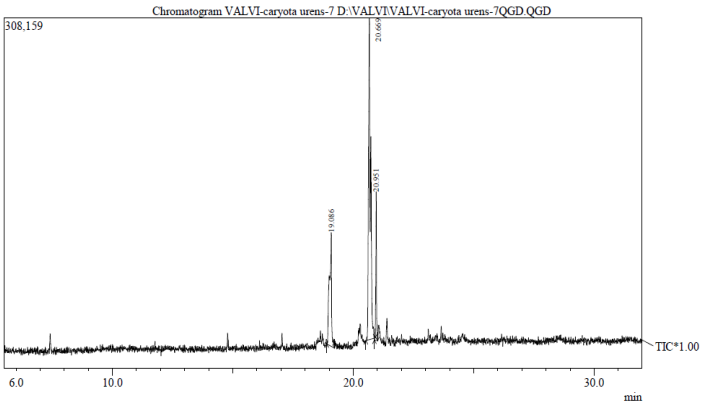

Fig2:GC-MS chromatogram of methanolic extract of Fruits of *Caryota urens* L.

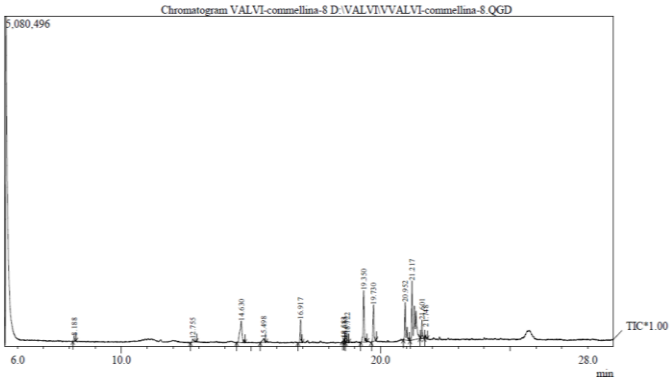

Fig. 3:GC-MS chromatogram of methanolic extract of leaves of *Commelina benghalensis* L.

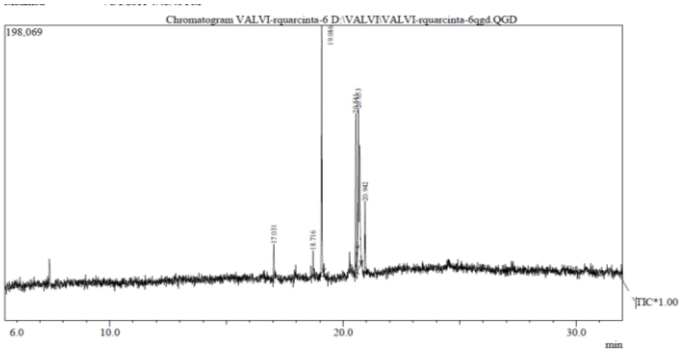

Fig.4 :GC-MS chromatogram of methanolic extract of leaves of *Garcinia indica* (Du Petit-Thou.) Choisy.

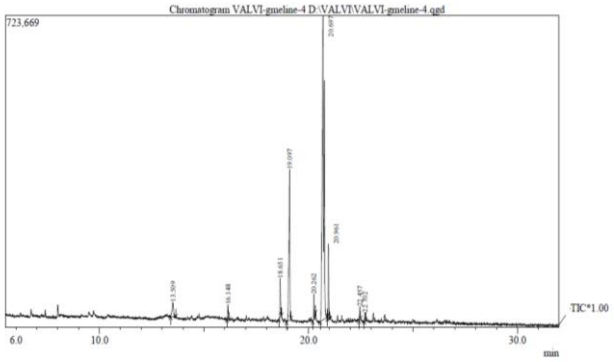

Fig.5:GC-MS chromatogram of methanolic extract of Fruits of *Gmelina arborea* Roxb.

Analysed bioactive compound from wild edible plants shown in table 1.

Sr.No.	Name of the plant	Family	Vernacular name	Edible plant part	Retention Time	% Area of peak	Compound Analyzed	Molecular formula	Mol. Wt. (In grams)
1.	*Bauhinia recemosa* Lam.	Caesalpiniaceae	Apata	Fruit	14.075	5.51	2-Ethoxyphenylacetonitrile	$C_{10}H_{11}NO$	161
					14.850	6.94	5-Acetylpyrimidine	$C_6H_6N_2O$	122
					17.664	75.96	4-Methylmannose	$C_7H_{14}O_6$	194
					19.367	0.51	Hexadecanoic acid	$C_{17}H_{34}O_2$	270
					19.737	6.99	n-Hexadecanoic acid	$C_{16}H_{32}O_2$	256
					19.903	0.42	2-Propen-1-one, 1,3-diphenyl-, E)-	$C_{15}H_{12}O$	208
					20.947	1.06	9,12-Octadecadienoic acid, methyl ester	$C_{19}H_{34}O_2$	294
					21.307	2.61	11,14-Eicosadienoic acid, methyl ester	$C_{21}H_{38}O_2$	322
2.	*Caryota urens* L	Areceae	Ardhashishi	Fruit	19.086	25.02	n-Hexadecanoic acid	$C_{16}H_{32}O_2$	256
					20.669	64.08	9,12-Octadecadienoic acid	$C_{19}H_{34}O_2$	294
					20.951	10.90	Octadecanoic acid	$C_{18}H_{36}O_2$	284
3.	*Commelina benghalensis* L	Commelinaceae	Kena	Leaves	8.188	1.12	Oxiraneethanol	$C_8H_{16}O_4$	176
					12.755	1.59	Nonanoic acid,	$C_{10}H_{18}O_3$	186
					14.630	13.51	3-Isopropoxy-1,1,1,7,7,7-hexamethyl-3,5,5-tris(trimethylsiloxy)tetrasiloxane	$C_{18}H_{52}O_7Si_7$	576
					15.498	2.35	Propanoic acid	$C_{16}H_{30}O_4$	286
					16.917	5.40	Cyclooctasiloxane	$C_{16}H_{48}O_8Si_8$	592
					18.583	0.35	Hexahydropseudoionone	$C_{13}H_{26}O$	198
					18.635	0.53	Z-5-Octadecen-1-ol acetate	$C_{20}H_{38}O_2$	310
					18.722	1.42	Heptasiloxane	$C_{14}H_{44}O_6Si_7$	504
					19.350	15.29	Hexadecanoic acid	$C_{17}H_{34}O_2$	270
					19.730	9.82	n-Hexadecanoic acid	$C_{16}H_{32}O_2$	256
					20.952	11.15	9,12-Octadecadienoic acid	$C_{19}H_{34}O_2$	294
					21.217	33.07	Phytol	$C_{20}H_{40}O$	296
					21.601	3.94	Octadecanoic acid	$C_{22}H_{44}O_4$	372
					21.748	0.47	11,14-Eicosadienoic acid	$C_{21}H_{38}O_2$	322
4.	*Garcinia indica* (Du Petit-Thou.) Choisy.	Clusiaceae	Kokam	Leaves	17.031	4.23	Tetradecanoic acid	$C_{14}H_{28}O_2$	228
					18.716	2.60	Hexadecanoic acid	$C_{17}H_{34}O_2$	270
					19.086	29.69	n-Hexadecanoic acid	$C_{16}H_{32}O_2$	256
					20.541	12.37	Phytol	$C_{20}H_{40}O$	296
					20.653	42.75	Octadecadienoic acid	$C_{19}H_{34}O_2$	294
					20.942	8.35	Octadecanoic acid	$C_{18}H_{36}O_2$	284
5.	*Gmelina arborea* Roxb.	Verbenaceae	Shivan	Fruit	13.509	2.66	Cycloheptasiloxane	$C_{14}H_{42}O_7Si_7$	518
					16.148	1.35	Cyclooctasiloxane	$C_{16}H_{48}O_8Si_8$	592
					18.651	2.85	Hexadecanoic acid	$C_{17}H_{34}O_2$	270
					19.097	18.16	n-Hexadecoic acid	$C_{16}H_{32}O_2$	256
					20.262	1.65	9,12-Octadecadienoic acid,	$C_{19}H_{34}O_2$	294
					20.961	5.32	Octadecanoic acid	$C_{18}H_{36}O_2$	284
					22.457	1.01	9-Octadecenoic acid	$C_{18}H_{34}O_2$	282
					22.702	0.65	Eicosanoic acid	$C_{20}H_{40}O_2$	312

Twenty chemical constituents have been identified from the ethanolic extract of *Mussaenda frondosa* (Vadivel, 2011). The major chemical constituents are (-)-Quinic acid(32.87%), 4- (IE)-3-Hydroxy-1-Propenyl)-2-methoxy phenol(8.30%), Naphthalene, decahydro-2-methoxy-(7.20%),1,2,3- Benzenetriol(7.70%).

Charles *et al* (2011) have done GC-MS analysis of bioactive components from the bark extract of *Alseodaphne semecarpifolia* Nees. GC-MS analysis revealed that the presence of Tridecanoicacid methyl ester, Hexadecanoic-2-oxo methyl ester is showed as minimum percent. The phenolic type compounds are recorded predominantly. (-)- 1,2,3,4-Tetrahydroisoquinolin-6-ol-1-carboxylic acid (9.1%), 5-Hydroxy-2,3,3-trimethyl-2- (3-methyl- buta -1, 3-dienyl) cyclohexanone (7.0%), Furo[2,3-b] pyridin-3-amine, 2-benzoyl-4- methoxymethyl-6-methyl (8.6%).

Abirami and Rajendran (2011) carried out the GC-MS analysis of *Tribulus terrestris.* Their results revealed the presence of 3, 7, 11, 1–tetramethyl2-hexadecen 1-01, n- hexadecanoicacid, Hexadecanoicacid, thylester, Phytol, 9,12 octadecadienoicacid (z,z) 9, 12, 15 octadecanicacid 1, 2 Benzene dicarboxylic acid, diisooctyl ester from this plant.

Enicostemma littorale have been evaluated using GCMS by Ambikapathy et al. (2011). They found various compounds like Laminaribiitol, 2-hydroxy-9-octadecenoic acid, Myricetin, 3.3-Methylenebis (4- hydroxycoumarin), catechin.

Senthilkumar et al (2012) analyzed some compound from the leaves of *Trichilia connaroides* through GCMS. They were identified Methyl 11',13'-dioxo-12'-aza-[4,4,3]-pro, methaniminomethano)naphthalene-9,11, Naphthalene, Tetradecene, Bicyclo, heptan-3-one,2,6,6-trimet, Isotridecanol, Octane, 1-bromo-2-chloro-1,1-difluro-2-tridecan (Hexacosane), Tetrahydroxy myrcenol, Dodecyl acrylate(Oleic acid), Benzene,1-(1,5-dimethyl-4-hexyl-4-methyl, pentatriacontane, Phenol,2,4-bis(1,1-dimethylethyl), Silane-trichlorodocosyl, Undecanethiol, Pentadecane, Undecane, Hydroxylamine,o-decyl, Dodecanoic acid Hexyl-1-octanol, Hexadecanoic acid methyl ester (palmitic acid), Ethyl oleate, Phthalic acid etc. Mahalingam *et al* (2012) evaluated the bioactive compounds from *Mirabilis jalapa* through GC-MS. The chemical compounds found were, 3,3'- Methylenebis (4-hydroxycoumarin). N-D-alpha-Phenylyglycine, laminaribiitol, 3-(4-(dimethylamino)cinnamoyl), 4-hydroxycoumarin. In present investigation the compounds analysed were 5-Acetylpyrimidine, 2-Ethoxyphenylacetonitrile, 4-Methylmannose, Hexadecanoic acid, n-

Hexadecanoic acid, 2-Propen-1-one, 1,3-diphenyl-, (E), Oxiraneethanol, 9,12-Octadecadienoic acid, Nonanoic acid, Hexahydropseudoionone, Heptasiloxane, Cyclooctasiloxane, Eicosanoic acid etc. The compounds identified were different than previous study except Hexadecanoic acid, n- Hexadecanoic acid.

Kubo and Kubo, (1995) studied the antimicrobial activity of the constituents ((E)2-Heprenal; (E)2-octenal; (E) 2-nonenal; (E)2-decenal; (E)2-undecenal; (E) (E)2,4-decadienal; 3-methyl-2- butenal; hexanoic acid; octanoic acid; hexanal) from the dried flowers of a Brazilian medicinal plant, *Tanaatum balsamita* against *Bacillus subtilis,*

Brevibacterium ammoniagenes, Staphylococcus aureus, Staphylococcus mutans, Propionibacterium acnes, Pseudomonas aeruginosa, Enterobacter aerogenes, Escherichia coli, Proteus vulgaris, Pitorosporum ovale;penicillium chrysogenum and *Trichophyton mentagrophytes.* Ibliiez *et al.* (1998) were analyzed the volatile components from various fruits. From raspberry they were analysed the linalool, citral, linalyl acetate, terpenolene, beta-lonone etc. From strawberry they analysed ethyl acetate, methyl butanoate, methyl 2 methyl butanoate, transe 2 hexene-1-ol, methyl hexanoate, ethyl hexanoate, butyl butanoate, ethyl octanoate, octyl acetate. From Blackberry they were analyzed the 3 methyl butanal, hexanal,transe 2 hexanal, transe 2 hexen-1-ol, 2 heptanol, p-cymen-8-ol. The hexanal and butane compounds are common from the present study.

Shanmugavasan *et al.* (2011) carried out the chemical compounds from the stem of *Ziziphus jujuba.* The compounds identified by them were (1, 5, 5, 8-Tetramethyl-bicyclo[4.2.1] non-9-yl)-acetic acid, methyl ester, 1,3-Tetradecen-1-o1 acetate, 1-Hexadecanethiol, 2-Cyclopenen-1-one,2-Cyclopenten-1-one, 2,3-dimethyl, 2-Cyclopenten-1-one, 2-hydroxy-3-methyl, 2-Cyclopenten-1-one, 3-ethyl-2-hydroxy, 2-Cyclopenten-1-one, 3-methyl- , 2-Furanmethanol, 2-Methyl-5-hydroxybenzofuran, 2-Propenoic acid, 2- (4-hxroxy-3-methoxyphenyl), Acetyl-2,5-dichlorothiophene, 3-Eicosene, (E), 9-Octadecenoic acid (Z)-, methyl ester, Cyclohexene, 1-pentyl-4-(4-propylcyclohexyl), Cyclohexene, 4-(4-ethylcyclohexyl)-1-pentyl- , Cyclopentadecanone, 4-methyl, Docosanoic acid, methyl ester, Ferrocene, octamethyl, Heptadecanoic acid, 16-methyl, methyl ester, Hexadecanoic acid, methyl ester, Napthalene, 1,4-dimethyl- , Napthalene, 1,6,7-trimethyl-, Napthalene, 1-methyl- Napthalene, 2,7-dimethyl, Octadec-9-enoic acid, Oleic acid, Phenol, 2,6-dimethyl, Tetracosanoic acid, methyl ester, Z-11,13-Dimethyl-11-tetradecen-1-ol acetate and Oxacyclohexadecan-2-one. The compounds belonging to acid group reported by authors were similar in present work.

CONCLUSION

In the present study, five different plants were studied for the presence of volatile compounds. The common compound identified in all plants were, n-Hexadecanoic acid, Hexadecanoic acid, 9, 12-Octadecadienoic acid and Octadecanoic acid.

In that tetradecanoic acid, hexadecanoic acid, octadecanoic acid are among the fatty acids known to have potential antibacterial and antifungal activity. These compound indicates their potential use for various diseases in traditional systems. Tetradecanoic acid is also called myristic acid which constitutes 60-75 percent of the fatty-acid content. So it is good edible value.

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