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RESEARCH ARTICLE

The GC MS Analysis of Ethyl Acetate Extract of *Merremia emerginata* Burm. F (*Ipomoea reniformis*)

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ABSTRACT

This study deals with the GC MS analysis of one herbal medicinal plant *Merremia emerginata* which is used ethnobotanically for the treatment of cough, headache, neuralgia, rheumatism, diuretic, inflammation, troubles of nose, fever etc. The plant was collected at Chengalpattu, Tamil Nadu, India and the ethyl acetate extract of the whole plant was prepared. The extract was subjected to GC MS analysis after processing it as per protocol. It was observed that some very important molecules were present in the GC MS profile such as Methyl 4-O-methyl-.beta.-D-xylopyranoside, D-Mannitol, Caryophyllene oxide, 11-Dodecenoic acid, 10-hydroxy-, methyl ester, Pentadecanoic acid, Phytol, 9,12,15-Octadecatrienoic acid, (Z,Z,Z)-, Octadecanoic acid, Methyl stearidonate, Eicosanoic acid, Gamolenic Acid, Docosanoic acid, .beta.-Tocopherol, O-methyl-, Stigmasterol, .beta.-Sitosterol, dl-.alpha.-Tocopherol, p-Coumaric acid, 1-Heptatriacotanol etc. These molecules indicate functions similar to the roles of this plant towards curing the ailments.

Keywords: GC MS, Herbal, *Merremia emerginata,* D-Mannitol, Methyl stearidonate, Eicosanoic acid, Gamolenic Acid, Docosanoic acid, .beta.-Tocopherol.

INTRODUCTION

The present study is to probe into the medicinal role of one herbal medicinal plant, *Merremia emerginata*, by GC MS analysis. This knowledge could help in understanding the function of the molecules present in the plant. There are many reports on the GC MS studies of almost all herbal medicinal plants, still lot more need be done [1-14]. Traditionally *M. emerginata* is used as diuretic, for cough, headache, neuralgia and rheumatism. In the Indigenous system of Medicine, *M. emerginata*has been claimed to be useful for cough, headache, neuralgia, rheumatism, diuretic, inflammation, troubles of nose, and fever due to enlargement of liver and also in kidney diseases. Powder of leaves is used as a snuff during epileptic seizures, Juice acts as purgative and the root is having diuretic, laxative, and applied in the disease of the eyes and gums. Babu *et al,* 2009 have studied the antioxidant activities of various extracts of *M. emerginata* [15]. Prabhu *et al*, 2012 have reported the phytochemical analysis, anti-inflammation, anti-arthritic analgesic and anticancer role of this plant [16-18]. Baskar *et al,* 2012 have shown the antioxidant, anti-inflammation, anti-arthritic analgesic and anti-proliferative role of *M. emerginata* [19]. Thakare *et al*, 2014 have reviewed the various medicinal aspects of this plant [20]. Angappan *et al*, 2018 have shown the diuretic role of this plant [21]. Elumalai *et al*, 2001 have reported the antibacterial role of this plant [22].

MATERIALS AND METHODS

The plant *Merremia emerginata* was collected from the nearby hills at Chengalpattu, Tamil Nadu. The plant was identified by a qualified botanist at Chennai. The ethyl acetate extract of the shade dried whole plant was collected after 48 h of soaking. The extract was evaporated and the dried powder was used for GC-MS analysis by standard procedures.

GC-MS Procedure

Instrument: GC (Agilent: GC: (G3440A) 7890A. MS/MS: 7000 Triple Quad GCMS) was equipped with MS detector. Sample Preparation. About 100 ml sample was dissolved in 1 ml of suitable solvents. The solution was stirred vigorously using vortex stirrer for 10 s. The clear extract was determined using GC for analysis.

GC-MS Protocol

Column DB5 MS (30 mm × 0.25 mm ID ×0.25 μm, composed of 5% phenyl 95% methylpolysiloxane), electron impact mode at 70 eV; helium (99.999%) was used as carrier gas at a constant flow of 1 ml/min injector temperature 280°C; auxilary temperature: 290°C ion-source temperature 280°C. The oven temperature was programmed from 50°C (isothermal for 1.0 min), with an increase of 40°C/min, to 170°C C (isothermal for 4.0 min), then 10°C/min to 310°C (isothermal for 10 min) fragments from 45 to 450 Da. Total GC running time is 32.02 min. The compounds are identified by GC-MS Library (NIST and WILEY).

RESULTS

The results of the GC-MS analysis of the whole plant ethyl acetate extract along with the possible medicinal role of each molecule of *Merremia emerginata* extract are tabulated in Table 1. Figure 1 represents the GC-MS profile of ethyl acetate extract of the whole plant of *Merremia emerginata.* The identification of metabolites was accomplished by comparison of retention time and fragmentation pattern with mass spectra in the NIST spectral library stored in the computer software (version 1.10 beta, Shimadzu) of the GC-MS along with the possible pharmaceutical roles of each bio molecule as per Dr. Duke's Phytochemical and ethnobotanical data base (National Agriculture Library, USA) and others as shown in Table 1 [23].

DISCUSSION

The GC MS profile of *Merremia emerginata* indicated the presence of the some phytochemicals such as Methyl 4-O-methyl-.beta.-D-xylopyranoside, D-Mannitol, Caryophyllene oxide, 11-Dodecenoic acid, 10-hydroxy-, methyl ester, Pentadecanoic acid, Phytol, 9,12,15-Octadecatrienoic acid, (Z,Z,Z)-, Octadecanoic acid, Methyl stearidonate, Eicosanoic acid, Gamolenic Acid, Docosanoic acid, .beta.-Tocopherol, O-methyl-, Stigmasterol, .beta.-Sitosterol, dl-.alpha.-Tocopherol, p-Coumaric acid, 1-Heptatriacotanol etc. the medicinal roles of which are indicated in Table 1. From the table it is clear that these molecules do have some relationship with the medicinal roles of this plant. It is concluded that the ethnomedical uses of this plant is supported by the roles of the molecules present in this plant as shown by the GC MS profile.

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Conflict of interest

The authors declare that no conflict of interest exists among them

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Table1. Indicates the retentions values, types of possible compound, their molecular formulae, molecular mass, peak area and their medicinal roles of each compound as shown in the GC MS profile of *Merremia emerginata*

Sl. No	Retention Time	Compound Name	Mol. Formula	Mol. Weight	% Peak Area	Possible medical Role
1	4.71	Methyl 4-O-methyl-.beta.-D-xylopyranoside	C7H14O5	178.1	1.59	Catechol-O-Methyl-Transferase-Inhibitor, Methyl-Donor, Methyl-Guanidine-Inhibitor, 17-beta-hydroxysteroid dehydrogenase-Inhibitor, Decrease gluatame oxaloacetate transaminase, decrease oxalate excretion, Antiamyloid-Beta, Down regulate nuclear and cytosol androgen reuptake, Inhibits destruction of Glycosaminoglycans, Ornithine decarboxylase

						inhibitor, AntiTGF-beta, Beta-2-Receptor-Agonist, Beta-Adrenergic Receptor Blocker, Beta-Andrenergic-Agent, Beta-Blocker, Beta-Galactosidase-Inhibitor, Beta-Glucuronidase-Inhibitor, ER-Beta-Binder, Aldehyde-Oxidase-Inhibitor, Anticancer, Antidote
2	6.52	D-Mannitol	C6H14O6	182.1	1.17	Smart drug, 17 beta hydroxysteroid dehydrogenase inhibitor, Alcohol dehydrogenase inhibitor, anticancer, antidote, antileukotrine D-4, circulatory depressant, CNS depressant, coronary dilator, Cyclin-D1-Inhibitor, Decalcifier, Decarboxylase-Inhibitor, Decongestant, Decrease C-Teleopeptide Excretion, Decrease Deoxypyridinoline Excretion, Decrease Endothilial Leukocyte Adhesion, Decrease Endothilial Platelet Adhesion
3	8.75	Silane, [(1,1-dimethyl-2-propenyl)oxy]dimethyl -	C7H16OSi	144.1	1.39	Not known
4	10.42	Caryophyllene oxide	C15H24O	220.2	0.84	Nitric oxide synthase inhibitor
5	12.56	11-Dodecenoic acid, 10-hydroxy-, methyl ester	C13H24O3	228.2	1.34	17 beta hydroxysteroid dehydrogenase inhibitor, Aryl hydrocarbon hydroxylase inhibitor, Testosterone hydroxylase inducer, Catechol-O- methyl transferase inhibitor, Methyl donor, Methyl guanidine inhibitor, Acidifier, Arachidonic acid inhibitor, Increase aromatic Amino acid decarboxylase activity
6	13.29	3,7,11,15-Tetramethyl-2-hexadecen-1-ol	C20H40O	296.3	1.55	Oligosaccharide provider
7	13.45	Benzene, 1-isocyanato-2-methoxy-	C8H7NO2	149	0.73	Not known

8	13.54	Pentadecanoic acid	C15H30O2	242.2	0.93	Acidifier, acidulant, Arachidonic acid inhibitor, Increase aromatic amino acid decarboxylase activity, inhibits production of Uric acid,
9	14.34	Scopoletin	C10H8O4	192	1.65	Not known
10	15.54	Tetradecanoic acid	C14H28O2	228.2	1.70	Acidifier, acidulant, Arachidonic acid inhibitor, Increase aromatic amino acid decarboxylase activity, inhibits production of Uric acid,
11	15.90	Phytol	C20H40O	296.3	3.50	Antimicrobial, anti-inflammatory, antioxidant, diuretic
12	16.28	Methyl 5,11,14-eicosatrienoate	C21H36O2	320.3	10.73	Catechol-O-methyltransferase inhibitor, methyl donor, methyl guanidine inhibitor
13	16.35	Pyrazine-2-carbohydrazide, N2-(2,4-dichlorobenzylideno)-	C12H8Cl2N4O	294	5.39	Not known
14	16.42	9,12,15-Octadecatrienoic acid, (Z,Z,Z)-	C18H30O2	278.2	2.35	Anti-inflammatory, hypocholesterolemic, cancer preventive, hepatoprotective, nematicide, insectifuge antihistaminic
15	16.59	Octadecanoic acid	C18H36O2	284.3	4.46	Acidifier, acidulant, Arachidonic acid inhibitor, Increase aromatic amino acid decarboxylase activity, inhibits production of Uric acid,
16	16.83	Phytol, acetate	C22H42O	338.3	1.66	Not known
17	17.96	Methyl stearidonate	C19H30O2	290.2	0.95	Catechol-O-methyltransferase inhibitor, methyl donor, methyl guanidine inhibitor
18	18.08	Eicosanoic acid	C20H40O2	312.3	1.59	Arachidonic acid Inhibitor, Increase Aromatic Amino acid decarboxylase activity, Inhibit production of uric acid, Urine acidifier,
19	18.17	Gamolenic Acid	C18H30O2	278.2	1.48	Acidifier, acidulant, Arachidonic acid inhibitor, Increase aromatic amino acid

						decarboxylase activity, inhibits production of Uric acid,
20	19.07	l-(+)-Ascorbic acid 2,6-dihexadecanoate	C38H68O8	652.5	1.52	Not known
21	19.59	Docosanoic acid	C22H44O2	340.3	0.81	Acidifier, acidulant, Arachidonic acid inhibitor, Increase aromatic amino acid decarboxylase activity, inhibits production of Uric acid,
22	20.35	Butyl 9,12-octadecadienoate	C22H40O2	336.3	2.01	Not known
23	20.40	Butyl 9,12-octadecadienoate	C22H38O2	334.3	1.53	Not known
24	20.58	Octadecanoic acid, 2,3-dihydroxypropyl ester	C21H42O4	358.3	0.99	Acidifier, acidulant, Arachidonic acid inhibitor, Increase aromatic amino acid decarboxylase activity, inhibits production of Uric acid
25	21.09	9,12,15-Octadecatrienoic acid, 2,3-dihydroxypropyl ester, (Z,Z,Z)-	C21H36O4	352.3	1.25	Not known
26	22.83	1,1,6-trimethyl-3-methylene-2-(3,6,9,13-tetramethyl-6-ethenye-10,14-dimethylene-pentadec-4-enyl)cyclohexane	C33H56	452.4	3.08	Not known
27	23.30	.beta.-Tocopherol, O-methyl-	C29H50O2	430.4	1.29	Tocopherol-Synergist, Catechol-O-Methyl-Transferase-Inhibitor, Methyl-Donor, Methyl-Guanidine-Inhibitor, 17-beta-hydroxysteroid dehydrogenase-Inhibitor, Antiamyloid-Beta, AntiTGF-beta, Beta-2-Receptor-Agonist, Beta-Adrenergic Receptor Blocker, Beta-Andrenergic-Agent, Beta-Blocker, Beta-Galactosidase-Inhibitor, Beta-Glucuronidase-Inhibitor, ER-Beta-Binder, Aldehyde-Oxidase-Inhibitor, Anticancer, Antidote, Antiretinitic

28	23.37	Docosanoic anhydride	C44H86O3	662.7	0.92	Not known
29	23.79	Campesterol	C28H48O	400.4	7.80	Not known
30	24.04	Stigmasterol	C29H48O	412.4	14.52	Precursor of progesterone act as intermediate in the biosynthesis of androgens, and estrogens Antiosteoarthritic, antihypercholestrolemic, cytotoxic, antitumor, hypoglycaemic, antimutagenic, antioxidant, anti-inflammatory, Analgesic
31	24.34	.beta.-Sitosterol	C29H50O	414.4	6.32	17 beta dehydrogenase inhibitor, androgen blocker, anti-amyloid beta, anticancer, Anti TGF beta, Beta 2-receptor, beta blocker, beta-galactosidase inhibitor, beta-glucuronidase inhibitor
32	24.44	Dodecane, 1-fluoro-	C12H25F	188.2	0.78	Not known
33	24.53	Phytonadione	C31H46O2	450.4	1.66	Not known
34	24.61	Cholesterol margarate	C44H78O2	638.6	1.24	Cholestolytic
35	24.73	4,22-Stigmastadiene-3-one	C29H46O	410.4	1.08	Not known
36	24.79	Stigmasta-5,22-dien-3-ol, acetate, (3.beta.,22Z)-	C31H50O2	454.4	0.95	Not known
37	25.12	dl-.alpha.-Tocopherol	C29H50O2	430.4	1.09	Tocopherol synergist, 5 alpha reductase inhibitor, Alpha agonist, Alpha amylase inhibitor, Alpha glucosidase inhibitor, HIF-1 alpha inhibitor, Ikappa B-alpha phosphorylation inhibitor, Increase alpha mannosidase activity, Interleukin 1-alpha inhibitor, Testosterone-5-Alpha-Reductase-Inhibitor, TNF- alpha inhibitor
38	25.56	p-Coumaric acid	C9H8O3	164	3.83	Inhibit Production of Uric Acid, Acidifier, Acidulant, Arachidonic acid-Inhibitor, Arachidonic-Acid-Inhibitor, Increase Aromatic Amino Acid Decarboxylase Activity, Urinary-Acidulant, Urine-Acidifier, Adrenalin-Pressor, Algogenic (pain-causing),

						Anesthetic-potentiator, ANS-Paralytic, Anti-cAMP-Phosphodiesterase, Anticancer, Antidote
39	25.62	1-Heptatriacotanol	C37H76O	536.6	0.99	Antibacterial Lupeol: Anticancer, antiprotozoal, chemopreventive and anti-inflammatory properties, Antimalarial Antiflu, Antiviral, antiprotozoal, Antioxidant, Antiperoxidant, Antitumor, anticancer, Enzyme inhibitor, anti-hypercholesterolemic effects
40	28.13	11,13-Dimethyl-12-tetradecen-1-ol acetate	C18H34O2	282.3	1.35	Oligosaccharide provider

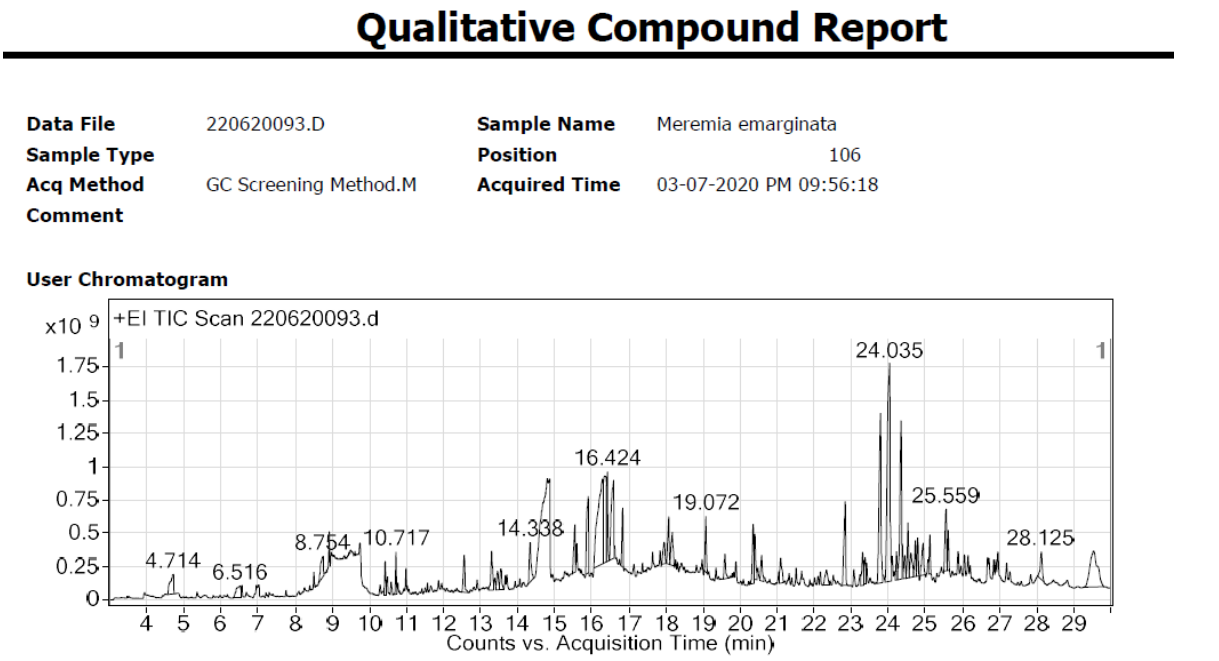

Figure 1. Indicates the GC MS profile of *Merremia emerginata*