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Research Article

Chemical investigation of *Pseudarthria viscida* root by GC-MS analysis

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ABSTRACT: This study was carried out to analyze the active constituents from *Pseudarthria viscida* roots using Gas Chromatography-Mass Spectrometry. The chemical composition of the methanolic extract of *Pseudarthria viscida* was investigated using Perkin-Elmer Gas Chromatography-Mass Spectrometry. Mass spectra of the compounds found in the extract were matched with the National Institute of Standards and Technology (NIST) library. This analysis revealed that *Pseudarthria viscida* root contains eighteen chemical constituents. The major chemical constituents are 3-O-Methyl-d-glucose (61.33%), n-Hexadecanoic acid (12.66%), Oleic acid (7.93%) and 9, 12- Octadecanoic acid (4.88%) This is the first report of identification of active constituents from the root of *Pseudarthria viscida* by GC-MS.

KEY WORDS: *Pseudarthria viscida,* GC-MS analysis, chemical components

INTRODUCTION

Plants are remarkable factories of chemical compounds, referred to as phytochemicals. Every plant synthesises a diverse array of phytochemicals. These compounds partake in a variety of roles in plant life including maintenance of physiological functions and defense against enemies such as bacteria, fungi, attacking insects and plant eating animals.[1,2] Phytochemicals have been utilized by humans since ancient times, when plants started to be used as medicines to cure different diseases based on experience. The plants were initially used in unmodified form, latter as extracts, and in the 19th century advances in chemistry made it possible to isolate the active compounds of some medicinal plants. A large number of pharmaceutical agents used today contain natural compounds, including those with various modification of the original molecule.[3]

Pseudarthria viscida (family Fabaceae) is a shrub, distributed throughout South India. The roots are astringent, thermogenic, digestive, anthelmintic, anti-inflammatory, diuretic, aphrodisiac, nervine, cardio and rejuvenating tonic. They are useful in vitiated conditions of cough, bronchitis, asthma, tuberculosis, helminthiasis, diarrhoea, gout, diabetes, hyperthermia and general debility.[4] The extracts from the leaf, root, stem and callus of the *Pseudarthria viscida* showed significant antifungal property.[5] The methanolic root extract of this plant was demonstrated for potential *in vitro* antioxidant activity.[6] There was also evidence supporting the anti-diabetic,[7] anti diarrheal[8] and anti cancer[9] property of this plant extract. Since there are no reports on the phytochemical aspects of *Pseudarthria viscida* root, it was chosen as the subject for this study. The aim of this paper is to validate a rapid method for the quantitative determination of organic compounds in the root parts of *Pseudarthria viscida* using rapid finger print procedure i.e. GC-MS technique.

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MATERIALS AND METHODS

Plant Material

The plant materials were collected from Kholli hills and adjoining downstream areas of Nammakkal District of Tamilnadu state, India. The specimen was identified and authenticated by botanist Dr. Sasikala Ethirajulu, Department of Pharmacognosy, Siddha Central Research Institute, Chennai, India. Cut removed root was washed in distilled water and kept in room temperature for air drying. Dried root was powdered and kept in air tight box for further use.

Preparation of extract

Twenty grams of powdered plant material were soaked in methanol for 12 hours and then filtered through Whatmann filter paper No. 41 along with 2 g sodium sulphate to remove the sediments and traces of water in the filtrate. Before filtering, the filter paper along with sodium sulphate was wetted with methanol. The filtrate was then concentrated by bubbling nitrogen gas into the solution and was concentrated to 1 ml. The extract contained both polar and non polar phytocomponents of the plant material. 2 µl of these solutions were employed for GC-MS analysis.

GC-MS analysis

GC-MS analysis was carried out using a GC Clarus 500 Perkin Elmer system comprising a AOC-20i auto sampler and gas chromatography interfaced to a mass spectrometer (GC-MS) equipped with a Elite-1 fused silica capillary column (30 m × 0.25 mm ID × 1 µm df, composed of 100% dimethyl poly siloxane). For GC-MS detection, an electron ionization system with ionization energy of 70 eV was used. Helium gas (99.999%) was used as the carrier gas at the constant flow rate of 1 ml/min and an injection volume of 2 µl was employed (split ratio of 10:1). The injector temperature is 250 °C and ion source temperature is 280 °C. The oven temperature was programmed from 110 °C (isothermal for 2 min), with an increase for 10 °C/min for 200 °C, then 5 °C/min to 280 °C, ending with a 9 min isothermal at 280 °C. Mass spectra were taken at 70 ev; a scan interval of 0.5 seconds and fragments from 45 to 450 Da. Total GC running time is 36 min. The relative percentage amount of each component was calculated by comparing its average peak area to the total areas. Software adopted to handle mass spectra and chromatograms was a TurboMass ver. 5.0.

RESULT AND DISCUSSION

GC-MS plays a key role in the analysis of unknown component of plant origin. GC-MS ionizes compounds and measures their mass number. It is also known that GC technique involves the separation of volatile components in the test sample using capillary column. The components of test sample are evaporated in the injection port of the GC-equipment and segregated in the column by adsorption and desorption technique with suitable temperature programme of the oven controlled by software. Different components are eluted from the column based on the boiling point of the individual components. The time at which each component is eluted from the GC column is termed as retention time (RT). The eluted component is detected in the mass detector.

Interpretation on 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 the unknown components was compared with the spectrum of the known components stored in NIST library

GC-MS chromatogram of the methanol extract of *Pseudarthria viscida* (Figure 1) showed 18 peaks indicating the presence of 18 phytochemical constituents. On comparison of the mass spectra of the constituent with the NIST library, the 18 phytoconstituents were characterized and identified. The active principles with their retention time (RT), molecular formula, molecular weight and concentration of that 18 phytoconstituents present in *Pseudarthria viscida* are presented in Table 1.

The major components present in the root of the plant *Pseudarthria viscida are* 3-O-methyl-d-glucose (61.33%), n-hexa decanoic acid (12.66%), oleic acid (7.93%) and 9,12 octadecanoic acid (Z,Z) (4.88%). Figures 2 to 5 show mass spectrum of these major compounds.

Using Dr. Duke's phytochemical and ethnobotanical database (online), the biological activity of the identified phytocomponents was ascertained. The various phytochemicals which contribute to the medicinal activity of the plant are given in Table 2. The activities listed are based on Dr. Duke's phytochemical and ethanobotanical database by Dr. Jim Duke of the Agricultural research services, USDA.

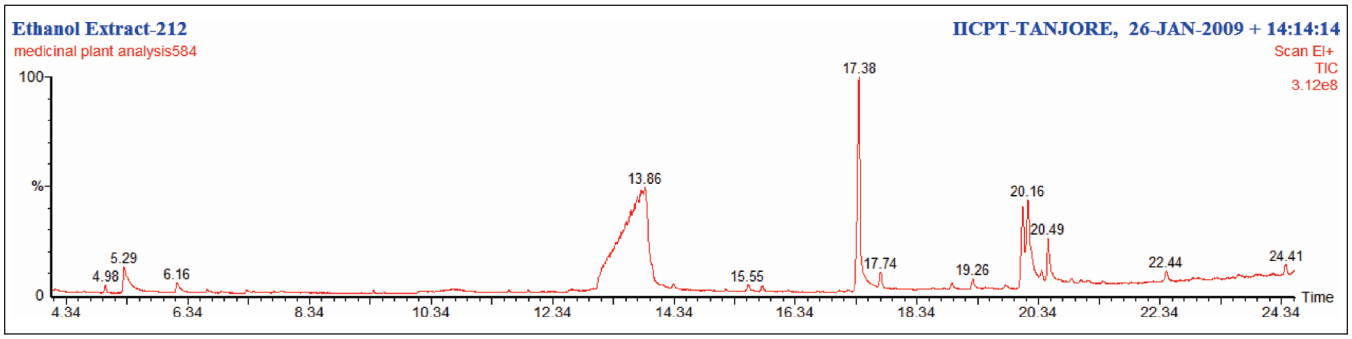

Figure 1: Chromatogram of *Pseudarthria Viscida* by GC-MS

Table 1: Phytocomponents identified in the methanol root extract of *pseudarthria viscida*

S. No.	RT	Name of the compound	Molecular formula	Molecular weight	Composition (%)
1.	3.58	Butane, 1,1-diethoxy -3-methyl	$C_9H_{20}O_2$	160	0.64
2.	4.00	Hexanoic acid, ethyl ester	$C_8H_{16}O_2$	144	0.66
3.	4.98	Propane, 1,1,3-triethoxy	$C_9H_{20}O_3$	176	0.34
4.	5.29	1- Butanol, 3-Methyl- formate	$C_6H_{12}O_2$	116	3.73
5.	6.16	4H-Pyran-4-One,2,3-dihydro-3-5-dihydroxy-6-methyl	$C_6H_8O_4$	144	0.87
6.	9.40	Decanoic acid, ethyl ester	$C_{12}H_{24}O_2$	200	0.12
7.	11.62	Undecanoic acid	$C_{11}H_{22}O_2$	186	0.13
8.	13.86	3-O-Methyl-d-Glucose	$C_7H_{14}O_6$	194	61.33
9.	14.33	Tetra decanoic acid	$C_{14}H_{28}O_2$	228	0.92
10.	15.55	Oxirane, tetra decyl	$C_{16}H_{32}O$	240	0.58
11.	17.38	n-Hexadecanoic acid	$C_{16}H_{32}O_2$	256	12.66
12.	17.74	Hexadecanoicacid ,ethyl ester	$C_{18}H_{36}O_2$	284	0.74
13.	19.26	5-Octadecene,(E)	$C_{18}H_{36}$	252	0.62
14.	19.79	d-Mannitol, 1-decylsulfonyl	$C_{16}H_{34}O_7S$	370	0.29
15.	20.08	9,12-Octadecanoic acid(Z,Z)	$C_{18}H_{32}O_2$	280	4.88
16.	20.16	Oleic acid	$C_{18}H_{34}O_2$	282	7.93
17.	20.49	Octadecanoic acid	$C_{18}H_{36}O_2$	284	2.94
18.	24.41	1-Monolinoleoglycerol trimethyl siliyl ether	$C_{27}H_{54}O_4Si_2$	498	0.60

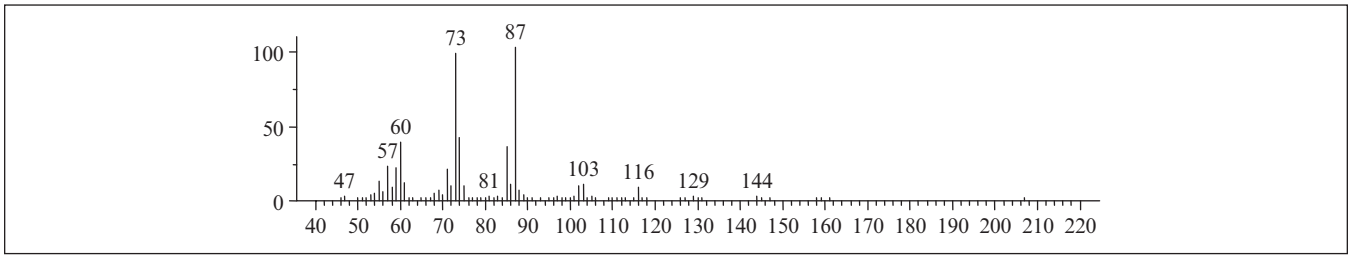

Figure 2: Mass spectrum of 3-O-Methyl-d-glucose

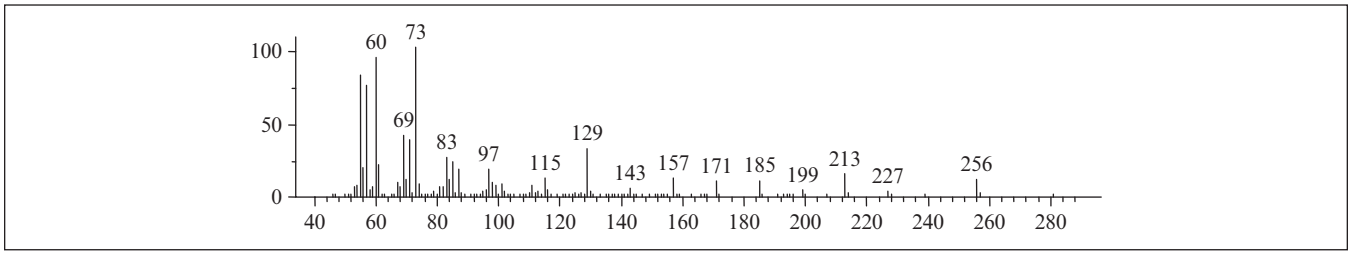

Figure 3: Mass spectrum of n-Hexadecanoic acid

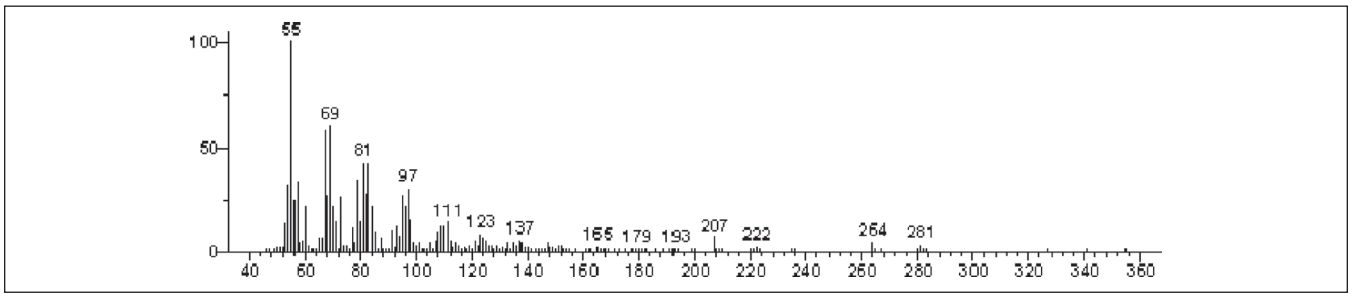

Figure 4: Mass spectrum of Oleic acid

CONCLUSION

This investigation has helped to identify the compounds present in the root of *Pseudarthria viscida,* a hitherto univestigated plant. Eighteen chemical constituents have been identified from methanolic root extract of this plant. The presence of various bioactive compounds justifies the use of this plant for various ailments by traditional practitioners. So it is recommended as a plant of phytopharmaceutical importance. However isolation

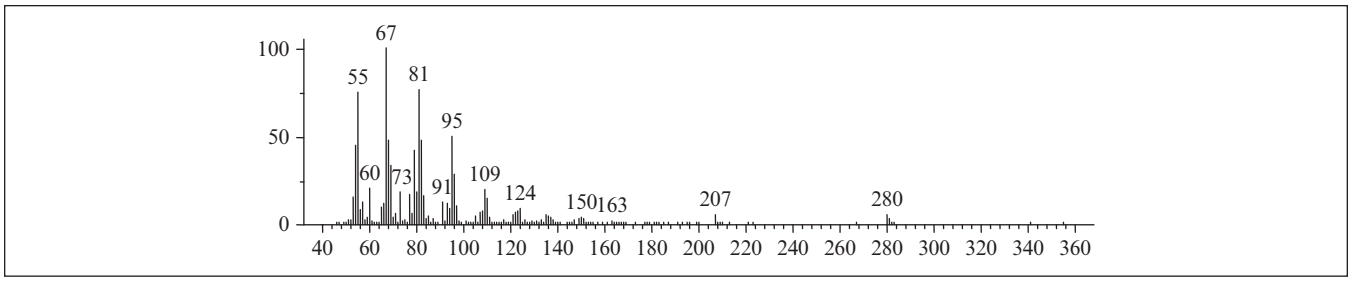

Figure 5: Mass spectrum of 9, 12-Octadecanoic acid

Table 2: Activity of phytocomponents identified in the plant *pseudarthria viscida*

S. No.	Name of the compound	Compound nature	Activity*
1.	4H-Pyran-4-one,2,3-dihydro-3-5-dihydroxy-6-methyl	Flavonoid fraction	Antimicrobial, Anti-inflammatory
2.	3-O-Methyl-d-Glucose	Sugar moiety	Preservative
3.	Tetradecanoic acid	Myristic acid	Antioxidant, Cancer preventive, Nematicide, Lubricant, Hypocholesterolemic
4.	n-Hexadecanoic acid	Palmitic acid	Antioxidant, Hypocholesterolemic, Nematicide, Pesticide, Flavor, Lubricant, Antiandrogenic, Hemolytic 5-α-reductase inhibitor
5.	Hexadecanoic acid ethyl ester	Fatty acid ester	Antioxidant, Hypocholesterolemic, Nematicide, Pesticide, Flavor, Lubricant, Antiandrogenic, Hemolytic 5-α-reductase inhibitor
6.	d-Mannitol, 1-decyl sulfonyl	Sulfur compound	Antimicrobial
7.	9,12-octa decanoic acid (Z,Z)	Linoleic acid	Anti-inflammatory, Hypocholesterolemic, Cancer preventive, Hepatoprotective, Nematicide, Insectifuge, Antihistaminic, Anti eczemic, Anti acne, Anti androgenic, Anti- arthritic, Anti coronary
8.	Oleic acid	Oleic acid	Anti-inflammatory, Antiandrogenic, Cancer preventive, Dermatitigenic, Hypocholesterolemic, 5-α-reductase inhibitor, Anaemiagenic, Insectifuge
9.	1-monolinoleoyl glycerol trimethyl silyl ether	Steroid	Anti microbial, Anti-inflammatory , Anti androgenic, Anti cancer, Anti -arthritic, Anti asthma, Diuretic

*[10] Dr. Duke's phytochemical & ethnobotanical database

of individual phytochemical constituents and subjecting it to biological activity will definitely give fruitful result.

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