Phytochemical Screening of Plant Extracts and GC-MS Profiling of Methanolic Extracts of Leaves and Flower of *Madhuca longifolia*

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Abstract— *India is the native home of Madhuca longifolia trees, which are mainly found in the states of Uttar Pradesh, Bihar, Maharashtra, Madhya Pradesh, Kerala, and Rajasthan, which is also known locally as "Mahua.". It is an extremely valuable herbal remedy. The indigenous people use almost every part of the plant to treat a variety of illnesses. The phytochemical analysis of the leaves and flowers of M. longifolia is the subject of very few scientific publications. Using gas chromatography-mass spectrometry (GC-MS) to identify the presence of pharmacologically bioactive constituents in M. longifolia flowers and leaves, the study's preliminary phytochemical screening of various leaf and flower extracts revealed the presence of various phytochemical compounds, including terpenoids, steroids, flavonoids, phenolic compounds, quinones, carbohydrates, tannins, and alkaloids. The plant M. longifolia has 80 components identified from the methanol extract of the leaves and 102 components identified from the methanol extract of the flowers, according to qualitative and quantitative analysis of various biologically active compounds from the methanolic extract using gas chromatography-mass spectrometry, which are a very detailed and first-time study. Any of the pharmacological characteristics of M. longifolia could be attributed to the compounds that this study found as a natural source of antioxidants, antibacterial.*

Keywords— M. longifolia, Phytochemical screening, GC-MS analysis, Bioactive constituents.

I. INTRODUCTION

Plants and plant-based products are an integrated part of most of the traditional and alternative systems of medicines worldwide. The discovery and development of new, affordable medications with improved efficacy may result from such medications [1]. *Madhuca longifolia* (synonym: *Madhuca* indica, Bassia longifolia, *Sapotaceae* family) is very important medicinal plant, all plant parts are used to cure various diseases. Almost all parts of *M. longifolia* tree have medicinal properties, and it is mostly used to treat diarrhea, skin diseases, chronic tonsillitis, chronic bronchitis, cushing's disease, fever and antidotes in snakebite [2-5]. It is commonly known as English butter tree or honey tree and locally known as Mahua. It is a large tree growing widely in dry tropical and sub-tropical regions. The flowers are edible, and it has good nutritional value. Seeds are a good source of edible fats and minerals with oil ranges from 33 to 61 % weight of the kernel [6,7] while flowers are a rich source of sugars, vitamins and calcium [8,9]. The seed oil is mainly composed of oleic acid followed by palmitic, stearic, and linoleic acid [10]. Tribal people are familiar with the plant due to its flower, which is primarily used to prepare local liquor by fermenting alcohol. The corolla of the flower is fleshy, and cream-colored having characteristics odor. During March and April, flowers fall on the ground in showers. The *M. longifolia* flowers are collected and dried in the open air on a clean surface. The dried flowers are used for years for various purposes. Traditionally, bark has many medicinal values. It is used to treat ulcers, rheumatism, tonsillitis, decoction is used to treat diabetes, powder is used in itching and bleeding gums [11] and paste is applied externally to treat cuts, wounds and bleeding [12]. Several pharmacological potentials of bark extracts have been reported such as anti-hyperglycemic [13,14] anti-inflammatory, analgesic and anti-pyretic [15,16], anti-ulcer [17]. With the use of GC-MS and phytochemical

screening, the current study set out to investigate the phytochemical components found in *M. longifolia* Linn leaf and flower extract. That's why the current study was conducted to validate the presence of sugars, tannins, flavonoids, and phenolics in two distinct methanolic extract portions. To the best of our knowledge, *M. longifolia* leaf and flower extracts have never been the subject of an official study.

II. MATERIAL AND METHODS

2.1 Chemicals and Reagents:

All chemicals and reagents employed in this research were of analytical grade, sourced from Merck (KGaA, Darmstadt, Germany). Methanol utilized for extraction was of HPLC grade.

2.2 Collection of plant materials and their extraction:

The leaves and flowers of *M. longifolia* were collected from eastern Uttar Pradesh. It was identified and authenticated by the taxonomist. The collected plant materials were taken to avoid cross-contamination and damage during storage. To get rid of contaminants like soil particles and stuck debris, the leaves were thoroughly cleaned two or three times under running tap water before being rinsed with distilled water. The leaves were cut, shade dried, ground into fine powder preserved and the powdered extract was treated with methanol while approximately 1 kg fresh flowers were collected in polybags. Special care was taken to avoid cross-contamination and damage during transportation [18].

2.3 Preparation of Plant Extracts:

The collected plants material was shade dried and ground to fine powder with the help of mortar pestle. The finely ground powder was then suspended in methanol and was left for 7 days with shaking. The filtrate was dried and finally weighed. Approx. 20 mg of semi-solid filtrates were then dissolved in appropriate amount of methanol. Extracts prepared from Leaf and Flower were subjected to GC-MS analysis [19].

2.4 Methodology of Phytochemical Screening:

Standard phytochemical screening methods were used to indicate the presence of various plant metabolites in the methanolic extracts of the Leaf and Flower of *M. longifolia* by using the following procedures [20- 22]. Screening of phytochemicals present in plant extracts provides general information about different classes of bioactive compounds. The results of the phytochemical screening of different extracts of *M. longifolia* materials are shown in Table 1.

TABLE 1
THE RESULTS OF PHYTOCHEMICAL SCREENING OF THE *M. LONGIFOLIA* IN DIFFERENT EXTRACTS

Extracts	n-Hexane Extract	EtOAc Extract	MeOH Extract	EtOH Extract
Alkaloids	_	+	+	+
Terpenoids	+	+	+	+
Flavonoids	_	+	+	+
Phenolics	_	+	+	+
Glycosides	_	+	+	+
R.Sugars	_	+	+	+
Saponins	_	+	+	+
Tannins	_	+	+	+
Quinones	_	+	+	+

2.5 Instrumentation and methodology of GC-MS analysis:

The GC-MS analysis was performed on an Agilent 7890 gas chromatograph coupled with an Agilent 5977 B MS detector (GC-MS) (Agilent, Santa Clara, CA, USA). GC conditions were modified according to established parameter to better adapt to the analysis [20, 30]. The separation of volatile compounds was carried out on a DB-5MS capillary column (30 m × 0.32 mm × 0.25 µm film thickness). Helium (purity > 99.999%) was employed as carrier gas with a constant flow rate of 1.2 mL/min. The injection volume was 1 µL. Injector temperature was set at 250 °C. The pulsed splitless mode was used. The oven temperature

was set at 45 °C at the initial stage for 3 min then increased to the to 200°C at 5°C/min hold for 10 min followed by final temperature of 250 °C at the rate of 40 °C/min and held for 20 min. The mass spectrometry was conducted with ionization mode of EI with electron energy of 70 eV. The ion source and quadrupole temperatures were set at 280 °C and 150 °C, respectively. Full scan mode was applied with a mass scan range of 35–800 atomic mass unit (amu). Data processing for compounds identification was performed by using Wiley Registry 12th Edition / NIST 2020 Mass Spectral Library by MassHunter Workstation Qualitative Analysis Version 10.0.10305.0 (Agilent Technologies, Palo Alto, CA, USA). The retention time, molecular weight and composition percentage of the sample materials of *M. longifolia* were recorded and presented in Figure-1; Figure-2 and Table-2.

TABLE 2 (A)
GC-MS ANALYSIS OF THE METHANOL EXTRACT OF FLOWER OF THE PLANT *M. LONGIFOLIA*

Component RT	Compound Name	Molecular Formula	Molecular weight	CAS Nos.	Area %
10.84	Methoxypropionaldehyde	C4H8O2	88	990000-34-9	0.05
11.53	Phenol	C6H6O	94	108-95-2	0.18
12.76	1,4-Dioxin, 2,3-dihydro-	C4H6O2	86	543-75-9	0.46
13.17	2-Propanone, 1-hydroxy-	C3H6O2	74	116-09-6	0.57
14.97	Acetic acid, hydroxy-, methyl ester	C3H6O3	90	96-35-5	0.23
15.1	1-Hydroxy-2-butanone	C4H8O2	88	5077-67-8	0.11
15.51	3-Hydroxy-2,6,6-trimethyl-hept-4-enoic acid	C10H18O3	186	990050-53-7	0.01
15.66	1-Hydroxybut-3-en-2-one	C4H6O2	86	990000-26-9	2.57
16.13	Acetic acid	C2H4O2	60	64-19-7	4.1
16.9	3-Amino-2-oxazolidinone	C3H6N2O2	102	80-65-9	0.28
17.31	Furfural	C5H4O2	96	98-01-1	6.98
17.67	4-Oxo-5-methoxy-2-penten-5-olide	C6H6O4	142	990009-92-5	1.28
18.46	Propanoic acid	C3H6O2	74	79-09-4	0.27
18.76	Ethanone, 1-(2-furanyl)-	C6H6O2	110	1192-62-7	0.44
19.13	3-Furancarboxylic acid	C5H4O3	112	488-93-7	0.11
19.68	2,4-Dihydroxy-2,5-dimethyl-3(2H)-furan-3-one	C6H8O4	144	10230-62-3	2.14
20.1	4-Cyclopentene-1,3-dione	C5H4O2	96	930-60-9	1.33
20.37	Opuntiol	C7H8O4	156	2860-28-8	0.06
20.48	5-Methyl furfural	C6H6O2	110	620-02-0	1.3
20.72	2-Propenoic acid	C3H4O2	72	79-10-7	0.26
21.01	1-Propanone, 1-(2-furanyl)-	C7H8O2	124	3194-15-8	0.03
21.19	Butyrolactone	C4H6O2	86	96-48-0	0.1
21.39	3-Furanmethanol	C5H6O2	98	4412-91-3	4.56
21.67	2,2'-Bifuran	C8H6O2	134	5905-00-0	0.24
21.92	1,2-Cyclohexanedione	C6H8O2	112	765-87-7	0.09
22.25	Hexanamide, N-(2-hydroxyethyl)-	C8H17NO2	159	9/6/7726	0.2
22.99	2-Furanmethanol, 5-methyl-	C6H8O2	112	3857-25-8	0.45
23.24	1,2-Cyclopentanedione	C5H6O2	98	3008-40-0	0.02
23.62	2(5H)-Furanone	C4H4O2	84	497-23-4	0.47
23.86	1,2-Cyclopentanedione	C5H6O2	98	3008-40-0	1.21
24.64	3-Furanmethanol	C5H6O2	98	4412-91-3	0.09
25.43	1,2-Cyclopentanedione, 3-methyl-	C6H8O2	112	765-70-8	0.26
26.1	4-Propyl-4-octanamine	C11H25N	171	990032-79-3	0.27
26.34	2,4,5-Trihydroxypyrimidine	C4H4N2O3	128	496-76-4	1.79
27.34	(2Z,4Z)-Hepta-2,4-dienoic acid methyl ester	C8H12O2	140	990009-02-8	0.11
27.87	Benzeneacetonitrile	C8H7N	117.058	140-29-4	0.42

28.39	3-Hydroxy-2H-pyran-2-one	C5H4O3	112	990001-76-1	2.3
28.96	2-Furancarboxylic acid, methyl ester	C6H6O3	126	611-13-2	1.11
29.32	Furaneol	C6H8O3	128	3658-77-3	1.65
29.51	Allomaltol	C6H6O3	126	644-46-2	0.08
29.81	Spiro(3.4)silaoctane	C7H14Si	126	990004-40-8	0.41
30.26	Dihydroxyacetone	C3H6O3	90	96-26-4	3.03
30.79	3(2H)-Furanone, 4-hydroxy-5-methyl-	C5H6O3	114	19322-27-1	1.53
30.94	cis-.alpha.-Bergamotene	C15H24	204	18252-46-5	0.49
31.08	Methyl-2-thiophene carboxylate	C6H6O2S	142	5380-42-7	0.49
31.35	.alpha.-Farnesene	C15H24	204	502-61-4	0.02
31.77	2-Hydroxy-gamma-butyrolactone	C4H6O3	102	19444-84-9	0.6
32.14	1,1,2-tri(propan-2-yl)diazane	C9H22N2	158	990020-32-8	0.55
32.54	5-formyl-2-furancarboxylic acid methyl ester	C7H6O4	154	990016-63-3	0.53
32.7	2,4(3H,5H)-Furandione, 3-methyl-	C5H6O3	114	1192-51-4	0.24
33.04	5-Acetoxymethyl-2-furaldehyde	C8H8O4	168	10551-58-3	0.42
33.65	4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl-	C6H8O4	144	28564-83-2	7.11
33.86	Cyclooctasiloxane, hexadecamethyl-	C16H48O8Si8	592	556-68-3	0.29
34.02	4H-Pyran-4-one, 3,5-dihydroxy-2-methyl-	C6H6O4	142	1073-96-7	1.47
34.27	Propanoic acid, 3-hydroxy-	C3H6O3	90	503-66-2	0.89
34.82	Ethanamine, N-ethyl-N-nitroso-	C4H10N2O	102	55-18-5	1.53
35.61	2H-Pyran-2-one, 4-methoxy-6-methyl-	C7H8O3	140	672-89-9	0.04
35.97	4-Vinylphenol	C8H8O	120	2628-17-3	0.04
36.75	2-Furancarboxylic acid	C5H4O3	112	88-14-2	0.78
37.4	4,4,6-Trimethyl-1,3-oxazinan-2-one	C7H13NO2	143	27830-77-9	0.34
38.07	5-(Hydroxymethyl)dihydrofuran-2(3H)-one	C5H8O3	116	10374-51-3	0.7
38.86	5-Hydroxymethyl-2-furaldehyde	C6H6O3	126	67-47-0	26.48
40.81	Furandimethanol	C6H8O3	128	1883-75-6	0.05
41.48	2(3H)-Furanone, dihydro-4-hydroxy-	C4H6O3	102	5469-16-9	0.51
43.21	Hexadecanoic acid, methyl ester	C17H34O2	270	112-39-0	0.04
44.68	Acetamide, N-(3,5-dichlorophenyl)-2-(1-pyrrolidinyl)-	C12H14Cl2N2O	272	990232-03-3	0.1
45.23	Melibiose	C12H22O11	342	585-99-9	1.41
45.57	1,2-Benzenedicarboxylic acid, bis(2-methoxyethyl) ester	C14H18O6	282	117-82-8	0.32
46.04	Tetradecanoic acid	C14H28O2	228	544-63-8	0.04
46.22	1-(2,5,6-trimethyl-3,4-dihydro-2H-pyran-2-yl)ethanone	C10H16O2	168	18229-58-8	0.72
46.71	Silane, [(dimethylsilyl)methyl]trimethyl-	C6H18Si2	146	1189-75-9	0.35
47	2-Propenoic acid, 3-phenyl-	C9H8O2	148	621-82-9	0.1
49.43	n-Hexadecanoic acid	C16H32O2	256	57-10-3	4.02
52.11	Benzeneacetonitrile, 4-hydroxy-	C8H7NO	133	14191-95-8	0.85
52.55	Pyridine, 4-methoxy-1-oxide-	C6H7NO2	125	1122-96-9	0.14
54.32	Octadecanoic acid	C18H36O2	284	57-11-4	0.39
55.55	(9E,11E)-Octadecadienoic acid	C18H32O2	280	544-71-8	1.61
56.61	D-Allose	C6H12O6	180	2595-97-3	1.03
57.27	9,12,15-Octadecatrienoic acid, (Z,Z,Z)-	C18H30O2	278	463-40-1	0.09
58.09	Lactone G	C5H8O4	132	0-00-0	0.33

TABLE 2 (B)

GC-MS ANALYSIS OF THE METHANOL EXTRACT OF LEAVES OF THE PLANT *M. LONGIFOLIA*

Component RT	Compound Name	Molecular Formula	Molecular weight	CAS Nos.	Area %
10.11	Proceroside	C29H40O10	548	25323-74-4	0.42
10.33	2,5-Dimethyl-4-hydroxy-3(2H)-furanone	C6H8O3	128	3658-77-3	0.24
10.68	2-Ethylhexyl ethylphosphonofluoridate	C10H22FO2P	224	990118-59-1	0.25
10.84	3-Furancarboxylic acid, methyl ester	C6H6O3	126	13129-23-2	0.03
10.91	2,4(1H,3H)-Pyrimidinedione, 5-hydroxy-	C4H4N2O3	128	20636-41-3	0.42
11.09	1-Buten-3-yne, 1-(1,1-dimethylethoxy)-, (E)-	C8H12O	124	34581-70-9	0.21
11.37	Maltol	C6H6O3	126	118-71-8	0.05
11.65	Propanal, propylhydrazone	C6H14N2	114	19718-39-9	0.02
11.99	4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl-	C6H8O4	144	28564-83-2	0.38
12.08	Diglycolic acid, ethyl 2-isopropylphenyl ester	C15H20O5	280	990252-86-9	0.26
12.15	(+)-2-Bornanone	C10H16O	152	464-49-3	0.04
12.3	Diglycolic acid, ethyl 2-isopropylphenyl ester	C15H20O5	280	990252-86-9	0.06
12.5	Lepidine	C10H9N	143	491-35-0	0.05
12.62	(+)-Neoisomenthol	C10H20O	156	990019-06-5	0.01
12.85	Catechol	C6H6O2	110	120-80-9	3.79
13.19	4-Vinylphenol	C8H8O	120	2628-17-3	1.08
13.66	1-Hydroxymethyl-1,2,3,4-tetrahydro-naphthalen-2-ol	C11H14O2	178	343332-31-0	0.02
13.83	Bis(trimethylsilyl) methylphosphonate	C7H21O3PSi2	240	18279-83-9	0.69
14.14	Hydroquinone	C6H6O2	110	123-31-9	0.65
14.26	1,2-Benzenediol, 3-methyl-	C7H8O2	124	488-17-5	0.56
14.67	Guaiacol <4-vinyl->	C9H10O2	150.068	7786-61-0	0.09
15.17	Phenol, 2,6-dimethoxy-	C8H10O3	154	91-10-1	0.09
15.28	2H-Pyran-3,4,5-triol, tetrahydro-2-methoxy-6-methyl-	C7H14O5	178	14009-07-5	0.01
15.6	4-Ethylcatechol	C8H10O2	138	1124-39-6	3.33
15.95	Bisphenol C	C17H20O2	256	79-97-0	1.93
16.12	Naphthalene, 1,4-dimethyl-	C12H12	156	571-58-4	0.01
16.23	Phenol, 2-(1,1-dimethylethyl)-4-(1-methyl-1-phenylethyl)-	C19H24O	268	56187-92-9	0.03
16.4	Epiquinine	C20H24N2O2	324	572-60-1	0.09
16.69	Cycloheptasiloxane, tetradecamethyl-	C14H42O7Si7	518	107-50-6	0.85
16.76	3-Fluoro-7-hydroxy-4-methyl-2H-chromen-2-one, TMS derivative	C13H15FO3Si	266	990217-08-9	1.32
17.13	Razoxane	C11H16N4O4	268	21416-67-1	0.29
17.2	D-Allose	C6H12O6	180	2595-97-3	0.53
17.91	1-Pentanone, 3-chloro-4,4-dimethyl-1-phenyl-	C13H17ClO	224	990119-50-2	0.05
17.98	Phenol, 4-ethenyl-2,6-dimethoxy-	C10H12O3	180	28343-22-8	0.06
18.14	3-Hydroxy-1,1,6-trimethyl-1,2,3,4-tetrahydronaphthalene(8)	C13H18O	190	990056-94-3	0.04
18.69	Cyclooctasiloxane, hexadecamethyl-	C16H48O8Si8	592	556-68-3	0.16
19.07	1,3,4,5-Tetrahydroxycyclohexanecarboxylic acid	C7H12O6	192	77-95-2	13.03

19.34	1-Tetradecanol	C14H30O	214	112-72-1	0.55
19.57	Dodecanoic acid, 3-hydroxy-	C12H24O3	216	1883-13-2	2.18
19.63	Z-3-Tetradecen-1-ol acetate	C16H30O2	254	990189-23-0	1.32
19.84	Pentadecanal-	C15H30O	226	9/11/2765	0.57
19.92	Myristic acid, methyl ester	C15H30O2	242	124-10-7	0.36
20.73	Loliolide	C11H16O3	196	6/2/5989	0.1
21.42	Methyl 13-methyltetradecanoate	C16H32O2	256	990194-04-1	0.04
21.52	3,7,11,15-Tetramethylhexadec-2-ene	C20H40	280	2437-93-6	0.03
21.64	Neophytadiene	C20H38	278	504-96-1	1.72
21.74	3,7,11,15-Tetramethylhexadec-2-ene	C20H40	280	2437-93-6	0.12
22.08	2-Hexadecen-1-ol, 3,7,11,15-tetramethyl-, acetate, [R-[R*,R*-(E)]]-	C22H42O2	338	10236-16-5	1
22.58	Dihydrosyringenin	C11H16O4	212	20736-25-8	0.05
23.26	Methyl hexadec-9-enoate	C17H32O2	268	10030-74-7	0.17
23.39	Hexadecanoic acid, methyl ester	C17H34O2	270	112-39-0	4.8
24.15	n-Hexadecanoic acid	C16H32O2	256	57-10-3	0.47
24.69	Cholestan-15-one, 3-(acetyloxy)-14-butyl-, (3.beta.,5.alpha.)-	C33H56O3	500	74420-87-4	0.06
25.1	Hexadecanoic acid, ethyl ester	C18H36O2	284	628-97-7	0.08
26.07	Heptadecanoic acid, methyl ester	C18H36O2	284	1731-92-6	0.04
28.44	9,12-Octadecadienoic acid (Z,Z)-, methyl ester	C19H34O2	294	112-63-0	2.98
28.67	9,12,15-Octadecatrienoic acid, methyl ester, (Z,Z,Z)-	C19H32O2	292	301-00-8	5.81
28.95	cis-13-Octadecenoic acid, methyl ester	C19H36O2	296	990295-18-2	0.1
29.07	Phytol	C20H40O	296	150-86-7	0.41
29.59	Methyl stearate	C19H38O2	298	112-61-8	3.66
29.73	cis-Vaccenic acid	C18H34O2	282	506-17-2	0.16
30.14	Linoleic acid ethyl ester	C20H36O2	308	544-35-4	0.32
30.22	Ethyl Oleate	C20H38O2	310	111-62-6	0.27
30.48	6,9-Octadecadienoic acid, methyl ester	C19H34O2	294	56599-55-4	0.01
30.55	Octadecanoic acid, ethyl ester	C20H40O2	312	111-61-5	0.1
30.86	Nonadecanoic acid, methyl ester	C20H40O2	312	1731-94-8	0.01
31.1	11,13-Dimethyl-12-tetradecen-1-ol acetate	C18H34O2	282	990259-44-9	0.01
31.38	Glycidyl palmitate	C19H36O3	312	7501-44-2	0.07
31.42	11-Eicosenoic acid, methyl ester	C21H40O2	324	5/8/3946	0.11
31.52	(Z)-2-(Heptadec-8-en-1-yl)oxazol-5(4H)-one	C20H35NO2	321	990357-29-9	0.15
31.59	Eicosanoic acid, methyl ester	C21H42O2	326	1120-28-1	0.22
32.21	Ethanol, 2-(9-octadecenyloxy)-, (Z)-	C20H40O2	312	5353-25-3	0.03
32.47	9-Octadecenoic acid (Z)-, oxiranylmethyl ester	C21H38O3	338	5431-33-4	0.06
32.62	Glycidol stearate	C21H40O3	340	7460-84-6	0.02
32.69	Hexadecanoic acid, 2-hydroxy-1-(hydroxymethyl)ethyl ester	C19H38O4	330	23470-00-0	0.8
32.82	Tricosanal	C23H46O	338	72934-02-2	0.24
33.84	9-Octadecenoic acid (Z)-, 2,3-dihydroxypropyl ester	C21H40O4	356	111-03-5	0.19
33.99	Octadecanoic acid, 2,3-dihydroxypropyl ester	C21H42O4	358	123-94-4	0.16
34.69	Squalene	C30H50	410	111-02-4	0.3
35.38	Octadecane, 3-ethyl-5-(2-ethylbutyl)-	C26H54	366	55282-12-7	0.05
37	.gamma.-Tocopherol	C28H48O2	416	7616-22-0	0.15

37.59	17-Pentatriacontene	C35H70	490	6971-40-0	0.11
38.01	Vitamin E	C29H50O2	430	59-02-9	1.57
40.05	Stigmasterol	C29H48O	412	83-48-7	0.79
40.28	Ergost-22-en-3-ol, (3.beta.,5.alpha.,22E,24R)-	C28H48O	400	36422-25-0	0.34
40.86	Bacteriochlorophyll-c-stearyl	C52H72MgN4O4	840	990649-96-9	0.11
41.1	Chondrillasterol	C29H48O	412	481-17-4	2.24
41.41	23(Z)-ethylcholestanol	C29H52O	416	0-00-0	0.16
41.64	9,19-Cyclolanost-24-en-3-ol, acetate, (3.beta.)-	C32H52O2	468	1259-10-5	0.17
42.1	.beta.-Amyrin	C30H50O	426	559-70-6	1.03
42.35	Stigmast-7-en-3-ol, (3.beta.,5.alpha.)-	C29H50O	414	521-03-9	1
42.84	9,19-Cyclolanost-24-en-3-ol, (3.beta.)-	C30H50O	426	469-38-5	0.59
43.07	Lupeol	C30H50O	426	545-47-1	1.15
43.43	Epilupeol; 20(29)-Lupen-3alpha-ol, acetate (isomer 1)	C32H52O2	468	990588-88-6	0.11
44.01	12-Oleanen-3-yl acetate, (3.alpha.)-	C32H52O2	468	33055-28-6	13.38
45.16	Lup-20(29)-en-3-ol, acetate, (3.beta.)-	C32H52O2	468	1617-68-1	10.16
46.54	9,19-Cyclolanostan-3-ol, 24-methylene-, (3.beta.)-, O-TMS	C34H60OSi	512	990614-17-5	0.06
47.51	Epilupeol; 20(29)-Lupen-3alpha-ol, acetate (isomer 1)	C32H52O2	468	990588-88-6	1.04
47.85	Epilupeol; 20(29)-Lupen-3alpha-ol, acetate (isomer 1)	C32H52O2	468	990588-88-6	0.48
50.41	Urs-12-en-28-al, 3-(acetyloxy)-, (3.beta.)-	C32H50O3	482	86996-88-5	0.23
51.06	Acetyl betulinaldehyde	C32H50O3	482	27570-21-4	0.6

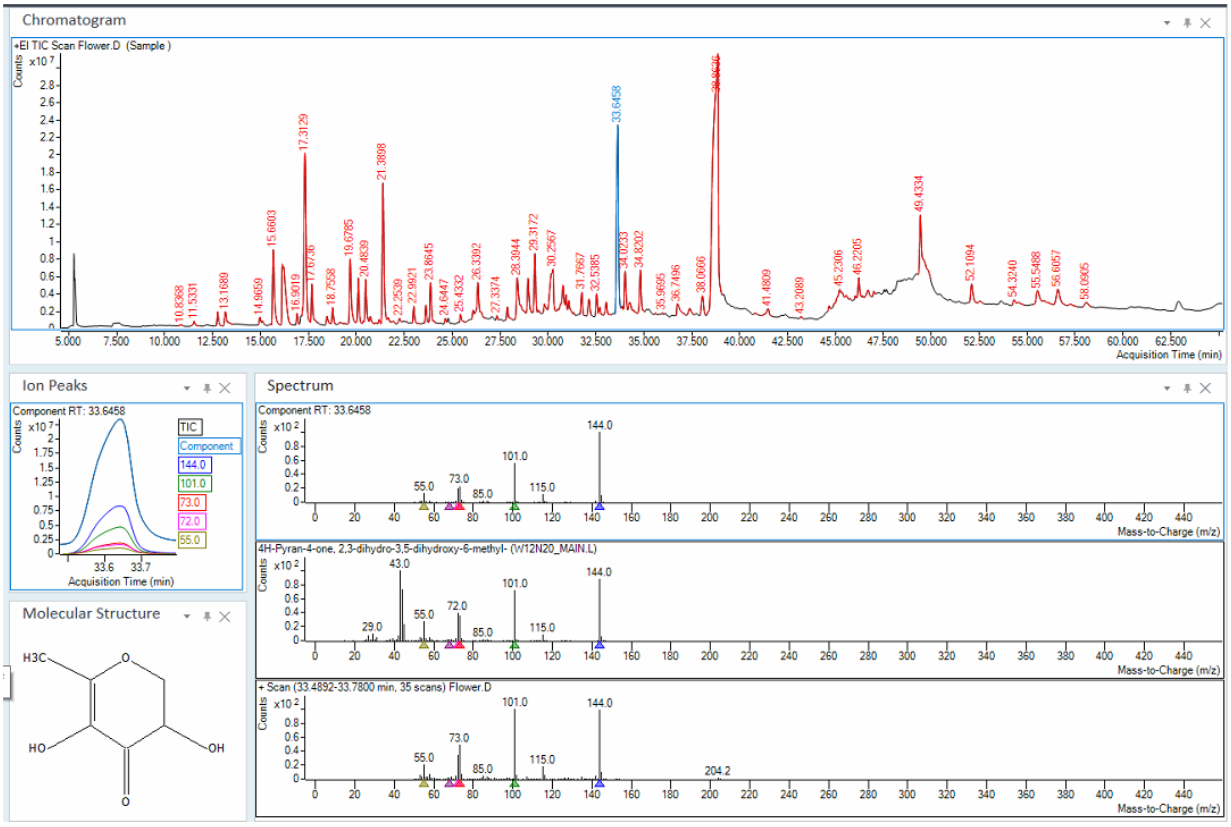

FIGURE 1: TIC of the Methanolic extract of flower of the plant *M. longifolia* (GC-MS)

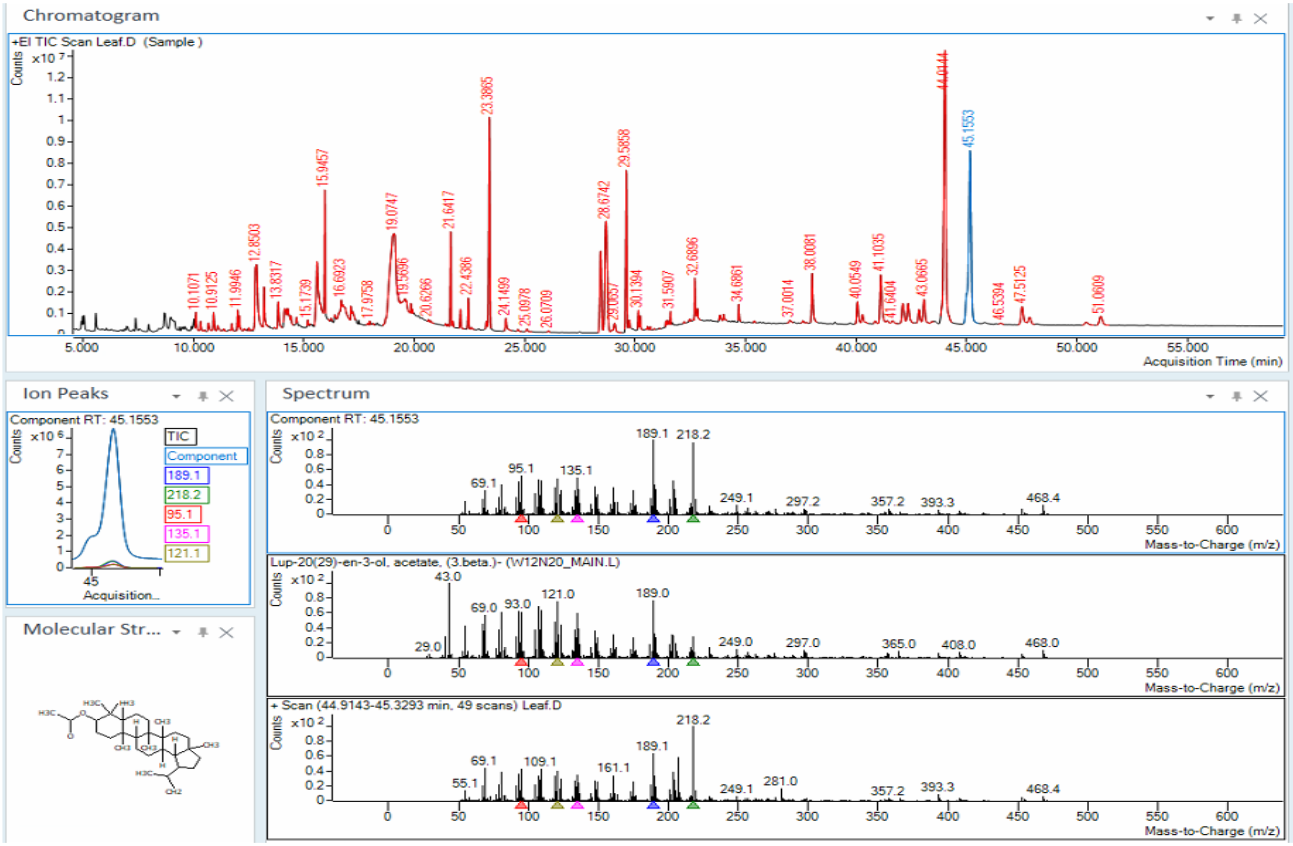

FIGURE 2: TIC of the Methanolic extract of leaves of the plant *M. longifolia* (GC-MS)

III. RESULTS AND DISCUSSION

3.1 Analysis of Phytochemical Constituents by Phytochemical Screening:

There are certain chemical compounds in medicinal plants that have specific physiological effects on human bodies, which give them their therapeutic value. The phytochemical screening of the n-hexane, ethyl acetate, methanol and ethanol extracts of the leaves and flower of *M. longifolia* revealed the presence of terpenoids, flavonoids, glycosides, sugars, phenolic compounds, saponins, quinones, alkaloids & tannins, their results summarized in the Table 1. Several significant components may have their therapeutic potency increased by the presence of carbohydrates, according to studies in the literature [22]. Due to their critical role in increasing the energy needed for defenses and their function as signals for monitoring defense genes, carbohydrates are said to be of particular significance [23]. When it comes to treating cancer, alkaloids are considered one of the chemo preventive phytochemicals that can be used in conjunction with agents to inhibit and delay the growth of tumors [24]. As nature's biological response modifiers, flavonoids have been shown to exhibit anti-microbial, anti-allergic, anti-inflammatory, and anti-cancer properties, while tannins typically have cytotoxic and anti-tumor properties [25]. According to our current investigation, the experimental plant sample contained both of these phyto-constituents.

3.2 GC-MS analysis of the plant extract:

The analytical GC-MS technique was used for the identification and quantification of the constituents present in the plant sample. Our present investigation revealed the presence of a total of 20 methanol soluble compounds from the methanolic extract of the leaves and flower of *M. longifolia*. By examining the molecular formula, retention time, and peak area of the data, the compounds' identities were confirmed. The whole result of the GC-MS analysis is shown in Figure-1; Figure-2 and Table-2 (A and B) including TIC curve.

It can be observed from Table-2 (A) that the total 80 component were identified from the methanol extract of flower was 98.25% and the composition of nearly 1.75% remained unidentified and in Table-2 (B) that the total 102 component were identified from the methanol extract of flower of the plant *M. longifolia* was 96.52% and the composition of nearly 3.48% remained unidentified respectively. Here major components were identified as 5-Hydroxymethyl-2-furaldehyde (26.48%), 4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl- (7.11%), Furfural (6.98%) etc. were founds in methanol extract of flower

and 12-Oleanen-3-yl acetate, (3.alpha.)- (13.38%), 1,3,4,5-Tetrahydroxycyclohexanecarboxylic acid (13.03%), Lup-20(29)-en-3-ol, acetate, (3.beta.)-(5.81%), Catechol (3.79%) etc. were founds. This is the first systematic and detailed study that we are aware of that looks into *M. longifolia* flower and leaves extracts.

IV. CONCLUSION

When one or more of the components found in herbal medicines are compared, variations may arise. The current study focused on how the polarity of the solvent affected the extraction process, phenolic, flavonoid, condensed tannin, gallo tannin, sugar content, antioxidant, and antimicrobial activities of *M. longifolia*. A good source of flavonoids, primarily condensed tannins with strong antioxidant activity, is themethanol extract. The majority of antibacterial compounds are found in extracts that range from medium to highly polar. Therefore, this plant may yield a large number of pharmacologically active secondary metabolites that have potential applications as organic antioxidants, antimicrobials, and anti-inflammatory agents. These findings might support the plant's traditional use. It is also used for quality control of herbal medicines, as it represents the chemical integrity of the herbs. Future research on *M. longifolia* quality and purity will be guided by the findings of this study.

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DISCLOSURE

The author reports no conflicts of interest in this work.

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