

**PHYTOCHEMICAL PROFILING IN THE LEAVES OF SOME MEDICINAL PLANTS USING GC-MS**

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**\*Corresponding author email:** [renubhardwaj82@gmail.com](mailto:renubhardwaj82@gmail.com)*Received on: 08-11-2015; Revised on: 18-12-2015; Accepted on: 20-12-2015***ABSTRACT**

The study was aimed at screening the phytochemicals present in the leaves of some medicinally important plants. The study revealed 18, 29, 22, 23, 13 and 19 compounds from *Sida acuta* Burm.f., *Cannabis sativa* L., *Debregeasia longifolia* (Burm.f.) Wedd, *Ageratum conyzoides* L., *Parthenium hysterophorus* L. and *Typha angustata* Chamb respectively. The major compound detected from the plants were pyrido[1,2-a]pyrimidine (*Sida acuta*), cannabinol (*Cannabis sativa*), cis-jasmone (*Debregeasia longifolia*), 2H-1-benzopyran,6,7-dimethoxy-2,2-dimethyl-ageratochromene (*Ageratum conyzoides*), stigmasterol (*Parthenium hysterophorus*) and verrucarol (*Typha angustata*).

**Keywords:** GC-MS, Phytochemical profiling, *Sida acuta*, *Cannabis sativa*, *Debregeasia longifolia*, *Ageratum conyzoides*, *Parthenium hysterophorus*, *Typha angustata*.

**INTRODUCTION**

Medicinal plants contain a large number of chemical compounds which are used for the cure of human diseases. Terpenoids, alkaloids, tannins, phenols and saponins are the most important compounds which are present in the plants. Because of their therapeutic properties and low toxicity, pharmacists are interested in these compounds<sup>[1]</sup>. Studies on phytochemical analysis have been carried out by various workers on biochemical and Phytochemical constitution of many plants such as *Acanthospermum hispidum*, *Adiantum incisum*, *Brassica juncea*, *Cayratia pedata*, *Calotropis gigantea*, *Cleistanthus collinus*<sup>[2-7]</sup>. The present study was designed to assess the various phytochemicals present in six medicinal plants *Sida acuta*, *Cannabis sativa*, *Debregeasia longifolia*, *Ageratum conyzoides*, *Parthenium hysterophorus* and *Typha angustata*. *A. conyzoides* belong to family asteraceae and is used for the treatment of various diseases such as asthma, headache, analgesic, leprosy etc.<sup>[8]</sup>. *P. hysterophorus*

belongs to family asteraceae and has anti-inflammatory and pesticidal activities<sup>[9]</sup>. *S. acuta* belongs to family malvaceae and is used for the treatment of various disorders i.e. diarrhea, headache, fever, dysentery etc.<sup>[10]</sup>. *T. angustata* belongs to family typhaceae and used as diuretic, anti-inflammatory and astringent agent etc. It is also used in the treatment of various diseases such as abdominal pain, haematuria, nose bleeding etc.<sup>[11]</sup>. *D. longifolia* belong to the family urticaceae and is used for the treatment of skin diseases, indigestion, sunburn etc.<sup>[12]</sup>. *C. sativa* belongs to family cannabaceae and has analgesic, anti-inflammatory, sedative activities etc.<sup>[13]</sup>.

**MATERIALS AND METHODS**

**Collection and processing of plant materials:** Plant samples were collected in the vicinity of river Beas from the Beas town (Punjab, India). From 1 g of oven dried leaves of each plant species, 100 ml methanolic extract was prepared and dried in the rotary vacuum

evaporator. To the dried extract, 4 ml of methanol was added which was used for the analysis of phytochemicals. 2 µl of sample was injected into the system. Identification and authentication of plants were done from the Botanical Survey of India, Dehradun.

**GC-MS analysis:** Phytochemical analysis of methanolic extracts of plants was carried out using Shimadzu GC-MS QP2010 Plus. Carrier gas used was helium. Initially the column oven temperature was set at 70°C and held for 5 min., then increased to 250°C at 10°C per min. and held for 10 min., temperature was increased to 300°C at intervals of 10°C per min. and held for another 10 min. The instrument specifications are as follows:

Injection temperature: 280 °C

Pressure: 110.8 kPa

Total flow: 38.9 ml/min

Injection mode: splitless

Column flow: 1.71 ml/min

Purge flow: 3 ml/min

Sample injection volume: 2 µl

Solvent cut time: 3.5 minute

Detector gain mode: relative

DB-5 ms analytical column with 30 m length.

Compounds were identified in the solutions by comparing with the mass spectra with National Institute of Standard and Technology (NIST08s) and Wiley 7 library.

## RESULTS AND DISCUSSION

Tables 1-6 showed the various phytochemicals found in the leaves of *S. acuta*, *C. sativa*, *D. longifolia*, *A. conyzoides*, *P. hysterophorus* and *T. angustata*. A total of 18, 29, 22, 23, 13 and 19 chemical compounds were detected in the *S. acuta*, *C. sativa*, *D. longifolia*, *A. conyzoides*, *P. hysterophorus* and *T. angustata*. The major compounds detected in *S. acuta* were pyrido[1,2-a]pyrimidine (18.38%) and benzenepropanoic acid, 3,5-bis(1,1-dimethylethyl)-4-

hydroxy- methyl ester (17.69%). Cannabinol (30.07%) and 3-propylcannabinol (8.76%) were the major compounds found in *C. sativa*. In *D. longifolia*, the major compounds detected were cis-jasmone (19.03%) and benzenepropanoic acid, 3, 5-bis(1,1-dimethylethyl)-4-hydroxy-, methyl ester (14.98%). 2H-1-Benzopyran,6,7-dimethoxy-2,2-dimethyl-ageratochromene (37.01%) and Benzenepropanoic acid, 3,5-bis(1,1-dimethylethyl)-4-hydroxy- methyl ester (11.55%) were the major compounds found in *A. conyzoides*. In *P. hysterophorus*, the major found were stigmasterol (19.02%) and palmitic acid (14.31%). Verrucarol (20.54%) and palmitic acid (16.32%) were the major compounds detected in *T. angustata*. Benzenepropanoic acid, 3, 5-bis(1,1-dimethylethyl)-4-hydroxy- methyl ester has been used as additive in motar cells, hydraulic fluids etc. It also possesses antioxidant and antifungal activities<sup>[14]</sup>. Stigmasterol is steroidal in nature and had antiviral, antioxidant and anti-hepatotoxic activities<sup>[15]</sup>. Pyrido [1, 2-a]pyrimidine most important heterocycle for drug designing<sup>[16]</sup>. Cannabinol like tetrahydrocannabinol possesses analgesic, anti-inflammatory and neuroprotective activities etc. Palmitic acid contained nematicidal and pesticidal activities<sup>[17]</sup>. These plants species are also rich source of amino acids as well as polyphenols<sup>[18-19]</sup>. Benzenepropanoic acid, 3, 5-bis(1,1-dimethylethyl)-4-hydroxy- methyl ester is the major common compound detected in *S. acuta*, *D. longifolia* and *A. conyzoides*. Palmitic acid is also the major common compound detected in *P. hysterophorus* and *T. angustata*.

## CONCLUSIONS

In the present study 18, 29, 22, 23, 13 and 19 chemical compounds were detected in the methanolic extracts of *S. acuta*, *C. sativa*, *D. longifolia*, *A. conyzoides*, *P. hysterophorus* and *T. angustata*. A total of 76 compounds were detected in the leaves of six species studied.

**Table 1 Compounds present in the leaves methanolic extracts of *Sida acuta* using GC-MS**

S.No.	Name of compound	R.time	Area (%)
1	8-Methyl-alpha-ionone	9.400	2.07
2	Phenol, 2,6-dimethoxy-2,6-dimethoxyphenol	9.964	1.27
3	Morpholine-4-(1-cyclopenten-1-yl)-1-morpholino-1-cyclopentene	12.089	0.96
4	Phenol, 2-methyl-5-(1-methylethyl)-carvacrol	14.995	2.05
5	Nonyl-phenol mix of isomers	15.100	3.07
6	Phenol, nonyl-nonylphenol	15.193	2.19
7	Benzene, 1,2-dimethoxy-4-(2-propenyl)-methyleugenol	15.269	2.54
8	Phenol, 4-(1,1-dimethylethyl)-p-tert-butylphenol	15.511	2.38
9	Cyclopropanecarboxylic acid, 3-(3-methoxy-2-methyl-3-oxo-1-propenyl)-2,2-dimethyl-3-(2-butenyl)-2-methyl-4-oxo-2-cycl	15.594	1.69

10	1-Alpha-18O-1,25-dihydroxycholecalciferol	16.185	0.68
11	Benzenepropanoic acid, 3,5-bis(1,1-dimethylethyl)-4-hydroxy- methyl ester	17.416	17.69
12	Palmitic acid	17.888	5.38
13	11H-Indeno[1,2-b]quinoxaline, 2-methyl	22.341	15.12
14	Pyrido[1,2-a]pyrimidine	22.592	18.38
15	1,4-Naphthoquinone,6-acetyl-2,5,8-trihydroxy-6-acetyl-2-hydroxynaphthazarin	28.506	6.61
16	Vitamin A alcohol	32.811	5.65
17	Gamma-sitosterol	34.187	9.93
18	5-Isopropylidene-6-methyldeca-3,6,9-trien-2-one	35.952	2.33

**Table 2 Compounds present in the leaves methanolic extracts of *Cannabis sativa* using GC-MS**

S.No.	Name of compound	R.time	Area (%)
1	Benzoic acid	7.389	2.17
2	Morpholine, 4-(1-cyclopenten-1-yl)-1-morpholino-1-cyclopentene	14.894	0.14
3	Phenol, 2-methyl-5-(1-methylethyl)-carvacrol	14.989	0.54
4	$\beta$ -elemenone	15.093	0.24
5	Phenol, nonyl- nonylphenol	15.188	0.32
6	Phenol, 5-methyl-2-(1-methylethyl)-thymol	15.502	0.43
7	Gynolutone	15.584	0.71
8	Benzenepropanoic acid, 3,5-bis(1,1-dimethylethyl)-4-hydroxy-, methyl ester	17.414	2.97
9	Palmitic acid	17.936	4.91
10	Acetic acid, 2-(2,2,6-trimethyl-7-oxa-bicyclo[4.1.0]hept-1-yl)-propenyl ester	19.291	0.47
11	Stearic acid	19.782	1.28
12	2H-1-Benzopyran-5-ol, 2-methyl-2-(4-methyl-3-pentenyl)-7-pentyl- (+/-)	20.558	5.69
13	Cannabispiran	20.642	3.13
14	Cannabidiol	20.995	0.73
15	3-Propylcannabinol	21.397	8.76
16	Resorcinol, 2-p-mentha-1,8-dien-3-yl-5-pentyl-(-)-(E)	21.768	3.22
17	1,3-Benzenediol, 2-[3-methyl-6-(1-methylethenyl)-2-cyclohexen-1-yl]-5-pentyl-(1R-trans)	21.881	1.02
18	Cannabielsoic acid -CO <sub>2</sub>	22.249	4.75
19	Alpha-cannabielsoin	22.403	2.75
20	Hexadecanoic acid, 2-hydroxy-1-(hydroxymethyl)ethyl ester 2-monopalmitin	22.532	3.24
21	Cannabinol	23.142	30.07
22	2-Chromamone, 6-tert-butyl-4-(4-methoxyphenyl)	24.110	3.08
23	Cholest-5-ene, 3-bromo-(3beta)	31.957	1.77
24	Stigmasterol	32.804	2.23
25	Gamma-sitosterol	34.210	7.81
26	Verrucarol	34.695	0.85
27	Methyl commate C	36.263	1.83
28	Methyl commate B	36.740	3.92
29	Taraxasterol	37.605	0.97

**Table 3 Compounds present in the leaves methanolic extracts of *Debregeasia longifolia* using GC-MS**

S.No.	Name of compound	R.time	Area (%)
1	8-Methyl-alpha-ionone	9.431	0.94
2	Phenol, 2,6-dimethoxy-2,6	9.987	1.21
3	Tetracyclo[6.3.2.0E2,5.0E1,8] tridecan-9-ol, 4,4-dimethyl	11.989	0.93
4	Benzene, 1-(1,5-dimethyl-4-hexenyl)-4-methyl-ar-curcumene	12.256	2.04
5	Benzeneacetaldehyde, alpha-(2-methylpropylidene)-4-methyl-2-phenyl-2-pentenal	12.540	2.90
6	Spathulenol	13.426	2.61
7	1-Adamantanecarboxylic acid, 2-ethylcyclohexyl ester	15.006	2.31

8	Nonyl-phenol mix of isomers	15.110	3.44
9	Phenol, nonyl-nonylphenol	15.206	2.36
10	Phenol, 2-methyl-5-(1-methylethyl)	15.519	2.52
11	1,2-Epoxy-1,2,5,9,9-pentamethyl-spiro(3.5)non-5-ene	15.601	1.60
12	(E,1'RS,2'RS,3'SR)-4-(2',3'-epoxy-2',6',6'-trimethylcyclohexyl)-3-methyl-3-buten-2-one	16.688	1.81
13	Benzenepropanoic acid, 3,5-bis(1,1-dimethylethyl)-4-hydroxy-, methyl ester	17.432	14.98
14	Palmitic acid	17.957	11.15
15	Acetic acid, 2-(2,2,6-trimethyl-7-oxa-bicyclo[4.1.0]hept-1-yl)-propenyl ester	19.308	2.67
16	Cis-jasmone	19.579	19.03
17	Hexadecanoic acid, 2-hydroxy-1-(hydroxymethyl)ethyl ester	22.520	3.85
18	Alpha-D-glucopyranose, 6-deoxy-6-iodo-tetraacetate-6-deoxy-6-iodo-alpha-D-glucopyranose tetraaceta	23.604	2.33
19	1-Alpha-18O-1,25-dihydroxycholecalciferol	24.818	0.88
20	Ergosta-7,22-dien-3-ol, (3beta 22E)	34.055	13.65
21	Methyl commate C	34.466	3.21
22	Methyl commate D	35.177	3.59

**Table 4 Compounds present in the leaves methanolic extracts of *Ageratum conyzoides* using GC-MS**

S.No.	Name of compound	R.time	Area (%)
1	8-Methyl-alpha-ionone	9.413	0.62
2	Phenol, 2,6-dimethoxy-2,6-dimethoxyphenol	11.384	0.94
3	2H-1-Benzopyran,6,7-dimethoxy-2,2-dimethyl-ageratochromene	14.312	37.01
4	Mexiletine acetate	14.908	0.51
5	Verbenyl ethyl ether	15.003	1.98
6	Metenolone acetate	15.108	2.40
7	Exo-6,7-isopropylidenedioxy-1-methoxytricyclo[3.3.0.0(2,8)]-oct-3-ene	15.203	1.29
8	D-homo-5alpha.-androstane-3-one, 5,8,17a beta-trimethyl-cyclic ethylene acetal	15.286	1.87
9	Carbamic acid,(2,4-difluorophenyl)-5-methyl-2-(1-methylethyl)phenyl ester	15.517	1.30
10	1,6,10-Dodecatrien-3-carbonic acid, methylester	15.600	1.00
11	Neocurdione	17.113	0.90
12	Benzenepropanoic acid, 3,5-bis(1,1-dimethylethyl)-4-hydroxy- methyl ester	17.432	11.55
13	Palmitic acid	17.952	7.27
14	Cis-jasmone	19.524	4.38
15	Stearic acid	19.786	1.10
16	Hexadecanoic acid, 2-hydroxy-1-(hydroxymethyl)ethyl ester (CAS) 2-monopalmitin	22.524	3.53
17	1-Alpha-18O-1,25-dihydroxycholecalciferol	24.823	0.68
18	Stigmasterol	32.901	9.74
19	Cholesta-7, 24-dien-3-ol, (3beta, 5alpha)	34.021	2.65
20	Gamma-sitosterol	34.233	4.64
21	Beta-sitosterol	35.122	1.88
22	Methyl commate B	36.282	1.93
23	Taraxasterol	36.846	0.80

**Table 5 Compounds present in the leaves methanolic extracts of *Parthenium hysterophorus* using GC-MS**

S.No.	Name of compound	R.time	Area (%)
1	Morpholine, 4-(1-cyclopenten-1-yl)-1-morpholino-1-cyclopentene	14.401	1.82
2	Phenol, 2-methyl-5-(1-methylethyl)-carvacrol	15.003	0.89
3	Nonyl-phenol mix of isomers	15.203	1.14
4	1-Alpha-18O-1,25-dihydroxycholecalciferol	15.824	1.63
5	Benzothiazole,2-(2-hydroxyethylthio)	17.096	7.33
6	Benzenepropanoic acid, 3,5-bis(1,1-dimethylethyl)-4-hydroxy-methyl ester	17.425	9.56
7	Palmitic acid	17.972	14.31

8	Ergost-5-en-3-ol, 22, 23-dimethyl-(3beta)	22.064	13.77
9	Hexadecanoic acid, 2-hydroxy-1-(hydroxymethyl)ethyl ester	22.536	4.80
10	4,4'-((p-phenylene) diisopropylidene) diphenol	23.605	3.56
11	Stigmasterol	32.890	19.02
12	Tricyclo[5.3.1.1(2,6)]dodecan-11-ol, 11-methyl-12-methylene-	34.176	11.19
13	Urs-12-en-28-oic acid, 3-hydroxy-methyl ester, (3beta)	37.412	10.97

**Table 6 Compounds present in the leaves methanolic extracts of *Typha angustata* using GC-MS**

S.No.	Name of compound	R.time	Area (%)
1	(7R)trans-bicyclo(4.3.0)-3-nonen-7-ol	7.893	4.52
2	8-Methyl-alpha-ionone	9.415	1.77
3	Phenol, (1,1-dimethylethyl)-4-methoxy-butylated hydroxyanisole	13.093	2.43
4	Hexestrol	14.994	2.44
5	Nonyl-phenol mix of isomers	15.097	1.27
6	Phenol, 2-methyl-5-(1-methylethyl)-carvacrol	15.506	1.89
7	Morpholine, 4-(1-cyclopenten-1-yl)-1-morpholino-1-cyclopentene	15.588	1.15
8	Benzenepropanoic acid, 3,5-bis(1,1-dimethylethyl)-4-hydroxy-, methyl ester	17.419	14.03
9	Palmitic acid	17.939	16.32
10	1-Alpha-18O-1,25-dihydroxycholecaliferol	19.510	2.27
11	Stearic acid	19.766	2.59
12	Hexadecanoic acid, 2-hydroxy-1-(hydroxymethyl)ethyl ester 2-monopalmitin	22.512	5.80
13	Stigmasterol	28.981	3.33
14	Stigmast-5-en-3-ol, (3beta)- 24beta-ethyl-5delta-cholesten-3beta-ol	32.808	4.52
15	Verrucarol	34.227	20.54
16	Stigmasta-3,5-dien-7-one-delta-3,5-sitostadiene-7-one	34.649	5.18
17	Pregn-4-ene-3,20-dione, 11-hydroxy-(11alpha)	35.590	5.18
18	Taraxasterol	36.172	2.70
19	Phenol,2,2'-[(1-methyl-1,2 ethanediyl) bis(nitriolomethylidyne)] bis	37.999	2.09

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