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Research Article

GAS CHROMATOGRAPHY–MASS SPECTROSCOPY ANALYSIS OF ETHANOLIC EXTRACT OF LEAVES OF *CORDIA OBLIQUA WILLD*

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ABSTRACT

Objective: *Cordia obliqua Willd.* also called as clammy cherry is a flowering plant species in the genus *Cordia* belonging to the family Boraginaceae. This study focus to find out the active principles and its therapeutic properties.

Methods: *C. obliqua* was collected from B. Maduvangarai, Tamil Nadu, India. The leaves were collected and extract prepared from ethanol by hot continuous percolation method in Soxhlet apparatus for 24 h. The ethanolic extract was collected and analyzed using Perkin–Elmer gas chromatography–mass spectroscopy (GC–MS) for the identification of active biochemical constituents present in the leaves of *C. obliqua* Willd.

Results: GC–MS analysis of the ethanolic extract of leaves of *C. obliqua* showed 11 bioactive compounds, the highest compound was named as 4-pentadecyne, 15-chloro-(13.574%) and lowest was named as 2-isopropyl-5-methylcyclohexyl 3-(1-(4-chlorophenyl)-3-oxobutyl)-coumarin-4-yl carbonate (6.461%).

Conclusion: In the present study, we concluded that the phytochemical constituents of the ethanolic extract of leaves of *C. obliqua* by GC–MS is to furnish the scientific information to evolve potential phytomedicine.

Keywords: Herbal plants, Gas chromatography–mass spectroscopy, *Cordia obliqua,* Therapeutic, Diseases, Phytomedicine.

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INTRODUCTION

India is the biggest producer of medicinal herbs and is appropriately called the botanical garden of the world [1]. Herbal plants play a most important role in humans to treat various life-threatening diseases. There are 13 species found in India, one of them is *Cordia obliqua* Willd. The clammy cherry is a flowering plant species in the genus *Cordia* belonging to the family Boraginaceae. It is found worldwide, mostly in warmer parts [2] of India and Ceylon. *C. obliqua* [3] leaves are simple, alternate, estipulate; petiole 25–50 mm long, slender, pubescent, grooved above, elliptic, ovate or orbicular; base acute, truncate, subcordate or rounded, apex acute or obtuse; margin entire or crenate, chartaceous, glabrous above, tomentose beneath; nerves 3–5 from the base, palmate, lateral nerves 4–7 pairs, prominent, pinnate, tomentose beneath, especially on the axils of nerve; and intercostal scalariform, prominent. Conventionally, *C. obliqua* is used for cooling effects, anthelmintic, expectorant [4], and diuretic. It lessens thirst and burning of urine, take away pains in the joints and it is used as treatment of diseases of spleen and leprosy [5,6]. Stem bark [7] is used as a mild tonic, kernels are a remedy in treatment in ringworm, leaves are used to treat ulcers and headache externally. Seeds are used as anti-inflammatory [8,9] and antimicrobial agent [10]. A pickle is prepared from raw fruits of *C. obliqua* and also used as vegetable [11,12]. Uphof [13] has stated that the fruits are used as a demulcent in Southern Iran. In the raw condition, they contain a gum [14] which can be used beneficially in gonorrhea [15].

GC–MS is a hyphenated system which is very suitable method and the most commonly used technique for the identification and determination purpose. The unidentified biological compounds in a complex mixture can be evaluated by interpretation and also by matching the spectra with reference spectra. The aim of this study is to identify the various bioactive compounds present in ethanolic extract of the leaves of *C. obliqua* using GC–MS analysis.

MATERIALS AND METHODS

Collection and Identification of *C. obliqua*

C. obliqua [16,17] was collected from B. Maduvangarai, Chidambaram Taluk, Cuddalore District, Tamil Nadu, India. Taxonomic identification was made from Botanical Survey of Medicinal Plants Unit Siddha, Government of India, Palayamkottai.

Extraction and Isolation of *C. obliqua*

The leaves of *C. obliqua* were dried under shade, segregated, pulverized by a mechanical grinder, and passed through a 40 mesh sieve. The powdered plant materials were stored in an air-tight container. The above powdered components were continuously extracted with ethanol in a Soxhlet apparatus using a 24 h continuous hot percolation method. The extract was concentrated on a rotary evaporator [18] and subjected to freeze-drying in a lyophilizer [19,20] until a dry powder was obtained.

Gas Chromatography–Mass Spectroscopy Analysis

Clarus 680 GC was passed down in the analysis to engaged a fused silica column, packed with Elite-5MS (30 m × 0.25 mm ID × 250 μm df, 5% biphenyl 95% dimethylpolysiloxane) and the components were distinct using helium as carrier gas at a constant flow of 1 ml/min. The injector temperature was set at 260°C throughout the chromatographic run. The 1 μL of extract sample infuse into the instrument, the oven temperature was as follows: 60°C (2 min); pursue by 300°C at the rate of 10°C min^{-1}; and 300°C, where it was held for 6 min. The mass detector conditions were, transfer line temperature 240°C and ion source temperature 240°C. The ionization mode electron impact at 70 eV with 0.2 s of scan time and 0.1 s of scan interval and from 40 to 600 Da (dalton) of fragments. The spectrums of the components were compared with the database of spectrum of known components stored in the GC–MS National Institute Standard and Technology (NIST) (2008) library.

Table 1: Phytocomponents identified in ethanolic extract of the leaves of *C. obliqua*

S. No.	RT	Name of the compound	Molecular formula	Molecular weight	Peak area %
1	21.441	11-Tridecen-1-ol	$C_{13}H_{26}O$	198	10.186
2	21.751	E-2-Octadecadecen-1-ol	$C_{18}H_{36}O$	268	8.459
3	27.693	16-Heptadecenal	$C_{17}H_{32}O$	252	10.327
4	27.743	Spiro[Androst-5-ene-17,1'-cyclobutan]-2'-one, 3-hydroxy-,(3.beta.,17.beta.)-	$C_{22}H_{32}O_2$	328	8.022
5	27.803	1-Hexyl-2-nitrocyclohexane	$C_{12}H_{23}O_2N$	213	10.156
6	28.304	1-Hexyl-1-nitrocyclohexane	$C_{12}H_{23}O_2N$	213	7.786
7	28.579	Cyclohexane, 1-(1,5-dimethylhexyl)-4-(4-methylpentyl)-	$C_{20}H_4O$	280	8.776
8	28.764	2-isopropyl-5-methylcyclohexyl 3-(1-(4-chlorophenyl)-3-oxobutyl)-coumarin-4-yl carbonate	$C_{30}H_{34}O_6$	490	6.461
9	28.899	Hexadecane, 1,16-dicholoro-	$C_{16}H_{32}C_{l2}$	294	7.483
10	29.274	4-Pentadecyne, 15-chloro-	$C_{15}H_{27}Cl$	242	13.574
11	29.859	(S)(+)-Z-13-methyl-11-pentadecen-1-ol acetate	$C_{18}H_{34}O_2$	282	8.770

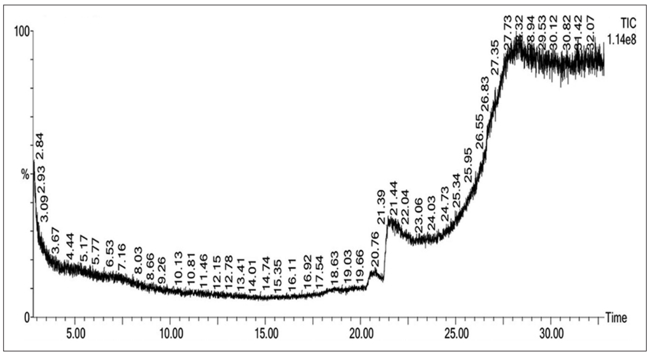

Fig. 1: GC–MS chromatogram of the ethanolic extract of leaves of *Cordia obliqua*

Identification of phytocomponents

Evaluation on GC–MS was conducted using the database of NIST having more than 62,000 patterns. The spectrum of the unknown compounds was correlated with the spectrum of known compounds stored in the NIST library. The structure, name, and molecular weight of the components of the test substances were confirmed [21].

RESULTS AND DISCUSSION

GC–MS analysis of the ethanolic extract of leaves of *C. obliqua* revealed various compounds with the help of NIST library [22]. A total of 11 most abundant compounds with their retention time, molecular formula, molecular weight, and peak area are listed in Table 1 and GC–MS chromatogram of the 11 peaks of the compounds detected is shown in Fig. 1. The components found in the ethanolic extract of leaves of *C. obliqua* Willd. were 11-Tridecen-1-ol [10.186], E-2-Octadecadecen-1-ol [8.495%], 16-Heptadecenal [10.327%], Spiro[Androst-5-ene-17,1'-cyclobutan]-2'-one,3-hydroxy-,(3.beta.,17.beta.)-[8.022%], 1-Hexyl-2-nitrocyclohexane [10.156%], 1-Hexyl-1-nitrocyclohexane[7.786%], Cyclohexane,1-(1,5-dimethylhexyl)-4-(4-methylpentyl)-[8.776%], 2-isopropyl-5-methylcyclohexyl 3-(1-(4-chlorophenyl)-3-oxobutyl)-coumarin-4-yl carbonate [6.461%], Hexadecane,1,16-dicholoro-[7.483], 4-Pentadecyne, 15-chloro- [13.574%], and (S)(+)-Z-13-methyl-11-pentadecen-1-ol acetate [8.770%]. Plants are important source of treatment approach in different traditional medicinal systems. A large group of people believe in herbal related medicines due to its lesser side effects. GC–MS analysis will often help to evaluate the quality of plant extract. Therefore, this method is direct and fast analytical approach for identification of active compounds. Evaluation of the ethanolic extract of the above plant showed positive outcomes for the majority of bioactive constituents. Based on the results, the above 11 bioactive compounds [23,24] were identified from *C. obliqua* through GC–MS [25-27], many of them show a potential therapeutic activity against various diseases [28,29].

CONCLUSION

The manifestation of assorted bioactive constituents detected after GC–MS analysis using the ethanolic extract of *C. obliqua* Willd. justifies the use of leaves for countless ailments by traditional practitioner. Therefore, it is recommended as a plant of phytopharmaceutical value. GC–MS analysis is the first step toward comprehension the nature of active components in the above plant. The isolation of accountable bioactive components and their biological activity is essential for future studies.

AUTHORS' CONTRIBUTIONS

All the authors contributed equally to the paper.

CONFLICTS OF INTEREST

No conflicts of interest.

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