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GC-MS ANALYSIS OF RUMEX VESICARIUS L.

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Abstract

The Gas chromatography-Mass spectrometry (GC-MS) analysis of *Rumex vesicarius* L. was carried out in four solvents like ethyl acetate extract (EE), ethyl alcohol extract (EAE), chloroform extract (CE), and hexane extract (HE)) to identified the phytochemical constituents. In hexane 61 compounds, chloroform 56 compounds, ethyl alcohol 49 compounds and ethanol extract 45 compounds were identified.

Key words:
Rumex vesicarius L., GC-MS analysis, Phytocompounds.

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INTRODUCTION

Medicinal plants are used in traditional treatments to cure variety of diseases. In the last few decades there has been an exponential growth in the field of herbal medicine. Natural products have been a source of drugs for centuries. *Rumex vesicarius* L. is an annual plant belong to family Polygonaceae[1] , commonly known as "Bladder dock". The importance of *Rumex* genus was based on its biological activities, like antimicrobial, anti-inflammatory, antidiarrhoeal and antiviral properties[2] *Rumex vesicarius* L. is an annual, glabrous herb, 15-30cm height, branched, leaves elliptic, ovate (or) oblong with monoecious flowers. The plant is widely cultivated as green leafy vegetable in many parts of India. According to Unnani systems of medicine, the herb is used as an analgestic, astringent, antiulcer, hepato-protective agent and also useful for scabies, leucoderma,

toothache, asthma, heart troubles, tumors, and scurvy. The leaves are used as asperient, diuretic, cooling and used as an antidote for snake venom, seeds are also used as cooling agent curing dysentery and considered as an antidote for scorpion venom [5,6,7,8]. In the present study four extracts of the plant (EAE, EE, CE, and HE) were analyzed by GC-MS technique to study the major and minor phytoconstituents of the aerial edible vegetative parts of the plant.

MATERIALS AND METHODS

Plant material

Rumex vesicarius L. was collected from fields at Tiruvannamalai, Tiruvannamalai District of Tamilnadu. The plant was well preserved and identified by BSI, South regional centre, Coimbatore, India. Type specimen was deposited in the Department of Botany, Government Arts College (Autonomous), Kumbakonam, Tamilnadu.

Preparation of plant extracts

The collected plant materials were shade dried, powered and passed through 40mm meshes and stored in closed vessel for further use. The dried powder material was extracted separately with different solvents viz., ethyl alcohol, ethyl acetate, chloroform and n-Hexane. The extract contains both polar and non-polar phytocomponents.

Gas chromatography-Mass spectrometry analysis

The Gas chromatography-Mass spectrometry (GC-MS) analysis of the extracts was performed using a GC-MS (Model; QP 2010 series, Shimadzu, Tokyo, Japan) equipped with a VF-5ms fused silica capillary column of 30m length, 0.25mm dia., and 0.25µm film thickness. For GC-MS detection, an electron ionization system with ionization energy of 70eV was used. Helieum gas (99.99%) was used as a carrier gas at a constant flow rate of 1.51ml/min. injector and mass transfer line temperature were set at 200 and 240°C respectively. The oven temperature was programmed from 70to 220°C at 10°C/min, held isothermal for 1min and finally raised to 300°C AT 10°C/min. 2µl of respective diluted samples was manually injected in the split less mode, with split ratio of 1:40 and with mass scan of 50-600 amu. Total running time of GC-MS is 35min.

The relative percentage of the each extract constituents was expressed as percentage with peak area normalisation.

Identification of components

The identity of the components in the extracts was assigned by the comparison of their retention indices and mass spectra fragmentation patterns with those stored on the computer library and also with published literatures. NIST08.LIB[9], WILEY8.LIB[10], PESTEI_3.LIB, and FA_ME.LIB library sources were used for matching the identified components from the plant material.

RESULTS AND DISCUSSION

The GC-MS analysis of the extracts showed the presence of phytocomponents, the phytocomponents of each extract are presented separately in Table 1-4 and the GC-MS chromatogram with peak area of each extract is also given figure1-4. Totally 211 constituents was identified in the present study from all the four extracts of the plant. Hexane extract recorded highest number of (61) phytoconstituents, while in ethanol extract lower number of (45) phytoconstituents was observed which including both major and minor constituents. More than 10 constituents were commonly present in all the four extracts.

The Hexane extract (HE) of the plant showed 61 constituents, the major constituents were n-Hexatriacontane (18.52%), Palmitic acid (16.20%),

Tetra tetra conatane (14.56%), α-Linoienic acid (12.31%), gamma-Sitosterol (9.87%), Cyclohexyl amine (3.79%), α-Tocopherol (2.79%) and Methyl linolenate (2.44%) along with minor constituents were also reported. (Table1). The GC-MS chromatogram with peak area has shown in Figure1.

The Chloroform extract (CE) of the plant showed 56 constituents (Table2), the major constituents were n-Tetracontane (14.19%), Docosane (11.38%), Hexadecanoic acid (9.61%), Octadecatrien (9.05%), α-Octadecene (6.77%) and l-docosene (4.80%) along with major constituents, minor constituents were also recorded. The GC-MS chromatogram with peak area was given in Figure 2.

The Ethyl acetate extract (EE) of the plant reveled 49 constituents (Table 3), the major constituents were Palmitic acid (24.38%), α-Linoienic acid (22.12%), n-Hexatriacontane (11.82%), Stigmastenol (9.96%), Tetratetracontane (9.50%) and alpha Tocopherol (3.12%) along with major constituents, minor constituents were also reported. The GC-MS chromatogram with peak area was presented in Figure 3

The Ethylalcohol extract (EAE) of the plant reveled that the presence of 45 constituents (Table 4), the major constituents were Hexadecanoic acid (27.40%), α-Linoienic acid (26.53%), gamma-Sitosterol (9.61%), Methylcycloheptene (6.52%), and along with major constituents, minor constituents were also reported. The GC-MS chromatogram with peak area has shown in Figure 4.

The aim of the present study is to provide more information about the essential phytoconstituents of *Rumex vesicarius* L. the results from the present investigation are very encouraging and indicates that all the plants should be studied more extensively to explore its potential to use as plant medicinal nutritive.

Figure 1: GC-MS chromatogram of Rumex vesicarius L. of hexane extract

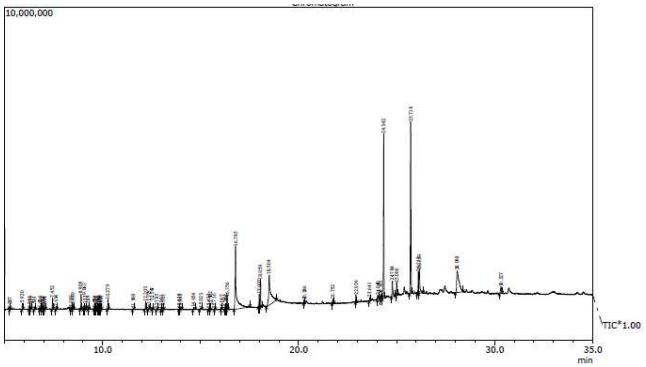

Table 1: List of phyto constituents in Hexane extract of Rumex vesicarius L.

S. No.	RT	CONSTITUENTS	RI	RI
1	5.287	Heptane,3,3,6-trimethyl-	29110	0.05
2	5.920	n-Undecane	285800	0.48
3	6.281	(2,4,6-Trinitro-phenyl)-carbamic acid 1-ethynyl-1,5-dimethyl-hex-4-enyl ester	50674	0.08
4	6.339	1,2,3,5-tetramehtylbenzene	72073	0.12
5	6.539	Isopropylcyclohexane	58688	0.10
6	6.826	1-Chlorohexadecane	80446	0.13
7	6.905	3,4-dimethylundecane	76055	0.13
8	7.004	Tetradecane	102864	0.17
9	7.051	Octanoic acid	59005	0.10
10	7.452	Dodecane	544196	0.90
11	7.634	2,6-Dimethylundecane	135859	0.23
12	8.389	2,10-Dimethylundecane	98224	0.16
13	8.489	2,6-Dimethylheptadecane	237162	0.39
14	8.909	n-Tridecane	670837	1.12
15	9.063	.alpha.-Mehtylnaphthalene	117636	0.20
16	9.133	3,7-Dimethylnonane	58886	0.10
17	9.280	1-Methylnaphthalene	70208	0.12
18	9.591	1-Tridecanol	113327	0.19
19	9.633	3-Methylheptane	43540	0.07

20	9.707	3,3,4-Trimethylhexane	63422	0.11
21	9.786	3-Ethylundecane	100390	0.17
22	9.853	Decanoic acid	76307	0.13
23	9.878	2,3,3-Trimethyloctane	58492	0.10
24	9.937	Dodecane,2,6,10-trimethyl-	102428	0.17
25	10.279	n-Tetradecane	498576	0.83
26	11.568	Nonane.3.7-dimehyl-	60227	0.10
27	12.203	2(4H)-Benzofuranone,5,6,7,7A-tetrahydro-4,4,7A-trimethyl	390907	0.65
28	12.375	n-Dodecanoic acid	296318	0.49
29	12.547	Fumaric acid, ethyl 2-methylallyl ester	72783	0.12
30	12.785	Decane, 1-bromo-2-methyl-	42977	0.07
31	13.001	5-Decyne-4,7-diol,2,4,7,9-tetramethyl-	20689	0.03
32	13.101	1-Mehtylethyl tetradecanoate	31204	0.05
33	13.935	Nonane,3,7-dimethyl-	36565	0.06
34	13.965	Ethanone,1-(3-pentylbicyclo[1.1.1]pent-1-yl)	38870	0.06
35	14.654	Hexadecanoic acid	129707	0.22
36	15.023	1-Chlorooctadecane	155247	0.26
37	15.423	Tetradecanal	38321	0.06
38	15.502	2-Pentadecanone,6,10,14-trimethyl-	195136	0.32
39	15.716	Dodecanoic acid	33478	0.06
40	16.067	Pentadecane	32675	0.05
41	16.252	3-Acetyl-3""-n-butyl[5]staffane	33954	0.06
42	16.306	Methyl (6Z)-6-octadecenoate	53029	0.09
43	16.356	Methyl palmitate	611347	1.02
44	16.785	Palmitic acid	9742653	16.20
45	17.997	Methyl (9E,12E)-9,12-octadecadienoate	740339	1.23
46	18.059	Methyl linolenate	1470238	2.44
47	18.504	.alpha.-Linolenic acid	7403171	12.31
48	20.286	5-methyl-5-(4,8,12-trimethyltridecyl)dihydro-2(3H)-furanone	147531	0.25
49	21.752	1,2-Benzenedicarboxylic acid	237354	0.39
50	22.929	n-Eicosane	412135	0.69
51	23.641	n-Tetratriacontane	270656	0.45
52	24.040	p-Nitrobenzoate	409674	0.68
53	24.191	Methyl cis-11-icosenoate	362459	0.60
54	24.342	Tetratetracontane	8753274	14.56
55	24.784	2,8-Dimethyl-2-(4,8,12-Trimethyltridecyl)-6-chromanol	1485705	2.47
56	25.006	Tetracontane	795767	1.32
57	25.718	n-Hexatriacontane	11139219	18.52
58	26.112	.alpha.-Tocopherol	1679983	2.79
59	26.159	Cyclohexyl-(octahydrobenzofuran-2-ylidene)-amine	2279982	3.79
60	28.098	.gamma.-Sitosterol	5934884	9.87
61	30.327	1H,3H-Furo[3,4-c]furan,tetrahydro-1,4-bis(3,4,5-trimethoxyphenyl)-,[1S-(1.alpha.,3a.alpha.,4.alpha.,6a.alpha.)]	794599	1.32

RT = Retention time, RI = Retention Indices, RA = Percentage of components

Figure 2: GC-MS Chromatogram of Rumex vesicarius L. of chloroform extract

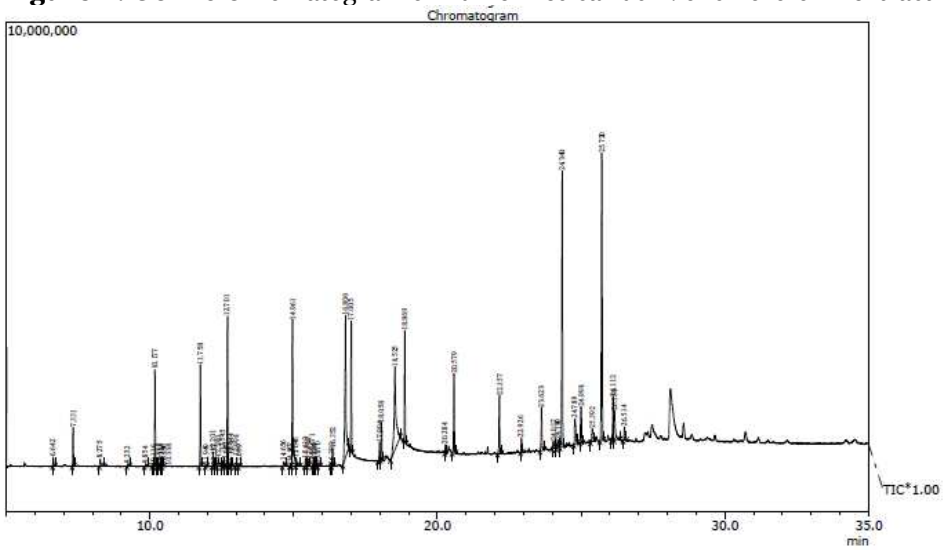

Table 2: List of Phytoconstituents in chloroform extract of *Rumex vesicarius* L.

S. No.	RT	CONSTITUENTS	RI	RI
1	6.642	2,5-Pyrrolidinedione	301684	0.32
2	7.331	.alpha.-Dodecene	1174913	1.25
3	8.275	Benzneacetic acid	352413	0.38
4	9.232	4-Hydroxy-3-methoxystyrene	97622	0.10
5	9.854	Decanoic acid	95522	0.10
6	10.116	(2E)-9-Methyl-2-undecene	41632	0.04
7	10.177	1-Pentadecene	3074539	3.27
8	10.275	Docosane	30779	0.03
9	10.338	2-Undecene,3-methyl-(E)-	51113	0.05
10	10.388	Benzeneacetamide	39824	0.04
11	10.446	4-Hydroxy-3-methoxy-brnzaldehyde	74249	0.08
12	11.758	3,5-Di-tert-butylphenol	3009329	3.20
13	11.949	(3E)-3-Nonen-2-one	49932	0.05
14	12.201	2(4H)-Benzofuranone,5,6,7,7A-tetrahydrid-4,4,7A-trimethyl	464023	0.49
15	12.257	p-Hydroxynitrobenzene	49650	0.05
16	12.380	n-Dodecanoic acid	433993	0.46
17	12.545	Decyl isopropylphosphonofluoridoate	185166	0.20
18	12.642	6-Methyl-1-octene	88974	0.09
19	12.701	E-14-Hexadecenal	462709	5.00
20	12.780	1-Iodo-2-methylnonane	54309	0.06
21	12.844	2-Ethyl-1-dodecne	64560	0.07
22	12.998	Cyclohexane,(2-ethyl-1-methylbutylidene)-	45866	0.05
23	13.099	Isopropyl decanoatte	47248	0.05
24	14.656	Pentadecanoic acid	293215	0.31
25	14.907	(4Z)-9-Methyl-4-undecne	83565	0.09
26	14.961	.alpha.-Octadecene	6354498	6.77
27	15.096	2-Cyclohexen-1-one,4-hydroxy-3,5,5-trimethyl-4-(3-oxo-1-butenyl)-	378791	0.40
28	15.419	2-Hexadecen-1-ol,3,7,11,15-tetramethyl-,[R-{R*,R*-(E)}]-	371599	0.40
29	15.499	2-Pentadecanone,6,10,14-trimethyl-	250078	0.27
30	15.671	(2E)-3,7,11,15-Tetramethyl-2-hexadecen-1-ol	50323	0.05
31	15.716	Decanoic acid	65972	0.07
32	15.771	Dludecyl phthalate	25746	0.03
33	15.870	(2E)-3,7,11,15-Tetramethyl-2-hexadecen-1-ol	100199	0.11
34	16.303	6-Octandecenoic acid, methyl ester (z)-	64974	0.07
35	16.352	Mehtyl n-hexadecanoate	588213	0.63
36	16.806	Hexadecanoic acid	9023025	9.61
37	17.005	1-Docosene	4511861	4.80
38	17.994	Methyl; (9E,12E)-9,12-octadecadienoate	644559	0.69
39	18.058	Methyl linolenate	1350784	1.44
40	18.525	(9E,12E,15E)-9,12,15-Octadecatrien-1-ol	8498799	9.05
41	18.869	Hexadecyl2,2,2-trifluoracetate	3842219	4.09
42	20.284	5-Methyl-5-(4,8,12-trimethyltridecyl)dihydro-2(3H)-furanone	262022	0.28
43	20.579	1-Octacosanol	3068136	3.27
44	22.157	Octadecyl trifluoroacetate	2232213	2.38
45	22.926	Tetratertracontane	530413	0.56
46	23.623	Octadecyl trifluoroacetate	1933129	2.06
47	24.037	P-Nitrobenzoate	480634	0.51
48	24.189	1-Triacontanol	457982	0.49
49	24.340	Docosane	10690260	11.38
50	24.789	Delta-tocopherol	1739219	1.85
51	24.998	Pentatriacontane	1887884	2.01
52	25.392	.beta.-Tocopherol	979721	1.04
53	25.720	n-Tetracontane	13324317	14.19
54	26.112	.alpha.-Tocopherol	2532528	2.73
55	26.158	Cyclohexyl-(octahydrobenzofuran-2-ylidene)-amine	1972820	2.10
56	26.154	Octatriacontyl trifluoroacetate	761427	0.81

RT = Retention time, RI = Retention Indices, RA = Percentage of components

Figure 3: GC-MS Chromatogram of *Rumex vesicarius* L. of ethyl acetate extract

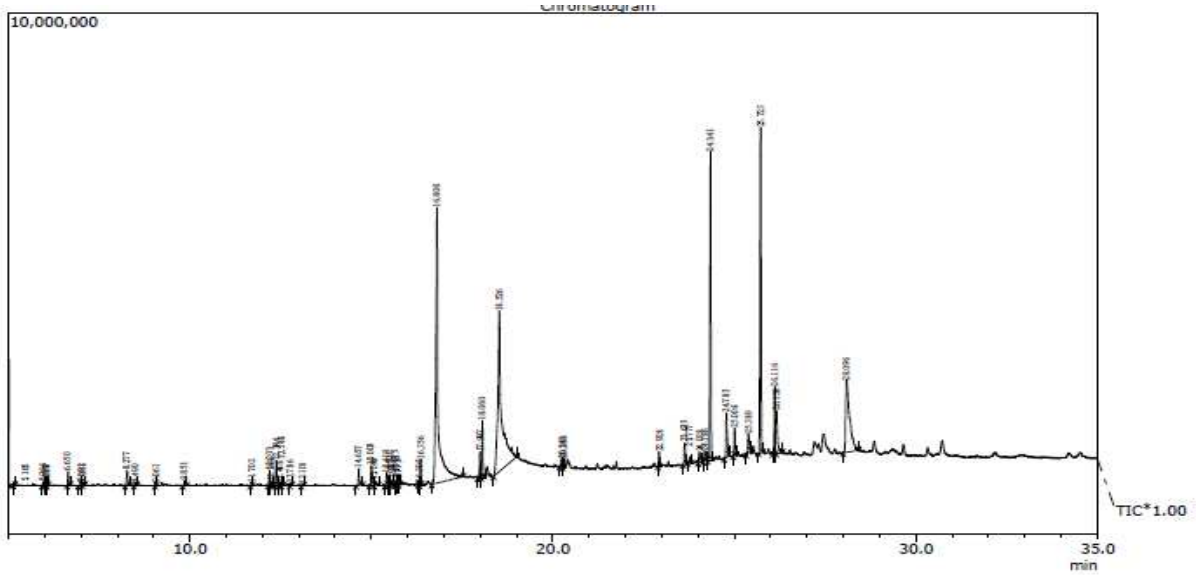

Table 3: List of Phytoconstituents in ethyl alcohol extract of *Rumex vesicarius* L.

S.No.	RT	CONSTITUENTS	RI	RI
1	5.165	2,4-Dihydroxy-3,3-dimethylbutanoic acid,gamma,Lactone	56676	0.05
2	5.966	2,3-Dihydroxypropyl acetate	140830	0.12
3	6.037	2-Mehtylbutyl acetate	81230	0.07
4	6.068	Cyclohexyl nitrate	49381	0.04
5	6.650	2,5-Pyrrolidinedione	401041	0.35
6	7.002	Benzoic acid	220408	0.19
7	7.051	Octanoic acid	121966	0.11
8	8.277	Benzeneacetic acid	681144	0.59
9	8.490	Nonanoic acid	95092	0.08
10	9.061	Nepetalactol	83136	0.07
11	9.851	Decanoic acid	159756	0.14
12	11.702	2,6-Ditert-butyl-4-methyl phenol	92217	0.08
13	12.203	2(4H)-Benzofuranone,5,6,7,7A-tetrahydrid-4,4,7A-trimethyl	476034	0.42
14	12.248	4-Nitophenol	163064	0.14
15	12.384	n-Dodecanoic acid	909189	0.79
16	12.468	4-Hydroxy-3-mehtoxybenzoic acid	121060	0.11
17	12.548	Fumaric acid, ethyl 2-methylally ester	190156	0.17
18	12.786	1-Iodo-2-methylundecane	73711	0.06
19	13.101	Isopropyl laurate	58641	0.05
20	14.657	n-Pentadecanoic acid	679926	0.59
21	15.003	2(4H)-Benzofuranone,5,6,7,7A-tetrahydro-6-hydroxy-4,4,7A-trimethyl-(6s-cis)	1099774	0.96
22	15.098	4-Hydroxy-3,5,5-trimethyl-4{(1E)-3-oxo-1-butenyl}-2-cyclohexen-1-one	246088	0.21
23	15.418	2-Hexasecen-1-ol,3,7,11,15-tetramethyl,-{R-[R*,R*-(E)]}	577576	0.50
24	15.501	6,10,14-Trimethyl-2-pentadecanone	383162	0.33
25	15.533	Trans-2-Dodecen-1-ol,trifluroacetate	96843	0.08
26	15.675	(2E)-3,7,11,15-Tetramethyl-2-hexadecen-1-01	68154	0.06
27	15.715	Pentadecanoic acid	237896	0.21
28	15.773	Phthalic acid,decyl isobutyl ester	41680	0.04
29	16.305	Methyl (7E)-7-hexadecenoate	100656	0.09
30	16.356	Methyl palmitate	819036	0.72
31	16.808	Palmitic acid	27922059	24.38
32	17.997	Methyl (9E,12E)-9,12-octadecadienoate	933607	0.82
33	18.060	Methyl (9Z,12Z,15Z)-9,12-octadecatrienoate	1928010	1.68
34	18.526	.alpha.-linoienic acid	25333720	22.12
35	20.243	2-(1-Hydroxy-1-Methylethyl)-2,3-dihydro-7H-furo(3,2-G)chromen-7-one	312672	0.27
36	20.288	4,8,12,16-Tetramethylheptadecan-4-olide	295405	0.26
37	22.928	n-Eicosane	534383	0.47
38	23.633	9-Octadecenamide	913144	0.80
39	23.777	Squalene	243383	0.21

40	24.038	P-Nitrobenzoate	672033	0.59
41	24.186	Stearyl p-nitrobenzoate	550441	0.48
42	24.341	Tetratetracontane	10877451	9.50
43	24.783	.delta.-Tocopherol	2298067	2.01
44	25.008	n-Tetracontane	960131	0.84
45	25.389	.beta.-Tocopherol	1104751	0.96
46	25.723	n-Hexatriacontane	13537391	11.82
47	26.116	.alpha.-Tocopherol	3569847	3.12
48	26.158	Cyclohexyl-(octahydrobenzofuran-2-ylidene)-amine	2613865	2.28
49	28.096	Stignmast-5-EN-3-OL,(3.Beta.,245)	11406821	9.96

RT = Retention time, RI = Retention Indices, RA = Percentage of components

Figure 4: GC-MS Chromatogram of *Rumex vesicarius* L. of ethanol extract

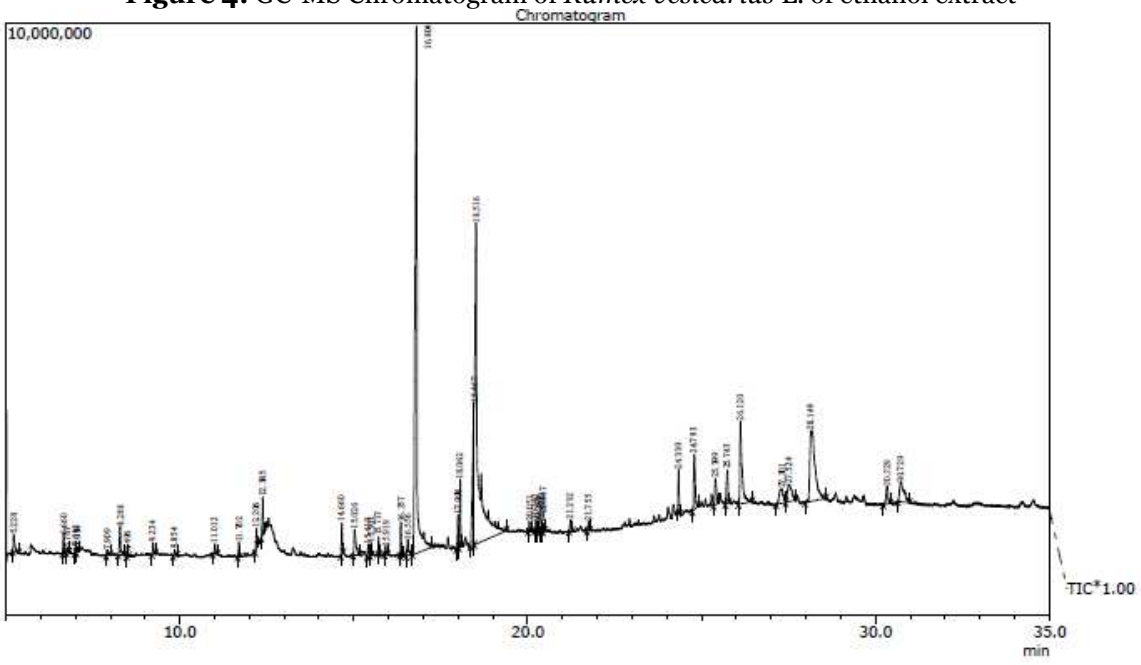

Table 4: List of Phyto constituents in ethanol extract of *Rumex vesicarius* L.

S. No.	RT	CONSTITUENTS	RI	RI
1	5.228	Methyl 3-chloropropionate	917565	0.65
2	6.660	Pyrrolidine-2,5-dione	539962	0.38
3	6.767	3,5-Dihydroxy-6-methyl-2,3-dihydro-4H-pyran-4-one	135119	0.10
4	7.011	Benzoic acid	195523	0.14
5	7.058	Octanoic acid	190795	0.13
6	7.909	2,3-Dihydro-benzofuran	262800	0.19
7	8.288	Benzeneacetic acid	1342295	0.95
8	8.496	Nonanoic acid	110458	0.08
9	9.234	4-Hydroxy-3-methoxystyrene	476041	0.34
10	9.854	n-Decanoic acid	241301	0.17
11	11.012	Ethyl 5-oxo-2-pyrrolidinecarboxylate	395393	0.28
12	11.702	Butylated hydroxytoluene	419461	0.30
13	12.206	(2,6,6-Trimethyl-2-hydroxycyclohexylidene)acetic acid lactone	589822	0.42
14	12.385	Lauric acid	1159634	0.82
15	14.660	Myristic acid	884748	0.62
16	15.026	2(4H)-Benzofuranone,5,6,7,7A-tetrahydro-6-hydroxy-4,4,7A-trimethyl-(6s-cis)	1845373	1.30
17	15.418	Neophytadiene	456526	0.32
18	15.501	6,10,14-Trimethyl-2-pentadecanone	336636	0.24
19	15.717	n-Pentadecanoic acid	442974	0.31
20	15.919	3-Hydroxy-4-methoxycinnamic acid	358402	0.25
21	16.357	Palmitic acid methyl ester	931222	0.66
22	16.556	cis-9-Hexadecenoiic acid	937969	0.66
23	16.804	Hexadecenoiic acid	38904779	27.40

24	17.998	Methyl (9Z,12Z)-9,12-octadecadienoate	1012631	0.71
25	18.062	Methyl (9Z,12Z,15Z)-9,12,15-octadecatrienoate	2019861	1.42
26	18.467	5-Methylcycloheptene	9251230	6.52
27	18.516	.alpha.-linoienic acid	37676477	26.53
28	20.051	Methyl (6Z)-6-octadecenoate	360437	0.25
29	20.242	Decylcyclohexane	335415	0.24
30	20.288	5-Methyl-5-(4,8,12-trimethyltridecyl)dihydro-2(3H)-furanone	264909	0.19
31	20.393	9,10-Anthracenedione,1,8-dihydroxy-3-methyl-	369899	0.26
32	20.425	9-Octadecenamide	191491	0.13
33	20.447	(3E)-3-Tetradecen-5-yne	229489	0.16
34	21.232	N-Benzoyltyramine	517032	0.36
35	21.755	DEHP;1,2-Benzenedicarboxylic acid, bis(2-ethylhexyl)ester	329576	0.23
36	24.339	n-Tetratetracontane	1244345	0.88
37	24.793	Delta-Tocopherol	2948332	2.08
38	25.399	Beta-Tocopherol	1564720	1.10
39	25.743	Stigmasta-5,22-dien-3-ol,acetate,(3.beta)-	1806291	1.27
40	26.120	Vitamin E	6608600	4.65
41	27.301	Campestrol	22124565	1.56
42	27.524	Stigmasta-5,22-dien-3B-ol	2685742	1.89
43	28.149	.gamma.-Sitosterol	13644187	9.61
44	30.329	1H,3H-Fure(3,4-c)furan,tetrahydro-1,4-bis(3,4,5-trimethoxyphenyl)-[15-(1.alpha.,3a.alpha.,4.alpha.,6.alpha.)]-	1364345	0.96
45	30.729	Methyl cis-13,16-docosadienate	3284326	2.31

RT = Retention time, RI = Retention Indices, RA = Percentage of components

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