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GC-MS Analysis Of Ethanolic Extracts Of Plant *Cardiospermum halicacabum* Linn, (SAPINDACEAE)

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ABSTRACT
The intention of the present study to analyze the major bioactive phytochemical constituents present in the plant extract of *Cardiospermum halicacabum* Linn, Sapindaceae by using GC-MS analysis. The collected dried, pulverized and coarsely powdered plant materials were extracted using organic solvent ethanol for 6hrs by using soxhlet extraction method. The presence of various phytochemical constituents was analyzed by GC-MS analysis. Totally 22 chemical constituents were identified through GC-MS analysis by using ethanolic extract. Among these, alpha- Amyrin (8.94%), Vitamin E (2.92%), Squalene (5.01%), beta.-Sitosterol (1.76%), Phytol acetate (0.73%), Eicosane (1.24%) , beta.-Sitosterol (1.76%), 2,6,10-trimethyl,14-ethylene-14-pentadecne(4.20%) are some of the therapeutically active components were identified. The obtained phytochemical constituents of ethanolic extracts of *Cardiospermum halicacabum* Linn used for the treatment of herbal treatment for skin psoriatic reactions.

KEYWORDS: Balloon vine, *Cardiospermum halicacabum,* Anti-microbial, Anti-inflammatory, GC-MS analysis.

I. INTRODUCTION:

Cardiospermum halicacabum Linn is a climber plant also known as Uzhinja valli in Malayalam and balloon vine, heart seed or heart pea, love in a puff, or puff-ball means in English belongs to Sapindaceae family **[1].** The plant is a twinner, perennial species, climbing or creeping plant, pubescent or nearly glabrous annual with slender branches, liming by means of tendrillar hooks. It is a herbaceous plant, widely distributed in tropical and subtropical Africa, Asia, North and South America, Australia and is one of the "Ten Sacred Flowers of Kerala," are called as Dasapushpam **[2].** The stem as grooved forms internodes between 6 to 10cm in length, but it can reach a height of up to 2 metres and it has approximately 3mm thick. The grooved stem possess alternate double triad leaves, which are hairless or they were covered in a soft down of hairs has 3 to 5 cm long **[3].** The leaves are trifoliate, ternately compound as biternate and about 5 to 7 cm long, leaflets are ovate to lanceolate, membranous, depressed and acuminate at top pyriform capsule wrangled at the angles. The fruit is obovoid in nature, inflated capsule about 2cm long, three keeled and seeds are black in colour with a large white shaped aril **[4].**

Unisexual flower consists of 2 to 5 cm long, zygomorphic in nature, white colour with yellowish centre. The genus name 'Cardiospermum 'derived from the peculiar appearance of the black coloured, light heart shaped seeds. The species Halicacabum comes from the name as Greek word 'salt cellar'. Decidous climbing shrub branched from the base and growing about 3 metres. It requires moist soil and a sunny sheltered position for cultivation. Petioles has three set leaflets. Flowering season mainly from july to august and fruit ripening season is from august to October **[5]** The major secondary metabolites include phytosterols, tannins, steroids, flavonoids, triterpenoids, phenols, polyphenols, aglycones, fattyacids, glycosides and volatile esters. Other secondary metabolites include sugars, lignins, cardiac glycosides, aminoacids are present in very small amount.[2] Also, (+) -pinitol, beta- arachidic acid, apigenin, apigenin- 7-o-glucuronide, chrysoeriol-7-o-glucuronide, lutrolin-7- O-glucuronide, along with beta-sitosterol and beta-D-glycoside (crystalline

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compound), β-sitosterol-β-D-galactoside, arachidic acid, stearic acid, linoleic acid, etc are present**.[6]**

THERAPEUTIC USES

Used for the treatment of hair growth, to treat ear ache and scalp treatment, herbal treatment for skin redness, psoriatic action, anti-pruritic action, used as a modulators in various reactions. Root as mainly used as diuretic, diaphoretic, emetic, laxative, stomachic, sudorific, amennorhoea, eczema, arthritis, nervous diseases, rubefacient **[7].**

VERNACULAR NAMES

Malayalam : Ulinja, Ulinna, Palloolavum
English : Balloon wine, Winter cherry, Heart seed, Smooth leaved heart pea
Tamil : Mutakkarran, Mudakatraan, Varutakakkoti.
Sanskrit : Indravalli
Arabic : Habb-ul-kalkal
Hindi : Chirputa, Kanphuta
Kannada : Eruvaballi
Telugu : Allena **[8].**

SYNONYMS (S)

Cardiospermum corycodes Kunze
Cardiospermum glabrum
Cardiospermum luridum
Cardiospermum microspermum
Cardiospermum hirsutum
Cardiospermum vesicarium **[9]**

PHARMACOLOGICAL ACTIVITY

Plant exhibits activities like anti-bacterial, anti-fungal, anti-inflammatory, anti-diarrhoeal, anti-tumor, anti-oxidant, anti- parasitic, anti- convulsant, anti- arthritic, anxiolytic, anti-pyretic, anti-histaminic, anti-diabetic, anti-malarial, anti-anxiety, anti-ulcer activity **[10].**

ETHNOMEDICINAL USES

- Decoction of root and leaves used for rheumatism, nervous diseases, piles, chronic bronchitis, and also used for amenorrhea**. [11].**
- The same preparation is dissolved in sesame oil and applied topically as a remedy for skin disorders, such as scabies and eczema, edema, varicose veins, anemia, chills, and fever, as well as for thrush, indigestion, snake bites, stiffness of limbs, and bloating in infants **[11].**
- Decoction of plant used for treatment of nervous diseases, pain rheumatism, and as diuretic, emetic, emmenagogue, laxative, rubefacient, stomachic, refrigerant **[12].**
- Plant leaves and stalk infusion is applied as an enema to cure for the treatment of diarrohea and dysentery, oedema, Nephritis, earaches, ophthalmias, Oliguria haemorrhoids, and muscular pains **[13].**
- The extract of Balloon vine is a good herbal treatment for cancer **[14].**
- Plant juice are useful for treatment of asthma ,gonorrhoea, amenorrhoea, and for other nervous disorders **[2],[15].**

II. MATERIALS AND METHODS

Plant material collection and authentification

Plant source selected for the present study was *Cardiospermum halicacabum* L. The leaves of the selected plant were collected from local areas in Vadakkencherry, Palakkad, Kerala, India. Plant material was identified and authenticated by examination of the morphological characteristics by a Botanist Dr. Ranjusha AP, Department of Botany, NSS College of Ottappalam. The specimen of *Cardiospermum halicacabum* Linn., voucher number was submitted in the Herbarium.

Extraction (Soxhlet extraction method)

The plant *Cardiospermum halicacabum* was collected, dried and pulverized and extracted by soxhelt apparatus. Around 30g of dried powder was weighed, moistened with the solvent and packed in the soxhlet extractor and was then extracted by using 500 methanol and chloroform for 6hours .The extract was then filtered through Whatmann No. 1 filter paper and concentrated. The filtered ethanolic leaf extract obtained was then subjected to GC-MS analysis.

GC -MS Analysis

Gas chromatography Mass spectroscopy analysis of ethanolic extract of *Cardiospermum halicacabum* was performed using Shimadzu GC-MS Model No: QP2010S equipped with Column - ELITE-5MS with 30 meter length, 0.25 mm Internal Diameter, and 0.25 µm thickness. Electron ionization system was used; details of GC Programme were given in Table I. The oven temperature was programmed from 70.00℃ which is given in Table II. Helium gas was used as the carrier gas. Details of GC-MS Programme was given in Table No 1. Programme specifications considering Mass Spectra were depicted in Table IV. GCMS Software including : GCMS Solutions, Libraries used as : WILEY 8 and NIST 11.

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Table no. 1 GC Programme (GC 2010)

GC – Parameters	Programme
Column oven temperature	70.00℃
Injection temperature	260.00℃
Injection mode	Split
Sampling time	2.00 min
Flow control mode	Linear velocity
Pressure	61.5kPa
Column flow	1.00mL/min
Total flow	24.0mL/min
Linear velocity	36.7cm/sec
Purge flow	3.0mL/min
Split ratio	20.0
Splitter Hold	OFF

Table no.2 Oven Temperature Programme

Rate	Temperature(℃)	Hold time (min)
	70.0	2.00
10.00	200.0	5.00
5.00	280.0	15.00

Table no. 3 GC-MS Programme (GCMS QP2010)

GC-MS Parameters	Programme
Ion source temperature	200.00℃
Interface temperature	280.00℃
Solvent cut time	6.50 min
Detector gain mode	Relative
Detector gain	0.98kV+ 0.20kV
Threshold	1000

Table no. 4 MS TABLE

Mass Spectroscopy Parameters	Programme
Start Time	6.70min
End Time	51.00min
ACQ Mode	Scan
Event Time	0.50Sec
Scan Speed	1000
Start m/z	50.00
End m/z	500.00

Identification of components

The identification of chemical constituents in ethanolic extract were identified by comparing their relative retention time and confirmation was done by comparing of their Mass spectroscopy with database from the Library of NIST 11 and Wiley 8. Gas chromatography – Mass spectroscopy chromatogram was obtained in the given figure no.1

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III. RESULTS AND DISCUSSIONS

The GC-MS analysis of the ethanolic leaf extract of *Cardiospermum halicacabum* Linn were carried out and identified group of 22 compounds which are depicted in Table no. The pharmacologically active compounds identified are 1,1,3-Triethoxybutane (0.69%), 1H-Indene, 1-ethylideneoctahydro-7a-methyl-,cis- (0.42%),Mome ionositol (42.86%), 2,6,10-trimethyl,14-ethylene-14-pentadecne (4.20%), 2-Nonadecanone (0.84%), Phytol, acetate (0.73%), Dibutyl phthalate (3.59%), Phytol (6.30%), Friedelan-3-one (2.66%), 4-Oxo-4-(trifluoromethylpiperidin-1-yl)-but-2-enoic acid (3.44%), 1,2-benzenedicarboxylic acid (1.73%), 2-methyloctacosane (2.25%), beta.-Sitosterol (1.76%), Eicosane(1.24%), Squalene(5.01%), Dotriacontane (3.54%), Tetratetracontane (1.42%), Heptacosane (1.79%), Vitamin E (2.92%), 2-methyloctacosane (0.63%), Stigmasta-5,22-dien-3-ol (3.04%), alpha amyrin (8.94%).

Figure no : 1 GC MS Chromatogram

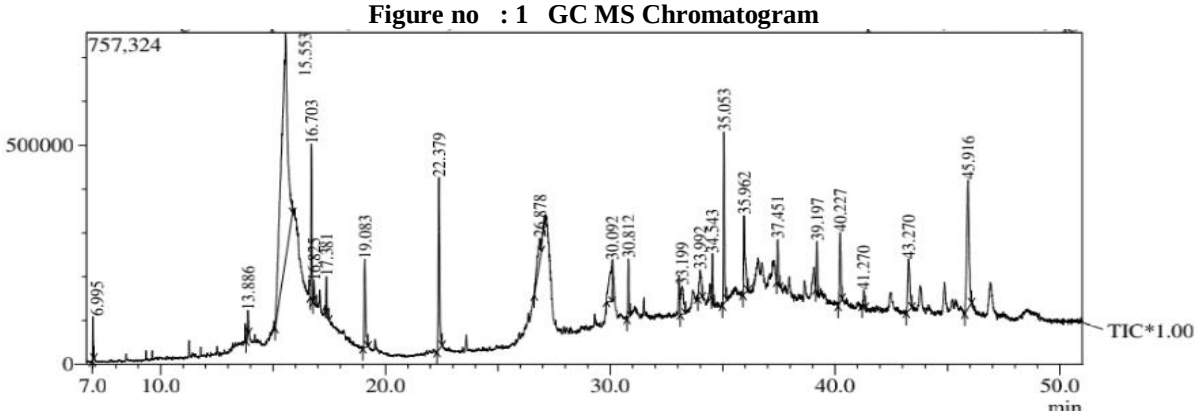

Table no. 5 Peak Report

Peak	R. Time	Area	Area%	Height	Height%	Name	Base m/z
1	6.995	165763	0.69	99466	2.71	1,1,3-triethoxybutane	73.00
2	13.886	100283	0.42	56639	1.54	1H-Indene, 1-ethylideneoctahydro-7a-methyl-, cis-	148.95
3	15.553	10343879	42.86	520896	14.20	Mome inositol	73.00
4	16.703	1014269	4.20	354361	9.66	2,6,10-trimethyl,14-ethylene-14-Pentadecne	68.00
5	16.825	203458	0.84	49734	1.36	2-Nonadecanone	58.05
6	17.381	177273	0.73	77398	2.11	Phytol, acetate	81.10
7	19.083	865420	3.59	202624	5.52	Dibutyl phthalate	148.95
8	22.379	1520740	6.30	393589	10.73	Phytol	71.00
9	26.878	641255	2.66	49907	1.36	Friedelan-3-one	69.00
10	30.092	830814	3.44	95013	2.59	4-Oxo-4-(trifluoromethylpiperidin-1-yl)-but-2-enoic acid	152.10
11	30.812	418331	1.73	134664	3.67	1,2-benzenedicarboxylic acid	148.95
12	33.199	544230	2.25	63997	1.74	2-methyloctacosane	57.00
13	33.992	424925	1.76	64346	1.75	beta.-Sitosterol	57.05
14	34.543	299728	1.24	107511	2.93	Eicosane	57.05
15	35.053	1208059	5.01	391797	10.68	Squalene	69.05
16	35.962	853980	3.54	179098	4.88	Dotriacontane	57.00

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17	37.451	341877	1.42	101227	2.76	Tetratetracontane	57.05
18	39.197	431100	1.79	118233	3.22	Heptacosane	57.05
19	40.227	704787	2.92	159661	4.35	Vitamin E	165.00
20	41.270	152649	0.63	38061	1.04	2-methyloctacosane	57.05
21	43.270	733055	3.04	117808	3.21	Stigmasta-5,22-dien-3-ol	55.00
22	45.916	2158711	8.94	293288	7.99	alpha.-Amyrin	218.05
		24134586	100.00	3669318	100.00		

Phytochemical constituents	**Pharmacological activity**
Phytol	Anti –depressant activity, Anxiolytic
beta.-Sitosterol	Anti-bacterial activity
2-methyloctacosane	Anti-bacterial, anti-oxidant activity
1,2-benzenedicarboxylic acid	Anti-microbial activity
Friedelan-3-one	Anti-convulsant activity
Dibutyl phthalate	Anti-tumour activity
1,1,3-triethoxybutane	Anti-oxidant activity
1H-Indene, 1-ethylideneoctahydro-7a-methyl-, cis-	Anti-fungal activity
Mome inositol	Anti-hyperlipidaemic activity
Eicosane	Anti-microbial, anti-inflammatory activity
Squalene	Anti-tumour, anti-oxidant activity
alpha.-Amyrin	Anti-inflammatory, anti-hyperlipidaemic, anti-tumour, hepatoprotective

IV. CONCLUSIONS

In this present study, about twenty two chemical constituents are identified from the ethanolic extract of *Cardiospermum halicacabum* Linn., Sapindaceae family. The identified active phytochemical constituents are used for various treatment of disorders. Major constituents are also supporting for the formulation of herbal ointment by comprising its various pharmacological activities mainly used for psoriatic, keratosis, and other dermatological diseases. The use of Cardiospermum externally in the therapy of psoriasis has proven to be effective in practice. So, Formulation studies helps to develop a medicated ointment having anti-microbial activity.

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CONFLICT OF INTEREST

The authors have no conflict of interest.

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