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AN INVESTIGATION ON EXTRACTION AND GC/MS ANALYSIS OF *MORINGA OLEIFERA* FLOWER

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Abstract – This research work emphasized on extraction of MoringaOleifera flower pods belonging to family Moringaceae and determination of phytochemicals present in this via Gas Chromatography and Mass spectroscopy with the help of different non polar solvents. The realm of applied sciences and technology benefits greatly from the versatility and effectiveness of GC-MS analytical techniques.For analytical research and development, quality control, quality assurance, production, and pilot plant departments for active pharmaceutical components, bulk medicines, and formulations, GC-MS is frequently employed in the pharmaceutical industry. Moringa the miracle tree is rich source of protein and its protein content are comparable with meat protein. Flowers are cholagogue, stimulant, tonic and diuretic and useful to increase the flow of bile. The result confirmed the presence of various phytochemical compounds in different extracts of MoringaOleifera which is responsible for various medicinal activities like anti-inflammatory, analgesic, simulant, antioxidant and many more.The flowers are rich in secondary metabolites which can be further investigate for development and validation of formulation.

Keywords - Anti-inflammatory, Metabolites, Cholagogue, Mass spectroscopy

Introduction

The Moringaoleifera tree is quite an attractive deciduous tree. Flowers are produced all year long in loose, up to 15 cm long axillary panicles. Due to heteromorphism, the bisexual, oblique, stalked, axillary, and heteromorphic flowers are heavily cross-pollinated. A member

of the Moringaceae vegetation family is Moringaoleifera. It is significant because of the high levels of phytochemicals, amino acids, and proteins that have positive health effects.The flowers have promising antibacterial, antifungal, anti-larval, antioxidant, anti-inflammatory, and anticancer activities because to the compounds they contain. The protein composition of the miracle tree, Moringa, is comparable to that of meat protein. Flowers are excellent to improve bile flow since they are cholagogues, stimulants, tonics, diuretics, and tonics. Acrid and stimulating, seeds. Flowers have been reported to have higher total antioxidant contents than other plant components. When compared to other sections, flowers were determined to have the highest vitamin C concentration. Different flower extracts were subjected to a range of qualitative analyses, which established the presence of saponins, tannins, alkaloids, flavonoids, steroids, glycosides, terpenoids, and phenols. The M. oleifera flower is used in Siddha medicine to make Pancacutameluku, which is used to treat syphilitic ulcer, chronic bronchitis, bee sting urticaria, and cough.

Material & Methodology

Flowers of plant MoringaOleifera was collected from forest of Korba district Chhattisgarh state. Collected *MoringaOlifera* flowers were washed, cleaned and converted into a fine powder. The fine powder were subjected into Soxhlet extraction with different non-polar solvents named Chloroform, Benzene, Hexane and Ethyl acetate. The extraction carried out for 24hours. 50gms of powdered *MoringaOliefera* was placed inside the thimble, assembled the soxhlet extractor and than extraction started with chloroform solvent at temperature at 61°C.After 24 hours the extracted has been collected and dried with vaccum distillation. The same steps were repeated for rest three solvents at boiling point 80°C, 68°C and 77°C for Benzene, Hexane and Ethyl acetate respectively. The extracts were labeled as *MoringaOlifera* flower Chloroform extract, *MoringaOlifera* flower Benzene extract. *MoringaOlifera* flower Hexane extract and *MoringaOlifera* flower Ethyl acetate extract. The final residue obtained was proceeded for GC-MS Analysis.

Result & Discussion

GC/MS analysis facilitated the presence of phytochemical compounds in *MoringaOlifera* flower with different non polar solvent extracts. A comparative study conducted with the extraction of *MoringaOlifera* flower part with different solvents in order to check the maximum phytochemical compounds possibility. The GC-MS analysis shows presence of several phytoconstituents present in plant extract. The compounds identified in hexane flower extract of *M. oleifera* were Benzene, 1,3-bis(1,1-dimethylethyl), Tetradecane, 5-methyl, Ethanol, 2-(2-butoxyethoxy) acetate, Heptadecane, 2,6,10-Trimethyltridecane, Undecane,

2,4-dimethyl, 2,4-Di-tert-butylphenol, Heneicosane, Eicosane, Dotriacontane, n-Hexadecanoic acid, Squalane, Dotriacontane, Octadecanoic acid, Triacontane and 1-bromo-Dotriacontane. The compounds identified in ethyl acetate flower extract of M. oleifera were Dimethyl Sulfoxide, Acetophenone, 1-Dodecene, Glycerol 1,2-diacetate, Tetradecane, 5-methyl, Hexadecane, Heptadecane, 1-Pentadecene, 2,6,10-Trimethyltridecane, Tetradecane, 5-methyl, 2,4-Dimethyldodecane, 2,4-Di-tert-butylphenol, Carbonic acid, decylundecyl ester, Heneicosane, Eicosane, Bis(2-isopropyl-5-methylcyclohexyl) methylph, 1-Nonadecene and Dotriacontane. The compounds identified in chloroform flower extract of M. oleifera were Benzene, 1,3-bis(1,1-dimethylethyl), 2,4-Dimethyldodecane, Dodecane, 4,6-dimethyl, Pentadecane, Heptadecane, Tetradecane, 5-methyl, 2,4-Dimethyldodecane, Eicosane, 2,4-Di-tert-butylphenol, Eicosane, 2,6,11-trimethyl and Diethyl Phthalate. The compounds identified in hexane flower extract of M. oleifera were Dimethyl Sulfoxide, Tridecane, Hexadecane, 5-methyl-2,4-Dimethyldodecane, 2,4-Di-tert-butylphenol, Eicosane, Heneicosane, Dotriacontane and 5,5-Diethylpentadecane.

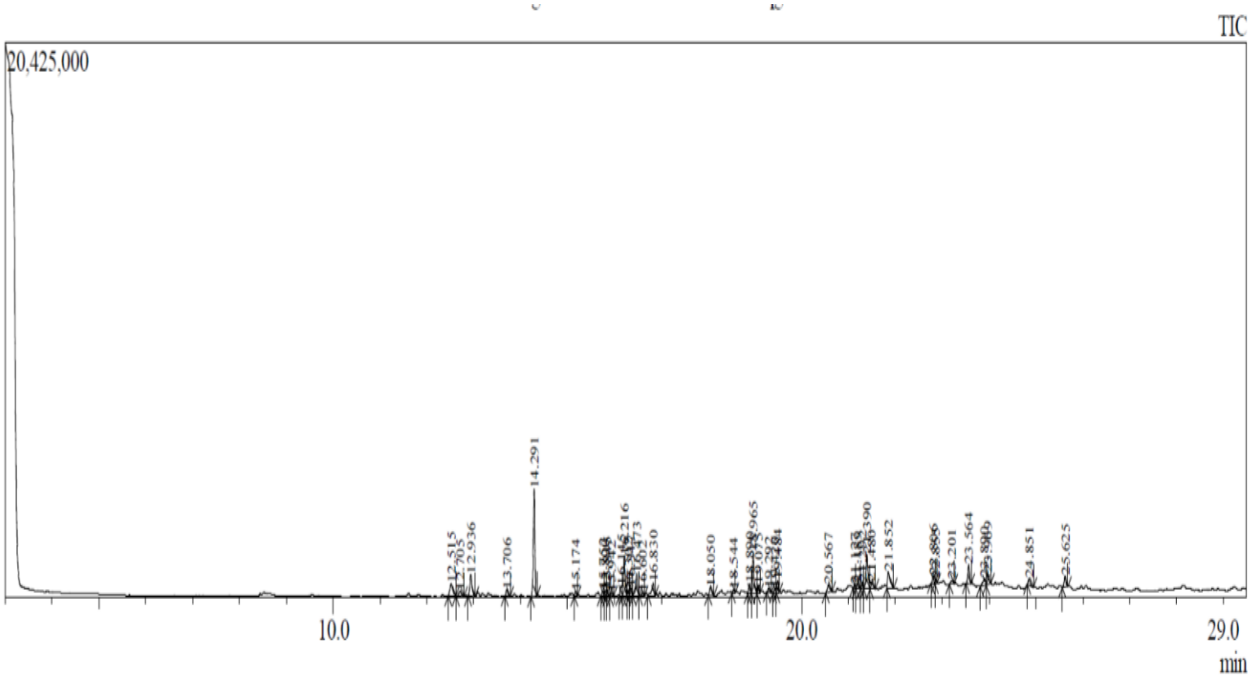

Figure 01 GC-MS spectra for benzene flower extract of M. oleifera

Table 01 Compounds identified in GC-MS spectra for benzene flower extract of M. oleifera

Peak	R.Time	F.Time	Area	Area%	Height	Basem/z	Name
1	12.515	12.620	1887312	3.60	436246	175.25	Benzene,1,3-bis(1,1-dimethylethyl)
2	12.705	12.790	737702	1.41	197180	57.15	Tetradecane, 5-methyl-
3	12.936	13.030	2658554	5.08	807051	57.15	Hexadecane
4	13.706	13.775	676419	1.29	242230	57.15	Hexadecane
5	14.291	14.350	9782180	18.68	3942856	57.15	Ethanol,2-(2-butoxyethoxy)-,acetate
6	15.174	15.210	378666	0.72	184813	57.15	Heptadecane
7	15.752	15.780	510746	0.98	210999	57.15	Heptadecane
8	15.800	15.825	459262	0.88	192002	57.15	2,6,10-Trimethyltridecane
9	15.845	15.895	526524	1.01	260462	57.15	Tetradecane, 5-methyl-
10	16.145	16.175	977343	1.87	339457	57.15	Undecane,2,4-dimethyl-
11	16.216	16.270	3448491	6.58	1452755	57.15	Heptadecane
12	16.302	16.320	393342	0.75	187575	57.15	Heptadecane
13	16.347	16.385	625819	1.19	290561	57.15	Heptadecane
14	16.473	16.525	2202516	4.21	811735	191.25	2,4-Di-tert-butylphenol
15	16.830	16.870	1602385	3.06	460540	57.15	Heptadecane
16	18.050	18.125	848459	1.62	284084	57.15	Heptadecane
17	18.544	18.580	248737	0.47	129081	57.15	Heptadecane
18	18.890	18.920	875799	1.67	340303	57.15	Heneicosane
19	18.965	19.040	3830849	7.31	1486884	57.15	Eicosane
20	19.075	19.110	667949	1.28	313533	57.15	Heneicosane
21	19.420	19.455	459194	0.88	162651	57.15	Heneicosane
22	19.484	19.515	1011177	1.93	469321	57.15	Eicosane
23	20.567	20.645	930506	1.78	273561	57.15	Heneicosane
24	21.189	21.255	423049	0.81	170560	57.15	Dotriacontane
25	21.292	21.320	452009	0.86	216301	57.15	Heneicosane
26	21.390	21.455	4054979	7.74	1273830	57.15	Eicosane
27	21.480	21.570	1011537	1.93	265616	57.15	Eicosane
28	21.852	21.965	2271038	4.34	594460	57.15	n-Hexadecanoicacid
29	22.806	22.840	769058	1.47	262899	57.15	Squalane
30	23.564	23.615	1750592	3.34	696564	57.15	Dotriacontane
31	23.890	23.935	1013869	1.94	234825	57.15	Octadecanoicacid
32	23.969	24.035	1135121	2.17	379183	57.15	Dotriacontane
33	24.851	24.945	680930	1.30	235755	69.10	Triacontane, 1-bromo-
34	25.625	25.680	1088226	2.08	398238	57.15	Dotriacontane

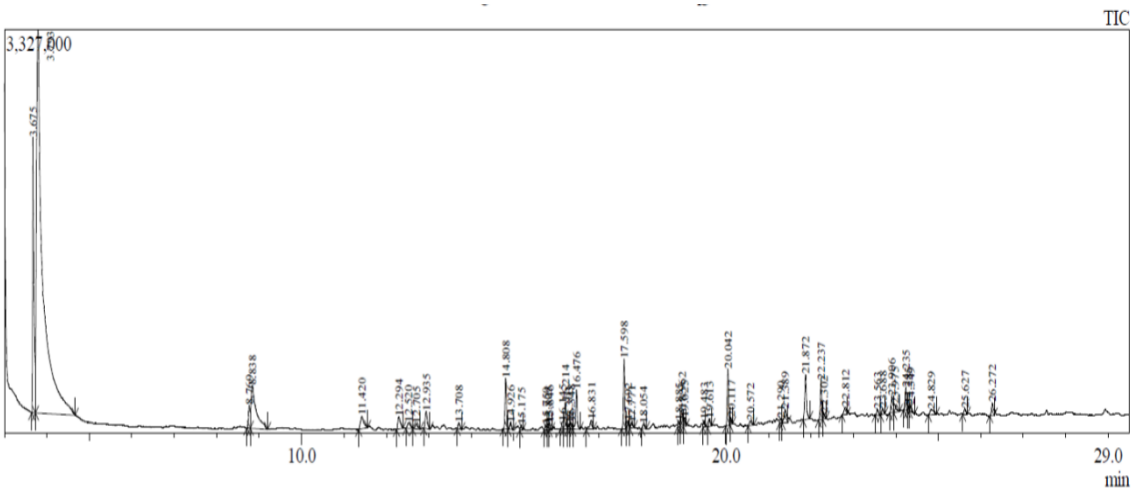

Figure 02 GC-MS spectra for ethyl acetate flower extract of M. oleifera

Table 02 Compounds identified in GC-MS spectra for ethyl acetate flower extract of M. oleifera

Peak	R.Time	F.Time	Area	Area%	Height	Basem/z	Name
1	3.675	3.735	4820835	8.71	2274363	63.05	DimethylSulfoxide
2	3.793	4.670	32821113	59.27	3163681	63.05	DimethylSulfoxide
3	8.769	8.790	458510	0.83	184981	105.10	Acetophenone
4	8.838	9.200	2986195	5.39	349908	105.10	Acetophenone
5	11.420	11.555	541938	0.98	101907	55.10	1-Dodecene
6	12.294	12.390	392015	0.71	100785	103.10	Glycerol1,2-diacetate
7	12.705	12.800	182753	0.33	41858	57.10	Tetradecane,5-methyl-
8	12.935	13.025	520448	0.94	140193	57.10	Hexadecane
9	13.708	13.775	138281	0.25	49004	57.10	Heptadecane
10	14.808	14.865	1006174	1.82	416510	55.10	1-Pentadecene
11	14.926	14.985	141398	0.26	54007	57.10	Tetradecane
12	15.175	15.210	94170	0.17	37609	57.10	Heptadecane
13	15.750	15.780	104198	0.19	42127	57.10	Hexadecane
14	15.805	15.830	110959	0.20	44167	71.15	2,6,10-Trimethyltridecane
15	15.846	15.895	102040	0.18	54389	57.10	Tetradecane,5-methyl-
16	16.145	16.170	160311	0.29	60407	57.10	2,4-Dimethyldodecane
17	16.214	16.270	550800	0.99	218584	57.10	Heptadecane
18	16.303	16.325	85940	0.16	37536	57.10	Heptadecane
19	16.348	16.385	120049	0.22	53687	57.10	Heptadecane
20	16.476	16.565	855375	1.54	325526	191.20	2,4-Di-tert-butylphenol
21	16.831	16.875	299963	0.54	75782	57.10	Heptadecane
22	17.598	17.645	1200570	2.17	575743	57.10	1-Heptadecene
23	17.692	17.730	130678	0.24	66763	57.10	Hexadecane
24	17.771	17.840	110448	0.20	39585	57.10	Carbonicacid,decylundecylester
25	18.054	18.125	116007	0.21	38555	57.10	Heptadecane
26	18.885	18.920	124736	0.23	52156	57.10	Heneicosane
27	18.962	18.995	346841	0.63	142201	57.10	Eicosane
28	19.025	19.060	178228	0.32	67287	97.15	Bis(2-isopropyl-5-methylcyclohexyl)methylph
29	19.483	19.515	132438	0.24	58801	57.10	Eicosane
30	19.613	19.665	160706	0.29	62642	57.10	Tetradecanoicacid
31	20.042	20.090	997746	1.80	464056	57.10	1-Octadecene
32	20.117	20.150	101043	0.18	53730	57.10	Octadecane
33	20.572	20.650	126286	0.23	36259	57.15	Heneicosane
34	21.290	21.320	95224	0.17	37409	57.10	Dotriacontane
35	21.389	21.455	481049	0.87	112619	57.10	Dotriacontane
36	21.872	21.970	1066930	1.93	371451	57.10	n-Hexadecanoicacid
37	22.237	22.275	738230	1.33	324012	57.10	1-Nonadecene
38	22.302	22.355	106333	0.19	45645	57.10	Heneicosane
39	22.812	22.850	248226	0.45	63071	57.10	Dotriacontane

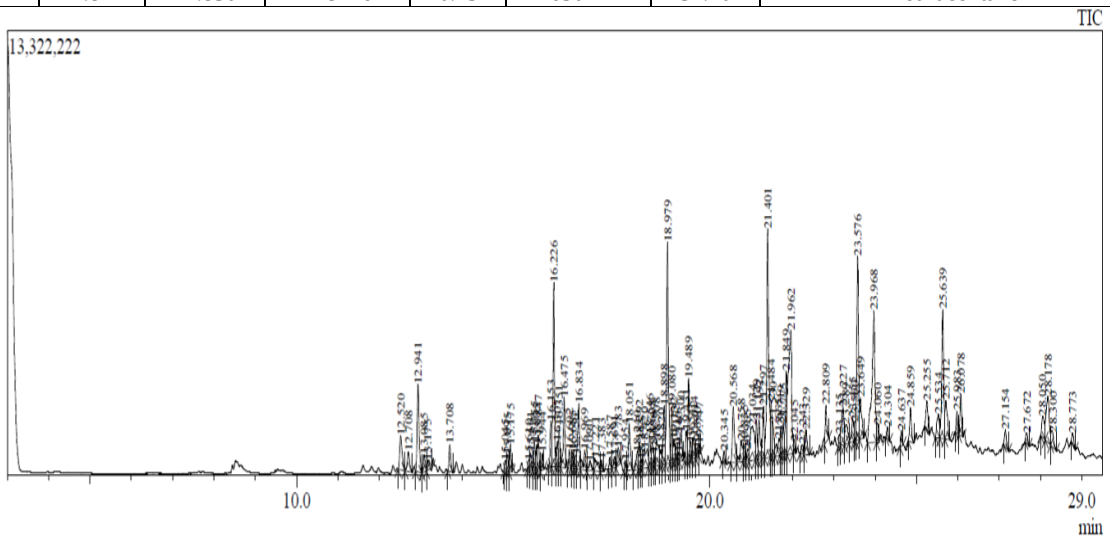

Figure 03 GC-MS spectra for chloroform flower extract of M. oleifera

Table 03 Compounds identified in GC-MS spectra for chloroform flower extract of M. oleifera

Peak	R.Time	F.Time	Area	Area%	Height	Basem/z	Name
1	12.520	12.625	4283900	1.21	1017613	175.25	Benzene,1,3-bis(1,1-dimethylethyl)-
2	12.708	12.795	2251100	0.64	594543	85.20	2,4-Dimethyldodecane
3	12.941	13.035	8458108	2.39	2611058	57.15	Hexadecane
4	13.085	13.145	1690673	0.48	520007	57.15	Hexadecane
5	13.175	13.280	833818	0.24	268508	57.15	Hexadecane
6	13.708	13.780	2239017	0.63	806919	57.15	Dodecane,4,6-dimethyl-
7	15.095	15.140	1286410	0.36	483578	57.15	Pentadecane
8	15.175	15.215	1892353	0.53	804508	57.15	Heptadecane
9	15.661	15.710	1048746	0.30	486709	57.15	Heptadecane
10	15.755	15.780	1926966	0.54	827961	57.15	Heptadecane
11	15.847	15.900	2221012	0.63	1040978	85.20	Tetradecane, 5-methyl-
12	16.153	16.170	3151166	0.89	1352068	85.20	2,4-Dimethyldodecane
13	16.226	16.275	14541715	4.11	5527172	57.15	Eicosane
14	16.307	16.325	1660379	0.47	763716	57.15	Heptadecane
15	16.351	16.390	2593787	0.73	1222935	57.15	Eicosane
16	16.475	16.515	5955745	1.68	2118720	191.25	2,4-Di-tert-butylphenol
17	16.685	16.715	965045	0.27	505234	57.15	Eicosane
18	16.834	16.870	6001083	1.70	1973130	57.15	Eicosane
19	16.969	17.025	2318266	0.66	592248	57.15	Eicosane
20	17.090	17.195	1226179	0.35	258236	71.15	Dodecane,2,6,11-trimethyl-
21	17.221	17.350	2213069	0.63	378793	57.15	Heptadecane
22	17.587	17.630	905688	0.26	363236	149.15	DiethylPhthalate
23	17.691	17.730	766292	0.22	345160	57.15	Hexadecane
24	17.783	17.845	1771757	0.50	529553	57.15	Heptadecane
25	18.051	18.135	4439192	1.25	1388936	57.15	Heneicosane
26	18.292	18.330	2108068	0.60	845407	57.15	Hexadecane
27	18.546	18.580	2521165	0.71	966048	57.15	Heptadecane
28	18.608	18.635	1873964	0.53	748678	57.15	Hexadecane

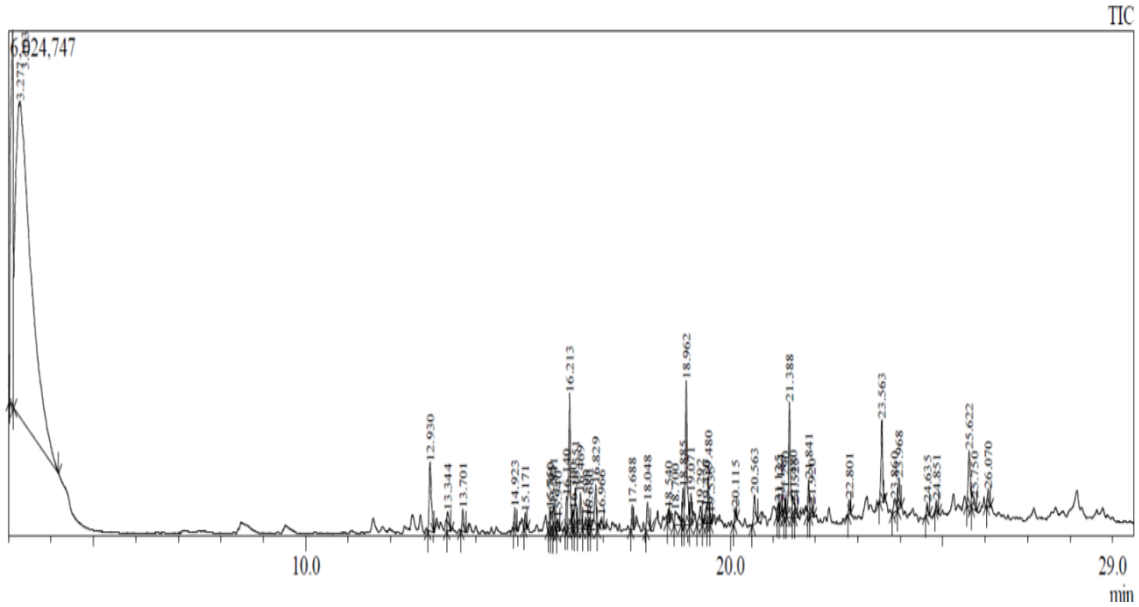

Figure 04 GC-MS spectra for hexane flower extract of M. oleifera

Table 04 Compounds identified in GC-MS spectra for hexane flower extract of M. oleifera

Peak	R. Time	F. Time	Area	Area%	Height	Basem/z	Name
1	3.103	3.125	19993629	12.13	4478449	63.05	DimethylSulfoxide
2	3.277	4.180	95931304	58.18	3768194	63.05	DimethylSulfoxide
3	12.930	13.020	2825706	1.71	820748	57.15	RT:12.930
4	13.344	13.420	698981	0.42	223331	57.15	Tridecane
5	13.701	13.770	744229	0.45	258234	57.15	Hexadecane
6	14.923	14.980	553006	0.34	245480	57.15	Tetradecane
7	15.171	15.210	360157	0.22	184400	57.15	Heptadecane
8	15.750	15.775	575766	0.35	249708	57.15	Heptadecane
9	15.841	15.890	598599	0.36	309174	57.15	Tetradecane, 5-methyl-
10	16.140	16.170	1047786	0.64	375280	57.15	2,4-Dimethyldodecane
11	16.213	16.265	3911413	2.37	1609970	57.15	Eicosane
12	16.300	16.320	494254	0.30	223918	57.15	Heptadecane
13	16.351	16.400	1232409	0.75	486387	57.15	Heptadecane
14	16.469	16.515	1326925	0.80	428926	191.25	2,4-Di-tert-butylphenol
15	16.829	16.870	1871235	1.13	527976	57.15	Eicosane
16	16.966	17.020	503140	0.31	143571	57.15	Eicosane
17	17.688	17.730	567091	0.34	284003	57.15	Hexadecane
18	18.048	18.125	1025333	0.62	334385	57.15	Heneicosane
19	18.540	18.575	314596	0.19	152032	57.15	Heptadecane
20	18.700	18.850	1012836	0.61	157165	57.15	Heptadecane
21	18.885	18.915	1140691	0.69	436796	57.15	Heneicosane
22	18.962	19.040	4973537	3.02	1713912	57.15	Eicosane
23	19.071	19.105	859955	0.52	366393	57.15	Eicosane
24	19.420	19.450	650852	0.39	198334	57.15	Eicosane
25	19.480	19.515	1240460	0.75	554859	57.15	Eicosane
26	19.535	19.565	216815	0.13	126529	57.15	Eicosane
27	20.115	20.145	289060	0.18	156026	57.10	Octadecane
28	20.563	20.645	1172991	0.71	344032	57.15	Heneicosane
29	21.184	21.215	378561	0.23	174609	57.15	Dotriacontane
30	21.290	21.320	392711	0.24	219322	57.10	Dotriacontane
31	21.388	21.450	4132173	2.51	1369382	57.15	Dotriacontane
32	21.525	21.590	414313	0.25	139610	57.15	5,5-Diethylpentadecane
33	21.841	21.870	951868	0.58	422576	57.15	Dotriacontane

Conclusion –This work focused on extraction of MoringaOleifera flower with non polar solvents and analysis via GC/MS of the same extract for analyzing the phytochemicals.The phytochemicals reported were Tetradecane, 5-methyl, Ethanol, 2-(2-butoxyethoxy) acetate, Heptadecane, 2,6,10-Trimethyltridecane, Undecane, 2,4-dimethyl, 2,4-Di-tert-butylphenol, Heneicosane, Eicosane, Dotriacontane, n-Hexadecanoic acid, Squalane, Dotriacontane, Octadecanoic acid, Triacontane and 1-bromo-Dotriacontane and many more mentioned in the above table. MoringaOleifera flower is a promising emerging plant with abundant

phytochemicals responsible for various pharmacological activity. The informations reported in this research can be further use for advance study of this in field of pharmaceutics and chemistry. Various formulations can be designed with the activity responsible by phytochemicals.

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