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Research Paper

GC-MS Analysis of Phytochemicals in the Aqueous Extract of Cyclea Peltata. (Lam) Hook.f.&Thomson

Botany

KEYWORDS : GC-MS analysis, phytochemicals, Cyclea peltata , Aqueous extract

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ABSTRACT

Cyclea peltata is locally called as "Pahadwel" belongs to the family Menispermaceae. It is a twining shrub, traditionally used in the treatment of wounds, skin infections and muscular sprains by local folk medicinal practioners. The present study was designed to determine the phytochemical compounds in the aqueous extract of Cyclea peltata (Voucher Specimen No. 510/BMV/184 and parts used as rhizome) by GC-MS analysis. GC-MS chromatogram of the aqueous extract showed ten major peaks at retention time of 22.281, 23.086, 23.577, 23.857, 24.602, 25.322, 26.023, 26.763, 27.603 and 28.569 minutes. The spectrum of the unknown components in the aqueous extract was compared with the spectrum of known compounds stored in the NIST library. The mass of the compounds and fragments recorded were matched with NIST database for identification of probable compounds present in the sample and from GC-MS results. Ten phytochemical compounds were identified and reported the activity such as Antimicrobial, Antioxidant, Inflammatory, Anticancer, Antidiabetic, and Hemolytic.

INTRODUCTION

Cyclea peltata is a member of the family Menispermaceae, in ayurveda it is commonly known as *Rajpatha* [1]and its local name is Pahadwel. It is a slender, much branched twining shrub found throughout South and East India. Roots are tuberous and are traditionally used in the treatment of cough, urinary disorder, snake poisoning, jaundice, diabetes, fever, stomach ache and asthma[2,3]. Leaves are peltate, hairy and are two to three centimeters long. Leaves are traditionally used as coolant, antidandruff and diuretic. Flowers are very small, male flowers are arranged in long panicles. Fruits are drupe and reniform. The species of this plant are easily distinguished by the cup-shaped calyx and corolla[4].Traditionally local folk medicine practioners residing in Uttamsagar tribal settlements of Multai taluka, Betul district, use this plant as one of the ingredients in their herbal formulations for treatment of wounds, skin infections and muscular sprains. Recent studies have shown that *Cyclea peltata* possesses anti oxidant activity[5], anti-diuretic activity[3], hepatoprotective activity[6], anti-hyperlipidemic activity[7] and anti-diabetic activity[8].It has been reported that rhizome of *Cyclea peltata* have capability of treating Nephrolithiasis[9] and Type 2 diabetes[10]. It contains tetrandrine and a bisbenzylisoquinoline dioxine having antioxidant activity[11]. Leaves contain alkaloids such as cycleanine, bebeerines, hayatinin, hayatidin and hayatin which are having medicinal value[3].There has been not much information available on phytochemical components in the aqueous extract of the rhizome part of *Cyclea peltata* , hence the present study was designed to identify phytochemical compounds in the aqueous extract of *Cyclea peltata* by GC-MS analysis.

MATERIALS AND METHODS

(i) Authentication of plant material

Plant materials were collected from Uttamsagar tribal settlements of Multai taluka, Betul district, Madhya Pradesh,India. The plants were photographed, taxonomically identified and their herbarium specimens were made. Herbarium specimens were deposited in the Department of Botany, Bharatiya Mahavidyalaya, Amravati, Maharashtra, India.

(ii) Collection of plant materials

Fresh plant materials of *Cyclea peltata* comprising only rhizomes were collected and were washed in sterile distilled water and cleaned plant material were wiped with clean dry cloth. The plant material was shade dried under room temperature for seven days and was ground into coarse powder.

(iii) Extraction of Plant Material

Twenty grams of powdered sample was subjected to soxhlet extraction using 500 ml of Distil water for eight hours at 50°C. The aqueous extract was filtered through Whatmann No. 1 filter paper and filtrate was evaporated in rotary evaporator, dried in desiccators and stored until further use.

(iv) Preparation of stock solution

The extract was reconstituted in Distil water. 1 µl of the aqueous extract was employed in GC-MS for the analysis of different compounds.

(v) Gas Chromatography-Mass Spectrometry analysis [12]

GC-MS analysis of the aqueous extract of *Cyclea peltata* (rhizome) was performed using a GC- MS Clarus 500 Perkin Elmer system which comprised a AOC- 20i autosampler and gas chromatograph interfaced to a mass spectrometer (GC-MS) instrument. GC was equipped with a fused capillary column Restek Rtx^{R} – 5, (30meter X 0.25 mm) (5% diphenyl / 95% dimethyl polysiloxane), running in electron impact mode at 70 eV. For GC-MS detection, an electron ionization system was operated in an electron impact mode with ionization energy of 70 eV. Helium (99. 999%) was used as carrier gas at a constant flow rate of 1ml/min.1.0 µl volume of aqueous extract of *Cyclea peltata* (rhizome) was injected to GC-MS which splits the components into 10:1 ratio and the injector temperature was maintained at 280°C, the ion-source temperature was 200°C. The oven temperature was programmed from 40°C (isothermal for 5 min.), with an increase of 6°C/ min to 280°C, then ending with a fifteen minutes isothermal at 280°C. Mass spectra were taken at 70 eV; a 0.5 seconds of scan interval and fragments from 40 to 550 Da. The total GC running time was 60 minutes.The relative percentage amount of each component was calculated by comparing its average peak area to the total areas. The mass-detector used in this analysis was Turbo-Mass Gold-Perkin-Elmer, and the software adopted to handle mass spectra and chromatograms was a Turbo-Mass ver-5.4.2.

(vi) Identification of phytochemical components

National Institute Standard and Technology (NIST) database having more than 62,000 patterns was used for interpretation on mass-spectrum GC-MS obtained for the respective plant extract. The spectrum of the unknown compounds were compared with the spectrum of known components stored in the NIST library and the name, molecular weight and structure of the components of the test plant extract was ascertained.

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RESULTS AND DISCUSSION

GC-MS chromatogram of the aqueous extract of *Cyclea peltata* rhizome showed ten major peaks at retention time of 22.281, 23.086, 23.577, 23.857, 24.602, 25.322, 26.023, 26.763, 27.603 and 28.569 minutes (Figure-1) and extracted ion chromatograms were obtained from matching all these major peaks with NIST library. The mass of the compounds and fragments recorded were matched with NIST database for identification of probable compounds present in the sample. Ten phytochemical compounds were identified in the aqueous extract of the rhizome of *Cyclea peltata* by GC-MS. Names of these phytocompounds along with its molecular formula and molecular weight details are all listed in table 1. From the results, it was observed that Sulfurous acid, 2-Propyl Tridecyl Ester, Sulfurous acid, Pentadecyl 2-Propyl Ester and Sulfurous acid, 2-Propyl Tridecyl were found to be the major components constituting about 28.59% of the extract. The second major components in the extract were –Hexatriacontane, Di-N-Decylsulfone and Eicosane,9-Octyl constituting about 27.23 % of the extract. P-Phenylhydroconnamonitrile, and Cyclotrisiloxane, Hexamethyl are the third major components in the extract constituting about 19.60 % of the extract. Whereas phytocomponents such as Trimethyl Silane were found to be in a very less quantity constituting about 6.48 % of the extract. The percentage of all the phytocompounds present in the extract were all listed in the table 1.

Figure 1: ***GC-MS Chromatogram of the rhizome part aqueous extract of Cyclea peltata***

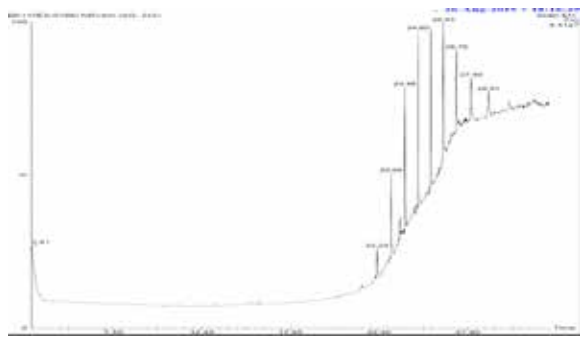

Table 1 Phytochemical constituents identified in the rhizome part aqueous extract of *Cyclea peltata* B-6-(15ES-0186) by GC-MS along with its molecular formula, molecular weight details.

Sr. No.	Retention Time	Peak area (%)	Compound analyzed	Molecular formula	Molecular weight	Common Name	Activity reported
1	22.281	1.646	Sulfurous acid,2-Propyl Tridecyl Ester	$C_{16}H_{34}O_3S$	306	Ethyl Acetate	Antimicrobial, antioxidant
2	23.086	3.340	Hexatriacontane	$C_{36}H_{74}$	506	Hexanoyl chloride	Antimicrobial, antioxidant
3	23.577	1.211	P-Phenylhydroconnamonitrile	$C_{15}H_{13}N$	207	Sodium chloride	Antimicrobial, Insecticidal
4	23.857	5.871	Sulfurous Acid, Pentadecyl 2-Propyl ester	$C_{18}H_{38}O_3S$	334	Ethyl acetate	Antioxidant, antimicrobial, anti-inflammatory
5	24.602	9.419	Di-N-Decylsulfone	$C_{20}H_{42}O_2S$	346	Ketone	Antioxidant
6	25.322	6.093	Sulfurous acid, 2-Propyl Tridecyl ester	$C_{16}H_{34}O_3S$	306	Phosphoric acid	Antioxidant
7	26.023	6.022	Eicosane, 9-Octyl	$C_{28}H_{58}$	394	Dipropyl methane	Anticancer
8	26.763	4.948	Di-N-Decylsulfone	$C_{20}H_{42}O_2S$	346	Ketone	Antioxidant
9	27.603	4.051	Cyclotrisiloxane, Hexamethyl	$C_6H_{18}O_3Si_3$	222	Dimethyl siloxane	Antioxidant,antimicrobial, Anti-inflammatory, Hemolytic
10	28.569	4.168	Trimethyl Silane	$C_6H_{18}O_3Si_3$	222	Phenol	Antioxidant, Antimicrobial, Antidiabetic, Anticancer

CONCLUSION

Cyclea peltata was used by folk medicinal practioners for treating various ailments since from very long time for many generations and there has been not much information available on phytochemical components of this plant extracts. With this background among ten phytochemical compounds identified in the present study a few of them may have some useful therapeutic activity which may be of pharmacological importance. Hence further isolation of these compounds and their screening for specific bioactivity is required for developing novel therapeutic agents for treating different ailments.

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