INTERNATIONAL JOURNAL OF CURRENT RESEARCH IN CHEMISTRY AND PHARMACEUTICAL SCIENCES

(p-ISSN: 2348-5213: e-ISSN: 2348-5221)

www.ijcrcps.com

DOI: 10.22192/ijcrcps Coden: IJCROO(USA) Volume 4, Issue 11 - 2017

Research Article

DOI: http://dx.doi.org/10.22192/ijcrcps.2017.04.11.006

GC-MS analysis of ethanolic flower extract of *Lantana camara* Linn (Verbenaceae)

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Abstract

Objectives: To investigate the bioactive constituents of ethanolic flower extract of *Lantana camara* Linn using GC-MS. **Methods:** GC-MS Analysis of flower extract was carried out by using Perkin-Elmer GC Clarus 500 system and Gas Chromotograph interfaced to a Mass Spectrometer (GC-MS) equipped with an Elite - I, fused Silica Capillary Column(30 mm x 0.25 mm 1 D x 1 µMdf, composed of 100% Dimethyl poly siloxane). **Results:** The results of GC-MS Analysis confirmed the presence of twenty six compounds. **Conclusions:** From the results, it can be concluded that the plant extract show the presence of twenty six bioactive compounds. These compounds justify the use of flower of *Lantana camara* for various ailments by traditional practitioners.

Keywords: GC-MS, Flower extract, *Lantana camara Linn.* Bioactive compounds.

1. Introduction

Natural remedies from medicinal plants are found to be safe and effective. Many plants species have been used in folkloric medicine to treat various ailments. Even today compounds from plants continue to play a major role in primary health care as therapeutic remedies in many developing countries [1].Standardization of plant materials is the need of the day. Several pharmacopoeia containing monographs of the plant materials describe only the physicochemical parameters. Hence the modern methods describing the identification and quantification of active constituents in the plant material may be useful for proper standardization of herbals and its formulations. Also the WHO has emphasized the need to ensure the quality of medicinal plants products using modern controlled technique and applying suitable standards [2].GC-MS is the best technique to identify the bioactive constituents of long chain hydrocarbons, alcohols, acids, ester, alkaloids, steroids, amino and nitro compounds etc [3].

2. Materials and Methods

The flowers of *Lantana camara* Linn were collected from the Punalvasal Village, Thanjavur District Tamil Nadu, India. The flowers were shaded dried and pulverized to powder in a mechanical grinder. Required quantity of powder was weighed and transferred to stoppered flask, and treated with ethanol until the powder is fully immersed. The flask was shaken every hour for the first 6 hours and then it was kept aside and again shaken after 24 hours. This process was repeated for 3 days and then the extract was filtered. The extract was collected and then subjected to GCMS analysis.

2.1. GC-MS Analysis

The GC-MS analysis of ethanolic flowers extract of *Lantana camara* Linn is carried out by using a Perkin-Elmer GC Clarus 500 system and Gas Chromotograph interfaced to a Mass Spectrometer (GC-MS) equipped with an Elite - I, fused Silica Capillary Column(30 mm x 0.25 mm 1 D x 1 µMdf, composed of 100% Dimethyl poly siloxane). The components were separated using Helium as carrier gas at a constant flow of 1 ml/min. The 2 µL sample extract injected into the instrument was detected by the Turbo gold mass detector (Perkin Elmer) with the aid of the Turbo mass 5.1 software. Interpretation on mass spectrum GC-MS was conducted using the database of National Institute Standard and Technology (NIST) having more than 62,000 patterns. The spectrum of the unknown component was compared with the spectrum of the known components stored in the NIST library. The name, molecular weight and structure of the components of the test materials were ascertained [4-6].

3. Results and Discussion

The 26 bioactive compounds have been identified in the ethanolic flowers extract of *Lantana camara* Linn by GC-MS analysis. The GC-MS Chromotogram of the dye extract is shown in figure 3.1. The active principles with their retention time (RT), molecular formula, molecular weight (MW) and concentration of peak (%) in the dye extract are listed in table 3.1. [7].

The identified phytocompounds in dye extract were 5,6-BIS(Methylidene)-2-Norbornen-7-one (fig. 3.1.1), 4-tert-Butoxycarbonyl-amino-piperidine - 2- carboxylic acid (fig. 3.1.2), 2-Propenoic acid, 2-ethylexyl ester (fig. 3.1.3), 1-Nonadecanol (fig. 3.1.4), 1-ethylcyclohexanol (fig. 3.1.5), 2-Butenoic acid,2-methyl-3-hexenyl ester (fig. 3.1.6), 2,2-dimethylcyclopropyl-methyl phenyl sufone (fig. 3.1.7), N-methyl-N-vinyl-2-methylpropanamide (fig. 3.1.8), 2-ethoxy-1-(2-bromo-ethoxy)-ethane (fig. 3.1.9), 1-Tetradecanol (fig. 3.1.10), Ethyl 4-methyl-(1,2,3,4-tetrahydro) benzofuran-1-carboxylate (fig. 3.1.11), 8-Pentadecanone (fig. 3.1.12), 1-(3-furyl)-2,2-dimethyl-3-butene-1-ol (fig. 3.1.13), 5-benzyl,4-(2-chlorobenzyl)1-,2,4-triazole-3-thione (fig. 3.1.14), 3-methyl-2-(2-methylallyl) furan (fig. 3.1.15), Vomifoliol (fig. 3.1.16), N-(2,2-Dichlorovinyl)-3,4,5-trimethoxybenzamide (fig. 3.1.17), 2-chloro-5-(4-methoxyphenyl)-1-phenyl - 1- (phenylamino) - 2-(p-tolylsulfinyl) pentane (fig.3.1.18),4-(tetrahydrofuranyl-2-oxy)-4-methyl-2-pentanone (fig. 3.1.19), 1,6-Hexanediol (fig. 3.1.20), 1-Hexadecanol (fig. 3.1.21), 1-Hexadecene (fig. 3.1.22), 2-Thioxo-3-phenyl-6,7,8,9-tetrahydrobenzothienol [2,3-d]-1,2,4-triazolo[1,5-a] pyrimidin-10(3H)-one (fig. 3.1.23), 2-Octyldodecan-1-ol (fig. 3.1.24), 5-[e-(N-methylamino)]-3-(2-thienyl)-1,2,4-oxadiazole (fig.3.1.25) and 2-Trifluoroacetylamino-4-phenylbutanoylpyrrolidine (fig. 3.1.26).

The major bioactive components and its biological activities obtained through GC-MS study of flowers extract of *Lantana camara* Linn are presented in table 3.2.

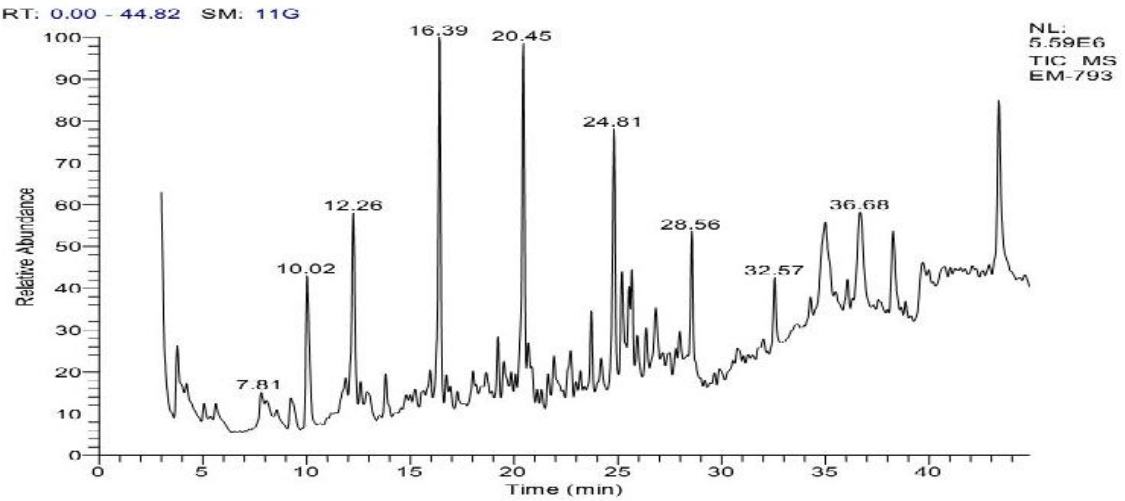

Fig. 3.1 GC-MS Chromotogram of the ethanolic flowers extract of *Lantana camara* Linn

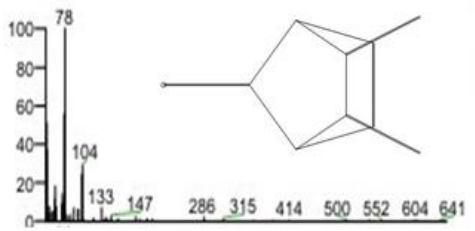

Fig. 3.1.1 Mass Spectrum of 5,6-BIS(Methylidene)-2-Norbornen-7-one

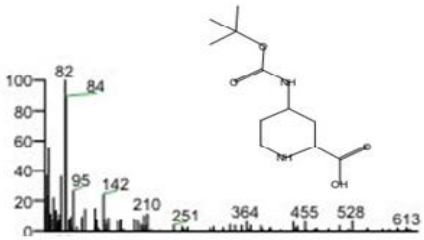

Fig. 3.1.2 Mass Spectrum of 4-tert-Butoxycarbonyl-amino-piperidine-2-carboxylic acid

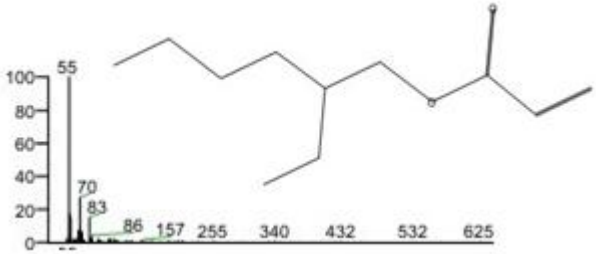

Fig. 3.1.3 Mass Spectrum of 2-Propenoic acid, 2-ethylexyl ester

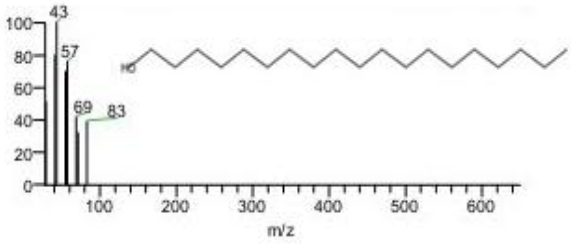

Fig.3.1.4 Mass Spectrum of 1-Nonadecanol

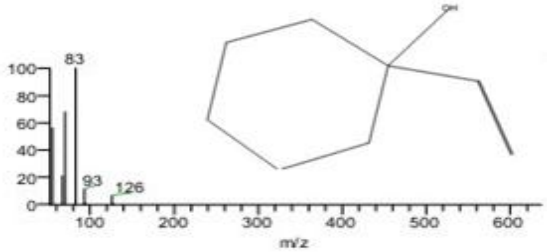

Fig. 3.1.5 Mass Spectrum of 1-ethylcyclohexanol

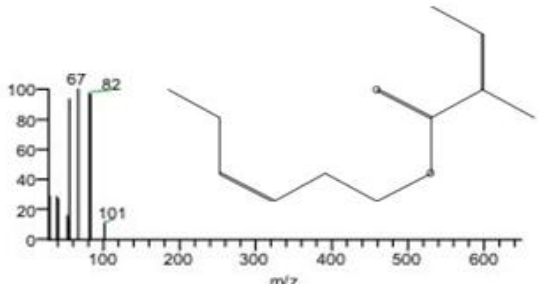

Fig. 3.1.6 Mass Spectrum of 2-Butenoic acid,2-methyl-3-hexenyl ester

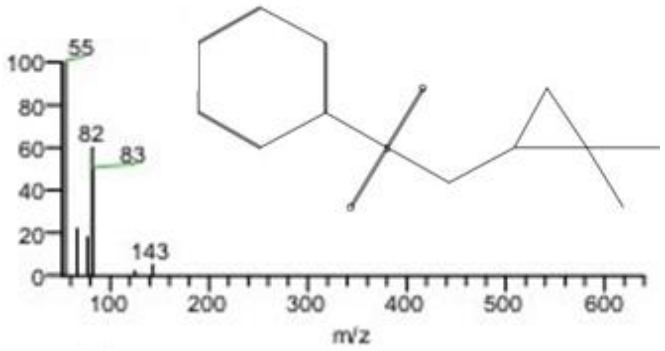

Fig. 3.1.7 Mass Spectrum of 2,2-dimethylcyclopropyl-methyl phenyl sufone

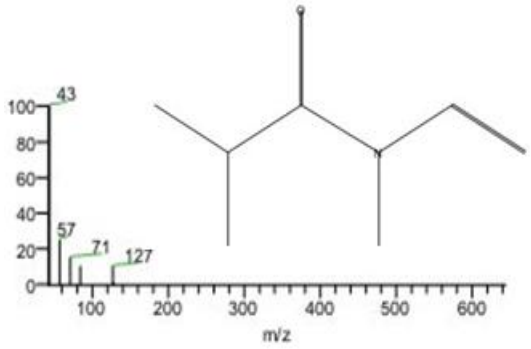

Fig. 3.1.8 Mass Spectrum of N-methyl-N-vinyl-2-methylpropanamide

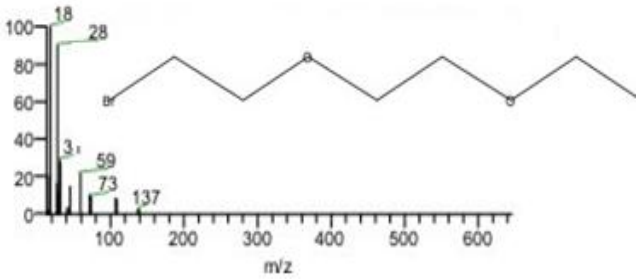

Fig. 3.1.9 Mass Spectrum of 2-ethoxy-1-(2-bromo-ethoxy) -ethane

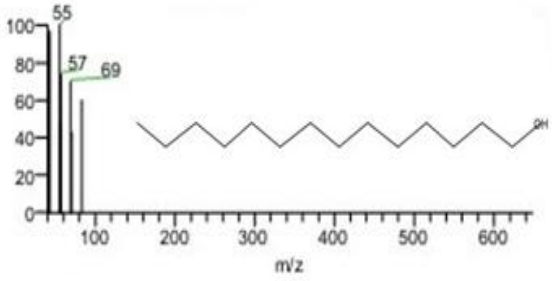

Fig. 3.1.10 Mass Spectrum of 1-Tetradecanol

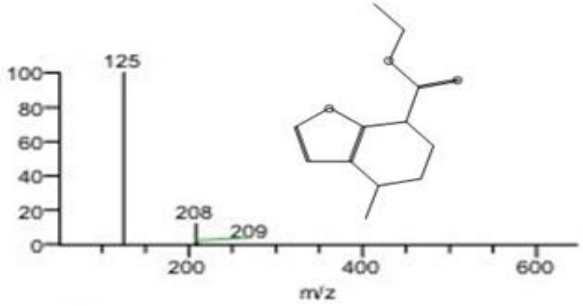

Fig. 3.1.11 Mass Spectrum of Ethyl 4-methyl-(1,2,3,4-tetrahydro) benzofuran-1-carboxylate

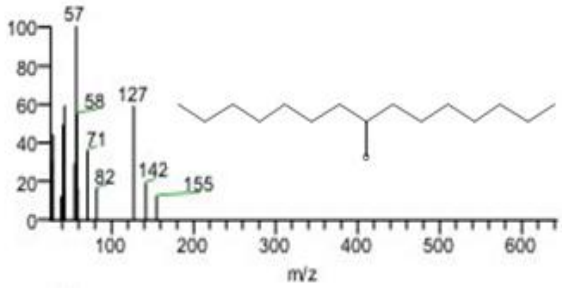

Fig. 3.1.12Mass Spectrum of 8-Pentadecanone

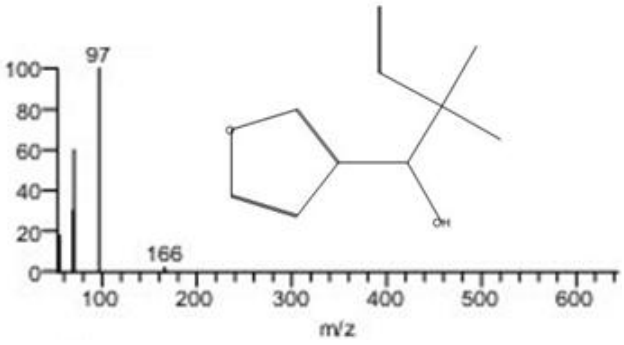

Fig. 3.1.13 Mass Spectrum of 1-(3-furyl)-2,2-dimethyl-3-butene-1-ol

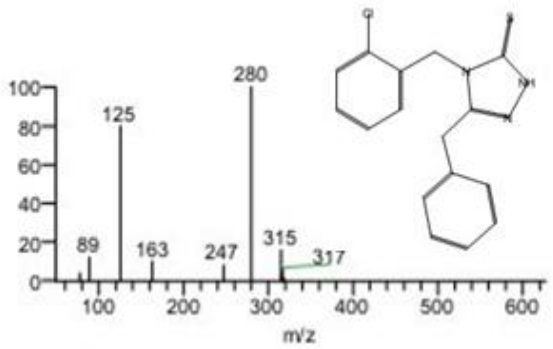

Fig. 3.1.14 Mass Spectrum of 5-benzyl,4-(2-chlorobenzyl)1-,2,4-triazole-3-thione

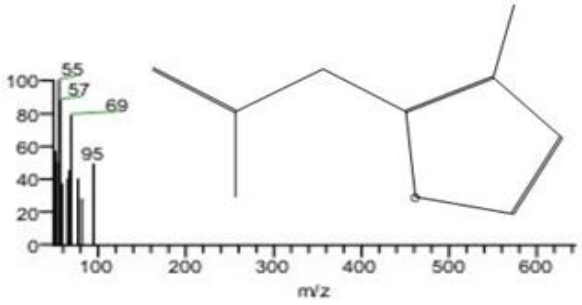

Fig. 3.1.15 Mass Spectrum of 3-methyl-2-(2-methylallyl) furan

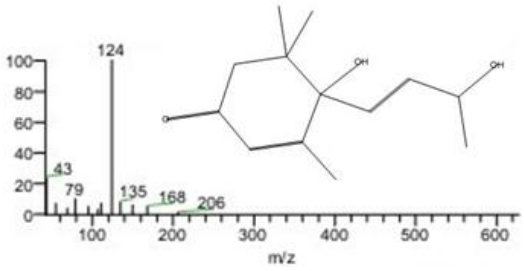

Fig. 3.1.16 Mass Spectrum of Vomifoliol

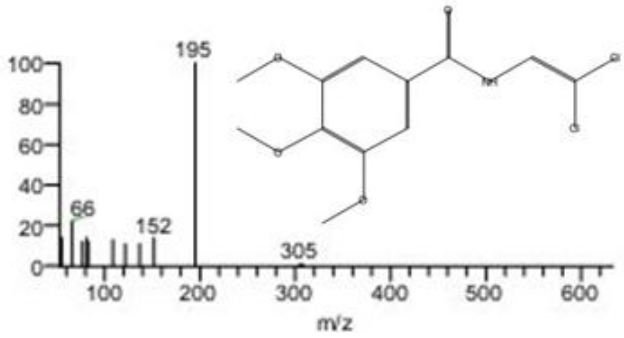

Fig. 3.1.17 Mass Spectrum of N-(2,2-Dichlorovinyl)-3,4,5-trimethoxybenzamide

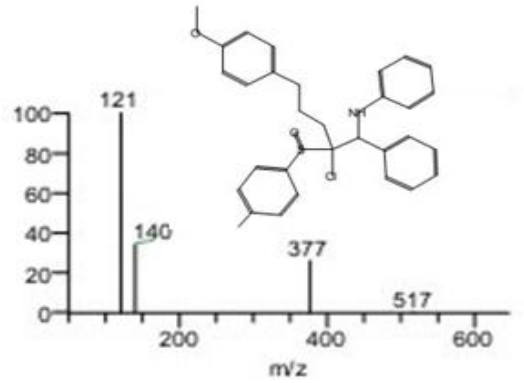

Fig. 3.1.18 Mass Spectrum of 2-chloro-5-(4-methoxyphenyl)-1-phenyl-1-(phenylamino)-2-(p-tolylsulfinyl) pentane

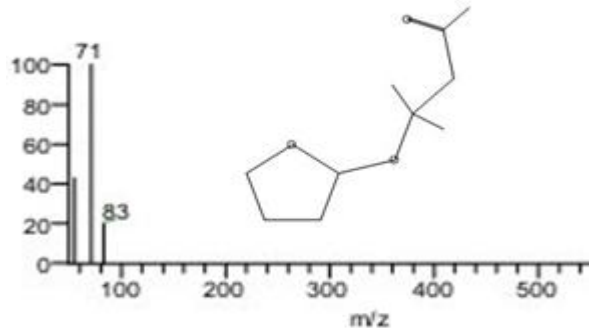

Fig. 3.1.19 Mass Spectrum of 4-(tetrahydrofuranyl-2-oxy)-4-methyl-2-pentanone

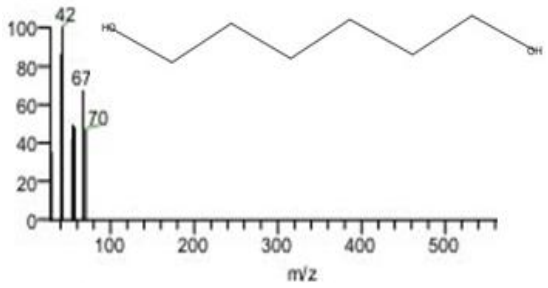

Fig. 3.1.20 Mass Spectrum of 1,6-Hexanediol

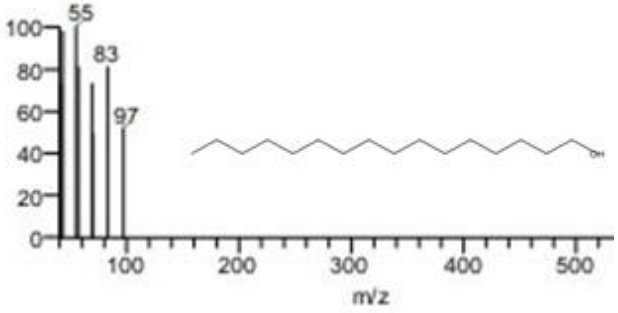

Fig. 3.1.21 Mass Spectrum of 1-Hexadecanol

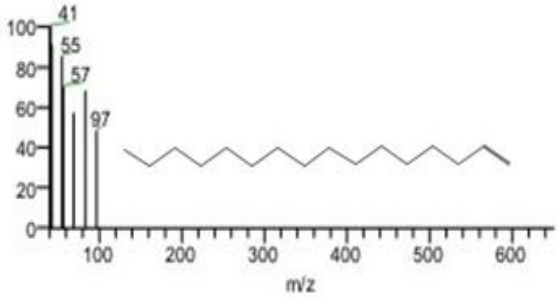

Fig. 3.1.22 Mass Spectrum of 1-Hexadecene

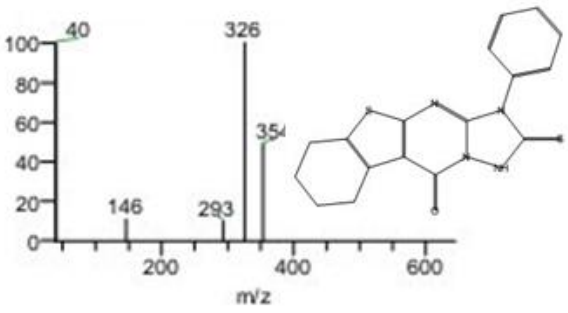

Fig. 3.1.23 Mass Spectrum of 2-Thioxo-3-phenyl-6,7,8,9-tetrahydrobenzothienol [2,3-d]-1,2,4-triazolo[1,5-a] pyrimidin-10(3H)-one

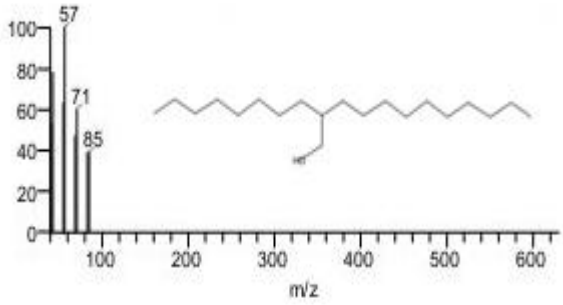

Fig. 3.1.24 Mass Spectrum of 2-Octyldodecan-1-ol

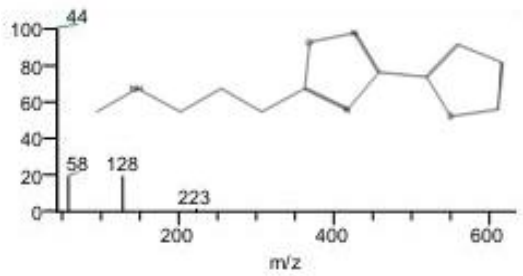

Fig. 3.1.25 Mass Spectrum of 5-[e-(N-methylamino)]-3-(2-thienyl)-1,2,4-oxadiazole

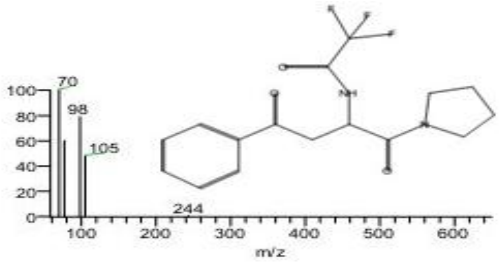

Fig. 3.1.26 Mass Spectrum of 2-Trifluoroacetylamino-4-phenylbutanoylpyrrolidine

Table 3.1 Phytocomponents detected in the ethanolic flowers extract of *Lantana camara* Linn

S. No	RT	Name of the compound	Molecular formula	Molecular weight	Peak (%)
1	3.76	5,6-BIS(Methylidene)-2-Norbornen-7-one	C_9H_8NO	132	2.06
2	9.24	4-tert-Butoxycarbonyl-amino-piperidine-2-carboxylic acid	$C_{11}H_{20}\ N_2O_4$	224	1.16
3	10.02	2-Propenoic acid, 2-ethylexyl ester	$C_{11}H_{20}O_2$	184	4.99
4	11.87	1-Nonadecanol	$C_{19}H_{40}O$	284	1.25
5	12.26	1-ethylcyclohexanol	$C_8H_{14}O$	126	6.95
6	13.80	2-Butenoic acid,2-methyl-3-hexenyl ester (CIS-3-Hexenyl Tiglate)	$C_{11}H_{18}O_2$	182	1.44
7	18.02	2,2-dimethylcyclopropyl-methyl phenyl sufone	$C_{12}H_{16}O_2S$	224	1.08
8	19.22	N-methyl-N-vinyl-2-methylpropanamide	$C_7H_{13}\ NO$	127	1.79
9	19.51	2-ethoxy-1-(2-bromo-ethoxy0-ethane	$C_6H_{13}BrO_2$	196	1.18
10	20.45	1-Tetradecanol	$C_{14}H_{30}O$	214	9.27
11	21.91	Ethyl 4-methyl-(1,2,3,4-tetrahydro) benzofuran-1-carboxylate	$C_{12}H_{16}O_3$	208	1.23
12	23.71	8-Pentadecanone	$C_{15}H_{30}O$	226	2.19
13	24.20	1-(3-furyl)-2,2-dimethyl-3-butene-1-ol	$C_{10}H_{14}O_2$	166	1.22
14	24.81	5-benzyl,4-(2-chlorobenzyl)1-,2,4-triazole-3-thione	$C_{16}H_{14}\ ClN_3S$	315	8.28
15	25.18	3-methyl-2-(2-methylallyl) furan	$C_9H_{12}O$	136	2.94
16	25.68	Vomifoliol	$C_{13}H_{20}O_3$	224	4.33
17	25.93	N-(2,2-Dichlorovinyl)-3,4,5-trimethoxybenzamide	$C_{12}H_{13}\ Cl_2NO_4$	305	1.13
18	26.34	2-chloro-5-(4-methoxyphenyl)-1-phenyl-1-(phenylamino)-2-(p-tolylsulfinyl) pentane	$C_{31}H_{32}Cl\ NO_2S$	517	1.37
19	26.82	4-(tetrahydrofuranyl-2-oxy)-4-methyl-2-pentanone	$C_{10}H_{18}O_3$	186	1.83
20	27.98	1,6-Hexanediol	$C_6H_{14}O_2$	118	1.84
21	28.56	1-Hexadecanol	$C_{16}H_{34}O$	242	3.79
22	32.57	1-Hexadecene	$C_{16}H_{32}$	224	2.33
23	35.00	2-Thioxo-3-phenyl-6,7,8,9-tetrahydrobenzothienol [2,3-d]-1,2,4-triazolo[1,5-a] pyrimidin-10(3H)-one	$C_{17}H_{14}OS_2$	354	6.69
24	36.07	2-Octyldodecan-1-ol	$C_{20}H_{42}O$	298	1.09
25	38.26	5-[e-(N-methylamino)]-3-(2-thienyl)-1,2,4-oxadiazole	$C_{10}H_{13}N_3OS$	223	4.96
26	39.64	2-Trifluoroacetylamino-4-phenylbutanoylpyrrolidine	$C_{16}H_{17}N_2O_3$	342	1.69

Table 3.2 Activity of the components identified in the ethanolic flowers extract of *Lantana camara* Linn

S. No	Name of the compound	Molecular formula	Nature of the compound	Activity
1	5,6-BIS(Methylidene)-2-Norbornen-7-one	C_9H_8NO	Ketone	No activity reported
2	4-tert-Butoxycarbonyl-amino-piperidine-2-carboxylic acid	$C_{11}H_{20}N_2O_4$	Ether compound	No activity reported
3	2-Propenoic acid, 2-ethylexyl ester	$C_{11}H_{20}O_2$	Fatty acid ester	Antioxidant, Cancer preventive, Lubricant
4	1-Nonadecanol	$C_{19}H_{40}O$	Fatty alcohol	Lubricant
5	1-ethylcyclohexanol	$C_8H_{14}O$	Alcoholic compound	Antimicrobial
6	2-Butenoic acid,2-methyl-3-hexenyl ester (CIS-3-Hexenyl Tiglate)	$C_{11}H_{18}O_2$	Fatty acid ester	Antioxidant
7	2,2-dimethylcyclopropyl-methyl phenyl sufone	$C_{12}H_{16}O_2S$	Ketone	No activity reported
8	N-methyl-N-vinyl-2-methylpropanamide	$C_7H_{13}NO$	Amide	No activity reported
9	2-ethoxy-1-(2-bromo-ethoxy0-ethane	$C_6H_{13}BrO_2$	Aromatic	No activity reported
10	1-Tetradecanol	$C_{14}H_{30}O$	Fatty alcohol	Ingredient in cosmetics
11	Ethyl 4-methyl-(1,2,3,4-tetrahydro) benzofuran-1-carboxylate	$C_{12}H_{16}O_3$	Aromatic acid	No activity reported
12	8-Pentadecanone	$C_{15}H_{30}O$	Ketone	No activity reported
13	1-(3-furyl)-2,2-dimethyl-3-butene-1-ol	$C_{10}H_{14}O_2$	Alcoholic compound	Antimicrobial
14	5-benzyl,4-(2-chlorobenzyl)1-,2,4-triazole-3-thione	$C_{16}H_{14}ClN_3S$	Heterocyclic	No activity reported
15	3-methyl-2-(2-methylallyl) furan	$C_9H_{12}O$	Heterocyclic	No activity reported
16	Vomifoliol	$C_{13}H_{20}O_3$	Alcoholic	Antibacterial
17	N-(2,2-Dichlorovinyl)-3,4,5-trimethoxybenzamide	$C_{12}H_{13}Cl_2NO_4$	amide	No activity reported
18	2-chloro-5-(4-methoxyphenyl)-1-phenyl-1-(phenylamino)-2-(p-tolylsulfinyl) pentane	$C_{31}H_{32}ClNO_2S$	Aromatic	No activity repored
19	4-(tetrahydrofuranyl-2-oxy)-4-methyl-2-pentanone	$C_{10}H_{18}O_3$	Ketone	No activity reported
20	1,6-Hexanediol	$C_6H_{14}O_2$	alcoholic	Antimicrobial
21	1-Hexadecanol	$C_{16}H_{34}O$	Fatty alcohol	Antimicrobial, Hypoglycemic
22	1-Hexadecene	$C_{16}H_{32}$	Hydrocarbon	Antibacterial
23	2-Thioxo-3-phenyl-6,7,8,9-tetrahydrobenzothienol [2,3-d]-1,2,4-triazolo[1,5-a] pyrimidin-10(3H)-one	$C_{17}H_{14}OS_2$	Heterocyclic	No activity reported
24	2-Octyldodecan-1-ol	$C_{20}H_{42}O$	Alcoholic	Antimicrobial
25	5-[e-(N-methylamino)]-3-(2-thienyl)-1,2,4-oxadiazole	$C_{10}H_{13}N_3OS$	Heterocyclic	No activity reported
26	2-Trifluoroacetylamino-4-phenylbutanoylpyrrolidine	$C_{16}H_{17}N_2O_3$	Heterocyclic	No activity reported

4. Conclusion

The presence of bioactive compounds in the flower extract of *Lantana camara* Linn. was analysed by GC-MS. The results pertaining to GC-MS analysis led to the identification of number of phytochemical compounds from the extract. The activities of these compounds were also predicted by Dr.Duke's phytochemical and ethnobotanical database. The GC-MS analysis showed the existence of various compounds with different chemical structures. The presence of various bio-active compounds confirms the application of flower extract of *Landana camara Linn*. for various ailments by traditional practitioners. However, isolation of individual phytochemical constituents may proceed to find a novel drug.

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Quick Response Code	Website: www.ijcrcps.com
	Subject: Chemistry
DOI: 10.22192/ijcrcps.2017.04.11.006	

How to cite this article:
P. Saravanan (2017). GC-MS analysis of ethanolic flower extract of *Lantana camara* Linn (Verbenaceae). Int. J. Curr. Res. Chem. Pharm. Sci. 4(11): 34-42.
DOI: http://dx.doi.org/10.22192/ijcrcps.2017.04.11.006