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European Journal of Experimental Biology, 2013, 3(1):73-80

ISSN: 2248 –9215
CODEN (USA): EJEBAU

Phytocomponents identified on the various extracts of stem of *Hugonia mystax* L. (Linaceae)

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ABSTRACT

Hugonia mystax L. is woody evergreen liana distributed throught India, in dry forest area. It is locally knows as Modirakanni (Tamil). Ethnobotanically, the stem bark is used for stomach pain, vomiting and indigestion. Powdered materials were subjected to successive extraction with petroleum ether, chloroform and ethanol by soxhlet method to determine the successive extractive values and GC-MS analysis to investigate the chemical components present in it. Totally 62 chemical compounds were identified of which 18 compounds were identified from petroleum ether extract, 29 compounds from chloroform extracts and 21 compounds from ethanol extract of which di-n-octyl phthalate (24.32%), 2-methyl-7-nonadecene (20.83%), α-D-Glucopyranoside, methyl (21.10%) were major constituent with the biological activities like antimicrobial, antifungal and antioxidant activity present in the stem extracts.

Key words: GC-MS analysis, *Hugonia mystax* L., petroleum ether extract, ethanol stem extracts.

INTRODUCTION

The genus *Hugonia* L., of family Linaceae comprise about 40 species in the world; of which two species namely *Hugonia mystax* L., and *H. ferruginea* Wight & Arn., were reported from India [1, 2]. The plant *Hugonia mystax* is a woody evergreen liana distributed throughout India in dry topical forest it is also known as Modirakanni. Ethnobotanically the bark is made in to a decoction with *Curcuma aromatica* and is given with honey for inflammations in the stomach, vomiting, stomach pain, indigestion [3]. The aerial parts used as herbal remedies for diabetes [4, 5]. Review of literature revealed less work on this plant. Hence in the present study, the successive extractive value and Gas Chromatography-Mass Spectrometry (GC-MS) analysis of petroleum ether, chloroform and ethanol extract of stem of *Hugonia mystax* were done.

MATERIALS AND METHODS

Collection of Plant material

The plant of *Hugonia mystax* L., was collected from the Marakanam forest vicinity, of Villupuram district, Tamil Nadu. The collected plant materials was botanically identified and confirmed by using flora such as Flora of Tamil Nadu Vols. 1-3 [6] and 'An Excursion Flora of Central Tamil Nadu Carnatic'[7]. The species conformation was engaged at French Institute Herbarium (HIFP), Puducherry. The herbarium specimen was prepared and deposited at the Department of Botany, Kanchi Mamunivar Centre for Post Graduate Studies, Lawspet, Puducherry, for future reference.

Preparation of the Extracts

The collected materials (stem) were chopped into small pieces separately, shade-dried, and coarsely powdered using a pulverizor. The coarse powders were subjected to successive extraction with organic solvents of increasing polarity such as petroleum ether, chloroform and ethanol by Soxhlet method. The extracts were collected and distilled off on a water bath at atmospheric pressure and the last trace of the solvents was removed *in vacuo* and stored at 4°C. The resulted extracts were subjected to GC-MS analysis.

Determination of Extractive values

All the successive extracts of stem were subjected to determine the successive extractive values by following standard methods [8].

Gas Chromatography-Mass Spectrometry (GC-MS) analysis

GC-MS analysis was performed with GC Clarus 500 Perkin Elmer equipment. Compounds were separated on Elite-1 capillary column (100% Dimethylpolysiloxane). Oven temperature was programmed as follows: isothermal temperature at 50ºC for 2min, then increased to 200ºC at the rate of 10ºC/min, then increased up to 280ºC at the rate of 5ºC/min held for 9 min. Ionization of the sample components was performed in the El mode (70 eV). The carrier gas was helium (1ml/min) and the sample injected was 2µl. The detector was Mass detector turbo mass gold-Perkin Elmer. The total running time for GC was 36 min and software used was Turbomass 5.2.

Using computer searches on a NIST Ver.2.1 MS data library and comparing the spectrum obtained through GC – MS compounds present in the plants sample were identified.

Identification of Compounds

The individual compounds were identified from ethanol extracts based on direct comparison of the retention times and their mass spectra with the spectra of known compounds stored in the spectral database, NIST (version year 2005).

RESULTS AND DISCUSSION

Successive Extractive values

In stems, extractive values recorded were 4 % in petroleum ether, 5 % in chloroform and 7 % in ethanol.

The results of GC-MS analysis on petroleum ether, chloroform and ethanol extracts of stem were given in the Table 1-3.

(i) Petroleum ether extract

In petroleum ether extract, 18 compounds were identified, of which 6 compounds were belonged to the class dicarboxylic acid, 5 compounds were belonged to the class fatty acids and their esters, 3 compounds were belonged to fatty alcohols and one compound each belonged to the class cardiac glycoside, secosteroid and aromatic acid and hydrocarbon respectively. Among this classes, di-n-octyl phthalate was found to be present as major constituent with the peak area 24.32% and retention time 21.28 minutes, followed by digitoxin with the peak area 12.16% and retention time 33.30 minutes and followed by 9,12-octadecadienoic acid, methyl ester, (E,E)-with the peak area 11.26% and retention time 15.07 minutes. Compounds such as 1,2-benzenedicarboxylic acid, diheptyl ester; 1,2-benzenedicarboxylic acid, dipentyl ester and benzoic acid, 2-(1-oxopropyl)- was found to be present as least quantity with the peak area 0.90 % and retention time 14.03, 14.79 and 13.95 respectively (Table 1; Fig.1).

(ii) Chloroform extract

In chloroform extract 29 compounds were identified, of which 5 compounds were belonged to the class hydrocarbons, 4 compounds were belonged to the class fatty alcohols, 3 compounds were belonged to the class fatty acids and their esters, 2 compounds each belonged to the class steroids, unsaturated hydrocarbons, aliphatic aldehydes and triterpene alcohols, one compound each belonged to the class aromatic ester, phenolic ester, dicarboxylic ester, carboxylic acid, alkaloid, ketones, aromatic hydrocarbon and pesticide respectively. Among this classes, 2-methyl-7-nonadecene was found to be presents as major constituent with the peak area 20.83% and retention time 23.72 minutes, followed by dehydrodiconiferyl alcohol with the peak area 13.54% and retention time 31.79 minutes and followed by 1-eicosanol with the peak area 8.39% and retention time 20.80 minutes. In this class, 1H-cycloprop[e]azulene,1a,2,3,4,4a,5,6,7b-octahydro-1,1,4,7-tetramethyl-,[1aR(1aα,4α,4aα,7bα)]- was found to be least quantity with the peak area 0.34% and retention time7.07 minutes respectively (Table 2; Fig.2).

Table 1. GC-MS analysis of petroleum ether extract of the stem.

S. No.	Name of the Compounds	Molecular Formula	Retention Time (min.)	Molecular weight	Peak area (%)
(i) Dicarboxylic acid ester					
1	Dibutyl phthalate	$C_{16}H_{22}O_4$	13.35	278	3.60
2	1,2-Benzenedicarboxylic acid, dipentyl ester	$C_{18}H_{26}O_4$	14.79	306	0.90
3	1,2-Benzenedicarboxylic acid, butyl 2-ethylhexyl ester	$C_{20}H_{30}O_4$	12.77	334	2.25
4	1,2-Benzenedicarboxylic acid, butyl 2-ethylhexyl ester	$C_{20}H_{30}O_4$	13.57	334	2.25
5	1,2-Benzenedicarboxylic acid, diheptyl ester	$C_{22}H_{34}O_4$	14.03	362	0.90
6	Di-n-octyl phthalate	$C_{24}H_{38}O_4$	21.28	390	24.32
(ii) Fatty acids and their esters					
7	13-Tetradecynoic acid, methyl ester	$C_{15}H_{26}O_2$	15.16	238	6.31
8	Cyclopentaneundecanoic acid, methyl ester	$C_{17}H_{32}O_2$	12.92	268	2.70
9	Hexadecanoic acid, ethyl ester	$C_{18}H_{36}O_2$	13.75	284	1.35
10	9,12-Octadecadienoic acid, methyl ester, (E,E)-	$C_{19}H_{34}O_2$	15.07	294	11.26
11	9,12,15-Octadecatrienoic acid, 2-[(trimethylsilyl)oxy]-1-[[(trimethylsilyl)oxy]methyl]ethyl ester, (Z,Z,Z)-	$C_{27}H_{52}O_4Si_2$	34.89	496	5.41
(iii) Fatty alcohol					
12	2,6,10-Dodecatrien-1-ol, 3,7,11-trimethyl-, (E,E)-	$C_{15}H_{26}O$	25.16	222	4.95
13	Z,Z-2,5-Pentadecadien-1-ol	$C_{15}H_{28}O$	16.06	224	1.80
14	9,12-Octadecadien-1-ol, (Z,Z)-	$C_{18}H_{34}O$	15.98	266	4.05
(iv) Cardiac glycosides					
15	Digitoxin	$C_{41}H_{64}O_{13}$	33.30	764	12.16
(v) Secosteroids					
16	Vitamin D_3	$C_{27}H_{44}O$	31.92	384	8.11
(vi) Aromatic acid					
17	Benzoic acid, 2-(1-oxopropyl)-	$C_{10}H_{10}O_3$	13.95	178	0.90
(vii) Hydrocarbon					
18	Heptadecane, 9-hexyl-	$C_{23}H_{48}$	29.24	324	6.76

Table 2. GC-MS analysis of chloroform extract of the stem.

S. No.	Name of the Compounds	Molecular Formula	Retention Time (min)	Molecular weight	Peak area (%)
(i) Hydrocarbons					
1	1-Tridecene	$C_{13}H_{26}$	6.72	182	1.60
2	1-Tridecene	$C_{13}H_{26}$	9.18	182	2.60
3	2-Methyl-7-nonadecene	$C_{20}H_{40}$	23.72	280	20.83
4	10-Heneicosene (c,t)	$C_{21}H_{42}$	19.35	294	1.86
5	Tetracontane, 3,5,24-trimethyl-	$C_{43}H_{88}$	29.43	604	1.70
(ii) Fatty alcohols					
6	2-Dodecanol	$C_{12}H_{26}O$	11.41	186	2.74
7	Cyclododecanemethanol	$C_{13}H_{26}O$	24.17	198	0.68
8	Hexadecen-1-ol, trans-9-	$C_{16}H_{32}O$	17.86	240	1.12
9	1-Eicosanol	$C_{20}H_{42}O$	20.80	298	8.39
(iii) Fatty acids and their esters					
10	Octadecanoic acid, ethyl ester	$C_{20}H_{40}O_2$	13.80	312	5.25
11	11,14-Eicosadienoic acid, methyl ester	$C_{21}H_{38}O_2$	16.04	322	2.19
12	Docosanoic acid, ethyl ester	$C_{24}H_{48}O_2$	27.82	368	1.89
(iv) Steroids					
13	Stigmasterol	$C_{29}H_{48}O$	32.18	412	5.47
14	α-Sitosterol	$C_{29}H_{50}O$	33.58	414	8.22
(v) unsaturated hydrocarbons					
15	1-Cyclohexylnonene	$C_{15}H_{28}$	25.66	208	0.49
16	1-Docosene	$C_{22}H_{44}$	16.49	308	2.53
(vi) Aliphatic aldehydes					
17	Pentadecanal-	$C_{15}H_{30}O$	19.89	226	0.83
18	cis-11-Hexadecenal	$C_{16}H_{30}O$	16.12	238	1.55
(vii) Aromatic alcohols					
19	4-((1E)-3-Hydroxy-1-propenyl)-2-methoxyphenol	$C_{10}H_{12}O_3$	10.98	180	3.84
20	Dehydrodiconiferyl alcohol	$C_{20}H_{22}O_6$	31.79	358	13.54
(viii) Triterpene alcohol					
21	Squalene	$C_{30}H_{50}$	25.27	410	0.81
(ix)Aromatic ester					
22	2-Butenoic acid, 3-(phenylthio)-, ethyl ester	$C_{12}H_{14}O_2S$	13.01	222	0.93
(x) Phenolic ester					
23	Phenol, 2,5-bis(1,1-dimethylethyl)-	$C_{14}H_{22}O$	8.26	206	1.89
(xi) Dicarboxylic ester					
24	Di-n-octyl phthalate	$C_{24}H_{38}O_4$	21.36	390	3.42

(xii) Carboxylic acid					
25	2-Acetylbenzoic acid	$C_9H_8O_3$	14.63	164	1.18
(xiii) Alkaloid					
26	2-Piperidinone, N-[4-bromo-n-butyl]-	$C_9H_{16}BrNO$	26.87	233	1.04
(xiv) Ketones					
27	9,9-Dimethoxybicyclo[3.3.1]nona-2,4-dione	$C_{11}H_{16}O_4$	25.06	212	1.68
(xv) Aromatic hydrocarbon					
28	1H-Cycloprop[e]azulene, 1a,2,3,4,4a,5,6,7b-octahydro-1,1,4,7-tetramethyl-, [1aR-(1aα,4α,4aα,7bα)]-	$C_{15}H_{24}$	7.07	204	0.34
(xvi) Pesticide					
29	Cinerin II	$C_{21}H_{28}O_5$	13.93	360	1.38

(iii) Ethanol extract

In ethanol extract 21 compounds were identified, of which 4 compounds were belonged to the class fatty acids and their esters, 3 compounds each belonged to the class sugars and aromatic alcohols, 2 compounds were belonged to the class phenols and phenolic esters, one compound each belonged to the class triol, alkene hydrocarbon, hydrocarbon, fatty alcohol, terpene, sesquiterpene, aromatic esters, lactames and dicarboxylic ester respectively. Among this classes, α-D-glucopyranoside, methyl was found to be present as major constituent with the peak area 21.10% and retention time 9.90 minutes, followed by glycerin with the peak area 18.91% and retention time 2.36 minutes, and followed by 2,7-dioxa-tricyclo[4.4.0.0(3,8)]deca-4,9-diene with the peak area 9.63% and retention time 7.59 minutes. In this class, 3, 5-Dimethoxy-4-hydroxybenzyl alcohol was found to be as least quantity with the peak area 0.35% and retention time 10.60 minutes respectively (Table 3; Fig.3).

Table 3. GC-MS analysis of ethanol extract of the stem.

S. No.	Name of the Compounds	Molecular Formula	Retention time (min)	Molecular weight	Peak area (%)
(i) Fatty acids and their esters					
1	1,2,3-Propanetriol, monoacetate	$C_5H_{10}O_4$	5.00	134	0.94
2	Acetic acid, trifluoro-, 3,7-dimethyloctyl ester	$C_{12}H_{21}F_3O_2$	5.79	254	0.84
3	Decanoic acid, decyl ester	$C_{20}H_{40}O_2$	28.92	312	0.70
4	Hexanedioic acid, bis(2-ethylhexyl) ester	$C_{22}H_{42}O_4$	19.28	370	0.65
(ii) Sugars					
5	L-Sorbose	$C_6H_{12}O_6$	3.90	180	9.17
6	α-D-Glucopyranoside, methyl	$C_7H_{14}O_6$	9.90	194	21.10
7	D-Glycero-d-tallo-heptose	$C_7H_{14}O_7$	10.16	210	4.42
(iii) Aromatic alcohols					
8	3,5-Dimethoxy-4-hydroxybenzyl alcohol	$C_9H_{12}O_4$	10.60	184	0.35
9	4-((1E)-3-Hydroxy-1-propenyl)-2-methoxyphenol	$C_{10}H_{12}O_3$	10.99	180	8.52
10	Dehydrodiconiferyl alcohol	$C_{20}H_{22}O_6$	31.65	358	3.59
(iv) Phenols and phenolic ester					
11	2-Methoxy-4-vinylphenol	$C_9H_{10}O_2$	5.87	150	2.00
12	Phenol, 4-ethenyl-, acetate	$C_{10}H_{10}O_2$	4.72	162	6.02
(v) Triol					
13	Glycerin	$C_3H_8O_3$	2.36	92	18.91
(vi) Alkene hydrocarbon					
14	2,7-Dioxa-tricyclo[4.4.0.0(3,8)]deca-4,9-diene	$C_8H_8O_2$	7.59	136	9.63
(vii) Hydrocarbon					
15	1-Undecene, 7-methyl-	$C_{12}H_{24}$	5.57	168	1.11
(viii) Fatty alcohol					
16	2-Methyl-1-undecanol	$C_{12}H_{26}O$	5.68	186	1.19
(ix)Terpene					
17	3-Decyn-2-ol	$C_{10}H_{18}O$	25.26	154	0.54
(x) Sesquiterpene					
18	Widdrol	$C_{15}H_{26}O$	31.22	222	0.97
(xi) Aromatic ester					
19	Benzenepropanoic acid, 2,5-dimethoxy-	$C_{11}H_{14}O_4$	13.94	210	3.51
(xii) Lactames					
20	2-Pyrrolidinone, 1-methyl-	C_5H_9NO	2.85	99	5.13
(xiii) Dicarboxylic ester					
21	1,2-Benzenedicarboxylic acid, diisooctyl ester	$C_{24}H_{38}O_4$	21.35	390	0.73

(iv) Comparative GC-MS analysis of compounds in various extracts of stem.

Comparatively in total 62 compounds were identified with the petroleum ether, chloroform and ethanol extract of stem. Among these, the compound such as di-n-octyl phthalate were found to be present in petroleum ether and chloroform extract where as it is absent in ethanol extract, compounds 4-((1E)-3-hydroxy-1-propenyl)-2-methoxyphenol and dehydrodiconiferyl alcohol were found to be present in chloroform and ethanol extract where as it is absent in petroleum ether extract, 1,2-benzenedicarboxylic acid, butyl 2-ethylhexyl ester present repeatedly in

same petroleum ether extract where as it is absent in chloroform and ethanol extract, 1-tridecene also present repeatedly in chloroform extract whereas it is absent in petroleum ether and ethanol extract. Compounds dibutyl phthalate; 1,2-benzenedicarboxylic acid, dipentyl ester; 1,2-benzenedicarboxylic acid, butyl 2-ethylhexyl ester; 1,2-benzenedicarboxylic acid, butyl 2-ethylhexyl ester; 1,2-benzenedicarboxylic acid, diheptyl ester; digitoxin; vitamin D3; benzoic acid, 2-(1-oxopropyl)-; 13-tetradecynoic acid, methyl ester; cyclopentaneundecanoic acid, methyl ester; hexadecanoic acid, ethyl ester; 9,12-octadecadienoic acid, methyl ester, (E,E)-; 9,12,15-octadecatrienoic acid, 2-[(trimethylsilyl)oxy]-1-[[(trimethylsilyl)oxy]methyl]ethyl ester, (Z,Z,Z)-; 2,6,10-dodecatrien-1-ol, 3,7,11-trimethyl-, (E,E)-; Z,Z-2,5-pentadecadien-1-ol; 9,12-octadecadien-1-ol, (Z,Z)-; heptadecane, 9-hexyl- were present only in petroleum ether extract. The compounds 2-butenoic acid, 3-(phenylthio)-, ethyl ester; phenol, 2,5-bis(1,1-dimethylethyl)-; 2-acetylbenzoic acid; 2-piperidinone, N-[4-bromo-n-butyl]-; 9,9-dimethoxybicyclo[3.3.1]nona-2,4-dione; 1H-cycloprop[e]azulene, 1a,2,3,4,4a,5,6,7b-octahydro-1,1,4,7-tetramethyl-, [1aR-(1aα,4α,4aα,7bα)]-; cinerin II; 2-methyl-7-nonadecene; 10-heneicosene (c,t); 1-docosene; tetracontane, 3,5,24-trimethyl-; 2-dodecanol; cyclododecanemethanol; hexadecen-1-ol, trans-9-; 1-eicosanol; octadecanoic acid, ethyl ester; 11,14-eicosadienoic acid, methyl ester; docosanoic acid, ethyl ester; 1-cyclohexylnonene; stigmasterol; pentadecanal-, cis-11-hexadecenal and squalene were present only in chloroform extract. The compounds 3,5-dimethoxy-4-hydroxybenzyl alcohol; 2-methoxy-4-vinylphenol; phenol, 4-ethenyl-, acetate; benzenepropanoic acid, 2,5-dimethoxy-; 2-pyrrolidinone, 1-methyl-; 1,2-benzenedicarboxylic acid, diisooctyl ester; 1,2,3-propanetriol, monoacetate; acetic acid, trifluoro-, 3,7-dimethyloctyl ester; decanoic acid, decyl ester; hexanedioic acid, bis(2-ethylhexyl) ester; L-sorbose; α-D-glucopyranoside, methyl; D-glycero-d-tallo-heptose; glycerin; 2,7-dioxa-tricyclo[4.4.0.0(3,8)]deca-4,9-diene; 1-undecene, 7-methyl-; 2-methyl-1-undecanol; 3-decyn-2-ol and widdrol were present only in ethanol extract (Table 4).

Table 4. Comparative GC-MS analysis of compounds in various extracts of stem.

S. No.	Name of the Compounds	Petroleum ether extract	Chloroform extract	Ethanol extract
(i) Fatty acids and their esters				
1	13-Tetradecynoic acid, methyl ester	*		
2	Cyclopentaneundecanoic acid, methyl ester	*		
3	Hexadecanoic acid, ethyl ester	*		
4	9,12-Octadecadienoic acid, methyl ester, (E,E)-	*		
5	9,12,15-Octadecatrienoic acid, 2-[(trimethylsilyl)oxy]-1-[[(trimethylsilyl)oxy]methyl]ethyl ester, (Z,Z,Z)-	*		
6	Octadecanoic acid, ethyl ester		*	
7	11,14-Eicosadienoic acid, methyl ester		*	
8	Docosanoic acid, ethyl ester		*	
9	1,2,3-Propanetriol, monoacetate			*
10	Acetic acid, trifluoro-, 3,7-dimethyloctyl ester			*
11	Decanoic acid, decyl ester			*
12	Hexanedioic acid, bis(2-ethylhexyl) ester			*
(ii) Fatty alcohol				
13	2,6,10-Dodecatrien-1-ol, 3,7,11-trimethyl-, (E,E)-	*		
14	Z,Z-2,5-Pentadecadien-1-ol	*		
15	9,12-Octadecadien-1-ol, (Z,Z)-	*		
16	2-Dodecanol		*	
17	Cyclododecanemethanol		*	
18	Hexadecen-1-ol, trans-9-		*	
19	1-Eicosanol		*	
20	2-Methyl-1-undecanol			*
(iii) Hydrocarbon				
21	Heptadecane, 9-hexyl-	*		
22	1-Tridecene		**	
23	2-Methyl-7-nonadecene		*	
24	10-Heneicosene (c,t)		*	
25	Tetracontane, 3,5,24-trimethyl-		*	
26	1-Undecene, 7-methyl-			*
(iv) Dicarboxylic acid ester				
	Dibutyl phthalate	*		
27	1,2-Benzenedicarboxylic acid, dipentyl ester	*		
28	1,2-Benzenedicarboxylic acid, butyl 2-ethylhexyl ester	**		
29	1,2-Benzenedicarboxylic acid, diheptyl ester	*		
30	1,2-Benzenedicarboxylic acid, diisooctyl ester			*
31	Di-n-octyl phthalate	*	*	
(v) Sugars				
32	L-Sorbose			*
33	α-D-Glucopyranoside, methyl			*
34	D-Glycero-d-tallo-heptose			*
(vi) Aromatic alcohols				
35	4-((1E)-3-Hydroxy-1-propenyl)-2-methoxyphenol		*	*

36	Dehydrodiconiferyl alcohol		*	*
37	3,5-Dimethoxy-4-hydroxybenzyl alcohol			*
(vii) Phenolic ester				
38	Phenol, 2,5-bis(1,1-dimethylethyl)-		*	
39	2-Methoxy-4-vinylphenol			*
40	Phenol, 4-ethenyl-, acetate			*
(viii)Aromatic ester				
41	2-Butenoic acid, 3-(phenylthio)-, ethyl ester		*	
42	Benzenepropanoic acid, 2,5-dimethoxy-			*
(ix) unsaturated hydrocarbons				
43	1-Cyclohexylnonene		*	
44	1-Docosene		*	
(x) Steroids				
45	Stigmasterol		*	
46	α-Sitosterol		*	
(xi) Aldehydes				
47	Pentadecanal-		*	
48	cis-11-Hexadecenal		*	
(xii) Carboxylic acid				
49	2-Acetylbenzoic acid		*	
(xiii) Alkaloid				
50	2-Piperidinone, N-[4-bromo-n-butyl]-		*	
(xiv) Ketones				
51	9,9-Dimethoxybicyclo[3.3.1]nona-2,4-dione		*	
(xv) Aromatic hydrocarbon				
52	1H-Cycloprop[e]azulene, 1a,2,3,4,4a,5,6,7b-octahydro-1,1,4,7-tetramethyl-, [1aR-(1aα,4α,4aα,7bα)]-		*	
(xvi) Cardiac glycosides				
53	Digitoxin	*		
(xvii) Lactames				
54	2-Pyrrolidinone, 1-methyl-			*
(xviii) Secosteroids				
55	Vitamin D_3	*		
(xix) Aromatic acid				
56	Benzoic acid, 2-(1-oxopropyl)-	*		
(xx) Pesticide				
57	Cinerin II		*	
(xxv) Triterpene alcohol				
58	Squalene		*	
(xxi) Alkene hydrocarbon				
59	2,7-Dioxa-tricyclo[4.4.0.0(3,8)]deca-4,9-diene			*
(xxii) Triol				
60	Glycerin			*
(xxiii) Terpene				
61	3-Decyn-2-ol			*
(xxiv) Sesquiterpene				
62	Widdrol			*

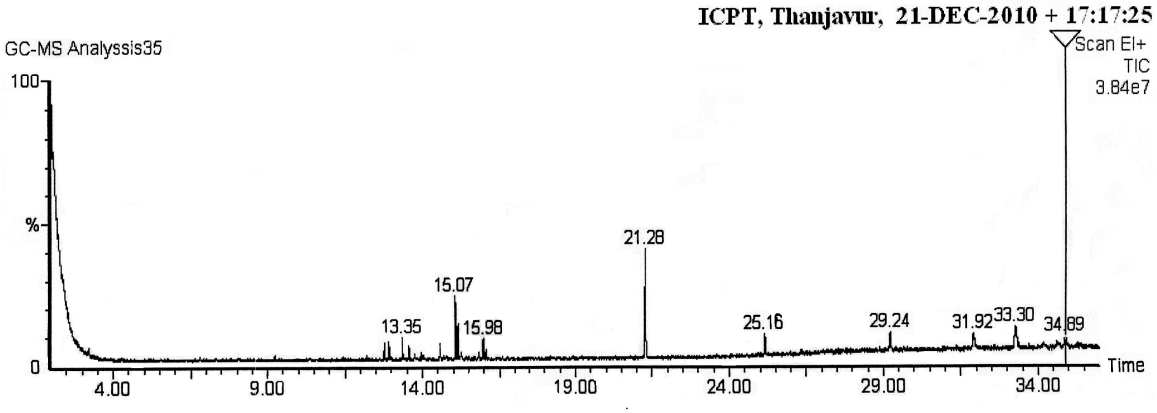

Fig.1. GC-MS Chromatogram of petroleum ether extract of stem of *Hugonia mystax*

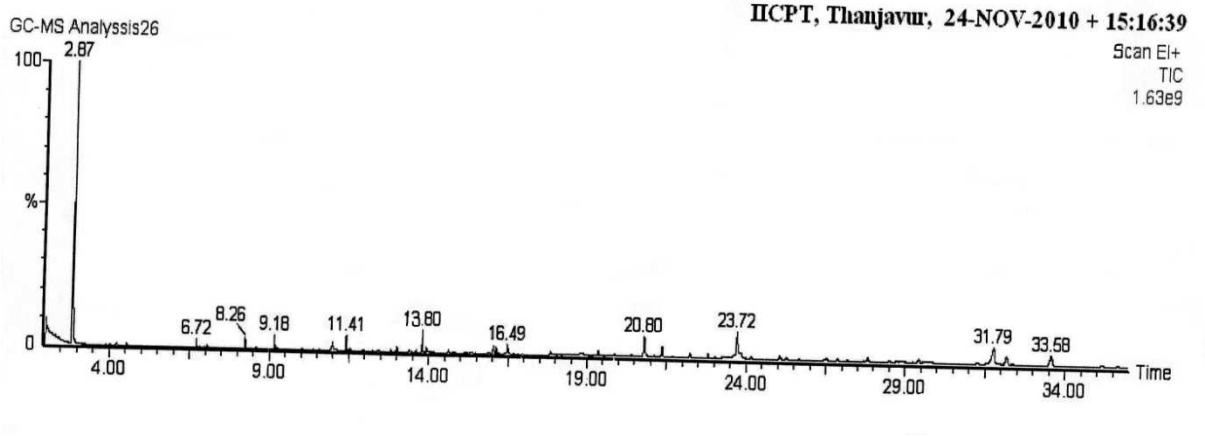

Fig.2. GC-MS Chromatogram of chloroform extract of stem of *Hugonia mystax*

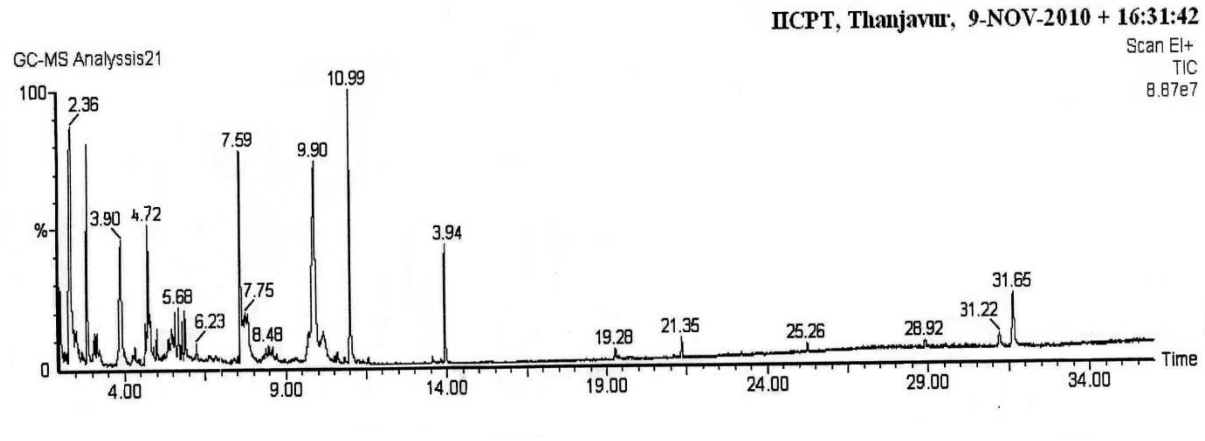

Fig.3. GC-MS Chromatogram of ethanol extract of stem of *Hugonia mystax*

In the present study, comparatively 62 components identified of which all the compounds are medicinally valuable. The compound like α-D-Glucopyranoside, methyl used as a preservative [9]; Phenolics usually possess antimicrobial and antifungal activities and consequently defensive functions [10]; cardiac glycosides used as inhibition of malignant cells [11-13]; anticancer effect in humans[14] and also digitoxin is a lower risk for leukemia/lymphoma as well as lower incidence of cancer of the kidney/urinary tract [15]; Squalene, an isoprenoid from the group of polyphenyl compounds, is an intermediate metabolite in cholesterol synthesis possessing antioxidant, immunostimulating, hypolipidemic, cholesterol reducing, anticarcinogenic and antiinflammatory activity [16]; antimicrobial activity particularly against to tuberculosis mycobacteria [17]. In addition, squalene the main component of skin surface polyunsaturated lipids, shows some advantages for the skin as an emollient and antioxidant, and for hydration and its antitumor activities [18]. Many naturally occurring polyhydroxylated sterols exhibit potent biological activities showed potent cytotoxicity to cancer cells [19-22]; stigmasterol isolated from plants were reported to be involved in the synthesis of many hormones like progesterone, androgens, estrogens and corticoids [23] with several pharmacological prospects such as antiosteoarthritic, antihypercholestrolemic, antitumor, hypoglycaemic, antimutagenic, antioxidant, anti-inflammatory and CNS effects [24-28]. Moreover, the presence of various bioactive compounds confirms the application of *H. mystax* for various ailments by traditional practitioners. Similarly, the same studies were previously reported by the plants like *Alseodaphne semecarpifolia*, *Stylosanthes fruticosa*, *Cassia auriculata*, *Wrightia tinctoria*, *Vernonia cinerea* [29-33]. However, isolation of individual phytochemical constituents may proceed to find a novel drug. In addition to this, the results of the GC-MS profile can be used as phytochemical tool for the identification of the bioactive components.

CONCLUSION

From the present study, it was concluded that the plant *Hugonia mystax* L. are highly valuable in medicinal usage for the treatment of various human ailments along with the chemical constituents present in it. The compounds needs further research on toxicological aspects to develop safe drug.

Acknowledgement
Authors thanks Mr. S. Kumaravel, Manager, Quality Control, Food Testing Laboratory, Indian Institute of Crop Processing Technology (IICPT), Thanjavur for providing facilities to carry out the work. The first author (A. Vimalavady) specially thanks Pondicherry Adi Dravidar Development Corporation (PADCO), Puducherry, for the financial assistance to carry out this research.

REFERENCES

[1] H. Santapau, A.N. Henry; A Dictionary of flowering plants in India. Council of Scientific and Industrial Research, New Delhi, **1983**, 103.
[2] T. Pullaiah, E. Chennaiah; Flora of Andhra Pradesh. Scientific Publishers, Jodhpur, India **1997**.
[3] P. Pushpangadan, C.K. Atal, *J. Ethnopharmacol*., **1984**, 11: 59-77.
[4] T.V.V. Seetharami Reddi, B.V.A. Ramarao Naidu, S. Prasanthi; In: I.A. Khan, A. Khanum, (Eds.), Ethnomedicine and Human Welfare (Ukaaz Publications, **2004-2005**)67.
[5] R. Mubeen, S. Fatima, A. Khanum, I.A. Khan, S.Y. Anwar; In: I.A. Khan, A. Khanum, (Eds.) Ethnomedicine and Human Welfare (Ukaaz Publications, **2005**)184.
[6] N.C. Nair, A.N. Henry; Flora of Tamil Nadu India, vol. 1, Botanical Survey of India Southern Circle, Coimbatore, **1983.**
[7] K.M. Matthew; An Excursion Flora of Central Tamil Nadu, India, Oxford & IBH publishing co. Pvt. Ltd., New Delhi, **1991**.
[8] W.C. Evans; Trease and Evans Pharmacognosy 15th ed. Elsevier India Pvt. Ltd., New Delhi: **2006**.
[9] V. Priya, R.K. Jananie, K. Vijayalakshmi, *J Chem. Pharm. Res*., **2011,** 3(5): 35-40.
[10] M. Mitova, R. Taskova, S. Popov, R.G. Berger, U. Krings, N. Handjieva, 2003. *Naturforsch*, **2003**, 58, 697-703.
[11] O. Shiratori, *Gann*, **1967,** 58: 521-528.
[12] Haux, J. Med. *Hypotheses*, **1999**, 53:543-548.
[13] M. Lopez-Lazaro, N. Palma de la Pen, N. Pastor, C. Martin-Cordero, E. Navarro, F. Cortes, M.J. Ayuso, M.V. Toro, *Planta Med*., **2003**, 69: 701-704.
[14] J.M. Cassady; In: J.M. Cassady, J.D. Douros, (Eds.), Anti Cancer Agents Based onNatural Products Models (Academic Press, New York, **1980**)201-269.
[15] J. Haux, O. Klepp, O. Spigset, S. Tretli, *BMC Cancer*, **2001**, 1:11.
[16] G.S. Kelly, *Altern. Med. Rev*.,**1999,** 4: 29-36.
[17] A. Jimenez-Arellanes, M. Meckes, R. Ramirez, J. Torres, J. Luna Herrera, *Phytother. Res***. 2003,** 17: 903-908.
[18] F.C. Huang, G. Horvath, P. Molnar, E. Turcsi, J. Deli, J. Schrader, G. Sandmann, H. Schmidt, W. Schwab, *Phytochemistry*, **2009,** 70**:** 457–464.
[19] A. Kandutsch, H.W. Chen, H.J. Heininger, *Science*, **1978**, 201: 498-501.
[20] L.L. Smith, B.H. Johnson, *Free Radical Biol. Med***., 1989**, 7: 285-332.
[21] L.M. Zeng, K.Q. Li, J.Y. Su, X. Fu, F.J. Schmitz, *J. Nat. Prod*., **1995**, 58: 296-298.
[22] J.G. Cui, L. M. Zeng, J.Y. Su, W.G. Lu, *Steroids***, 2001**, 66: 33- 38.
[23] S. Kaur, H.P. Singh, D.R. Batish, D.R. R.K. Kohli, *J. Med. Plants Res*., **2011, 5**(19): 4788-4793.
[24] V.O. Marquis, T.A. Adanlawo, A.A. Olaniyi, *Planta Med*., **1977,** 31(4): 367-74.
[25] G.D. Prestwich, W.S. Eng, R.M. Roe, B.D. Hammock, *Arch. Biochem. Biophys*., **1984,** 228: 639.
[26] J.A. Svoboda, H.H. Rees, M.J. Thompson, N. Hoggard, *Steroids***, 1989,** 53(3-5): 329-43.
[27] R. Chowdhury, R.B. Rashid, M.H. Sohrab, C.M. Hasan, *Pharmazie***, 2003,** 58(4): 272-273.
[28] J. Gook-Che, P. Myoung-Soon, Y. Do-Young, S. Chul-Ho, S. Hong-Sig, U. Soo Jong, *Exp. Mol. Med*., **2005,** 37(2): 111-120.
[29] A. Charles, A. Leo Stanly, M. Joseph, V. Alex Ramani, *Asian J. Plant Sci. Res*., **2011**, 1 (4): 25-32.
[30] M. Paul John Peter, J. Yesu Raj, V. P. Prabhu Sicis, V. Joy, J. Saravanan, S. Sakthivel, *Asian J. Plant Sci. Res*., **2012**, 2 (3): 243-253.
[31] J. Yesu Raj, M. Paul John Peter and V. Joy, *Asian J. Plant Sci. Res*., **2012**, 2 (2): 187-192.
[32] T. Jayamathi, N. Komalavalli, V. Pandiyarajan, *Asian J. Plant Sci. Res*., **2012**, 2 (6): 688-691.
[33] P. Abirami, A. Rajendran, *European J. Exp. Biol*., **2012**, 2 (1): 9-12.