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Phytochemical and GC-MS analysis of bioactive compounds present in the *Adiantum incisum* forsk

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ABSTRACT

To isolate and analyse the phytochemical constituents of Adiantum incisum forks using GC-MS. The present study was carried out for the preliminary phytochemical analysis of the ethanolic extract of Adiantum incisum forks. GC-MS analysis was performed on the ethanolic extract of Adiantum incisum forks to find out the bioactive compounds. Phytochemical screening revealed the presence of alkaloids, carbohydrates, phenols, flavonoids, saponins where present .In the GC-MS analysis 26 no of compounds were identified viz.,17-Pentatriacontene - (26.44%), Neophytadiene -(10.68%), Hexadecanoic acid –(10.07%), 2-Hexadecen-1-ol,3,7,11,15-tetramethyl-(6.08%), 2-[3-Carbethoxypropionamide]-3,4-dicarbethoxy-1-benzyloxymethyl pyrrole (5.62%) etc. The presence of various bioactive compounds confirms the application of Adiantum incisum for various diseases by traditional use. However, isolation of individual phytochemical constituents may proceed to find a novel compound.

Keywords: Phytochemical, *Adiantum incisum* forks, GC-MS analysis, Ethanolic extract.

INTRODUCTION

Medicinal plants from the backbone of traditional medicine [1]. For centuries as remedies for human disease [2,3]. The plants are having still holds many species of plant contain substance of medicinal values which are yet to be discovered [4]. Increasing recognition of healthcare the screening of medicinal plants for active compounds has become very significant. [5]

The determination of phytoconstituents is largely performed by the relatively expensive and often laborious technique such as gas (GC) and liquid chromatography (LC) combined with specific detection schemes in the last few years, GC-MS has become a key technological metabolic profiling in both plant and non-plant species [6-8].

Adiantum incisum forks is one of the species among 200 species of adianntaceae family, it is distributed across the world. In cool temperate zones so many *Adiantum* species have been used for the traditional system of medicine. The preliminary phytochemical studies have shown the presence of various class of compounds like alkaloids, steroids, phenols, flavonoids [10,11]. It posses multiple pharmacological activities such as analgesic, antimicrobial, anti-inflammatory activities. Hence the present investigation was carried out to determine the possible phytochemical components from *Adiantum incisum* forks by GC-MS analysis for developing new bioactive compounds.

MATERIALS AND METHODS

Collection of the plant materials

The plant *Adiantum incisum* forks was collected from Bharathipuram, Kulathupuzha at Kerala in the month of March 2013. The same was authenticated by Dr. G. V. S. Murthy, Scientist ‘F’ & Head of Office, Botanical survey of India, Southern Regional Centre at Coimbatore.

Preparation of plant extract

Weighed 100 gm of *Adiantum incisum* forks was shade dried and coarsely powdered plant material was extracted with 1500 ml of ethanol solvent by using Soxhlet extractor up to green colour was discharged, the extract was distilled and viscous semi solid masses obtained.

Phytochemical screening.

The ethanolic extract was tested for alkaloids, carbohydrates, glycoside, flavonoids, phenols, steroids, saponins. Phytochemical screening of the extract was carried out accordingly by standard methods.

GC-MS analysis

The GC-MS analysis of ethanolic extracts of *Adiantum incisum* forks was performed using a thermo GC - TRACE ultra ver: 5.0, thermo MS DSQ II. Experimental conditions of GC-MS system were as follows: column: zb 5 - ms capillary standard non - polar column. Dimension: 30 mts, id: 0.25 mm, film: 0.25 µm, carrier gas: Helium, flow: 1.0 ml/min .temp prog : oven temp 70° c raised to 260° c at 6 c /min and injection volume was 1µl.sample which fully run at a range of 50-650m/z and the result were compared with wiley spectral library search program. The mass spectra detected in 40 min.

RESULTS AND DISCUSSION

The phytochemical screening of *Adiantum incisum* forsk extract revealed Table1 that the ethanolic extract contains alkaloids, carbohydrates, glycosides, flavonoids, phenols, steroids, saponis.

Table 1. Preliminary phytochemical screening of ethanolic extract of *Adiantum incisum*

Tests	Ethanolic extract
Alkaloids	+
carbohydrates	+
glycosides	+
flavonoids	+
phenolic compound	+
steroids	+
Saponins	+

The GC-MS analysis result lead to identification of number of compound present in the ethanolic extract of *Adiantum incisum*. They were identified through mass spectrometry attached with GC. Compound Present in the extract of *Adiantum incisum* forks *using* GC-MS analysis given in the Table 2. The result revealed the presence of 45 different phytocompounds based upon the Probability viz.,

2-[3-Carbethoxypropionamide]-3,4-dicarbethoxy-1-benzyloxymethylpyrrole-(5.62%), t-butyl 3-{[(3'R)-3'(benzyloxy) butanoyl]oxy}butanoate –(5.62%), D-Glucopyranuronic acid –(4.86%),5-Thio-D-glucose –(4.86%), Cyclobutylidenacetaldehyde-(0.75%),2-Imino-4-methylpentanenitrile- (0.75%), Nonane (CAS) –(0.82%),Docosane (CAS) –(0.82%), (1-p-Tolylmethylene)cyclopropane –(0.52%), à-Methylbenzylidenecyclopropane –(0.52%), 1-(3-Methylphenyl)buta-1,3-diene–(0.52%), Tetradecane, 1-chloro- (CAS)-(0.79%), undec-2-ene-(0.79%), Dihydro naphtho[2,1-b]furan –(0.24%), 1,2- [1,1'-Biphenyl]-3-ol (CAS) –(0.24%), Cyclohexanecarboxylic acid, hexyl ester–(0.43%), ethylcyclopentenolone–(0.43%),2-tert-Butyl-4-trifluoromethyl-1-methylimidazole-(2.67%),5-Isopropyl-4-(trifluoromethyl)-1H-pyrimidin-2-one -(2.67%),2-Allyl-5-t-butylhydroquinone -(2.67%),3,4-Dihydro-2H-1,5-(3"-t-butyl)benzodioxepine-(2.67%), 2(4H)-Benzofuranone,5,6,7,7a-tetrahydro-4,4,7a-trimethyl- (CAS)-(0.66%),2-methoxy-7à-methyl-1á,5á-epoxy-1á,7à-bicyclo[5.3.0]dec-2-ene-(1.45%),3-Ethoxy-4-methoxy aceto phenone-(1.45%), 2-Cyclohexen-1-one,4-(3-hydroxy-1-butenyl)-3,5,5-trimethyl-,[R-[R*,R*-(E)]]- (CAS)-(0.49), 2-Butyl-5-methyl-3-(2-methylprop-2-enyl)cyclohexanone –(0.35%),-[(2,6-dioxo-1,2,3,6-tetrahydro-pyrimidine-4-carbonyl)-amino]-butyric acid–(0.35%),1-{2-[3-(2-Acetyloxiran-2-yl)-1,1-dimethylpropyl]cycloprop-2-enyl} ethanone-(0.41%), Ethanol, 2,2'-iminobis- (CAS) –(0.28%), Benzene, (1-methyldecyl)- (CAS) –(0.28%), (-)-Loliolide –(2.45%),(e)-1-(p-methoxyphenyl)-2-methoxyprop-1-e–(2.45%),1-Methyl-3-ethyl-4-dimethylamino-2-piperidine –(1.75%), Neophytadiene-(10.68%),3,7,11,15-Tetramethyl-2-hexadecen-1-ol-(10.68%), 2-Hexa decen-1-ol, 3,7,11,15-tetramethyl-,[R-[R*,R*-(E)]]- (CAS)-(2.31%),6-Ethynyl-5,5'-dimethyl-2,2'-bipyridine –(1.42%), hexadecanoic acid –(10.07%),10,12,14-Nonacosatriynoic acid –(0.61%),9-Octadecenoic acid (Z)- (CAS) –(10.06%),17-Pentatriacontene-(26.44%), 12-Hydroxy-14-methyl-oxa-cyclotetradec-6-en-2-one-(26.44%), Phytol, acetate –(0.47%),3,7,11,15-Tetramethyl-2-hexadecen-1-ol-(l0.47%), Chromone, 5-hydroxy-6,7,8-trimethoxy-2,3-dimethyl -(0.79%). The GC-MS spectrum confirmed the presence of the mencend compound for the following retention time . 9.10, 12.42,14.84,19.98,21.81,24.33,30.88,33.15,36.31, respectively(Fig.1)

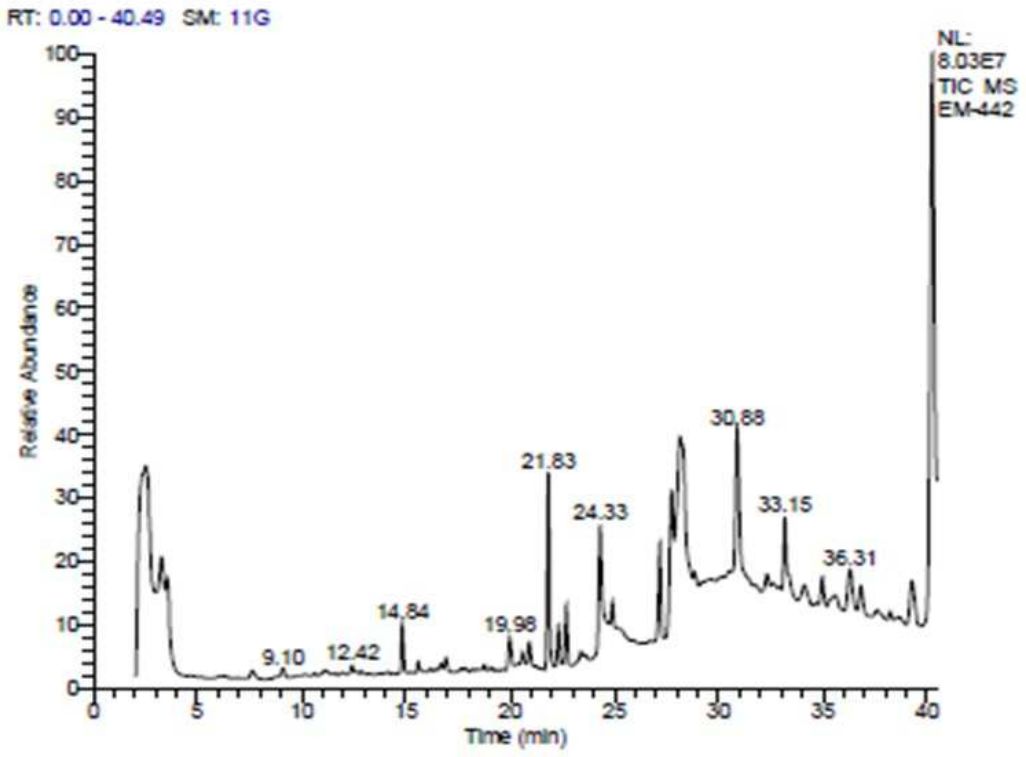
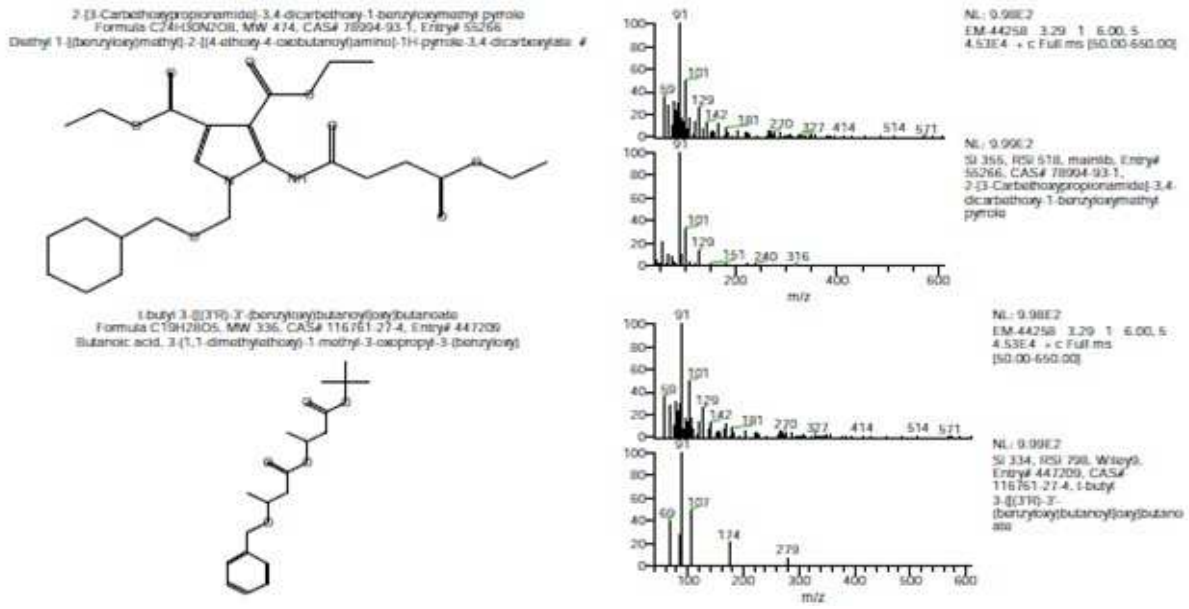
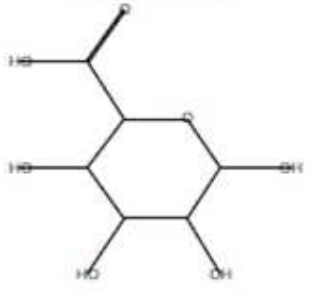


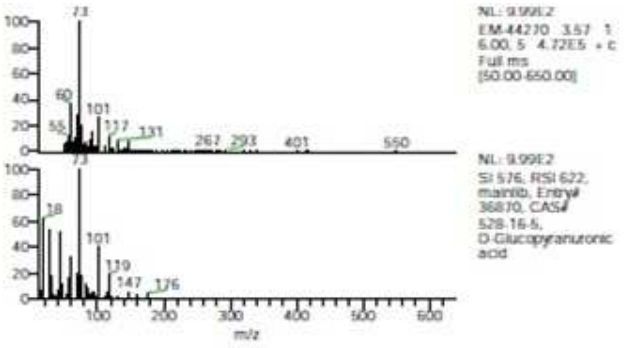
Fig 1. GC-MS Chromatogram of ethanolic extract of *Adiantum incisum* forsk

In the present study, methanolic extract of *Adiantum incisum* forsk is analyzed through GC-MS. Still there is no reports where published regarding GC-MS analysis of *Adiantum incisum* forsk. The following compounds are having some important medicinal values for further drug discovery. 2-[3-Carbethoxy propionamide] -3,4-dicarbethoxy-1-benzyloxy methyl pyrrole, t-butyl-3-{[(3'R)-3'-(benzyloxy)butanoyl]oxy}butanoate,D-Glucopyranuronic acid, Cyclobutyli-denacetaldehyde, Nonane (CAS), Tetradecane, 1-chloro- (CAS), 1,2-Dihydronaphtho[2,1-b]furan, Bufa-20,22-dienolide, 14,15-epoxy-3,16-dihydroxy (3á,5á,15á,16á), 6-chloro-n~2~, n~4~-dicycloheptyl-1,3,5-triazine-2,4-diamine.

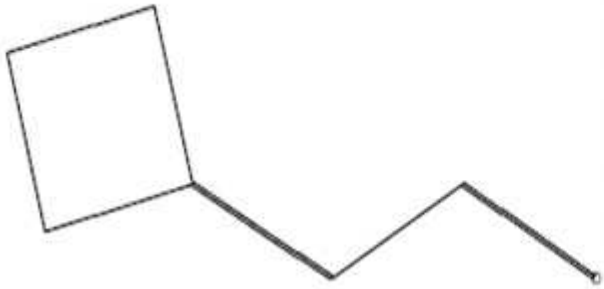


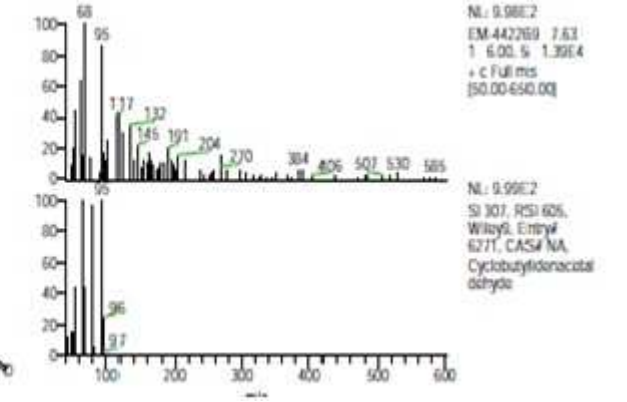
D-Glucopyranuronic acid
Formula C6H10O7, MW 194, CAS# 528-16-5, Entry# 36870
Glucopyranuronic acid, D-



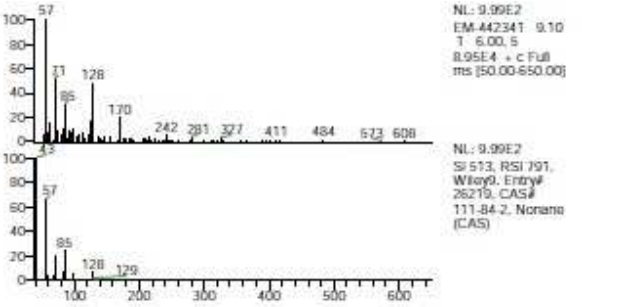


Cyclobutylideneacetaldehyde
Formula C6H8O, MW 96, CAS# NA, Entry# 6271

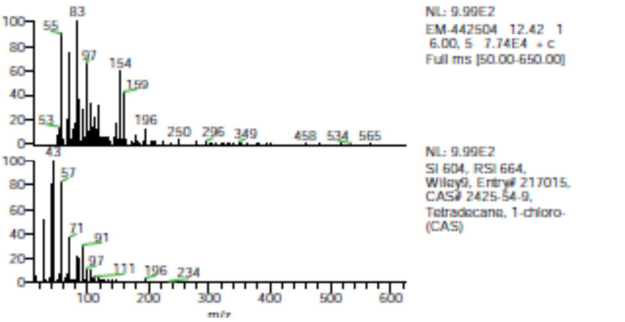




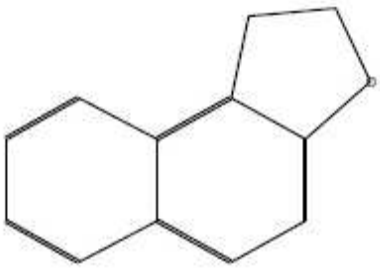
Nonane (CAS)
Formula C9H20, MW 128, CAS# 111-84-2, Entry# 26219
n-Nonane

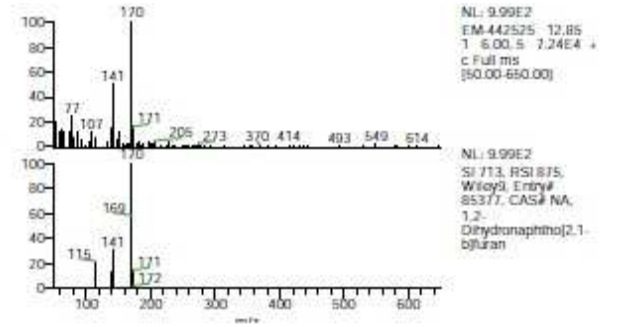


Tetradecane, 1-chloro- (CAS)
Formula C14H29Cl, MW 232, CAS# 2425-54-9, Entry# 217015
Myristyl chloride



1,2-Dihydronaphtho[2,1-b]furan
Formula C12H10O, MW 170, CAS# NA, Entry# 85377





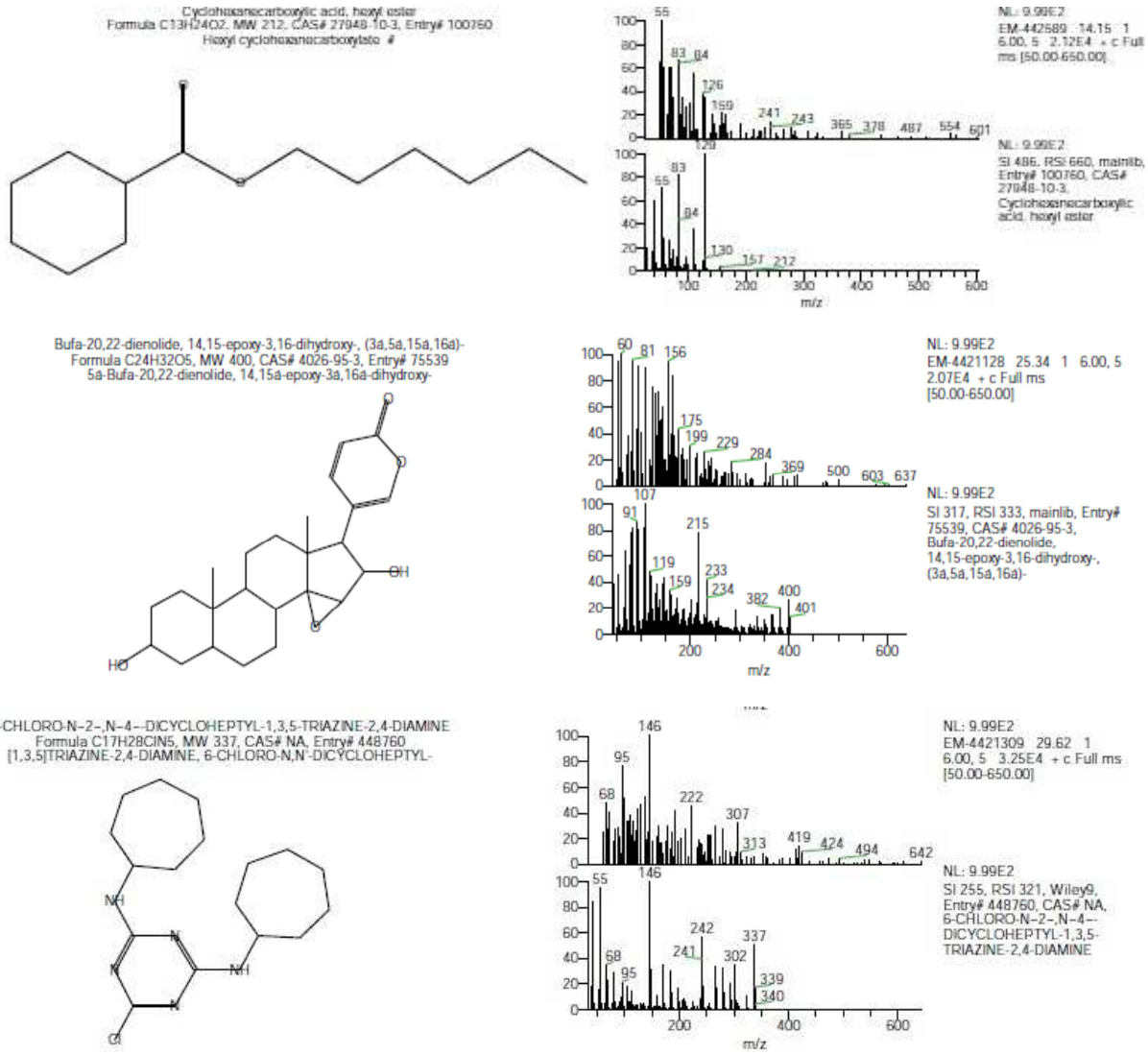


Table 2 Compounds present in the methanolic extract of *Adiantum incisum* forsk using GC-MS analysis

SI	RSI	Compound Name	Probability	Molecular Formula	Molecular Weight	Area %
355	518	2-[3-Carbethoxypropionamide]-3,4-dicarbethoxy-1-benzyloxymethyl pyrrole	8.61	C24H30N2O8	474	5.62
334	798	t-butyl 3-{[(3'R)-3'-(benzyloxy)butanoyl]oxy}butanoate	3.66	C19H28O5	336	5.62
576	622	D-Glucopyranuronic acid	12.52	C6H10O7	194	4.86
569	614	5-Thio-D-glucose	9.59	C6H12O5S	196	4.86
307	605	Cyclobutylidenacetaldehyde	8.85	C6H8O	96	0.75
298	766	2-Imino-4-methylpentanenitrile	6.42	C6H10N2	110	0.75
513	791	Nonane (CAS)	16.65	C9H20	128	0.82
509	523	Docosane (CAS)	14.06	C22H46	310	0.82
443	852	(1-p-Tolylmethylene)cyclopropane	14.29	C11H12	144	0.52
439	845	à-Methylbenzylidenecyclopropane	12.07	C11H12	144	0.52
604	664	Tetradecane, 1-chloro- (CAS)	7.00	C14H29Cl	232	0.79
592	773	Undec-2-ene	4.66	C11H22	154	0.79
713	875	1,2-Dihydronaphtho[2,1-b]furan	37.31	C12H10O	170	0.24
690	843	[1,1'-Biphenyl]-3-ol (CAS)	13.62	C12H10O	170	0.24
486	660	Cyclohexanecarboxylic acid, hexyl ester	4.04	C13H24O2	212	0.43
481	695	Ethylcyclopentenolone	3.25	C7H10O2	126	0.43
948	952	2-tert-Butyl-4-trifluoromethyl-1-methylimidazole	19.71	C9H13F3N2	206	2.67
939	943	5-Isopropyl-4-(trifluoromethyl)-1H-pyrimidin-2-one	14.31	C8H9F3N2O	206	2.67
776	818	2(4H)-Benzofuranone	28.17	C11H16O2	180	0.66
712	871	2-methoxy-7à-methyl-1á,5á-epoxy-1á,7à-bicyclo[5.3.0]dec-2-ene	16.42	C12H18O2	194	1.45
702	850	3-Ethoxy-4-methoxyacetophenone	11.59	C11H14O3	194	1.45
604	745	2-Cyclohexen-1-one, 4-(3-hydroxy-1-butenyl)-3,5,5-trimethyl-,[R-[R*,R*-(E)]]- (CAS)	25.59	C13H20O2	208	0.49
381	518	2-Butyl-5-methyl-3-(2-methylprop-2-enyl)cyclohexanone	9.00	C15H26O	222	0.35
370	420	4-[(2,6-dioxo-1,2,3,6-tetrahydro-pyrimidine-4-carbonyl)-amino]-butyric acid	6.17	C9H11N3O5	241	0.35
607	665	1-{2-[3-(2-Acetyloxiran-2-yl)-1,1-dimethylpropyl]cycloprop-2-enyl}ethanone	23.46	C14H20O3	236	0.41
587	645	Sylvenone	10.68	C14H24O	208	0.41
589	949	Ethanol, 2,2'-iminobis- (CAS)	21.09	C4H11NO2	105	0.28

574	713	Benzene, (1-methyldecyl)- (CAS)	12.78	C17H28	232	0.28
751	789	(-)-Loliolide	65.15	C11H16O3	196	2.45
666	900	(e)-1-(p-methoxyphenyl)-2-methoxyprop-1-ene	5.86	C11H14O2	178	2.45
575	903	(-)-Loliolide	82.13	C11H16O3	196	1.70
548	697	4-(2,4-Dimethylcyclohex-3-enyl)but-3-en-2-one	1.19	C12H18O	178	1.70
714	979	-Methyl-3-ethyl-4-dimethylamino-2-piperidine	81.30	C10H20N2	168	1.75
580	758	nicotinic acid-à-d	1 3.14	C6H4DNO2	123	1.75
895	901	Neophytadiene	24.07	C20H38	278	10.68
894	913	3,7,11,15-Tetramethyl-2-hexadecen-1-ol	23.13	C20H40O	296	10.68
843	898	2-Hexadecen-1-ol, 3,7,11,15-tetramethyl-, [R-[R*,R*-(E)]]- (CAS)	30.22	C20H40O	296	2.31
842	915	3,7,11,15-Tetramethyl-2-hexadecen-1-ol	29.05	C20H40O	296	2.31
560	792	6-Ethynyl-5,5'-dimethyl-2,2'-bipyridine	37.80	C14H12N2	208	1.42
510	565	2,4,6-Tris(allyloxy)-s-triazine	7.69	C12H15N3O3	249	1.42
878	894	Hexadecanoic acid	73.49	C16H32O2	256	10.07
878	894	n-Hexadecanoic acid	73.49	C16H32O2	256	10.07
789	828	Hexadecanoic acid, ethyl ester	74.52	C18H36O2	284	1.39
333	343	10,12,14-Nonacosatriynoic acid	7.57	C29H46O2	426	0.61
317	333	Bufa-20,22-dienolide, 14,15-epoxy-3,16-dihydroxy-,(3á,5á,15á,16á)	4.36	C24H32O5	400	0.61
705	790	Phytol, acetate	17.07	C22H42O2	338	0.47
255	321	6-chloro-n~2~,n~4~-dicycloheptyl-1,3,5-triAzine-2,4-diamine	4.81	C17H28ClN5	337	0.79

CONCLUSION

The present study confirmed the presence of alkaloids , carbohydrates, glycoside, flavonoids, phenols, steroids , saponins with varies degree. In addition to this, GC-MS profile can be used as biochemical markers in the pharmaceutical industries to identify the authentic mother plants and differentiate from its adulterants.

Acknowledgement
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