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GC-MS ANALYSIS OF VOLATILE COMPONENTS IN PETROLEUM ETHER EXTRACTS OF COLDENIA PROCUMBENS LINN.

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ABSTRACT

Coldenia procumbens Linn. is a procumbent, deep rooted, hairy herb and very rare valuable medicinal plant species belongs to Boraginaceae family. The present work deals with the GC-MS analysis of petroleum ether extract of *Coldenia procumbens Linn.* The results had shown many compounds with different peak areas showing highest peak area percentage for 9,12-Octadecadienoic acid and least peak area percentage for Stigmast-4-en-3-one. The results of this study will give information about the occurrence of different types of chemical compounds from Coldenia procumbens Linn. along with their significant pharmacological active properties.

KEYWORDS: Coldenia procumbens Linn., Boraginaceae, GC-MS Analysis, 9,12-Octadecadienoic acid, Stigmast-4-en-3-one.

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INTRODUCTION

Naturally occurring plants are the excellent sources for active chemical constituents which are regularly using to cure even chronic diseases. The plant derived molecules which are identified as drugs are playing a vital role in Ayurveda and Siddha therapies from the last few ages. Hence natural products are always becoming new sources for the synthesis of new drugs with different pharmacological activities. Basing on literature survey and pharmaceutical potential values, *Coldenia procumbens Linn.*[1] was selected for our present study. *Coldenia procumbens Linn.* Grows like an annual herb, and a common weed in India[2,3] belongs to Boraginaceae[4]family, which has around 150 genera and almost 2,500 species across the globe. *Coldenia procumbens Linn.* is only species of its genus has a place both in the Hortus Bengalensi's and Moon's Catalogue of Ceylon plants[5]. The plant is efficacious in treating fever, piles and scorpion stings. In the traditional system of medicine, the plant was used as anti inflammatory[6], anti microbial[7], analgesic[8], anti diabetic[9], CNS depressant[10]. Fresh leaves of *Coldenia procumbens Linn. powdered* and applied to Rheumatic Swellings, equal parts of dried powder mixed with seeds of fenugreek causes Suppurations of boils[11]. Acetone, water, metabolic extract of dried aerial parts shows weak angiotensin-converting enzyme inhibition in vitro[12,13]. The preliminary investigation of this plant showed the presence of Flavonoids, Carbohydrates & Glycosides, Steroids and Alkaloids[14]. The active constituents like coumestan derivative Wedelolactone[15] and rare Cyanoglucosides[16] were also extracted from this plant. In this study, the whole plant extract of *Coldenia procumbens Linn.* in petroleum ether was used to determine the possible chemical constituents by GC-MS analysis.

MATERIALS AND METHODS

PLANT MATERIAL COLLECTION

The plant material was collected at Nunna near Vijayawada, Andhra Pradesh, India from moist place in agricultural land. The plant was authenticated by Prof .V. S. Raju and voucher specimen was kept in the Department of Botany, Kakatiya University, and Warangal, India with authentication number 1877.

Figure 1
Coldenia procumbens Linn.

PREPARATION OF PLANT EXTRACTS & GC-MS Methodology

The leaves of the *Coldenia procumbens Linn.*were shade dried, powdered and subjected to preliminary phytochemical studies[17,18]. The plant powder (100g) was packed in an aspirator and extracted with petroleum ether, extraction was continued until the solvent becomes colorless by several psyphonings. The excess of the solvent was distilled off and the crude extract was collected and stored in a refrigerator for further analysis. For GC-MS detection 1 ppm concentration of the crude petroleum ether extract was prepared by diluting with petroleum ether. From that, 1µl of pet.ether extract of Coldenia procumbens Linn.was injected into the instrument with HP-5 MS capillary column . Helium gas(99-999%) was used as carrier gas at a constant flow rate of 1 ml/mn. The compounds were detected by MSD (Mass Selective Detector) and Mass spectra were taken at 70 ev; a scan interval of 0.5 sec and the Mass spectrometer was scanned from m/z 29 t0 600 for EI. The total GC-MS running time was 36 mn. The relative percentage amount of each component was calculated by comparing its average peak area to the total areas.

RESULTS AND DISCUSSION

GC-MS analysis

The GC-MS studies were done at IICT, Hyderabad. The GC-MS analysis was carried out on an Agilent 6890N GC equipped with 5973 inert MSD. HP-5ms capillary column length 30 m, 0.25mm ID and 0.25µm film thickness was used. The column oven was programmed initially from 50°C with 2min hold-up time to the final temperature of 250°C at a heating rate of 10°C/min. The final temperature hold-up time was 10 min. The inlet and interface temperatures were maintained at 200°C and 250°C. The EI source and quadrupole temperatures were maintained at 230°C and 150°C respectively. The MSD (Mass Selective Detector) was used. The GC-MS analysis of petroleum ether extract of whole plant of *Coldenia procumbens Linn.* showed different phytocomponents and they were identified by comparison of their mass spectra with the data base of Indian Institute of Chemical Technology

(IICT), Hyderabad. The name of the compound, retention time, molecular formula and peak area were determined based on the Wiley library at IICT. The GC-MS analysis of petroleum ether extract of *Coldenia procumbens Linn*. revealed the presence of total 20 compounds, out of which 13 compounds were found to have some prominent biological activities. From the results, it was observed that 9,12-Octadecadienoic acid, Hexadecanoic acid, Stigmasta-5,22-dien-3-ol, Phytol, Oxirane, Squalene, Phenol,2,4-bis(1,1-dimethylethyl)-, Eicosanoic acid, Ergost-5-en-3-ol, Gamma-Tocopherol were found to present as major components and 1-Dodecene, 1-Tetradecene, Tetradecane, Tetradecanoic acid, 1-Octadecene, 2-Pentadecanone, 2-Heptadecanone, Hexadecenoic acid, Stigmast-4-en-3-one were present as minor components. These compounds were identified mainly on their peak area, retention time, molecular weight, molecular formula and also by comparision with the compounds presented in Wiley library and are present in table 1 and figure 2. The presence of all the above phytocomponents in the whole plant extract of *Coldenia procumbens Linn.* from GC-MS analysis shows pharmacological activities like anti-bacterial, anti-microbial, anti-tuberculosis, anti-fungal, anti-inflammatory, anti-arthritic and anti-cancer. Hence the current study leads the research to isolate above chemical compounds that are responsible for pharmacological activities in the herb *Coldenia procumbens Linn.*

Figure 2

GC-MS Chromatogram of petroleum ether extract of Coldenia procumbens Linn.

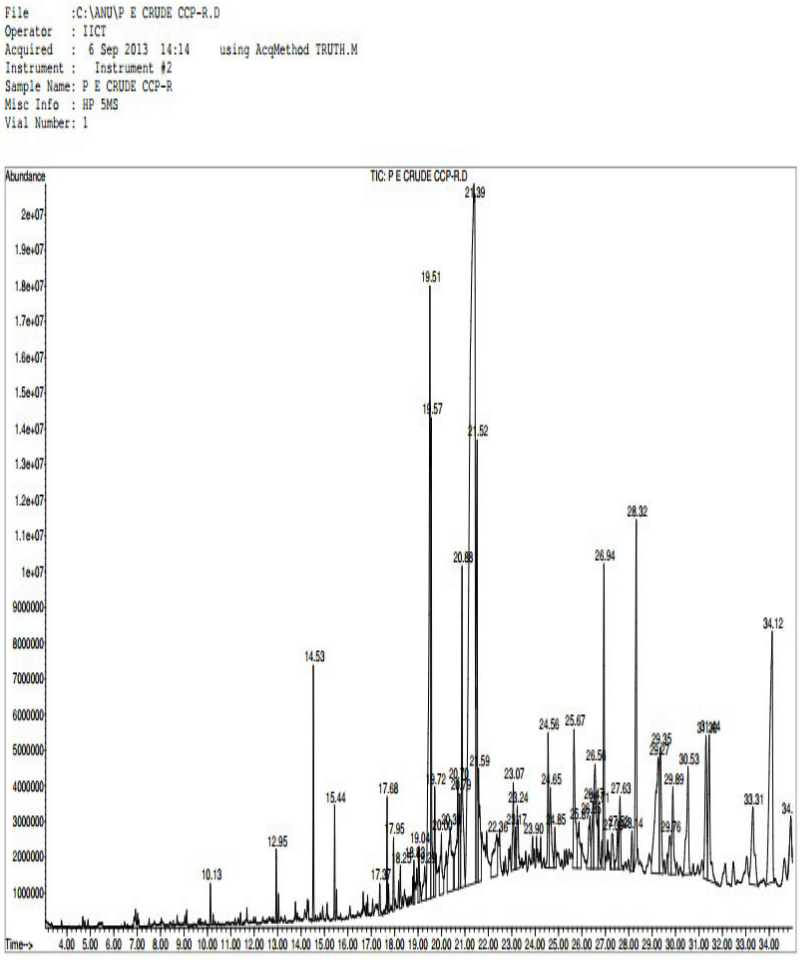

Table 1
GC-MS Analysis of petroleum ether extract of Coldenia procumbens Linn.

S.No	RT	Name of the Compound	Mol. Formula	MW	Peak area in percentage
1	10.122	1-Dodecene	$C_{12}H_{24}$	168	0.427%
2	12.934	1-Tetradecene	$C_{14}H_{28}$	196	0.608%
3	13.036	Tetradecane	$C_{14}H_{30}$	198	0.226%
4	14.524	Phenol,2,4-bis(1,1-dimethylethyl)-	$C_{14}H_{22}O$	206	2.29%
5	17.361	Tetradecanoic acid	$C_{14}H_{28}O_2$	228	0.304%
6	17.664	1-Octadecene	$C_{18}H_{36}$	252	0.845%
7	18.244	6, 10, 14,-Trimethyl-2-Pentadecanone	$C_{18}H_{36}O$	268	0.370%
8	18.824	2-Heptadecanone	$C_{17}H_{34}O_2$	270	0.248%
9	19.291	Hexadecenoic acid	$C_{16}H_{30}O_2$	254	0.148%
10	19.499	Hexadecanoic acid	$C_{16}H_{32}O_2$	256	18.470%
11	20.880	Phytol	$C_{20}H_{40}O$	296	4.207%
12	21.347	9,12-Octadecadienoic acid	$C_{18}H_{32}O_2$	280	45.446%
13	23.074	Eicosanoic acid	$C_{20}H_{40}O_2$	312	1.307%
14	26.650	Stigmast-4-en-3-one	$C_{29}H_{48}O$	503	0.130%
15	26.908	Squalene	$C_{30}H_{50}$	410	4.068%
16	28.314	Oxirane	$C_{10}H_{20}O$	156	5.888%
17	29.897	Gamma-Tocopherol	$C_{28}H_{48}O_2$	416	1.282%
18	33.290	Ergost-5-en-3-ol	$C_{28}H_{48}O$	400	1.295%
19	34.059	Stigmasta-5,22-dien-3-ol	$C_{29}H_{48}O$	412	11.449%
20	31.285	Vitamin E	$C_{29}H_{50}O_2$	430	5.149%

Table2
Activities of some of the phytocomponents identified in petroleum ether extract of Coldenia procumbens Linn.

S.No	Name of the Compound	Nature of the compound	Activity
1	1-Octadecene	Aliphatic Hydrocarbon	Anti-tuberculosis activity and Anti-fungal activity[19]
2	Phenol,2,4-bis(1,1-dimethylethyl)-	Alcoholic compound	Antifungal activity, Antimicrobial, UV stabilizer and an antioxidant for hydrocarbon-based products, Antimalarial activity, Antibacterial activity, Antioxidant[20]
3	6, 10, 14,-Trimethyl-2-Pentadecanone	Aliphatic Hydrocarbon	Allelopathic activity, Antimicrobial activity[20]
4	Phytol	Diterpene	Antimicrobial activity, , Anticancer, Antiinflammatory and Diuretic activity[21]
5	Hexadecenoic acid	Fatty acid	Analgesic, Antipyretic and Anti-inflammatory activities[22]
6	Tetradecanoic acid	Fatty acid	Antioxidant, Lubricant, Hypercholesterolemic, Cancer-preventive, Cosmetic[23]
7	Hexadecanoic acid	Fatty acid	Antioxidant, Pesticide, Flavor, 5-Alpha Reductase-inhibitor, Antifibrinolytic, Hemolytic, Lubricant, Nematicide, Antialopecic[23]
8	9,12-Octadecadienoic acid	Fatty acid	Anticoronary, Antialopecic, Antiarteriosclerotic, Antiarthritic, antianaphy- lactic, Antieczemic, Cancerpreventive, antiprostatic, hepatoprotective, Hypocholesterolemic, Metastatic, Nematicide[23]
9	Gamma-Tocopherol	Methylated phenols	Anticancer, Antioxidant, Antitumor, Antiinflammatory, Hypocholesterolemic, Cardioprotective[23]
10	Ergost-5-en-3-ol/ Campesterol	Phytosterol	Antioxidant, Hypocholesterolemic[23]
11	Stigmasta-5,22-dien-3-ol/ Stigmasterol	Phytosterol	Antihepatotoxic, Antiviral, Antioxidant, Cancerpreventive, Hypocholesterolemic[23]
12	Vitamin E	Vitamin Compound	Antiaging, Antialzheimeran, Antidermatitic, Antidiabetic, Antioxidant, Antitumor, Cancer-preventive, Hypocholesterolemic, Immunostimulant[23]
13	Squalene	Triterpene	Antibacterial, antioxidant, antitumor, cancer preventive, immunostimulant[24]

CONCLUSION

The results from the GC-MS analysis of petroleum ether extract of *Coldenia procumbens Linn.* conclude that the phyto components present in this species are having several medicinal properties and offers further research to isolate novel compounds in order to develop their pharmaceutical properties. Hence,the *Coldenia procumbens Linn.* is used as herbal alternative for the synthesis of pharmacological active constituents and is safe to use in traditional medicine system.

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