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COMPARATIVE GC-MS ANALYSIS OF *EUPHORBIA HIRTA* AND *EUPHORBIA MILLI* FOR THERAPEUTIC POTENTIAL UTILITIES

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Abstract

Euphorbia genus has been widely used for treating inflammation, constipation and diarrhoea due to antimicrobial, antibacterial, antidiabetic, antiinflammatory, antifungal and anticancerous activities. The phyto-compound analysis was performed by the GC-MS method for comparing two species of this genus namely *Euphorbia hirta* and *Euphorbia milli*. The study identified 81 and 93 phytochemical compounds from *E. hirita* and *E. milli*, respectively. Amongst the identified phytochemicals, important ones were Isosorbide Dinitrate, 4H-Pyran-4-one, 2, 3-dihydro-3, 5-dihydroxy-6-methyl-, Oleic Acid and Hexadecanoic acid in good quantities. The study is likely to help researchers for listing the compounds and their use as a reference while carrying out the routine isolation of any specific compound.

Key words: *Euphorbia hirta; Euphorbia milli;* GC-MS; secondary metabolites

Introduction

Plants produces many drugs and World Health Organization (WHO) has estimated that more than 80% of the world's population depends mainly on conventional medicines for their health care. The ethnic and rustic people of India depend vastly on medicinal plants and utilize plants like *Datura stramonium, Ephedra gerardiana* and *Withania somnifera*. These plants exhibit anti-fungal, anti-diabetic, anti-inflammatory, anti-bacterial, and anti-cancer properties (Rautela *et al.*, 2018). The commercial crops like *Saccharum barberi* has also been reported to possess therapeutic properties for fighting fungus, microbes, cancer, etc. (Sharma *et al.*, 2015). The ethanol and methanol extract of many plants has revealed potentials of secondary metabolites for depicting anticancer, anti-malarial, anti-diabetic and antioxidant activities. (Sharma *et al.,* 2016; Rautela *et al.*, 2018). This has caught the attention of botanists and workers for studying medicinal plants for understanding the medicinal properties. The species of *Euphorbia* are known to possess various secondary metabolites such as glycosides, saponins, flavonoids, steroids, tannins, alkaloids, terpenes which were subsequently utilized to fight disease causing pathogens. *Euphorbia* is a small tender shrub and grows about 1.7 m having a spiny stem. The other morphological characters of *Euphorbia* includes slender spine, long and broad leaves and flowers with petal like bracts. The plant has dark colored dentate leaves accompanied most oftenly by flaming red coloured bracts and the color might range from pale green, pink, white to cream or marbled. The bracts are often mistaken for flower petals due to their grouping and colour. Succulent *Euphorbia* plants were used in traditional Chinese medicine, where it was regarded as one of the 50

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fundamental herbs. Therapeutically, flavonoids found in *Euphorbia* plants had been engaged to possess some biological actions and pharmacological effects and one such example is Ingenolmebutate, a drug used to treat actinic keratosis, was a diterpenoid found in *Euphorbia* peplum (Ukwubile *et al.*, 2015; Ali *et al.*, 2018; Yang *et al.*, 2020). Moreover, this plant contains the inhibitory properties against enzymes such as acetylcholinesterase, butyrylcholinesterase, α-glucosidase, α-amylase and tyrosinase (Saleem *et al.*, 2019). This study aimed to identify the different phyto-chemical compounds found in *Euphorbia hirta* and *Euphorbia milli* medicinal plants and their potency and expediency for future use in the field of medicine and health care.

Materials and Methods

GC-MS technique was used for the identification of the different phyto-compounds present in the *Euphorbia* plant extract which relates to the medicinal plant species naming, *Euphorbia hirta* and *Euphorbia milli*. The leaves of both the species were dried and methanol was added before grinding. The content was then kept for 24 h for drying up. The next day, 2 ml petroleum ether was added and the sample was preserved in airtight screw-cap bottle. GC-MS analysis was based on electron ionization energy systems which were used with carrier gas at a constant flow rate of 1.50 ml/min and an injection volume of 2µl. GC ran for 50-55 min and with the help of software mass spectra and chromatograms were prepared. The compounds were identified on the basis of their molecular structure, mass and calculated fragments. Interpretation on mass spectrum GC-MS was conducted by the database of NIST (National Institute Standard and Technology) and Wiley library. The name, molecular weight and structure of the components of the samples were correlated with the library. The relative percentage amount of each component was calculated by comparing its average peak area to the total areas and both the results were recorded (Sharma *et al.*, 2015).

Results and Discussion

The comparative percentage amount of every component was deduced by comparing its standard peak area to the total area. GC-MS analysis of methanolic extract obtained from *Euphorbia hirta* revealed the presence of 81 phyto-component while *Euphorbia milli* identified 93 phytochemical respectively. The compounds deduced were steroids, acids, phytosterols, alkaloids, ketones, ester, etc. Various compounds identified were Isosorbide Dinitrate, 4H-Pyran-4-one, 2, 3-dihydro-3, 5-dihydroxy-6-methyl-, 2-Desoxy-ribose, Oleic Acid and n-Hexadecanoic acid in larger proportion as compared

Table 1: Phytochemical compounds identified from medicinal plant *Euphorbia milli.*

Peak	R. Time	Area	Area in %	Name
1	4.285	624244	0.04	heptane-2,4-dimethyl
2	6.301	3059926	0.18	pentane,3-ethyl-2,4-dimethyl
3	6.701	1031655	0.06	ethanone,1-(3-ethyloxiranyl)
4	8.27	620947	0.04	decane
5	8.747	441437	0.03	Decane-4-methyl
6	9.449	663609	0.04	nonane,5-(2-methylpropyl)
7	9.567	469699	0.03	decane-3,7-dimethyl
8	10.4	1260984	0.07	undecane
9	12.378	2081713	0.12	dodecane
10	13.293	1201041	0.07	benzene,1,3-bis(1,1 -dimethylethyl)
11	13.742	751914	0.04	dodecane-4,6-dimethyl
12	14.037	3487041	0.2	isobornyl acetate
13	14.203	487544	0.03	Tetratetracontane
14	14.563	428544	0.03	2,6,10-trimethyltridecane
15	15.91	793642	0.05	Tetradecane
16	17.314	715826	0.04	Heptadecane
17	17.516	470326	0.03	Pentadecane
18	18.602	2671590	0.15	dodecanoic acid
19	19.032	883050	0.05	Hexadecane
20	20.464	1457259	0.08	Heneicosane
21	20.702	3095683	0.18	Pentadecanal
22	21.06	546473	0.03	Eicosane
23	21.419	5591336	0.32	tetradecanoic acid
24	21.738	1213213	0.07	cyclohexane,2-butyl-1,1,3 -trimethyl
25	21.833	1143825	0.07	Octadecane
26	22.312	1038381	0.06	Neophytadiene
27	22.387	2576119	0.15	2-pentadecanone,6,10,14 -trimethyl
28	22.697	539119	0.03	pentadecanoic acid
29	23.443	882678	0.05	hexadecanoicacid,methyl ester
30	23.72	856040	0.05	Isophytol
31	24.072	23161155	1.34	n-hexadecanoic acid
32	24.284	2258539	0.13	hexadecanoicacid,ethyl ester
33	24.372	1242374	0.07	Docosane
34	25.13	661734	0.04	kaur-16-ene
35	25.202	1363823	0.08	Phyllocladen
36	25.403	1297051	0.08	2-hexadecenol
37	25.552	2454743	0.14	2-methylhexacosane
38	25.745	50812885	2.94	Menthol-8-D
39	26.177	25487255	1.48	9,12,15-octadecatrien-1-ol
40	26.386	3629516	0.21	octadecanoic acid
41	26.69	524226	0.03	Pentacosane
42	27.226	706959	0.04	5-(hydroxymethyl)-1,1,4A -trimethyl-6-methylenede-cahydro-2-naphthalenol

table 1 cont.....

table 1 cont.....

43	27.403	1469535	0.09	(S)-cembrene
44	27.525	2484216	0.14	16 beta-H-Kauran-16-ol
45	27.771	1128332	0.07	n-icosane
46	27.951	2527383	0.15	bicyclo[3.1.1]hept-2-ene, 2,2'-(1,2-ethanediyl)bis[6,6-dimethyl
47	30.119	824035	0.05	behenic alcohol
48	30.19	1299875	0.08	tetracontane
49	30.512	27526393	1.59	podocarp-7en-3-one,13 .beta-methyl-13-vinyl
50	30.613	2754105	0.16	bis(2-ethylhexyl)phthalate
51	31.367	3845223	0.22	n-hexatriacontane
52	32.326	12740441	0.74	tetratriacontane
53	32.944	3348876	0.19	9,19-cyclocholestan-3-ol, 14-methyl-,(3.beta,5.alpha)-
54	33.486	28131415	1.63	squalene
55	33.741	2078047	0.12	docosyl aldehyde
56	34.511	35953599	2.08	tetrapentacontane
57	34.732	5931645	0.34	oxirane
58	34.909	26165319	1.52	2,2-dimethyl-3-(3,7,16,20 -tetramethylheneicosa-3, 7,11,15,19-pentaenyl)
59	35.148	22582351	1.31	delta-tocopherol
60	35.634	2842048	0.16	1,6,10,14,18,22-tetracosa-hexaen-3-ol,2,6,10, 15,19,23-hexamethyl
61	35.826	19952809	1.16	nonadecane
62	36.328	8385226	0.49	acetic acid
63	36.539	16227663	0.94	heneicosanal
64	36.696	16347605	0.95	gamma tocopherol
65	37.115	3275349	0.19	solanesol
66	37.718	125689929	7.28	2-methylhexadecane
67	37.828	29977698	1.74	1-hexacosanol
68	38.204	47399497	2.74	25,7,8-tetramethyl-2-(4,8, 12-trimethyltridecyl)-3,4 -dihydro-2H-chromen-6-YL hexofuranoside
69	38.526	2619569	0.15	cholestan-3-one,
70	39.008	19924217	1.15	cyclic-1,2-ethanediyl acetal,(5.alpha)
71	39.588	27988585	1.62	Hexatriacontane
72	39.8	13011537	0.75	neryl linalool isomer
73	40.182	5054007	0.29	ergost-5-en-3-ol
74	40.761	26149371	1.51	7-DI-O-glucoside
75	41.553	1857254	0.11	D-friedoolean-14-en-3-one
76	42.621	201875669	11.69	Tetracosane
77	43.194	3623754	0.21	Lanosterol
78	43.644	36474854	2.11	beta-amyrin
79	43.99	4288064	0.25	methyl commate B
80	44.4	3002795	0.17	Lupeol
81	45.739	186420181	10.8	3-isopropyl-3A,

table 1 cont.....

table 1 cont.....

82	46.359	25547536	1.48	olean-12-en-3-ol, acetate,(3.beta)-
83	48.29	219168616	12.69	D:A-friedooleanan-3-ol,(3.beta)-
84	48.779	32271318	1.87	olean-12-en-3-one
85	49.101	15918057	0.92	D:B-friedo-B':A' -Neogammacer-5-en-3-one
86	49.671	92453113	5.35	einecs-211-474-5
87	49.987	12275887	0.71	d-norandrostane (5.alpha 14.alpha)
88	50.394	20902538	1.21	1-naphthalenepropanol
89	51.246	113451276	6.57	D:A-friedooleanan-7-ol, Acetate(7-alpha)-
90	51.484	14976354	0.87	Phytyltetradecanoate
91	52.105	8974404	0.52	2,4A,8,8-Tetramethy-ldecahydrocyclopropa [d]naphthalene
92	52.884	21198217	1.23	2,2,3,5,6-pentamethy lcyclohex-4-enyl
93	53.852	4256319	0.25	Methyltricosane

to other compounds based upon the peak areas of the compounds. Also, among all these compounds, oleic acid was the most abundant phytochemical compound identified (Das *et al.*, 2014). The obtained results has been depicted in Table 1, 2, 3 and 4 and Fig. 1.

Almost all these compounds had been reported to possess some or the other biological activity. For example, Syringol and 4-hydroxydihydro-2 (3H)-furanone were known to possess antioxidant activities. Whereas many phytochemical compounds such as, Tridemorph; Pentanal; 2-methyl 4H-Pyran-4-one; 2, 3-dihydro-3, 5-dihydroxy-6-methyl-; 4-hydroxydihydro-2 (3H)-furanone and 2-Furan carboxaldehyde had been reported to be antimicrobial (antibacterial or antifungal) in nature (Dandekar *et al.*, 2015; Hase *et al.*, 2017). n-Hexadecanoic acid was a considerably important phytochemical compound, also having antioxidant, hypocholesterolemic, nematicide, pesticide, antiandrogenic, hemolytic, 5-alpha reductase inhibitor activities. Levulinic acid was a precursor to pharmaceuticals, Melamine possessed trypanocidal activity. 1, 2, 3-Propanetriol, 1-acetate was anti-dipogenic in nature Oleic had been reported to be effective in treatment of skin papillomas. 2-benzenedicarboxylic acid and Palmitic acid, the other elutant and biologically active compounds also possessed antitumor and anticancerous properties (Bhat, 2017). The compound isosorbide dinitrate can be used for vasodilator therapy of heart failure and Stearic acid for lowering of plasma cholesterol levels and 1, 2-Benzenediol possessed carcinogenic

Table 2: Biological activity of identified phytochemical from medicinal plant *Euphorbia milli.*

S. No.	Compound Name	Biological Activity
1	Benzene,1,3-bis (1,1-dimethylethyl)-	Antibacterial
2	Tetradecane	Antimicrobial diuretic, anti tuberculosis
3	Heptadecane	Antimicrobial
4	Pentadecane	Antimicrobial and antioxidant
5	Hexadecane	Antimicrobial and antioxidant
6	Eicosane	Antibacterial
7	Hexadecanoic acid, methyl ester	Antibacterial, antioxidant, antitumor, immunostimulant
8	Heneicosane	Antiasthmatics urine acidifiers Antimicrobial
9	Tetracosane	Antioxidant and antimicrobial
10	Tetratriacontane	Antibacterial
11	Squalene	Antibacterial, antioxidant, antitumor, anticancer, immunostimulant, chemo preventive, lipoxygenase inhibitor, pesticide
12	beta-amyrin	antidiabetic, anti-inflammatory, antiarthritic, and anticancer
13	Tetramethyl hexadec-2-en-1-ol	Anti-inflammatory, antioxidant, antimicrobial
14	Isophytol	Isophytol efficiently inhibits muscle damageinduced by calcium ionophore
15	Phylloclade	exemplifies the phenomenon of homoeosis, which was the transference of features from one organ to another
16	Tocopherol	Antiageing, analgesic, antidiabaticanti-inflammatory antitumor,anticancer, hepatoprotective,hypocholesterolemic, antiulcerogenic,
17	Lanosterol	reversed protein aggregate in cataracts
18	beta amyrin	an inhibitory effect on xanthine oxidase,
19	tetradecanoic acid	Antioxidant, anticancer preventive, Nematicide, Lubricant, Hypocholesterolemic
20	2-Pentadecanone, 6, 10, 14-Trimethyl	Allelopathic activity

activity (Hameed *et al.*, 2015). Some reports depicted the presence of chebulic acid and brevifolincarboxylic acid derivatives in plants which showed diverse biological

Table 3: Phytochemical compounds identified from medicinal plant *Euphorbia hirta.*

Peak#	R. Time	Area	Area %	Name
1	8.824	3169994	1.23	1-(3-Methyl-3-Butenyl) Pyrrolidine
2	9.871	805484	0.31	Cyclohexane, Azido-
3	10.013	1082018	0.42	Nonanenitrile
4	11.544	8629914	3.35	4H-Pyran-4-One, 2,3-Dihydro- 3,5-Dihydroxy-6-Methyl-
5	12.394	587740	0.23	Pyrrolidine-2-Carboxylic Acid, 1-Ethyl-, Ethyl Ester
6	12.931	919612	0.36	Citronellol
7	13.070	22003036	8.53	2,3-Dihydro-Benzofuran
8	13.386	1105586	0.43	Geraniol
9	13.784	315766	0.12	3-(.Alpha.-Hydroxyethyl) -Aniline
10	14.518	8058722	3.12	2-Methoxy-4-Vinylphenol
11	14.879	494791	0.19	Cyclohexene, 4-Ethenyl-4-Methyl-3-(1-Methylethenyl)-1-(1-
12	15.205	576325	0.22	2,6-Octadien-1-Ol, 3,7-Dimethyl-, Acetate, (Z)-
13	15.397	683965	0.27	2,6-Octadienoic Acid, 3,7 -Dimethyl-, (E)-
14	15.533	1074906	0.42	Geranyl Acetate
15	15.818	1368289	0.53	Cyclohexane, 1-Ethenyl-1-Methyl-2,4-Bis(1-M
16	16.205	754807	0.29	Pyrrolidine, 1-(1-Cyclohexen-1-Yl)-
17	16.364	1089400	0.42	Caryophyllene
18	16.469	588309	0.23	Cyclohexane, 1-Ethenyl-1-Methyl-2-(1-Methylethenyl)-4-(1-
19	16.514	277182	0.11	Cis-.Alpha.-Bergamotene
20	16.609	765246	0.30	1-Aminocyclopentanecarboxylic Acid, N-Ethoxycarbonyl-, B
21	16.947	278163	0.11	1,4,8-Cycloundecatriene, 2,6,6, 9-Tetramethyl
22	17.257	882790	0.34	1H-1,3a-Ethanopentalen-5-Ol, Hexahydro-, Trans-
23	17.350	771285	0.30	(S,1Z,6Z)-8-Isopropyl-1-Methyl-5-Methylenecyclodeca-1,6-D
24	17.594	1803004	0.70	.Alpha.-Farnesene
25	17.695	1230598	0.48	.Beta.-Bisabolene
26	17.862	6679637	2.59	2-Hydroxy-1-(1'-Pyrrolidiyl)-1-Buten-3-One
27	18.213	998761	0.39	(-)-5-Oxatricyclo[8.2.0.0(4,6)] Dodecane,,12-Trim
28	18.495	305652	0.12	1,6,10-Dodecatrien-3-Ol, 3,7,11 -Trimethyl-, [S-(Z
29	18.563	2455316	0.95	3-Tert-Butyl-4-Hydroxyanisole
30	19.102	498529	0.19	Trans,Trans-2,6-Dimethyl-2,

table 3 cont.....

table 3 cont.....

				6-Octadiene-1,8-Diol
31	19.191	242669	0.09	1,2,3,4-Tetrahydro-Cyclopenta [B]Indole
32	19.423	171893	0.07	Benzamide, 3-Fluoro-N-Butyl-N-Methyl-
33	19.514	261586	0.10	(2E,4S,7E)-4-Isopropyl-1,7-Dimethylcyclodeca-2,7-Dienol
34	19.608	1237929	0.48	Isospathulenol
35	19.806	1164950	0.45	1-(3-Ethoxyphenyl)-2-Propanone
36	20.078	735305	0.29	Neointermedeol
37	20.788	14326723	5.55	.Beta.-D-Glucopyranoside, Methyl
38	21.450	3137218	1.22	4-(Hexyloxy)Phenyl Hexopyranoside
39	21.712	1349615	0.52	Isospathulenol
40	22.301	347216	0.13	Neophytadiene
41	22.863	744882	0.29	2(4H)-Benzofuranone, 5,6,7, 7a-Tetrahydro-3,6-Dimethyl-
42	23.057	1115933	0.43	3-(2,2-Dimethylhydrazino)-2-Cyclohexen-1-O
43	23.373	220806	0.09	Farnesol 1
44	23.439	1375367	0.53	Hexadecanoic Acid, Methyl Ester
45	23.544	395684	0.15	N-(2,7-Dimethyl-1,7-Octadien-3-Yl)-2,7-Dimethyl-2,7-Octadie
46	24.066	13736506	5.33	N-Hexadecanoic Acid
47	24.337	2484097	0.96	2H-1-Benzopyran-2-One, 5,7-Dimethoxy-
48	24.795	185510	0.07	1,5-Dibromo-3-Methylpentane
49	24.917	803376	0.31	Hexane, 1-Bromo-6-Chloro-
50	25.015	890383	0.35	Methoxsalen
51	25.310	4457774	1.73	7H-Furo[3,2-G][1]Benzopyran-7-One, 4-Methoxy-
52	25.473	694609	0.27	9,12-Octadecadienoic Acid, Methyl Ester
53	25.549	2133514	0.83	9,12,15-Octadecatrienoic Acid, Methyl Ester, (Z,Z,Z)-
54	25.722	33864905	13.13	2-Hexadecen-1-Ol, 3,7,11,15-Tetramethyl-, [R-[R
55	26.178	21747060	8.43	9,12,15-Octadecatrienoic Acid, (Z,Z,Z)-
56	26.379	2608963	1.01	3,3-Dimethyl-2-(Phenylselenyl) Butanoic Acid, 2-[(6,6-Dimeth
57	27.256	10783917	4.18	7H-Furo[3,2-G][1]Benzopyran-7-One, 4,9-Dimethoxy-
58	27.603	955102	0.37	3-Cyclopentylpropionic Acid, 2-Dimethylaminoethyl Ester
59	27.941	446766	0.17	Cyclohexanone, 2-(4,4,4-Trichlorobutyl)-

table 3 cont.....

table 3 cont.....

60	28.012	318384	0.12	2-Pyrrolidinone, 1-[2-(4-Piperidinyl)Ethyl]-
61	29.174	15555152	6.03	2,6,6-Trimethylbicyclo[3.1.1] Heptane-2,3-Diol
62	29.656	1560154	0.60	3-Cyclopentylpropionic Acid, 2-Dimethylaminoethyl Ester
63	30.154	2243089	0.87	1,3,3-Trimethyl-2-Oxabicyclo [2.2.2]Octan-6-Ol
64	30.430	7303271	2.83	Hexadecanoic Acid, 2-Hydroxy-1-(Hydroxymethyl)Ethyl Ester
65	31.486	383910	0.15	Silane, Diethylhexyloxy (3-Methylbutoxy)-
66	31.747	344638	0.13	Hexanoic Acid, 6-(4-Cyanophenyl)-2-Naphthalenyl Ester
67	32.289	3548142	1.38	9,12-Octadecadienoic Acid (Z, Z)-, 2,3-Dihydroxypropyl Ester
68	32.362	7010332	2.72	Ethyl (9z,12z)-9,12-Octadecadienoate #
69	32.556	368255	0.14	Octadecanoic Acid, 2,3-Dihydroxypropyl Ester
70	32.733	588788	0.23	(Z)-3,7-Dimethylocta-2,6-Dien-1-Yl Palmitate
71	34.242	514423	0.20	Citronellyl Palmitoleate
72	34.350	984448	0.38	(9Z,12Z,15Z)-3,7-Dimethyloct-6-En-1-Yl Octadeca-9,12,15-Tr
73	34.467	1122563	0.44	17-Pentatriacontene
74	34.673	746729	0.29	(9Z,12Z)-(E)-3,7-Dimethylocta-2,6-Dien-1-Yl Octadeca-9,12-
75	34.793	1143627	0.44	(9Z,12Z,15Z)-(E)-3,7-Dimethylocta-2,6-Dien-1-Yl Octadeca-
76	36.622	618869	0.24	.Gamma.-Tocopherol
77	37.974	3910407	1.52	Vitamin E
78	39.997	1819847	0.71	Ergost-5-En-3-Ol, (3.Beta.,24r)-
79	40.596	2974665	1.15	Stigmasterol
80	42.149	9327651	3.62	.Gamma.-Sitosterol
81	42.691	1190456	0.46	Lanost-8-En-3-Ol,(3.Beta.)-

properties such as anti-inflammatory, anti-oxidant, hepato-protective, anti-hyperglycemia, and anti-diabetic effects (Yang *et al.*, 2020). The compounds like phytol, vitamin K, and vitamin E contributed to antimicrobial and anti-mycobacterial activities which were well supported as promising agents to be used in future (Nirmal *et al.*, 2020). Even, most of the world population suffers from the gout problem for which *E. hirta* could be used as a potent remedy due to the presence of natural phyto-chemical compounds (Nanadagopalan *et al.*, 2015; Abu Baker *et al.*, 2020; Ali *et al.*, 2020; Shilpa *et al.*, 2020). Antioxidant property was one of the crucial properties possessed by plant, in the present study compounds and therapeutics.

Table 4: Biological activity of identified phytochemical from medicinal plant *Euphorbia hirta.*

S. No.	Compound Name	Biological Activity
1.	1-(3-Methyl-3-Butenyl) Pyrrolidine	Antibacterial, antifungal, enzyme inhibition
2.	Cyclohexane	Antibacterial activity
3.	Citronellol	Antifungal activity
4.	Geraniol	Anti-cancerous, antimicrobial, antioxidant, anti-inflammatory
5.	Geranyl Acetate	Antimicrobial activity
6.	Caryophyllene	Anti-inflammatory, antibiotic, antioxidant, anti-carcinogenic, local anesthetic activities
7.	Cis-Alpha-Bergamotene	Anti-microbial activities
8.	1,4,8-Cyclounde-catriene	Antiarthritic activity, antifungal anti-microbial activities
9.	1H-1,3a-Ethanope ntalen -5-Ol, Hexahydro-, Trans-	anti-cancer, *anti-microbial activity*
10.	Alpha-Farnesene	Anti-bacterial and anti-microbial activities
11.	Beta-Bisabolene	Antioxidant, antimicrobial activity
12.	3-Tert-Butyl-4-Hydroxyanisole	Acute toxicity, tumor-promoting activities
13.	Trans,Trans-2,6-Dimethyl-2,6-Octadiene-1,8-Diol	Anti-microbial, antipyretic
14.	1,2,3,4-Tetrahydro-Cyclopenta [B] Indole	Antifungal, cytotoxic
15.	Isospathulenol	Antimicrobial activities
16.	Neointermedeol	Antioxidat, enzymatic inhibiting
17.	Beta-D-Glucopy-ranoside, Methyl	Antimicrobial, cytotoxic activity
18.	Neophytadiene	Antioxidant anti-bacterial activities
19.	Farnesol 1	A*antimicrobial* and fungicide activity
20.	Hexadecanoic Acid, Methyl Ester	Anti-inflammatory, cytotoxic activity
21.	2H-1-Benzopy ran-2-One	Antibacterial, anti-arrhythmic
22.	1,5-Dibromo-3 -Methylpentane	Antibacterial
23.	Methoxsalen	Antibacterial
24.	Octadecanoic Acid	Role in antioxidant, anticancer, antimicrobial activities.
25.	Citronellyl	Antimicrobial

table 4 cont.....

	Palmitoleate	
26.	Gamma-Tocopherol	Antioxidant
27.	Vitamin E	Antioxidant
28.	Ergost-5-En-3-Ol	Anticancer, anti-inflammatory, antibacterial activity
29.	Stigmasterol	Anti-angiogenic, anti-cancer
30.	Gamma.-Sitosterol	Antioxidant, free radical scavenging, antidiabetic *activity*
31.	1-(3-Methyl-3-Butenyl) Pyrrolidine	Antibacterial, antifungal, enzyme inhibiting
32.	Cyclohexane	Anti-bacterial activities
33.	Nonanenitrile	Anti-microbial
34.	Citronellol	Antifungal, anti-microbial activities
35.	2,3-Dihydro-Benzofuran	Antibacterial, antifungal, antiviral, antioxidant, anti-inflammatory, anticancer
36.	Geraniol	Antimicrobial, anti-oxidant, anti-inflammatory, anti-cancerous
37.	3-(Alpha.-Hydroxy ethyl)-Aniline	Anti-fungal
38.	2-Methoxy-4 -Vinylphenol	Antioxidant, anti-inflammatory, *antimicrobial activities*

Conclusion

The GC-MS analysis of *E. milli* and *E. hirta* provided a detailed insight in determining the presence of a number of phyo-chemicals in their plant extract. Most of the plant extract had some biological activities which made them compelling to be used in the field of medicines. These plants were used from ancient times in foods and medicines to treat hypertension, inflammation, constipation, diarrhea and other gut related patients, now their more effective properties to fight infections, arthritis, and diabetic. These properties made this medicinal plant much more viable in the sight of researchers and scientists and also to the medical health workers. Collected data from the analytical experiment clearly indicated that *E. milli* contained more phyto-compounds than the *E. hirta* which made *E. milli* to contain more biological properties and this called for more potential for medicinal use. Moreover, *E. hirta* was found to be more diverse and abundant in the phyto-compound profile. Many phyto-compounds were still to be examined for other influential biological properties whereas some compounds were yet to be discovered.

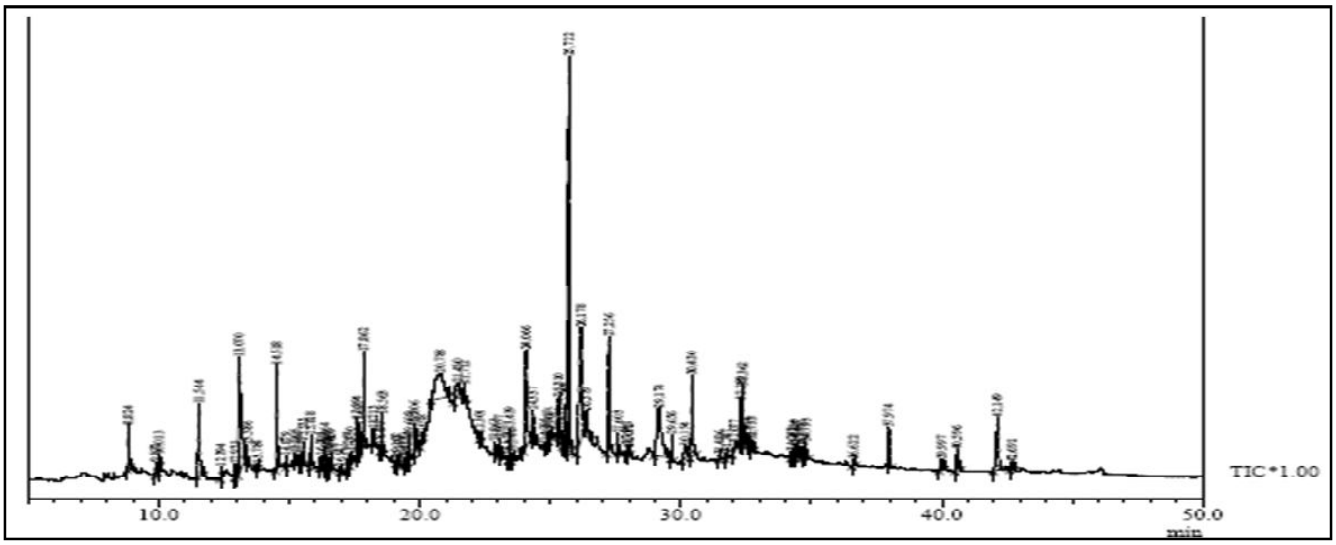

Fig. 1: GC-MS analysis of methanolic extract of medicinal plant *Euphorbia milli*.

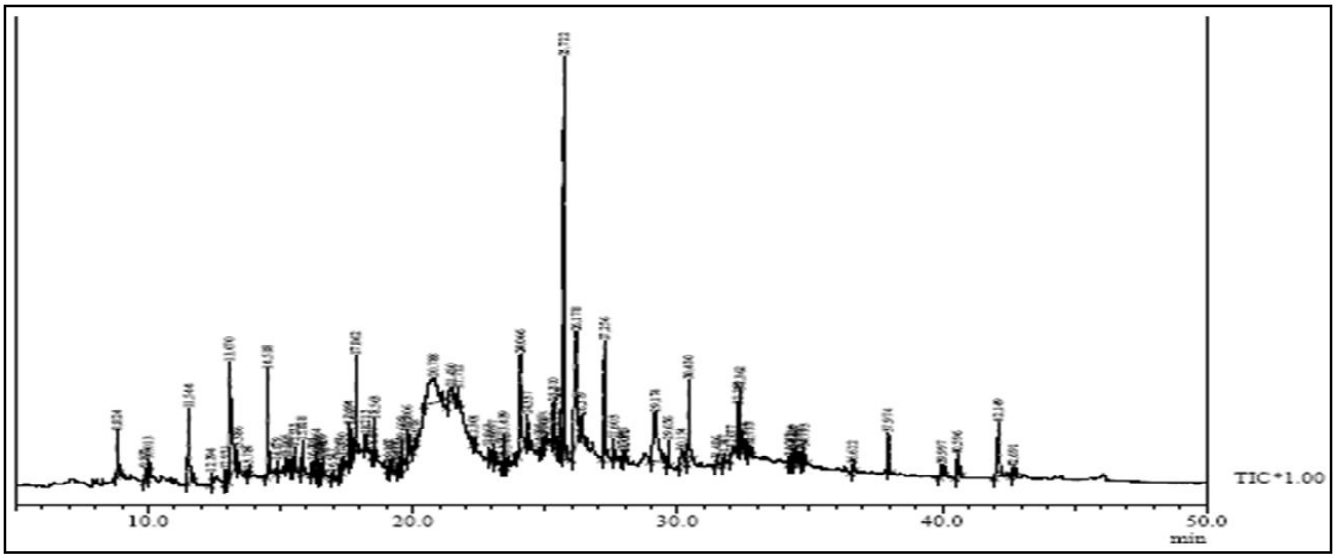

Fig. 2: GC-MS analysis of methanolic extract of medicinal plant *Euphorbia Hirta*.

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