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Research Article

ASSESSING THE BIOACTIVE CONSTITUENTS OF *CADABA FRUTICOSA* (L.) DRUCE THROUGH GC-MS

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ABSTRACT

Objective: The present effort was intended to investigate *Cadaba fruticosa* for phytochemical compounds and characterize the chemical constituents of plant using GC-MS.

Methods: The shade dried aerial parts of plant powder *Cadaba fruticosa* was extracted with ethanol overnight and filtered and concentrated. The GC Clarus 500 (Perkin Elmer) used in the investigation employed a column packed with Elite- 5MS (5%Diphenyl / 95% Dimethyl poly siloxane, 30mm x 0.25mm x0.25µmdf) and the components were separated using Helium (1mL/min) as the carrier gas. The 2 µl sample extract injected into the instrument was detected by the Turbo mass gold detector (Perkin Elmer) with the aid of the Turbomass 5.2 software.

Results: The GC-MS analysis provided different peaks determining the presence of twenty different phytochemical compounds.

Conclusion: The presence of various bioactive compounds proves the purpose of *C. fruticosa* for various disorders. However, seclusion of individual phytochemical constituents may proceed to find an innovative drug.

Keywords: *Cadaba fruticosa*, Ethanolic extract, GC-MS analysis, Phytoconstituents.

INTRODUCTION

Plants have been used for medicinal rationale for many centuries. Today, herbal medicines are being engaged worldwide in a variety of health care settings and as home remedies. In some developing countries, society relies profoundly on traditional health practitioners and medicinal plants to meet their vital health care requirements. In many developed countries herbal medicines are gaining fame as alternative and complementary therapies [1].

During the last decade, use of traditional medicine has prolonged globally and has gained attractiveness. With the incredible expansion in the use of traditional medicine worldwide, safety and efficiency as well as quality control of herbal medicines and traditional therapies have become important concerns for both health authorities and the public [2].

In many developed countries popular use of Complementary and Alternative Medicine is practiced by concern about the adverse effects of chemical drugs, inquiring of the approaches and assumptions of allopathic medication, and greater civic access to health information. In developing countries, broad use of Traditional Medicine is frequently attributable to its accessibility and affordability [3]. There is still a significant lack of research data in this field. In the absence of pharmacopoeia data on the various plant extracts, it is not possible to isolate or standardize the active contents having the desired effects [4]. Screening of active components from plants has direct to the development of new medicinal drugs which have efficient protection and treatment role against various diseases [5].

Cadaba fruticosa (L.) Druce (family Capparidaceae) is a slender shrub with strongly furrowed stem. *C. fruticosa* is distributed throughout the world mostly tropical and sub-tropical regions. In India *C. fruticosa* are found in Punjab, central and western India, Gujarat, Tamilnadu and Karnataka. The whole plant is purgative, anthelmintic, antisyphilitic, emmenagogue, aperients, stimulant, antiscorbutic, antiphlogistic. It is also used in treatment of cough, fever, dysentery and as antidote against poisoning. Leaves are externally used to relieve rheumatic pain [6]. The boiled leaves are eaten as an anthelmintic; decoction with other ingredients is employed in the treatment of amenorrhea, dysmenorrheal and uterine obstruction. The root of plant possess similar medicinal properties like leaves, the root preparation is used in anthrax. The flower buds are stimulant, antiscorbutic, and purgative, emmogogue, antiphlogistic and anthelmintic especially for round worm **[7].** Large number of medicinal plants and their purified constituents has shown beneficial therapeutic potentials. With this situation, this study was aimed to identify the phytoconstituents present in ethanolic extract of *C. fruticosa* using GC-MS analysis.

MATERIALS AND METHODS

Collection and Preparation of Plant:

The aerial parts of plant were collected from the natural habitats of Viruthunagar District of Tamilnadu, India on Sep 2013. The plant was authenticated by Botanist Dr. V. Chelladurai, Research officer-Botany (Retd.), Central council for research in Ayurveda and Siddha, Government of India and the herbarium of voucher specimen number P2401 has been deposited at the herbarium in Department of Botany, Presidency College, Chennai (India). The samples were washed thoroughly in running tap water to remove soil particles and adhered debris and finally washed with sterile distilled water. The aerial parts of plant were shade dried and ground into fine powder. The powdered materials were stored in air tight polythene bags until use.

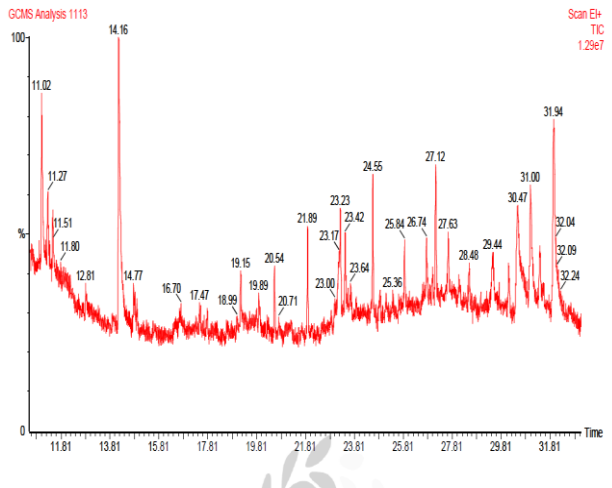

Fig. 1: The GC Chromatogram of ethanolic extract of C. fruticosa.

Plant sample extraction

Fifty grams of powdered sample was extracted with ethanol overnight and filtered through ash less filter paper with sodium sulphate and the extract was concentrated. The extract was analyzed using the Clarus 500 GC-MS (Perkin Elmer). 2 µL of the ethanolic extract of *C. fruticosa* was employed for GC-MS analysis.

GC-MS analysis

The Clarus 500 GC (Perkin Elmer) used in this analysis. It employed a fused silica column packed with Elite -5MS (5%Diphenyl / 95% Dimethyl poly siloxane, 30mm x 0.25mm x0.25µm df) and the components were separated using helium as carrier gas at a constant flow of 1 mL/ min. The 2 µL sample extract injected into the instrument. It was detected by the Turbo gold mass detector (Perkin Elmer) with the aid of Turbo mass 5.2 software. During the GC process the oven was maintained at a temperature of 110^{0}c with 2 min holding. The injector temperature was set at 250^{0}c. The different parameters involved in the operation of the Clarus 500 MS were also standardized. The Inlet line temperature was 200^{0}C and source temperature was 200^{0}C. Mass spectra were taken at 70 eV; a scan interval of 0.5s and fragments from 45-450 Da. The MS detection was completed in 36 min. The detection employed the NIST ver. 2.0 year 2005 library.

RESULTS

The results concerning to GC-MS analysis led to the identification of number of compounds from the GC fractions of the ethanolic extract of *C. fruticosa.* These compounds were identified through mass spectrum attached with GC. The active principles with their retention time (RT), molecular formula (MF), molecular weight (MW) and concentration (%) were tabulated in Table 1.

Table 1: Components identified in ethanol extract of aerial parts of *C. fruticosa.*

S. No.	RT	Name of the compound	Molecular Formula	MW	Peak Area %
1	11.02	2-Tridecen-1-ol, (E)-	$C_{13}H_{26}O$	198	16.23
2	11.27	Pyrrolidine, 1,1'-methylenebis-	$C_9H_{18}N_2$	154	11.91
3	11.9	1,6-Anhydro-3,4-dideoxy-á-D-manno-hexapyranose	$C_6H_{10}O_3$	130	3.91
4	14.16	Phytol	$C_{20}H_{40}O$	296	19.39
5	14.77	5,10-Dioxatricyclo[7.1.0.0(4,6)]decane	$C_8H_{12}O_2$	140	1.87
6	16.7	Azonia-5-hexene-1-ol, N,N-dimethyl-, carbamate ester, bromide	$C_8H_{17}N_2O_2$	173	0.49
7	19.15	3-Hexadecyloxycarbonyl-5-(2-hydroxyethyl)-4-methylimidazolium ion	$C_{24}H_{45}N_2O_3$	409	1.43
8	20.54	Octane, 1,1'-oxybis-	$C_{16}H_{34}O$	242	1.19
9	21.89	Octadecane, 1-(ethenyloxy)-	$C_{20}H_{40}O$	296	2.14
10	23.23	1,2-15,16-Diepoxyhexadecane	$C_{16}H_{30}O_2$	254	4.38
11	23.42	2,6,10-Dodecatrien-1-ol, 3,7,11-trimethyl-	$C_{15}H_{26}O$	222	1.73
12	24.55	Methoxyacetic acid, 3-tridecyl ester	$C_{16}H_{32}O_3$	272	3.24
13	25.84	3-Trifluoroacetoxypentadecane	$C_{17}H_{31}F_3O_2$	324	1.62
14	26.74	Bicyclo[3.3.1]nonan-9-one, 1,2,4-trimethyl-3-nitro-,(2-endo,3-exo,4-exo)-(.+-.)-	$C_{12}H_{19}NO_3$	225	1.67
15	27.12	Heptadecane, 2,6,10,15-tetramethyl-	$C_{21}H_{44}$	296	2.77
16	27.63	(1-Ethyl-3,7-dimethylocta-2,6-dienylthio)benzene	$C_{18}H_{26}S$	274	1.87
17	30.47	Z,Z,Z-4,6,9-Nonadecatriene	$C_{19}H_{34}$	262	7.18
18	31.00	1,3-Bis-(2-cyclopropyl,2-methylcyclopropyl)-but-2-en-1-one	$C_{18}H_{26}O$	258	4.61
19	31.37	1-Naphthalenepropanol, à-ethyldecahydro-5- (hydroxymethyl)-à,5,8a-trimethyl-2-methylene-, [1S- [1à(S*),4aá,5à,8aà]]-	$C_{20}H_{36}O_2$	308	1.82
20	31.94	Androstan-3-one, 17-hydroxy-2,4-dimethyl-,(2à,4à,5à,17á)-	$C_{21}H_{34}O_2$	318	10.55

The results revealed that the presence of 2-Tridecen-1-ol,(E)-(16.23%), Pyrrolidine, 1,1'-methylenebis-(11.91%), 1,6-Anhydro-3,4-dideoxy-á-D-manno-hexapyranose(3.91%), Phytol(19.39%), 5,10-Dioxatricyclo[7.1.0.0(4,6)]decane(1.87%), Azonia-5-hexene-1-ol, N,N-dimethyl-, carbamate ester, bromide(0.49%), 3-Hexadecycloxycarbonyl-5-(2-hydroxyethyl)-4-methylimidazolium ion(1.43%), Octane, 1,1'-oxybis-(1.19%), Octadecane, 1-(ethenyloxy)-(2.14%), 1,2-15,16-Diepoxyhexadecane(4.38%), 2,6,10-Dodecatrien-1-ol, 3,7,11-trimethyl-(1.73%), Methoxyacetic acid, 3-tridecyl ester(3.24%), 3-Trifluoroacetoxypenta decane(1.62%), Bicyclo[3.3.1]nonan-9-one,1,2,4-trimethyl-3-nitro-,(2-endo,3-exo,4-exo)-(.+-.)-(1.67%), Heptadecane, 2,6,10,15-tetramethyl-(2.77%), (1-Ethyl-3,7-dimethylocta-2,6-dienylthio)benzene(1.87%), Z,Z,Z-4,6,9-Nonadecatriene(7.18%), 1,3-Bis-(2-cyclopropyl,2-methylcyclopropyl)-but-2-en-1-one(4.61%), 1-Naphthalenepropanol,à-ethyldecahydro-5-(hydroxymethyl)-à,5,8a-trimethyl-2-methylene-, [1S-[1à(S*),4aá,5à,8aà]]-(1.82%), Androstan-3-one,17-hydroxy-2,4-dimethyl-,(2à,4à,5à,17á)-(10.55%). The spectrum profile of GC-MS confirmed the presence of twenty components with the retention time 11.02, 11.27, 11.90, 14.16, 14.77, 16.70, 19.15, 20.54, 21.89, 23.23, 23.42, 24.55, 25.84, 26.74, 27.12, 27.63, 30.47, 31.00, 31.37and 31.94 min likewise which shows in Figure 1.

DISCUSSION

Gas Chromatography- Mass Spectrometry (GC-MS) is a precious tool for reliable detection of bioactive constituents. This study results were interpreted. By interpreting these compounds, it is found that *C. fruticosa* possesses various therapeutical applications. The present study characterized the chemical profile of *C. fruticosa* using GC-MS. The GC chromatogram shows the relative concentration of various compounds getting eluted as a function of retention time. The heights of the peak point out the relative concentration of the presented components. The mass spectrometer analyzes the compounds eluted at different times to identify the nature and structure of the compounds. These mass spectra are figure print of that compound which can be identified from the data library. 2-Tridecen-1-ol,(E)- is suggested to be an alcohol and Pyrrolidine, 1,1'-methylenebis is recommended as pyrrolidine compound. 1,6-Anhydro-3,4-dideoxy-á-D-manno-hexapyranose is suggested to be anhydrosugar moiety and it may acts as an preservative. Phytol is suggested to be a diterpene compound and it may act as an antimicrobial anti-inflammatory anticancer diuretic [8, 9, 10]. 5,10-Dioxatricyclo[7.1.0.0(4,6)]decane may be an epoxide compound and Azonia-5-hexene-1-ol, N,N-dimethyl-, carbamate ester, bromide is recommended to be a carboxylic compound. 3-Hexadecycloxycarbonyl-5-(2-hydroxyethyl)-4-methylimidazolium ion is suggested to be an amino compound and it may act as an antimicrobial [11]. Octane, 1,1'-oxybis- is suggested to be an alkane in nature and acts as an antistatic agent. Octadecane, 1-(ethenyloxy)- is recommended as an ether and acts as an antisepsis. 1, 2-15, 16-Diepoxyhexadecane is recommended to be an epoxide. 2, 6, 10-Dodecatrien-1-ol, 3, 7, 11-trimethyl- is suggested to be a sesquiterpene alcohol and acts as an antimicrobial, anti-inflammatory and antihyperlipidemic agent. Methoxyacetic acid, 3-tridecyl ester is an ester compound and acts on cytotoxicity. 3-Trifluoroacetoxypenta decane is suggested to be an acetate compound. Bicyclo[3.3.1]nonan-9-one,1,2,4-trimethyl-3-nitro-,(2-endo,3-exo,4-exo)-(.+-.)- is suggested to be a nitrogen compound and it may acts as an antimicrobial agent. Heptadecane, 2,6,10,15-

tetramethyl- is suggested to be an alkyl compound and acts as a sex hormone in algae [12]. (1-Ethyl-3,7-dimethylocta-2,6-dienylthio)benzene is suggested to be an amino compound. Z,Z,Z-4,6,9-Nonadecatriene is suggested to be an alkene and it may acts as an antioxidant. 1,3-Bis-(2-cyclopropyl,2-methylcyclopropyl)-but-2-en-1-one is suggested to be an ketone. 1-Naphthalenepropanol, à-ethyldecahydro-5-(hydroxymethyl)-à,5,8a-trimethyl-2-methylene-, [1S-[1à(S*),4aá,5à,8aà]]- is suggested to be a poly hydroxyl compound. Androstan-3-one, 17-hydroxy-2,4-dimethyl-,(2à,4à,5à,17á)- is suggested to be a steroid and it may acts on the formation of 5 alpha- dihydrotestosterone.

Table 2 shows the nature of compound and biological activity of the predicted compounds.

Table 2: Activity of phyto-components identified in ethanol extract of Aerial parts of *C. fruticosa*

S. No.	Nam e of the compound	Compound Nature	Activity Reported
1	2-Tridecen-1-ol	Alcohol	No activity reported
2	Pyrrolidine, 1,1'-methylenebis	Pyrrolidine	No activity reported
3	1,6-Anhydro-3,4-dideoxy-á-D-manno-hexapyranose	Anhydro sugar	No activity reported
4	Phytol	Diterpene	Anticancer Anti-inflammatory Antimicrobial, Diuretic
5	5,10-Dioxatricyclo[7.1.0.0(4,6)]decane	Epoxide	No activity reported
6	Azonia-5-hexene-1-ol, N,N-dimethyl-, carbamate ester	Carboxylic	No activity reported
7	3-Hexadecyloxycarbonyl-5-(2-hydroxyethyl)-4-methylimidazolium ion	Amino	Antimicrobial
8	Octane, 1,1'-oxybis	Alkane	Antistatic agent
9	Octadecane, 1-(ethenyloxy)-	Ether	Antisepsis
10	1,2-15,16-Diepoxyhexadecane	Epoxide	Cytotoxicity
11	2,6,10-Dodecatrien-1-ol, 3,7,11-trimethyl-	Sesquiterpene alcohol	Antimicrobial, Anti-inflammatory, Anti hyperlipidemic
12	Methoxyacetic acid, 3-tridecyl ester	Ester	Cytotoxicity
13	3-Trifluoroacetoxypentadecane	Acetate	No activity reported
14	Bicyclo[3.3.1]nonan-9-one, 1,2,4-trimethyl-3-nitro-,(2-endo,3-exo,4-exo)-(.+-.)-	Nitrogen	Antimicrobial
15	Heptadecane, 2,6,10,15-tetramethyl-	Alkyl	Sex hormone in algae
16	(1-Ethyl-3,7-dimethylocta-2,6-dienylthio)benzene	Amino	No Activity reported
17	Z,Z,Z-4,6,9-Nonadecatriene	Alkene	Antioxidant
18	1,3-Bis-(2-cyclopropyl,2-methylcyclopropyl)-but-2-en-1-one	Ketone	No activity reported
19	1-Naphthalenepropanol, à-ethyldecahydro-5-(hydroxymethyl)-à,5,8a-trimethyl-2-methylene-, [1S-[1à(S*),4aá,5à,8aà]]-	Poly hydroxyl	No activity reported
20	Androstan-3-one, 17-hydroxy-2,4-dimethyl-, (2à,4à,5à,17á)-	Steroid	Formation of 5alpha-dihydrotestosterone

CONCLUSION

Several phytochemical evaluations have been carried out in different parts of globe using GC-MS. This analysis showed the existence of various compounds with different chemical structures. The occurrence of various bioactive compounds proves the purpose of *C. fruticosa* for various disorders. However, seclusion of individual phytochemical constituents may proceed to find an innovative drug. Hence, this type of effort will be supportive for in depth study.

CONFLICT OF INTEREST STATEMENT

We declare that we have no conflict of interest.

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REFERENCES

1. Information products on Medicinal Plants World Health Organization 2002. Available at http://www.who.int/dsa/cat98/Medicinalplants2002.pdf.
2. General Guidelines for Methodologies on Research and Evaluation of Traditional Medicine - WHO/EDM/TRM/2000.1.Available at http://whqlibdoc.who.int/hq/2000/WHO_EDM_TRM_2000.1.pdf.
3. Traditional Medicine Strategy 2002–2005 WHO/EDM/TRM/2002.1. Available at http://whqlibdoc.who.int/hq/2002/who_edm_trm_2002.1.pdf.
4. Joy P P, Thomas J, Samuel M, Skaria B P. Medicinal Plants. Kerala Agricultural University, Aromatic and Medicinal Plant Research, Ernakulam. 1998; 3-7. Available athttp://www.armchairpatriot.com/HardCorePrepper/Medicinal%20Plants.pdf.
5. Mukherjee P K, Kumar V, Houghton P J. Screening of Indian medicinal plants for acetyl cholinesterase inhibitory activity. Phytother Res 2007; 21: 1142-5.
6. Patel D, Kaur G, Sawant M G, Deshmukh P. Herbal medicine – A natural cure to arthritis. Indian Journal of Natural products and Resources 2013; 4 (1): 27-35.
7. Nadkarni AK. Indian Materia Medica- 1, 3rd ed., Popular Prakashan, Bombay; 2002: 225-26.
8. Alagammal M, Tresina P S and Mohan V R. GC-MS determination of bioactive components of polygala javana dc. Int J of Curr Pharm Res 2012; 4 (2): 42-4.
9. Gopinath S, Sakthidevi G, Muthukumaraswamy S and Mohan V R. GC-MS analysis of bioactive constituents of *Hypericum mysorense* (Hypericaceae). J. Curr. Chem. Pharm. Sc 2013. 3(1): 6-15.
10. Prabhadevi V, Sathish S, Johnson M, Venkatramani B, Janakiraman N. Phytochemical studies on *Allamanda cathartica* L. using GC-MS. Asian Pac J Trop Biomed 2012; 2 (2): 550-4.
11. Santhi V,Sivakumar V, Thilaga R D, Thangathirupathi A. Analgesic, antipyretic and anti inflammatory activities of column fraction of *Babylonia zeylanica* (bruguiere, 1789) in albino rats 2012; 2 (3): 151-9.
12. Nor Qhairul Izzreen, M.N. and Vijaya Ratnam, R. Volatile compound extraction using Solid Phase Micro Extraction coupled with Gas Chromatography Mass Spectrometry(SPME-GCMS) in local seaweeds of *Kappaphycus alvarezii, Caulerpa lentillifera* and *Sargassum polycystem*. International Food Research Journal 2011; 18(4): 1449-56