

## Phytochemical Screening and GC-MS Analysis on *Spermacoe articularis* L.F. (Rubiaceae)

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**Abstract:** The present study describes the phytochemical profile and GC-MS analysis of *Spermacoe articularis* L.f. Ethanol, Acetone, Chloroform and Ethyl acetate extracts of *S. articularis* were screened for phytochemical constituents and found to contain carbohydrate, saponins, phenols, phytosteroids, tannins, flavonoids and catechin. *S. articularis* did not contain cardiac glycosides and alkaloids. Ethanolic extract of *S. articularis* has been subjected to GC-MS analysis. Twenty Five chemical constituents were identified of which 2-Benzylidene- 3- oxo4- (octlsulfany1)-2, 3- dihydrothiophene-1 dioxide (27.71), Tridecanoic acid [CAS] (17.46), 3,7- Dimethyl- 3- hydroxyl-4-isopropenyl-6- octadiene (6.73), Octadecanoic acid (CAS) (5.60), Methyl-threo-9, 10-dichloro-octacecanoate (4.05) were the major constituents.

**Key Words:** *Spermacoe articularis*, Carbohydrate, Saponins, GC-MS, 2-Benzylidene- 3- oxo4- (octlsulfany1)-2, 3- dihydrothiophene-1 dioxide.

### Introduction

Naturally occurring therapeutic substances are of plants, animals and mineral origin. They are organic substances obtained in both primary and secondary metabolic process; they also provide a source of medicine since the earliest time. The plant kingdom has proven to be the most useful in the treatment of diseases and they provide an important source of all the world's pharmaceuticals. The most important of these bioactive constituents of plants are steroids, terpenoids, carotenoids, flavanoids, alkaloids, tannins and glycosides. Plants in all facet of life have served a valuable starting material for drug development<sup>1</sup>. Antibiotics or antimicrobial substances like saponins, glycosides, flavonoids and alkaloids etc are found to be distributed in plants, yet these compounds were not well established due to the lack of knowledge and techniques<sup>2</sup>. The phytoconstituents which are phenols, anthraquinones, alkaloids, glycosides, flavonoids and saponins are antibiotic principles of plants. From these phytoconstituents, saponins have been reported to exhibit hemolytic and foaming activity, antifungal, anti-inflammatory, fungistatic, molluscidal<sup>3</sup>.

Plants are now occupying important position in allopathic medicine, herbal medicine, homoeopathy and aromatherapy. Medicinal plants are the sources of many important drugs of the modern world. Many of these indigenous medicinal plants are used as spices and food plants; they are also sometimes added to foods meant for pregnant mothers for medicinal purposes<sup>4&5</sup>.

A knowledge of the chemical constituents of plants is desirable, not only for the discovery of therapeutic agents, but also because such information may be of value in disclosing new sources of such economic materials

as tannins, oils, gums, precursors for the synthesis of complex chemical substances, etc. In addition, the knowledge of the chemical constituents of plants would further be valuable in discovering the actual value of folkloric remedies<sup>6</sup>.

The skin irritant, tumor, anti-cancer and recently anti-HIV activities of *Euphorbia* species have also been reported in *E. heterophylla* leaf<sup>7</sup>. Polyphenols contribute to the prevention of cardiovascular diseases, cancers, osteoporosis and antioxidant character with potential health benefits<sup>8, 9&10</sup>. They are known to have beneficial effects on cardio vascular system<sup>11, 12&13</sup> and have a role in the prevention of neurodegenerative diseases and diabetes mellitus<sup>14</sup>.

## Materials and Methods

### Taxonomic Description of *Spermacoce articularis* (Rubiaceae)

**Vernacular names:** Nathachuri (Tamil)

**Herb** perennial, to 50 cm, often prostrate and mat- forming, stem 4- angled, densely covered with adpressed, rusty brown hairs, and stipules somewhat broad, connate to the petioles, basal part 2 - 3 mm long, bristles 5 - 8, 2 - 5 mm long. **Leaves** elliptic to elliptic-oblong or obovate, (7-)20 – 45 x (4-)8 - 15mm, margins usually flat, above and below usually glabrous, with a few hairs particularly on the margin and midrib, apex acute, base attenuate, lateral nerves 3 - 4 pairs, petiole 0 - 2 mm. **Flowers** in few flowered auxiliary clusters, bracteoles inconspicuous. **Hypanthium** 2 - 2.5 mm long. **Calyx** lobes 4, 1.5 - 2 mm long, lobes ovate to triangular, 2.5 - 3.5 hypocrateriform, pink, tube 5 - 6 mm long, lobe ovate triangular, 2.5 - 3.5 mm long, inside finely pilose at the base. **Filaments** slender, 1 - 1.5 mm long, anthers oblong, 0.8 - 1 mm. Style 8 - 9 mm, exserted, stigma shortly bifid. **Capsule** obovoid, 2.5 - 3.5 mm long, hispid, splitted into two valves, leaving a scarious septum behind. **Seeds** oblong, brown, finely reticulate.

**Distribution:** Continental S.E. Asia, Malesia, Tropical Africa.

**Ecology:** Common weedy species.

### Qualitative Phytochemical analysis<sup>15</sup>

The Ethanol, Acetone, Chloroform, Ethyl acetate extracts of *Spermacoce articularis* was preliminarily tested for various photochemical analyses by using standard procedure.

### GC-MS Programme

Equipment	: Thermo GC - Trace Ultra Ver: 5.0, Thermo MS Dsq li
Column	: Db 35 - Ms Capillary Standard Non - Polar Column
Dimension	: 30 mts, id: 0.25 mm, film: 0.25 µm
Carrier Gas	: He, flow: 1.0 ML/Min
Temp Prog	: Oven Temp 80 C raised to 250 C At 5 C /Min
Injection Volume	: 1 micro litter

## Results and Discussions

### Phytochemical analysis

The qualitative test revealed the presence of various phytochemicals (Carbohydrates, Saponins, Phenols, Phytosteroids, Tannin, Flavonoids and Catechin). Carbohydrate is present in all extract (ethanol, acetone, Chloroform, and Ethyl Acetate) of *Spermoceae articularis*. Phenol is present in Ethanol and Ethyl Acetate extracts where as Phytosteroids are present in Ethanol and Acetone extract. Saponins, Tannin and Catechins are present in Acetone extract only. Flavonoids are present in chloroform extract (Table 1).

**Table 1: Preliminary Phytochemical Analysis of *Spermacoce articularis***

S. No.	Secondary metabolites	Ethanol	Acetone	Chloroform	Ethyl Acetate
1.	Alkaloids	—	—	—	—
2.	Carbohydrates	+	+	+	+
3.	Glycosides	—	—	—	—
4.	Saponins	—	+	—	—
5.	Phenols	+	—	—	+
6.	Phytosteroids	+	+	—	—
7.	Terpenoids	—	—	—	—
8.	Tannin	—	+	—	—
9.	Flavonoids	—	—	+	—
10.	Catechin	—	+	—	—

‘+’ Presence of secondary metabolites

‘—’ Absence of secondary metabolites

### GC-MS analysis

The plant sample on subjecting to GC-MS provides the result of different peaks determining the presence of seven different compounds. The molecular weight of these compounds is also known. By interpreting these compounds, it is found that this plant possess various therapeutically uses.

This typical gas chromatogram shows the relative concentrations of various compounds getting eluted as a function of retention time. The heights of the peak indicate the relative concentrations of the components present in the plant. The numbers at various peaks are the retention time in minutes. The mass spectrometer analyzes the compounds eluted at different times to identify the nature and structure of the compounds. The large compound fragments into small compounds giving rise to appearance of peaks at different m/z ratios. The GC-MS analysis of 25 compounds and its biological activity were presented in table-2. Major compounds are (1-Choloheptylacetate, 4-iso cyanobenzonitrile, 3- Methyl-4-ethoxypentan -2-01, Nonanoic acid, methyl ester [CAS], Tridecanoic acid [CAS], Heptadecane, 2-methyl-(CAS), Trans-6-methyl-1-phenylthio-4-oxahept-1, 6-diene, Tridecanal (CAS), a.citronellol, 2-Pentyl-2-allyey clopentanone, 3,7-Dimethyl-3-hydroxyl-4-isopropenyl-6-octadiene, Pentadecanoc acid methyl ester (CAS, Octadecanoic acid (CAS) (Figure-1). 2-Benzylidene-3-oxo-4-(octlsulfany1)-2,3-dihydrothiophene-1 dioxide, 3-chloromethyl furan, Methyl-threo-9, 10-dichloro-octacecanoate, 7-Sulfamoyl-3, 4-dihydro-1, 2,4- benzothiadiazine, 2-Nonanone (CAS), Azophenyzy-(1-Ethyz), Nonan-3, 6-Dien-Y2, I-Dotriacontanol (CAS). The highest coverage area of 2-Benzylidene- 3- oxo4-(octlsulfany1)-2,3- dihydrothiophene-1 dioxide (27.71), Tridecanoic acid [CAS] (17.46), 3,7- Dimethyl- 3-hydroxyl-4-isopropenyl-6- octadiene (6.73), Octadecanoic acid (CAS) (5.60), Methyl-threo-9, 10-dichloro-octacecanoate (4.05).

**Table 2: Phytoconstituents present in *Spermacoce articularis* as identified by GC-MS**

S. No	RT	Compound Name	Molecular Formula	Molecular Weight	Area %
1.	8.42	1- Choloheptylacetate	C <sub>9</sub> H <sub>15</sub> C <sub>1</sub> O <sub>2</sub>	190	0.85
2.	9.70	4- Iso cyanobenzonitrile	C <sub>8</sub> H <sub>4</sub> N <sub>2</sub>	128	0.66
3.	11.72	3- Methyl-4-ethoxypentan -2-01	C <sub>8</sub> H <sub>18</sub> O <sub>2</sub>	146	1.33
4.	13.72	Nonanoic acid, methyl ester [ CAS]	C <sub>10</sub> H <sub>20</sub> O <sub>2</sub>	172	1.66
5.	14.51	Tridecanoic acid [CAS]	C <sub>13</sub> H <sub>26</sub> O <sub>2</sub>	214	17.46
6.	15.21	Heptadecane,2-methyl-( CAS)	C <sub>18</sub> H <sub>38</sub>	254	0.67
7.	16.90	Trans-6-methyl-1-phenylthio-4-oxahept-1, 6-diene	C <sub>13</sub> H <sub>16</sub> OS	220	0.80
8.	17.22	Tridecanal (CAS)	C <sub>13</sub> H <sub>26</sub> O	198	4.86
9.	18.20	a.citronellol	C <sub>13</sub> H <sub>20</sub> O	156	3.24
10.	18.75	2-Pentyl-2-allyey clopentanone	C <sub>13</sub> H <sub>22</sub> O	194	0.81
11.	19.32	3,7- Dimethyl- 3- hydroxyl-4-isopropenyl-6-octadiene	C <sub>13</sub> H <sub>22</sub> O	194	6.73
12.	20.97	Pentadecanoc acid methyl ester (CAS)	C <sub>16</sub> H <sub>32</sub> O <sub>2</sub>	256	3.32
13.	21.95	Octadecanoic acid (CAS)	C <sub>18</sub> H <sub>36</sub> O <sub>2</sub>	284	5.60
14.	23.99	2-Benzylidene- 3- oxo4- (octlsulfany1)-2,3-dihydrothiophene-1 dioxide	C <sub>12</sub> H <sub>22</sub> O <sub>2</sub> S <sub>2</sub>	262	27.71
15.	24.19	3-chloromethyl furan	C <sub>5</sub> H <sub>5</sub> C <sub>10</sub>	116	2.47
16.	24.54	Methyl-threo-9, 10-dichloro-octacecanoate	C <sub>19</sub> H <sub>36</sub> C <sub>12</sub> O <sub>2</sub>	366	4.05
17.	23.33	7-Sulfamoyl-3, 4-dihydro-1, 2,4- benzothiadiazine	C <sub>7</sub> H <sub>9</sub> N <sub>3</sub> O <sub>4</sub> S <sub>2</sub>	263	1.48
18.	28.04	2-Nonanone (CAS)	C <sub>9</sub> H <sub>18</sub> O	142	1.02
19.	28.88	Azophenyzy-(1-Ethyz), Nonan-3, 6-Dien-Y2	C <sub>17</sub> H <sub>2</sub> N <sub>42</sub>	256	0.99
20.	29.71	I-Dotriacontanol (CAS)	C <sub>32</sub> H <sub>660</sub>	466	3.33
21.	31.36	Spiro[4.7] dodecane	C <sub>12</sub> H <sub>22</sub>	166	1.60
22.	33.32	Nonadecane (CAS)	C <sub>19</sub> H <sub>40</sub>	268	2.41
23.	34.22	2-Acetoxymethyl-6-propa-1,2-dienyl-2H-5,6-dihydropyran	C <sub>11</sub> H <sub>14</sub> O <sub>4</sub>	210	2.34
24.	35.72	5a-androst-16-en-3a-0l-(Ct-butyl)	(25H <sub>44</sub> OSi)	388	2.87
25.	37.80	1-(1-Cyclopentenyl)-1-hydroxy-5,5-dimethyl-6-hepten-3-one	C <sub>14</sub> H <sub>22</sub> O <sub>2</sub>	222	1.64

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