



## PHYTOCHEMICAL SCREENING OF THE LEAF EXTRACT OF *CAPPARIS DIVARICATA* LAM. BY GC-MS ANALYSIS

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### Abstract

The present study was carried out to determine the phytochemicals in the methanolic leaf extract of *Capparis divaricata* Lam. (Capparaceae). It is commonly known as *thuratti* and distributed throughout India. Gas Chromatography-Mass Spectroscopy (GC-MS) analysis of the extracts were carried out using GC-MS Clarus500 Perkin Elmer system. The GC-MS analysis had shown the presence of 19 phytochemicals in the methanolic extract of leaf. The major components were 1 H - Indole-3-ethanamine, N, N-dimethyl; Methyl, 2- irnyl- 5- ethyl- 5- dimethyl-; delta-methylpyrophaeophorbide- a and homologues; 2, 6, 10, 14, 18, 22- Tetracosahexaene, 2, 6, 10, 15, 19, 23-hexamethyl; 2, 3, 3a, 4, 5, 6-Hexahydro- 1H-benzo [f] pyrrolo [1, 2-a] Azepine and Hexadecanoic acid, methyl ester. All identified phytochemicals were generally reported as having some pharmacological activity, so that *C. divaricata* can be considered as a plant of phytopharmaceutical importance.

**Keywords:** *Capparis divaricata*, GC-MS analysis, Methanolic leaf extract, Phytochemicals and Biological activity

## I. INTRODUCTION

Indian flora has innumerable medicinal plants. Usage of plant in medicine had been a long practice by man from ancient time. Medicinal plants are the richer biosources for traditional and modern medicine, nutraceuticals, food supplements, folk medicines, pharmaceutical intermediates and chemical entities of synthetic drugs [1]. The genus *Capparis* belongs to capparaceae comprises about 80 species. There is a long history of safe usage of *Capparis* parts both in diet and as plant drug throughout the world. *Capparis* that hold potential for being physiologically and medically active including alkaloids, flavonoids, vitamins, proteins and amino acid [2]. *Capparis divaricata* is a small armed tree, endemic to India and Sri Lanka. Leaves elliptic to lanceolate, mucronate with stipular spines; flowers axillary, solitary, creamy white; fruit berry, globose, ribbed and beaked. Preliminary phytochemical study of ethanolic extract of leaves of *Capparis divaricata* showed the presence of alkaloids, glycosides, flavonoids, phenolic compounds, terpenoids, saponins and tannins [3]. *C. divaricata* is used in Siddha and Vetrinary medicine for trypanosomiasis. The bark extract pounded with leaves of *Erythrina varigata*, ginger, garlic and turmeric in goat's milk and given orally [4]. To the best of our knowledge, no work has been done on the GC-MS analysis of *C. divaricata*. Hence the present investigation was carried out to determine the phytochemical compounds using GC-MS analysis.

## II. MATERIALS AND METHOD

### 2.1 Collection and identification of plant material

*Capparis divaricata* leaves were collected from Tirunelveli district, Tamil Nadu. The plant was identified and authenticated by Botanical Survey of India, Southern Regional Centre, Coimbatore as *Capparis divaricata* Lam. (Capparaceae). Voucher specimens (SMCH-4011 & SMCH-

4012) were deposited in, St. Mary's College Herbarium, Department of Botany, Thoothukudi, Tamil Nadu, India.

## 2.2 Preparation of powder and extract

Fresh leaves were dried at room temperature under shade and pulverized into fine powder by use of electrical grinder. 25 gm of leaf powder was packed in soxhlet apparatus and extracted with methanol. The filtrate was then evaporated using a rotary evaporator. The final residue obtained was then subjected to GC-MS analysis.

## 2.3 Gas Chromatography-Mass Spectrometry analysis [5]

GC- MS analysis of the extract was carried out using GC-MS Clarus500 Perkin Elmer system and Gas chromatograph interfaced to a Mass spectrometer (GC-MS) employing the following conditions : column Elite -1 fused silica capillary column (30 mm×0.25 mm ID × 1µm df, composed of 100% Dimethyl poly siloxane), operating in electron impact mode at 70 eV; Helium (99.999%) was used as a carrier gas at a constant flow of 1 ml /min and an injection volume of 0.5 µl was employed (split ratio of 10:1); injector temperature 250°C; ion-source temperature 280°C. The oven temperature was programmed from 110°C (isothermal for 2 min), with an increase of 10°C /min, to 200°C then 5°C /min to 280°C ending with 9 minute, isothermal at 280°C. Mass spectra were taken at 70 eV; a scan interval of 0.5 seconds and fragments from 40 to 550 Da. Total GC running time was 40 min.

## 2.4 Characterization of compounds

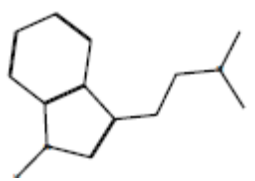
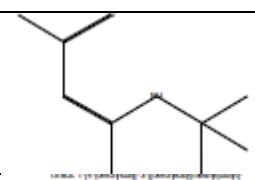
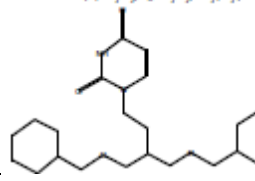
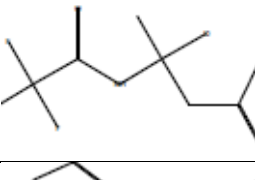
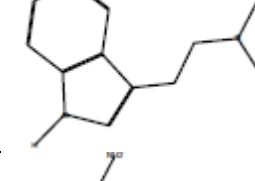
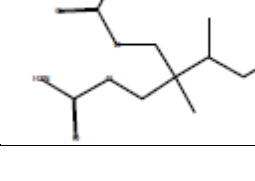
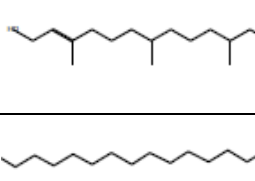
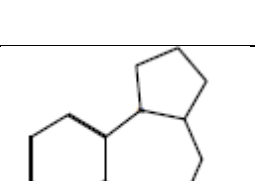
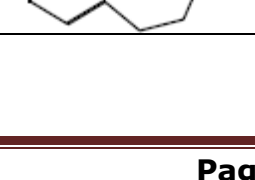
Interpretation on mass spectra of GC-MS was conducted using the database of National Institute of Standard and Technology (NIST). The mass spectra of the unknown compounds were compared with that of the known components stored in the NIST-library and the name, molecular weight and structure of the components were ascertained. The biological activities of phytocomponents were ascertained based on Dr. Duke's Phytochemical and Ethnobotanical Databases by Dr. Jim Duke of the Agricultural Research Service/USDA.

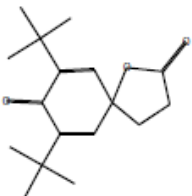
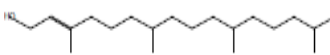
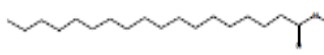
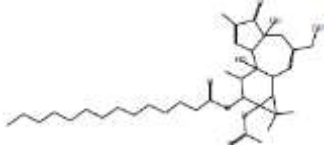
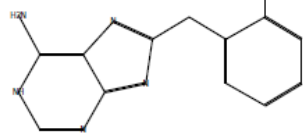
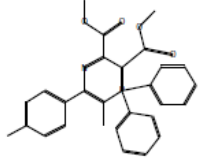
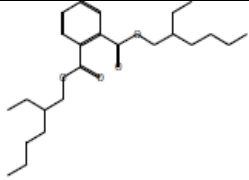
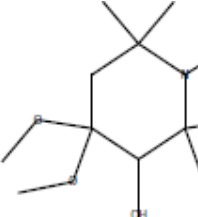

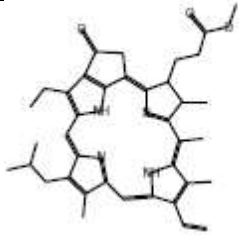
## III. RESULT AND DISCUSSION

Gas chromatography and mass spectroscopy analysis was carried out in methanolic extract of leaf of *Capparis divaricata*, and the results were shown in (table 1). The GC-MS chromatogram of nineteen major compounds detected was shown in (fig. 1). The first peak was determined to be cyclohexanol. The second peak indicated to be (Z)-4-(tert-Butylamino)-3-penten-2-one. The next peaks were considered to be 2, 4 (1H, 3H)-Pyrimidinedione; N-(1-deutero-1-methyl-2-phenyl 2.07 Ethyl)-n-trifluoroacetyl amine; 1H-Indole-3-ethanamine N,N-dimethyl; Mebutamate; 3,7,11,15-Tetramethyl-2-hexadecen-1-ol; Hexadecanoic acid, methyl ester; 2,3,3a,4,5,6-Hexahydro-1H-benzo [f] pyrrolo[1,2-a] Azepine; 7, 9-di-tert-butyl-1-oxaspiro[4.5]deca-6,9-diene-2,8-dione; Phytol; Octadecanoic acid, methyl ester; Tetradecanoic acid; 1H-Purin-6-amine, [(2-fluorophenyl)methyl]; 2,3-Bis(methoxycarbonyl)-5-methyl-4,4-diphenyl-6-(p-tolyl)-1-aza-4.lambda.(5)-phosphinine; 1, 2-Benzenedicarboxylic acid, bis (2-ethylhexyl)ester; 1-oxyl-4,4-dimethoxy-3-hydroxy-2,2,6,6-tetramethyl; 2, 6, 10, 14, 18, 22- Tetracosahexaene 2, 6, 10, 15, 19, 23-hexamethyl and Methyl,2-irnyl-5-ethyl-5-demethyl-.delta.-methylpyropheophorbide-a and Homologues. The major components identified and their biological activities were shown in (table 2). The major phytocomponents were 1H-Indole-3-ethanamine, N, N-dimethyl; Methyl, 2-irnyl-5- ethyl-5 -dimethyl-. delta.- methylpyropheophorbide- a and homologues; 2,6,10,14,18,22-Tetracosahexaene, 2,6,10,15,19,23-hexamethyl;2,3,3a,4,5,6-Hexahydro-1H-benzo[f]pyrrolo [1,2-a] Azepine and Hexadecanoic acid, methyl ester. The identified compounds possess many biological activities. 1H-Indole-3-ethanamine, N, N-dimethyl is a nitrile compound which has antiviral, anticarcinogenic and disinfective properties. Methyl, 2-irnyl-5-ethyl-5-dimethyl-.delta.-methylpyropheophorbide-a and homologues is a pheophorbide compound possess antiviral, anticarcinogenic [6], antiinflammatory and antihypercholesterolemic activity 2, 6, 10, 14, 18, 22-Tetracosahexaene, 2, 6, 10, 15, 19, 23-hexamethyl is a squalene compound which possess antiviral, antidiarrhoeal, antianemic and

anticarcinogenic activities [7]. A heterocyclic compound 2, 3, 3a, 4, 5, 6-Hexahydro-1H-benzo[f] pyrrolo [1, 2-a] Azepine has antineoplastic, antidepressant property and used in prostate cancer treatment. Hexadecanoic acid, methyl ester possesses antimicrobial, antiinflammatory, antineoplastic, antiurolithic, antiobesity and antifibrinolytic activities [8]. Many of the natural phytochemicals possess antioxidant activity [9-11].

**Table 1: Phytochemicals identified in the methanol leaf extracts of *Capparis divaricata***

No	RT	Name, formula, Molecular weight of the phytochemicals	Peak area %	Structure
1	3.57	Cyclohexanol Formula: C <sub>10</sub> H <sub>20</sub> O Mw:156	2.48	
2	6.27	(Z)-4-(tert-Butylamino)-3-penten-2-one Formula: C <sub>9</sub> H <sub>17</sub> NO Mw:155	2.43	
3	6.78	2,4(1H,3H)-Pyrimidinedione, Formula: C <sub>23</sub> H <sub>26</sub> N <sub>2</sub> O <sub>4</sub> Mw:394	4.48	
4	10.28	N-(1-deutero-1-methyl-2-phenyl 2.07 Ethyl)-n-trifluoroacetyl amine Formula: C <sub>11</sub> H <sub>11</sub> DF <sub>3</sub> NO Mw:231	2.00	
5	14.63	1H-Indole-3-ethanamine,N,N-dimethyl Formula: C <sub>12</sub> H <sub>16</sub> N <sub>2</sub> Mw:188	17.53	
6	17.66	Mebutamate Formula: C <sub>10</sub> H <sub>20</sub> N <sub>2</sub> O <sub>4</sub> Mw:296	1.35	
7	18.67	3,7,11,15-Tetramethyl-2-hexadecen-1-ol Formula: C <sub>20</sub> H <sub>40</sub> O Mw:296	0.85	
8	21.72	Hexadecanoic acid, methyl ester Formula: C <sub>17</sub> H <sub>34</sub> O <sub>2</sub> Mw:270	6.34	
9	22.65	2,3,3a,4,5,6-Hexahydro-1H-benzo[f]pyrrolo[1,2-a]Azepine Formula: C <sub>13</sub> H <sub>17</sub> N Mw:187	6.46	

10	23.89	7,9-di-tert-butyl-1-oxaspiro[4.5]deca-6,9-diene-2,8-dione Formula: C <sub>17</sub> H <sub>24</sub> O <sub>3</sub> Mw:276	1.16	
11	25.20	Phytol Formula: C <sub>20</sub> H <sub>40</sub> O Mw:296	2.89	
12	25.51	Octadecanoic acid, methyl ester Formula: C <sub>19</sub> H <sub>38</sub> O <sub>2</sub> Mw:298	1.16	
13	28.76	Tetradecanoic acid Formula: C <sub>14</sub> H <sub>28</sub> O <sub>2</sub> Mw:228	2.16	
14	30.91	1H-Purin-6-amine,[(2-fluorophenyl) methyl] Formula: C <sub>12</sub> H <sub>10</sub> FN <sub>5</sub> Mw:243	5.06	
15	32.60	2,3-Bis(methoxycarbonyl)-5-methyl-4,4-diphenyl-6-(p-tolyl)-1-aza-4.lambda.(5)-phosphinine Formula: C <sub>28</sub> H <sub>26</sub> NO <sub>4</sub> P Mw:471	1.69	
16	33.20	1,2-Benzenedicarboxylic acid, bis(2-ethylhexyl)ester Formula: C <sub>24</sub> H <sub>38</sub> O <sub>4</sub> Mw:390	3.91	
17	35.61	1-oxyl-4,4-dimethoxy-3-hydroxy-2,2,6,6-tetramethyl piperidine Formula: C <sub>11</sub> H <sub>22</sub> NO <sub>4</sub> Mw:232	5.87	
18	36.62	2,6,10,14,18,22-Tetracosahexaene, 2,6,10,15,19,23-hexamethyl Formula: C <sub>30</sub> H <sub>50</sub> Mw:410	6.80	
19	37.63	Methyl,2-irnyl-5-ethyl-5-demethyl-.delta.-methylpyrophaeophorbide-aandHomologues Formula: C <sub>38</sub> H <sub>44</sub> N <sub>4</sub> O <sub>3</sub> Mw:604	8.29	

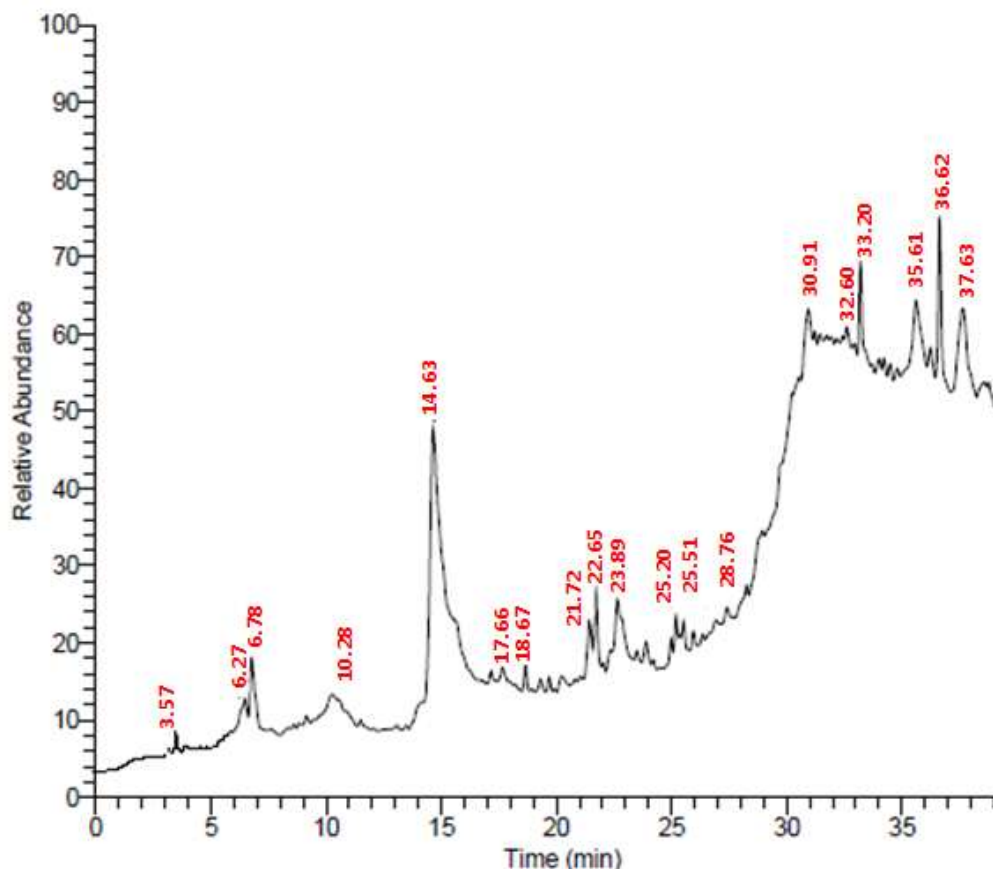


Fig. 1: GC-MS chromatogram of methanolic leaf extract of *Capparis divaricata*

Table 2: Bioactivity of major components identified in the methanolic leaf extract of *Capparis divaricata*

S.No.	Name of the compound	Peak area %	Nature of the compound	**Activity
1.	1H-Indole-3-ethanamine, N,N-dimethyl	17.53	Nitrile compound	Antiviral, Anticarcinogenic, Antibiotic, Antiinfective
2.	Methyl, 2-irnyl-5-ethyl-5-demethyl-.delta.-m Ethylpyrophaeophorbide-a and Homologues	8.29	Pheophorbide	Antiinhibitory activity, Anticarcinogenic, Antiviral, Antihypercholesterolemic, Antiinflammatory
3.	2,6,10,14,18,22-Tetracosahexaene, 2,6,10,15,19,23-hexamethyl	6.80	Squalene	Antiviral, Antidiarorheal, Antiarthritic, Antianemic, Antihypertensive, Anticarcinogenic
4.	2,3,3a,4,5,6-Hexahydro-1H-benzo[f]pyrrolo[1,2-a] Azepine	6.46	Hetrocyclic	Antineoplastic, Antidepressant, Prostate cancer treatment
5.	Hexadecanoic acid, methyl ester	6.34	Fatty Acid Methyl Ester	Antimicrobial activity, Anti-inflammatory, Antineoplastic, Antiurolithic, Antiobesity, Antifibrinolytic

\*\* Dr. Duke's Phytochemical and Ethnobotanical Database



#### IV. CONCLUSION

From the GC-MS analysis results, it was concluded that *C. divaricata* contains various bioactive compounds and it justifies the use of *C. divaricata* for various ailments by traditional practitioner. Evaluation of pharmacological activity is under progress. Therefore *C. divaricata* is recommended as a plant of phytopharmaceutical importance.

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