Research Article

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Screening of the Potential Phytochemicals from the *Capparis Decidua* Fruit Extract using GC-MS

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ABSTRACT

The aim of the present study was to investigate the medicinal phytochemicals from the *Capparis decidua* (*C. decidua*) fruit extract by gas chromatography –mass spectroscopy (GC-MS) analysis. For this purpose, fruits were collected from Jhunjhunu district, Rajasthan, India. After collection they were washed, shade-dried and powdered. The methanolic extract was then prepared by soxhalate method. Fruits of *C. decidua* extract were analysed for the phytocompounds present in it using GC-MS. Identification was done by the National Institute of Standards and Technology (NIST) library. Fatty acid, phenolic and heterocyclic compounds were identified. These compounds isolated from the GC-MS analysis of methanolic extract of C. decidua fruit are known to be responsible for the antibacterial, antidiuretic and anti-inflammatory activities, therefore of importance in the pharmaceutical industries.

KEYWORDS: *C. decidua*; Phytochemicals; Gas chromatography-mass spectroscopy

INTRODUCTION

The plant has been used as source of food and for therapeutics since the ancient times. In recent time, medicinal plants are playing special role in the pharmaceutical industries due to the presence of phytochemical compounds which are physiologically active and capable of divulging the health problems [1-3].

The people are reconsidering the use of plants for their medicinal values, the different types of products are derived from many herbs and shrubs due to multifunctional curing efficacy of the bioactive constituents present in them. According to the recent reports, there is great demand for the herbal medicine, it is estimated that about 70-80% of the world population specifically in developing countries, relies on herbal medicine and about 25% of the allopathic medicines are derived from medicinal plants [4,3].

C. decidua is the perennial woody plant of family Capparidaceae, usually grown wild in the dry climate particularly in the desert areas i.e. Rajasthan, Gujarat and Western Ghats [5,6]. The fruits of *C. decidua* are small, fleshy, globular, and glabrous berries which are green in color when unripe and pink on ripening and black in color when dried [7,8]. Capparis species are rich sources of glycolipids and phospholipids and major fatty acids like palmitic, palmitioleic, stearic, linoleic, linolenic, and myristic acids. The oleic acid followed by linoleic acid is present in caper seeds [9].

Medicinal properties of *C. decidua* have also been reported. It has curing properties such as antirheumatic, tonic, antispasmodic, analgesic and antipyretic properties [10]. Various biochemical compounds, alkaloids, phenols, sterols or glycosides present in Capparis sp. might be medicinally important and/or nutritionally valuable.

GC-MS is a technique used to analyze drugs and help in the identification of the compounds in a sample. There are a few reports available in literature on the extraction of phytochemical constitutes in various solvent and analysis of bioactive compounds present in *C. decidua* plant parts using GC-MS but fruit has not been analyzed.

Thus, the present research is aimed to screen and analyze of phytochemicals present in the methanolic solvent extract by GC-MS study in the fruits of *C. decidua*.

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MATERIAL AND METHODS

Collection of Plant Material

Green fruits of *C. decidua* L. (Kair) were collected from Jhunjhunu district, Rajasthan, India. The proper identification of this plant was done by a competent botanist (Voucher Specimen No: RUBL-211371) from Department of Botany, University of Rajasthan, Jaipur.

Preparation of *C. Decidua* Extract (CDE)

Fruits of *C. decidua* were washed under tap water to remove dust then shade-dried in dust free environment. Powder was obtained by using a grinder separately for extraction. The dry powder was preserved in airtight container.

The dried powdered samples of fruit were extracted in Soxhlet extraction unit, 5 grams of sample was extracted successively with methanol in 8 hours. Brown coloured residues were obtained after concentrating the extract under reduced pressure using rotary evaporator. The obtained extract was stored in desiccator for further analysis. The dried sample was reconstituted in methanol to obtain 10 µg ml-1concentrations. Finally, 2 ml of supernatant was taken and filtered through Axiva 0.2 µm nylon syringe filter and transferred to GC vial for analysis.

Interpretation of Mass Spectrum

For the analysis of GC-MS, 1 mg/ml concentration of the CDE extract was prepared in methanol. The prepared sample was kept in a sterile glass vial for further GC-MS process.

GC-MS Conditions

GC-MS analysis of the methanolic extract of *C. decidua* was carried out on a Shimadzu GCMSQP2010 Ultra system. The injector temperature was 280 °C.The samples were injected in the split mode with split ratio 1/60. Injection volume was 1.0µL. A capillary column Rtx-5MS (5% Diphenyl-95% Dimethyl Polysiloxane), 30 m (length) x 0.25mm (diameter) x 0.25 µm (film thickness), was used. Carrier gas was helium with constant flow of 1.00 mL/min.

The initial temperature of the oven was 60 °C, held for 2 min, increased to 10 °C/min up to 260 °C and held for 10 min. The MS ionization potential was 70 eV, temperature interface 260 °C having ion source temperature of 280 °C and mass scan range between 40-550 m/z.

RESULTS

Identification of Components

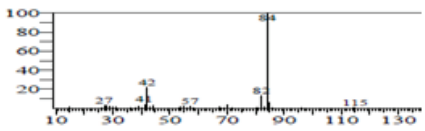
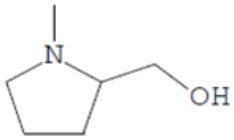
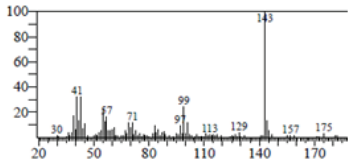
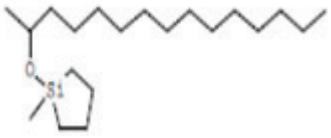
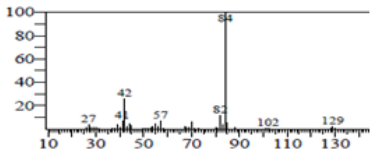
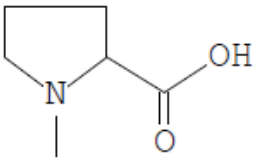
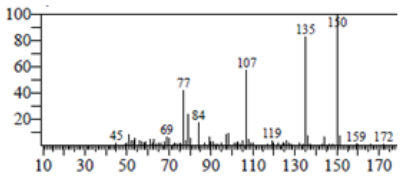
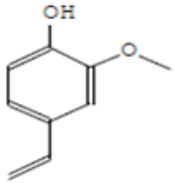
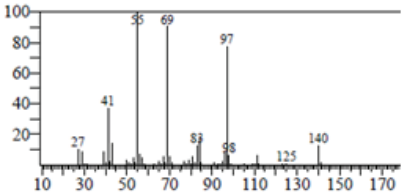
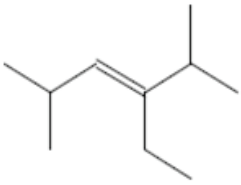
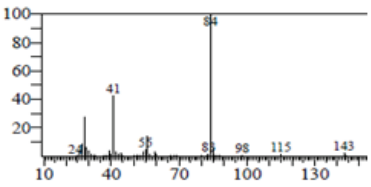
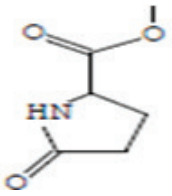
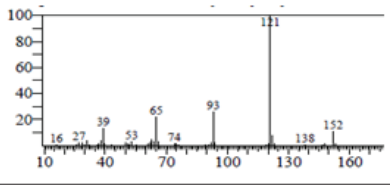
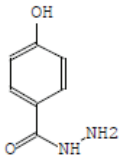
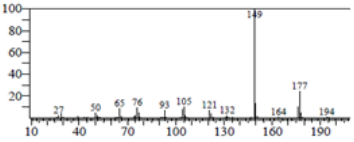
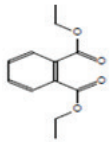
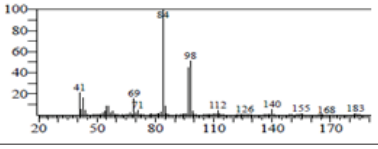
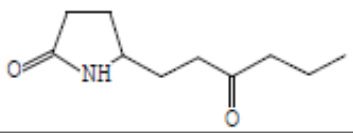
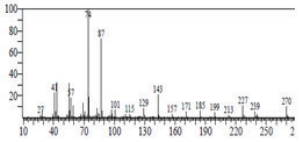
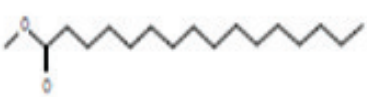
Identification of phytocompounds was based on the principles of retention time, molecular formula, molecular weight (MW), and concentration (peak area %). Some compounds identified in extract of fruit part have medicinal value. The GC mass spectrum of the sample was interpreted by using the database of National Institute of Standards and Technology (NIST) having more than 2,00,000 patterns. The spectrum of the unknown component was compared with the spectrum of the known components stored in the NIST library 14. The names of compounds with MW and structure of the test materials were ascertained.

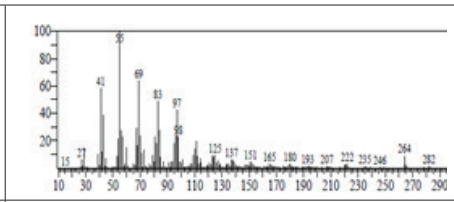
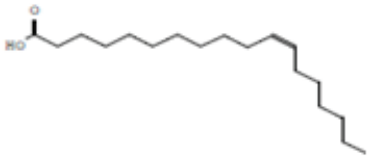
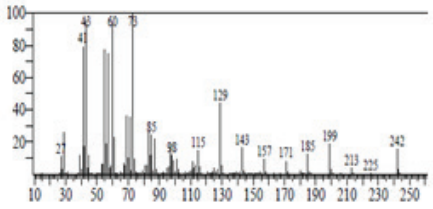
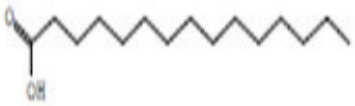
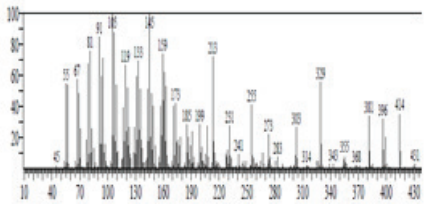
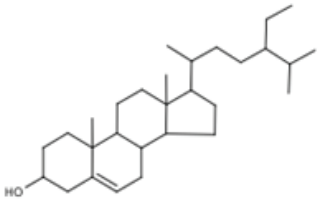
GC/MS analysis of fruit extract of *C. decidua* revealed the existence of several compounds. The major compounds identified in *C. decidua* fruit in term of the area percentage were N-methyl-L-prolinol (10.24),1-methyl-1-(2-pentadecyl)oxy-1-silacyclopentane (1.88),1-Methyl-pyrrolidine-2-carboxylic acid (72.93), 2-methoxy-4-vinylphenol(0.19), 3-hexene, 3-ethyl-2,5-dimethyl (0.32), L-proline (1.95), 5-oxo-methyl ester (1.95), Benzoic acid, 4-hydroxy- hydrazide (0.39), Diethyl phthalate (3.24), pyrrolidin-2-one, 5-[2-butyrylethyl] (0.33), hexadecanoic acid, methyl ester (0.24),cis-vaccenic acid (0.65), pentadecanoic acid (3.70), beta-sitosterol (3.93) (Table 1,2); (Figure 1).

Table 1: Phytocomponents identified in the methanolic fruit extract of C. *decidua*.

S. No.	Retention Time	Area	Area %	Compound Name
1.	7.234	6623894	10.24	N-Methyl-L-prolinol
2.	7.904	1218557	1.88	1-Methyl-1-(2-pentadecyl)oxy-1-silacyclopentane
3.	9.225	47181977	72.93	1-Methyl-pyrrolidine-2-carboxylic acid
4.	11.1	123920	0.19	2-Methoxy-4-vinylphenol
5.	11.435	208681	0.32	3-Ethyl-2,5-dimethyl-3-hexene
6.	11.93	1260022	1.95	L-Proline, 5-oxo-methyl ester
7.	13.062	251627	0.39	Benzoic acid
8.	14.642	2098404	3.24	Diethyl Phthalate
9.	18.096	213885	0.33	Pyrrolidin-2-one
10.	18.299	152551	0.24	Hexadecanoic acid
11.	18.455	423707	0.65	Cis-Vaccenic acid
12.	18.649	2395564	3.7	Pentadecanoic acid
13.	35.282	2544752	3.93	β-Sitosterol

Table 2: GC-MS chromatogram of isolated phytochemicals compounds with structures of *C. decidua*.

S. No.	Name of compound	GC MS Chromatogram	Structure
1.	N-Methyl-L-prolinol		
2.	1-Methyl-1-(2-pentadecyl) oxy-1-silacyclopentane		
3.	1-Methyl-pyrrolidine-2-carboxylic acid		
4.	2-Methoxy-4-vinylphenol		
5.	3-Ethyl-2,5-dimethyl-3-hexene		
6.	L-Proline, 5-oxo- methyl ester		
7.	Benzoic acid, 4-hydroxy-hydrazide		
8.	Diethyl Phthalate		
9.	Pyrrolidin-2-one, 5-[2-butyrylethyl]-		
10.	Hexadecanoic acid		

11.	Cis-Vaccenic acid		
12.	Pentadecanoic acid		
13.	β-Sitosterol		

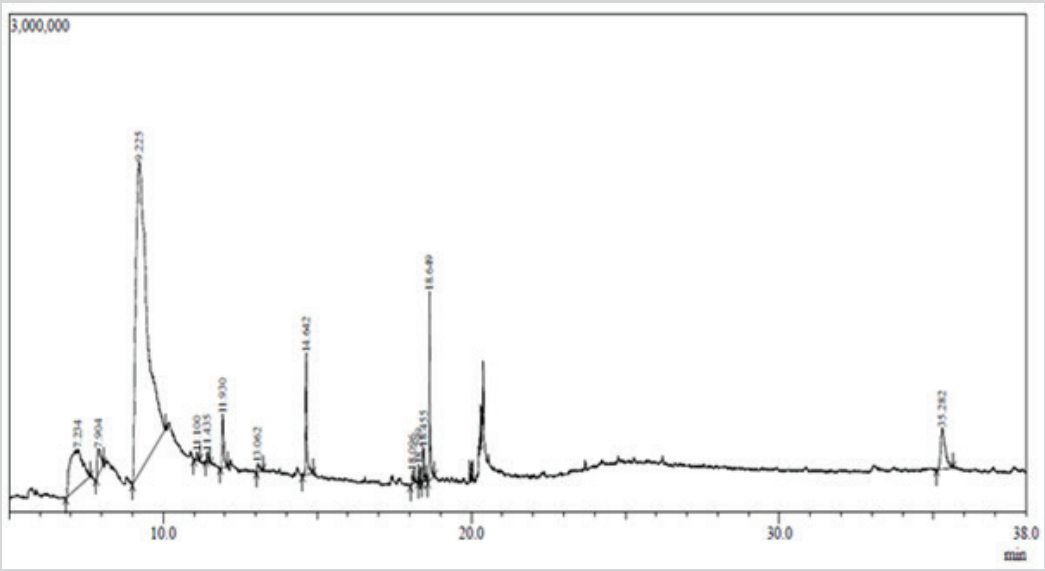


Figure 1: GC-MS chromatogram of C. *decidua* fruit extract.

DISCUSSION

The screening of the methanolic extract of *C. decidua* fruit extract observed positive results for most of the phytochemical constituents. According to the above results, most of the compounds are medicinally important and are used in cure of various infections. The major components of the fruits are fatty acids and heterocyclic compounds which are antibacterial, antifungal, antidiabetic and anti-inflammatory. Hexadecanoic acid and pentadecanoic acid fatty acid have antimicrobial activities [11].The local people of the India use the Caper fruit in food to make pickle and curry and as anti-diabetic, eye smoothening and as laxative [11-14,3]. It has been also reported that fruit extract of caper mixed with sugar ameliorates rheumatism and diarrhea in livestock animals. Antispasmodic, analgesic, antipyretics, tonic, expectorant properties have also been reported by the different researchers in caper plant [15,16,3].

One of the constituent Beta-sitosterol identified in other fruits showed significant anti-inflammatory activity in carageenan-induced rat paw edema very similar to that of indomethacin and also showed a inhibition of cyclooxygenase and 5-lipooxygenase pathways in adjuvant induced rat paw edema [17]. *C. decidua* is also useful against inflammation and asthma [14]. The consumption of the caper fruit also reduces the level of blood sugar and help in improving lipid profile [18]. Seeds of C. decidua contain isothiocyanate a glycon which arrested the growth of gram negative bacteria such as Vibrio cholera, V. ogava, V. inaba,V. ettorGaind, and V eltor [19-21].

CONCLUSION

In countries like, India, Turkey, Egypt, and Morocco, *C. decidua* is being used in traditional medicine since ages. Nowadays, *C. decidua* is also commercially cultivated in several countries for its fruits. Research are being carried out continuously by scientists on the xerophytic plants by identifying, isolating, and extracting potentially useful medicinal constituents which lead towards the treatment of various ailments as anti-inflammatory, hepatoprotective, antihelmintic, antibacterial, antifungal and other infections.

There are only few reports on the isolation and identification of the bioactive compounds of the Capparis species. In this study the methanolic extract of the *C. decidua* fruit were analyzed for their active components of medicinal values by GC-MS analysis. The major constituents belong to the alkaloids and fatty acids. These identified components are used in curing various diseases as reported by the researchers. Fruits are also used in traditional medicinal practices [22].

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