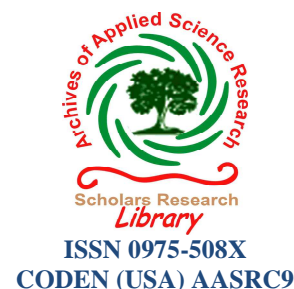




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Identification of chemical compounds in *Cissus quadrangularis* L. Variant-I of different sample using GC-MS analysis

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ABSTRACT

Different species of plants serve the health needs of large number of human being. The present study of phytochemical analysis of aerial parts of *Cissus quadrangularis* L. Variant-I of two different samples was extracted with aqueous alcohol (50% ethanol) and analysed using GC-MS. Nearly thirty bioactive chemical compounds were identified in both extracts. Predominantly acid derivatives, fatty acid, fatty acid ester, alcoholic compounds and hydrocarbons were present. This analysis revealed that the existence of n-hexadecanoic acid, ethan-1,1-diethoxy, 9,12,15-octadecatrienoic acid-methyl ester(Z,Z,Z) as major constituents. These different active phytochemicals have been found to possess a wide range of biological applications.

Key Words: (GC-MS, Phytochemicals, *Cissus quadrangularis* L, Hexadecanoic acid and Alcoholic extract)

INTRODUCTION

In Indian systems of medicine, a large number of drugs of either herbal or mineral origin have been implicated in various diseases and other pathological conditions in human[1,2]. *Cissus quadrangularis* L.[3] syn. *Vitis quadrangularis* Wall.[4], belongs to the family Vitaceae. It is a rambling shrub, commonly known as “Hadjora” (in Hindi)[5]. Based on morphological characters three variants of *Cissus quadrangularis* were reported to occur; square-stemmed, round-stemmed and flat-stemmed termed as variant I, II and III respectively[6]. Pharmacognostical studies on *Cissus quadrangularis* L. Variant I and II were undertaken by Anoop Austin *et. al.*[7]. Variant-I grows almost everywhere in India. It is one of the valuable medicines in the Indian Traditional Systems of Medicine. In the present investigation was undertaken on variant-I of *Cissus quadrangularis* during flowering period. The aerial parts of the plant are considered useful in asthma, dog bite, insect bite[9], alterative, stomachic[10-12], scurvy, menorrhagia, digestive disorders and to join broken bones[13-17]. It also has menstrual disorder, epistaxis, anti-inflammatory[18-21], wound-healing properties, cardiovascular activity[22] and antipyretic[23]. Fracture healing mechanism of the herb was also studied[24-34].

MATERIALS AND METHODS

The aerial parts of *Cissus quadrangularis* Variant-I were collected during flowering period. Sample-A collected from reddish clay loam soil at Arumbavur, Perambalur Dist., Tamil Nadu, India, similarly Sample-B collected from sandy clay loam soil at Muthupet sea shore, Thiruvavur Dist., Tamil Nadu, India. The plant material was identified with the help of local Floras[35-39]. Specimens were further confirmed with reference to Herbarium sheets available in The Rapinat Herbarium, St. Joseph's College, Tiruchirappalli and Botanical Survey of India, Southern Circle, Coimbatore.

PREPARATION OF EXTRACT

The samples were collected and dried under shade. The dried materials were powdered mechanically. Required quantity of the powder was treated with aqueous alcohol (50% ethanol). The extract contains both polar and non-polar components of the material and 1 μ L of extract was employed in GC-MS for analysis of different compounds.

GC-MS ANALYSIS

The aqueous alcohol extract was examined in GC-MS for its chemical composition by GC-MS engine model GC-Clarus 500 Perkin Elmer and Computer Mass Library with a GC column Elite -1 (100% Methyl Poly Siloxane). The other conditions were as follows: Injector: GC-Clarus -500; Perkin Elmer; Carrier gas flow Helium 1ml/min; Split ratio – 1:25; Sample injected 1 μ L; Oven temperature- 110°C; upto 270°C at the ratio of 5°C/min – 4min hold; Injector temperature 250°C; Total GC-time 38min; MS inlet line temperature 200°C; Source temperature 200°C; Electron energy 70eV; Mass Scan 25-400; MS Time 39min.

IDENTIFICATION OF PHYTOCHEMICAL COMPOUNDS

Interpretation of mass spectrum of GC-MS was done using the database of National Institute Standard and Technology (NIST) having more than 62,000 patterns. The mass spectrum of unknown components was compared with the spectrum of the known components stored in the NIST Library. The name, molecular weight and molecular formula of the components of the test materials were ascertained[40-42]. The compounds are arranged in the descending order of their percentage of peak area with respect to sample-A.

RESULTS AND DISCUSSION

The result pertaining to the preliminary phytochemical analysis and chemical compositions are given in the Table-1 & 2 respectively. Sample-A possess greater extractive value(13.82%) than sample-B(13.44%) and both extract are dark green in colour, oily semisolid with a characteristic odour. Both extracts of this plant positively answered for the phytochemicals tested except Mayer and Wagner tests.

The GC-MS studies show the presence of chemical constituents with their molecular formula, molecular weight and percentage of peak area of sample-A & B are presented in Table-2. GC-MS Chromatogram of samples shown in Fig-1 & 2.

The aqueous alcoholic extract of sample-B possess more number of compounds than sample-A. The major chemical constituents present in both samples are n-Hexadecanoic acid, Ethan-1,1-diethoxy, 9,12,15-Octadecatrienoic acid methyl ester (Z,Z,Z) are given in the Table-2. The percentage of peak area of Compound No.1&2 in sample-B is greater than sample-A since Compound No.3 in sample-B is lesser. The Compound No.4,5,8,13,25 & 29 are absent in sample-B. Similarly Compound No.31-38 are absent in sample-A. Trace amount of Compound No.15,18,24,26,27,31,33 & 35 found in sample-B and Compound No. 28 & 29 found in sample-A. The Compound No.(7,8,26), (9,14), (11,23) and (18,21) are having same molecular weight. Compound No.(1,4), (8,21) and (36,37) are isomers. The presence of phytochemical compounds are responsible for various pharmacological activities.

TABLE-1 Preliminary qualitative phytochemical analysis of *Cissus quadrangularis* L.

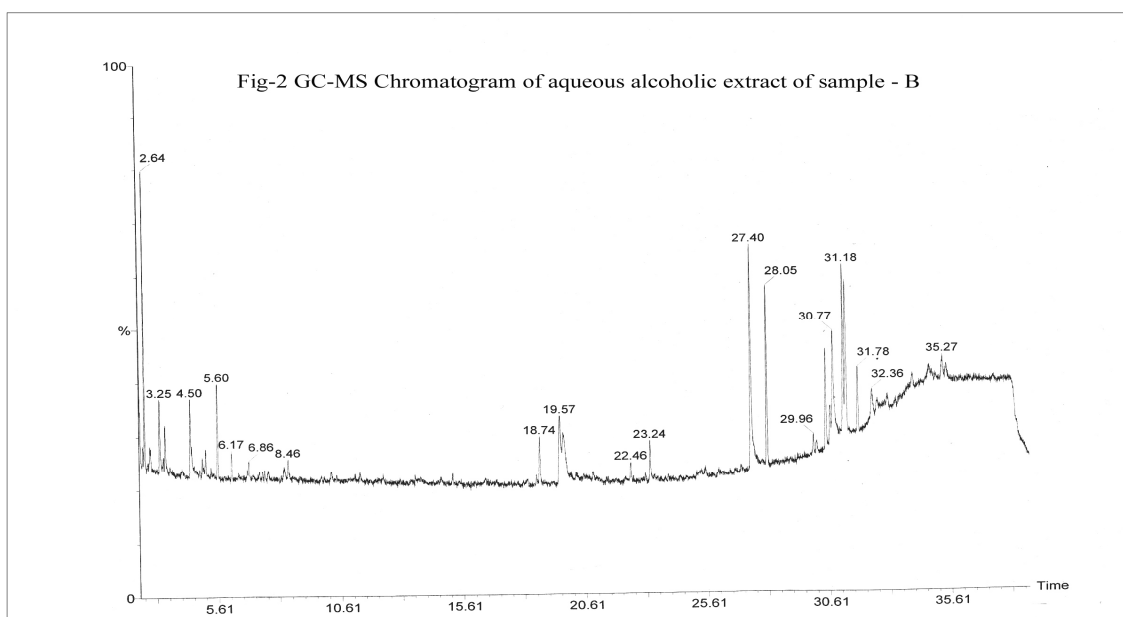
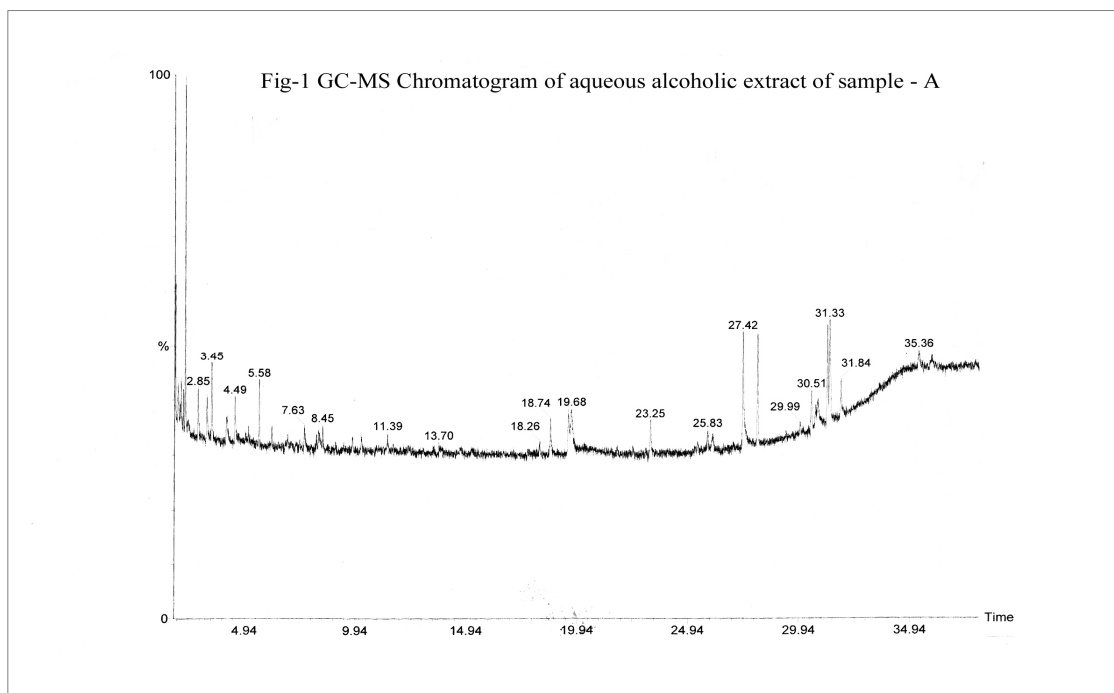
Compound Test & Reagents		Sample - A	Sample - B
Colour and Physical Nature		Dark green oily semi-solid	Dark Brown Semi- solid
Carbohydrate	Felting's	+	+
	Molish's	+	+
	Benedict's	+	+
Alkaloids	Mayer's	-	-
	Wagner's	-	-
	Hanger's	+	+
	Drangondroff's	+	+
Tannis and Phenols	FeCl ₃ Test	+	+
	Lead Acetate	+	+
	Gelatin	+	+
Fixed oil & Fats	Spot Test	+	+
Gum & Mucilage	Alcohol Precipitation	+	+
Saponins	Foam Test	+	+
Phytosterol	L.B. Test	+	+
Flavonoides	Shinoda's	+	+
Extract Value		13.82 %	13.44 %

(+) = Present

(-) = Absent

TABLE-2 Chemical constituents of aqueous alcoholic extract of *Cissus quadrangularis* L.

Compound Number	Name of the chemical compounds	Molecular Formula	Molecular Weight	% Peak Area of Samples	
				A	B
1	n - Hexadecanoic acid	C ₁₆ H ₃₂ O ₂	256	11.65	14.02
2	Ethan -1,1- diethoxy	C ₆ H ₁₄ O ₂	118	11.62	14.15
3	9, 12, 15 - Octadecatrienoic acid methyl ester (Z, Z, Z)	C ₁₉ H ₃₂ O ₂	292	9.48	7.18
4	Tetradecanoic acid, ethyl ester	C ₁₆ H ₃₂ O ₂	256	7.77	-
5	9, 12, Octadecadienoic acid, methyl ester (E, E)	C ₁₉ H ₃₄ O ₂	294	7.12	-
6	Butanedioic acid - 2, 3 - bis (acetyloxy), (R, R*, R*)	C ₈ H ₁₀ O ₈	234	4.43	1.79
7	Ethyl a - d - glycopyranoside	C ₈ H ₁₆ O ₆	208	4.01	5.88
8	13 - Tetradecene - 11 - yn - 1 - ol	C ₁₄ H ₂₄ O	208	3.51	-
9	Glycerin	C ₃ H ₈ O ₃	92	3.47	1.20
10	Tetradecanoic acid	C ₁₄ H ₂₈ O ₂	228	3.43	2.12
11	Benzene - 1, 2, 4 - trimethyl	C ₉ H ₁₂	120	3.36	3.33
12	2- Formylhistamine	C ₆ H ₉ N ₃ O	139	3.33	4.93
13	Phytol	C ₂₀ H ₄₀ O	296	3.06	-
14	Glycerin	C ₃ H ₈ O ₃	92	3.01	4.23
15	2 - Cyclopenten - 1 - one, 2 - hydroxyl	C ₅ H ₆ O ₂	98	2.98	Trace
16	Undecanoic acid	C ₁₁ H ₂₂ O ₂	186	2.63	2.38
17	Octadecanoic acid, ethyl ester	C ₂₀ H ₄₀ O ₂	312	2.23	3.03
18	DL - 3, 4 - Dimethyl - 3, 4 - hexane diol	C ₈ H ₁₈ O ₂	146	2.02	Trace
19	Hexanedioic acid, mono 2- ethylhexyl) ester	C ₁₄ H ₂₆ O ₄	258	1.90	2.19
20	4H - Pyran - 4 - one, 2, 3 - dihydro - 3, 5 - dihydroxy - 6 - methyl	C ₆ H ₈ O ₄	144	1.58	1.07
21	DL - 3, 4 - Dimethyl - 3, 4 - hexane diol	C ₈ H ₁₈ O ₂	146	1.30	0.65
22	1, E - 11, Z - 13 - Octadecatriene	C ₁₈ H ₃₂	248	1.19	2.00
23	Benzene - 1 - ethyl - 3 - methyl	C ₉ H ₁₂	120	1.02	1.03
24	2 - Furancarboxaldehyde, 5 - hydroxyl methyl)	C ₆ H ₆ O ₃	126	0.89	Trace
25	n - Decanoic acid	C ₁₀ H ₂₀ O ₂	172	0.79	-
26	Asarone	C ₁₂ H ₁₆ O ₃	208	0.76	Trace
27	1, 3, 8 - P - Menthatrien	C ₁₀ H ₁₄	134	0.62	Trace
28	Phenol - 4 - (3 - hydroxyl - 1 - Propenyl) - 2 - methoxy	C ₁₀ H ₁₂ O ₃	180	Trace	0.95
29	Nonanoic acid, 5 - methyl, ethyl ester	C ₁₂ H ₂₄ O ₂	200	Trace	-
30	1, 2, 3 - Propanetriol, monoaceta	C ₅ H ₁₀ O ₄	134	0.82	0.40
31	Benzene - 1 - ethyl 2,4 - dimethyl	C ₁₀ H ₁₄	134	-	Trace
32	Nonanol	C ₉ H ₁₈ O	142	-	0.42
33	Benzene - 1 - methlethyl	C ₉ H ₁₂	120	-	Trace
34	D - Glycero - d - tallo - heptose	C ₇ H ₁₄ O ₇	210	-	0.45
35	Dacanoic acid, octyl ester	C ₁₈ H ₃₆ O ₂	284	-	Trace
36	Hexadecanoic acid, ethyl ester	C ₁₈ H ₃₄ O ₂	282	-	8.30
37	Oleic acid	C ₁₈ H ₃₄ O ₂	282	-	9.19
38	Linoleic acid ethyl ester	C ₂₀ H ₂₆ O ₂	308	-	5.97



CONCLUSION

In the present study more than thirty chemical constituents have been identified from aqueous alcoholic extract of aerial parts of *Cissus quadrangularis* L. Variant- I by GC-MS analysis. The comparative analysis reveals sample-B possess more number of chemical constituents. The presence of various bioactive compounds justifies the use of whole plant various ailments by traditional practitioners.

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