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Evaluation and characterization of phytocompounds from aerial parts of *Coldenia procumbens* Linn.

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Abstract
The plant *Coldenia procumbens* Linn. is used as a common medicine in Indian system for various illness. The investigation of functional group of phytocompounds by FTIR and GC-MS analysis from methanolic extracts of the *Coldenia procumbens*. The FTIR spectra revealed the occurrence of functional characteristic peaks of aromatic amines, carboxylic acids, ketones, phenols and alkyl halides group, etc. from aerial parts of *Coldenia procumbens* extracts. The GC-MS analysis of methanol extracts from aerial parts of *Coldenia procumbens* detected the presence of 58 phytochemical compounds. The biological significance of the extract of antimicrobial, cytotoxicity, anti-inflammatory, pharmacological and hepatoprotective activity etc. were studied. The detailed results were recorded and discussed.

Keywords: substituted Li ferrite, magnetostatic and spin waves, microstrip array antenna, X-band frequency range

Introduction

The world is enriched with varieties of medicinal plants which have drawn the attention of researchers due to their innumerable benefits to mankind, especially their usage in pharmaceutical and food industries. Their medicinal and pharmacological properties were due to the presence of bioactive components that produce definite physiological action in the human body (Akinmoladun *et al.*, 2007) [3].

In modern day synthetic and chemical drugs are often explored with hesitate as they exhibit side effects (Philomena, 2011) [17], while traditional herbs are eco-friendly gaining to more energy and to avoid side effects (Sahoo and Manchikant, 2013) [23]. The benefits of modern synthetic medicines, people have still preferred plant based natural medicines over synthetic medicines (Yuan *et al.*, 2016) [28]. Most of the medicinal plants are distinctive in their ability to treat as well as to cure various human ailments owing to the contribution of various valuable phytoconstituents present in different plant parts (Anand *et al.*, 20119 and Semwal *et al.*, 2019) [5, 25]. In India, from ancient time, different parts of medicinal plants (~80,000 species) have been used as traditional medicines in different systems of Indian medicines for treatments of various diseases (Pandey *et al.*, 2013) [16]. *Coldenia procumbens* Linn. (Family: Boraginaceae) is abundantly available in India and it has been used in many medicinal purposes. In villages, the fresh leaves are ground and applied to rheumatic swelling. The whole plant used in external application of causing suppuration of boils. The leaves are also used to cure fever, piles and scorpion sting.

The initial screening of medicinal plants by spectrometric and chromatographic methods provides basic information on chemical and pharmacological activities, which helps to select the biologically active plants (Juszczak *et al.*, 2019) [9]. In recent years, Fourier-transform infrared (FTIR) and Gas chromatography -Mass spectrometry (GC-MS) has commonly been employed for the detection of functional groups and identification of various bioactive therapeutic compounds that are present in medicinal plants (Satapute *et al.*, 2019 and Fan *et al.*, 2018) [24, 6]. GC-MS is one of the best, fast and accurate methods to detect non-volatile compounds including alcohols, alkaloids, nitro compounds, long chain hydrocarbons, organic acids, steroids, esters and amino acids etc. (Razack *et al.*, 2015) [21]. Hence, in the present study, UV-spectrophotometeric, FTIR and GC-MS technique was adopted for detection and identification of phytochemical compounds from *C.procumbens*.

Methodology

Plant collection and extraction

Coldenia procumbens plant is collected manually from harvesting rice field, N.V Kudikadu, Thanjavur district, Tamilnadu, India. The plant was authenticated by St. Josesph's College, Trichy. The aerial parts of *Coldenia procumbens* plant were dried in shadow. These dried materials are pulverized to attain a coarse powder. The aerial parts of *Coldenia procumbens* powder was extracted by cold maceration using methanol for 7 days with proper intermediate shaking and the macerate was filtered into a container. The extract was concentrated in an evaporator. The dried residue was stored in a desiccator.

FT-IR analysis (Pramila *et al*., 2012) [20]

Fourier transform infrared (FT-IR) was used to identify the characteristic functional groups in the extract. A small quantity of the *C.procumbens* methanolic extract was mixed in dry potassium bromide (kbr). The mixture was thoroughly mixed in a mortar and pressed at a pressure of 6 bars within 2 min to form a kbr thin disc. Then the disc was placed in a sample cup of a diffuse reflectance accessory. The IR spectrum was obtained using Bruker, Germany Vertex 70 infrared spectrometer. The sample was scanned from 4000 to 400 cm^{-1}. The peak values of the FT-IR were recorded.

Gas Chromatography - Mass Spectrometric (GC-MS) analysis (Podea *et al*., 2001) [18]

The Gas Chromatography Mass Spectrometry analysis of the *C.procumbens* methanolic extract was performed using GC-MS (Model: GC-MS-QP 2010, Shimadzu, Tokyo, Japan) equipped with a VF 5ms fused silica capillary column of 30m length, carrier gas was Helium (99.99%), used at a constant flow rate of 1.51ml/min. Two microlitre of the sample was injected in a split mode with a scan range of 40 – 1000 m/z. The total running time of GC-MS was 35 min. The relative percentage of the extract was expressed as percentage with peak area normalization.

Identification of compounds

The components in the extract were assigned by the comparison of their retention indices and mass spectra fragmentation patterns with those stored on the NIST library and also with standard databases.

Results and discussion

FTIR analysis

The methanolic extract of aerial parts of *C.procumbens* were preformed in functional groups like free O-H-bond, polymeric association, chelate compounds, Iso cyanides, Alkanes, Alkane-CH_2- tertiary alcohols, glem-dimethyl, C-NO_2, nitro compounds aromatic, secondary alcohols and C-Cl bond with respective retention time of 3701.09, 3663.55, 3396.51, 2970.13, 2948.75, 2924.85, 2867.61, 2844.16, 2527.20, 2076.13, 2052.91, 1652.27, 1455.51, 1347.13, 1385.91, 1347.13, 1111.93, 1055.13, 1015.66, 1031.57 and 655.83 cm^{-1} were determined. However, the molecules of fundamental vibration and molecules predicted numbers of peaks were observed respectively (Table 1 and Fig. 1).

Fourier Transform Infrared Spectroscopy (FT-IR) is a high-resolution analytical technique to identify the functional compounds and elucidate the structural compounds (Hashimoto and Kameoka, 2008 and Hussain *et al*., 2007). FT-IR spectroscopy detects vibration frequencies and functional group of the components in the mixture of organic matters includes aromatic and aliphatic organic compounds (oxygen, nitrogen, sulfur and functional groups).

Previously Monika *et al*. (2020) [13] reported that the methanolic extracts of *Berberis aristata* was examined using FTIR spectroscopy that shown in probable functional groups. *V. amygdalina* leaf studied the FTIR spectroscopy the presence of higher wavelength (lower frequency) at peak of 3314.43 cm^{-1} is due to N-H stretching of proteins and O-H stretching of carbohydrate and water. In addition, the peak at 2906.30 cm^{-1} is due to the CH_2 anti-symmetric stretch of methyl groups mainly from lipids (Lu *et al*., 2011) [12]. The FTIR spectrum of examined in methanol leaf extract of *M. pudica*. The peak at 3313.6 cm^{-1} revealed the presence of alcohols, phenols (O–H stretch, H–bonded). The peak at 2978.8 and 2944.8 cm^{-1} refers to the presence of alkanes (C–H stretch). The peak at 1705.3 cm^{-1} corresponds carboxylic acid group (C=O stretch). A peak at 1559.906 cm^{-1} shows the presence of alkenes and aromatic compound (C=C bend). The results of FT-IR spectroscopy confirm the presence of various chemical constituents such as alcohol, alkanes, aromatic carboxylic acid, esters and ethers. The presence of the identified phytoconstituents is responsible for various medicinal properties of the plant (Ahuchaogu *et al*., 2020) [2].

GCMS analysis of methanolic extract of *C.procumbens*

In the present investigation totally 58 phytocompounds were determined and these compounds like Methyl salicylate, 2,2,7,7-Tetramethyl-3,6-Octanedione, Phenol, 2-(1-phenylethyl)-, (Z)-CIS-9,10-Epoxyheptadec-6-ene, l-(+)-Ascorbic acid 2,6-dihexadecanoate, Isobutyl vinylacetate, Cyclohexanepropanol-, 1-Hexyl-2-nitrocyclohexane, Dicyclomine, 1,2-Oxathiane, 6-dodecyl-, 2,2-dioxide, Methanamine, N-(1-methylbutylidene)-, 9,12-Octadecadienoic acid (Z,Z)-, Pyrrolidin-2-one, 5-[2-propionylethyl]-, Heptadecyl acetate, Des-N-solasodine, 6,6-Dimethyl-9-methylene-undec-3-ene-2,5,10-trione, 1-Chloromethyl-4,4-dimethyl-2,8,9-trioxa-5-aza-1-sila-bicyclo[3.3.3]undecane, Chloroacetic acid, hexyl ester, 2-Fluorobenzoic acid, 2-methylpentyl ester, 1-Tetradecyl acetate, Phenol, 2,4-bis(1-phenylethyl)-, Phenol, 2,4-bis(1-phenylethyl)-, 1,3-Diphenyl-1-(2-hydroxyphenyl)butane, 2H-Pyran, 3,6-dihydro-4-methyl-2-(2-methyl-1-propenyl)-, Acetonyl laurate, Phosphorochloridic acid, propyl dodecyl ester, Phenol, 2,4-bis(1-phenylethyl)-, 1,3-Dioxolane, 2-heptyl-4-octadecyloxymethyl-, Nonadecyl pentafluoropropionate, Hexadecanoic acid, 2-hydroxy-1-(hydroxymethyl) ethyl ester, Glutaric acid, 2-methylpent-3-yl 2-tert-butylcyclohexyl ester, Diisooctyl phthalate, Terephthalic acid, but-3-enyl heptadecyl ester, 1-Dichloromethyl (dimethyl) silyloxybutane, 1-Triethylsilyloxyheptadecane, Octadecanoic acid, benzyldimethylsilyl ester, Chlorogenin diacetate, Hexadecanoic acid, (2-pentadecyl-1,3-dioxolan-4-yl) methyl ester, 1H-Indole-3-Ethanamine, 2-(1H-Indol-3-YL) ethanamine 2-(1H-indol-3-YL) ethanamine (amino-2 ethyl), 1,3-Dioxane, 2-(chloromethyl)-, Stigmasta-3,5-diene, decanamide, N-(2,6-dihydroxyphenyl)-, E-11,13-Tetradecadienal, Cyclooctanecarboxylic acid, 4,5-dimethyl-, methyl ester, Cholestan-3-one, cyclic 1,2-ethanediyl aetal, (5.beta.)-, Fumaric acid, 2-methoxyphenyl 8-chlorooctyl ester, Ethanone, 1-(3,3-dimethylbicyclo [2.2.1] hept-2-yl)-, exo-, 1,4-Benzenedicarboxylic acid, bis(2-ethylhexyl) ester, 1,4-Methanobenzocyclodecene, tetradecahydro-, 2,2,3,5,6,6,7-Heptamethyl [1,4,2,3,5,6,7] dioxapentasilepane, Naphtho [2,1-b] furan, dodecahydro-3a,6,6,9a-tetramethyl-, Hexanamide, 2-butyl-2-hydroxy-N-(2-pyridyl)-, Succinic acid, tridec-2-yn-1-yl 2,2,3,4,4,4-hexafluorobutyl ester, 1-Oxaspiro [4.5] dec-3-en-2-one, 6-isopropyl-9-methyl-, Undecanoic acid, 11-Phenoxy- 11-phenoxyundecanoic acid, Butane, 1,3-dibromo- and Naphtho [2,1-b] furan, dodecahydro-3a,6,6,9a-tetramethyl- were recorded in methanolic extract of *C.procumbens* (Table 2 and Fig. 2).

Evidently, the methanolic extract of *C.procumbens* was analyzed by GCMS. Totally, 58 compounds with retention as well as molecular characterizations were predicting in the compounds. Even though, the GC-MS analysis revealed the 27 chemical compounds in ethanolic leaf extract of *Waltheria indica* (Prabhanna and Jayaraj, 2018) [19]. The

tetradecane chemical compound retrieved from *Hibiscus tiliaceus* (Nandagopalan *et al*., 2015) [15], *Marsilea quadrifolia* (Karikalan and Udayakumar, 2014) [10] and *Gymnema sylvestre* (Thirunavukkarasu *et al*., 2016) [26]; *Nepeta deflersiana* (Ahmed *et al.*, 2020); *Coldenia procumbens* (Rethinam and Venkatanarasimhan, 2020) [22]. Similarly, phytol and squalene also showed the various biological activities as reported for *Coldenia procumbens* (Kesava and Usha, 2016) [11]. Previously it has been reported that the methanolic leaf extract of mangrove plant, *Avicennia marina* contain different molecules (Almardeai *et al*., 2017) [4]. Muthukumaran *et al*. (2020) [14] reported the GC-MS method to conform the secondary metabolites especially the eugenol and Flavonoids found in *Amorphophallus sylvaticus* (Roxb.). GC–MS spectra of *Lumnitzera racemosa* extract revealed the peaks that indicated the occurrence of different compounds. Likewise, it has been reported that the methanolic leaf extract of mangrove plant, *Avicennia marina* contain different molecules (Almardeai *et al*., 2017) [4]. A combination of GC-MS and FTIR methods was used to characterize the various fractions of the phytochemical compounds of *C.procumbens*. Over the past years, many highly accurate and sensitive methods for the analysis of complex mixtures of compounds have been retrieved (Yalavarthi, 2016) [27].

Table 1: FTIR analysis of methanolic extract of *C.procumbens*

S. No	Retention time (cm^{-1})	Functional Group
1	3701.09	Free O-H bond
2	3663.55	Free O-H bond
3	3396.51	Polymeric association
4	2970.13	Chelate compounds
5	2948.75	Chelate compounds
6	2924.85	Chelate compounds
7	2867.61	Chelate compounds
8	2844.16	Chelate compounds
9	2527.20	Chelate compounds
10	2076.13	Isocyanides
11	2052.91	Isocyanides
12	1652.27	Alkene
13	1455.51	Alkane, $-CH_2-$
14	1347.13	Tertiary alcohols
15	1385.91	Alkane, gem-dimethyl
16	1347.13	C-NO_2, Nitro compounds aromatic
17	1111.93	Secondary alcohols
18	1055.13	Alkane group
19	1015.66	Amino group
20	1031.57	C=O group
21	655.83	C-Cl bond

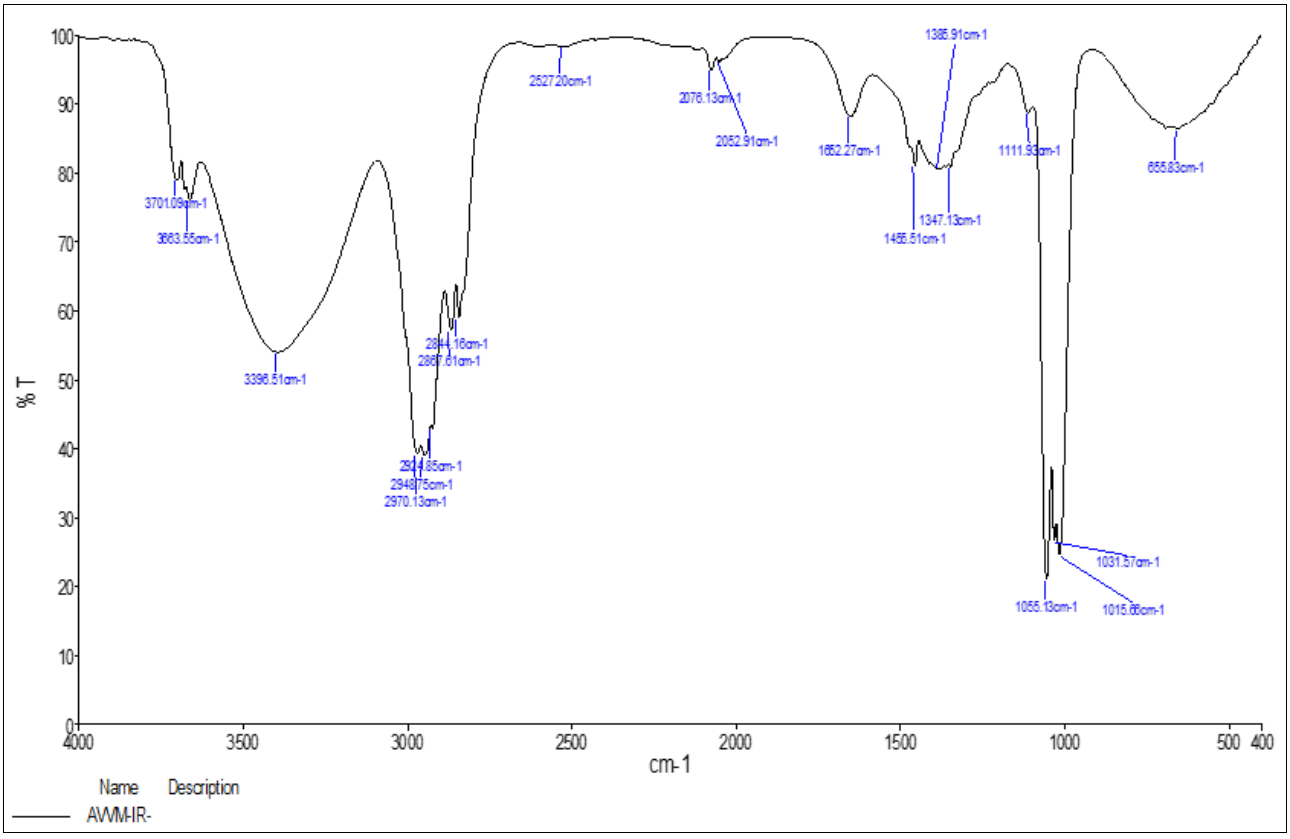

Fig 1: FTIR analysis of methanolic extract *C.procumbens*

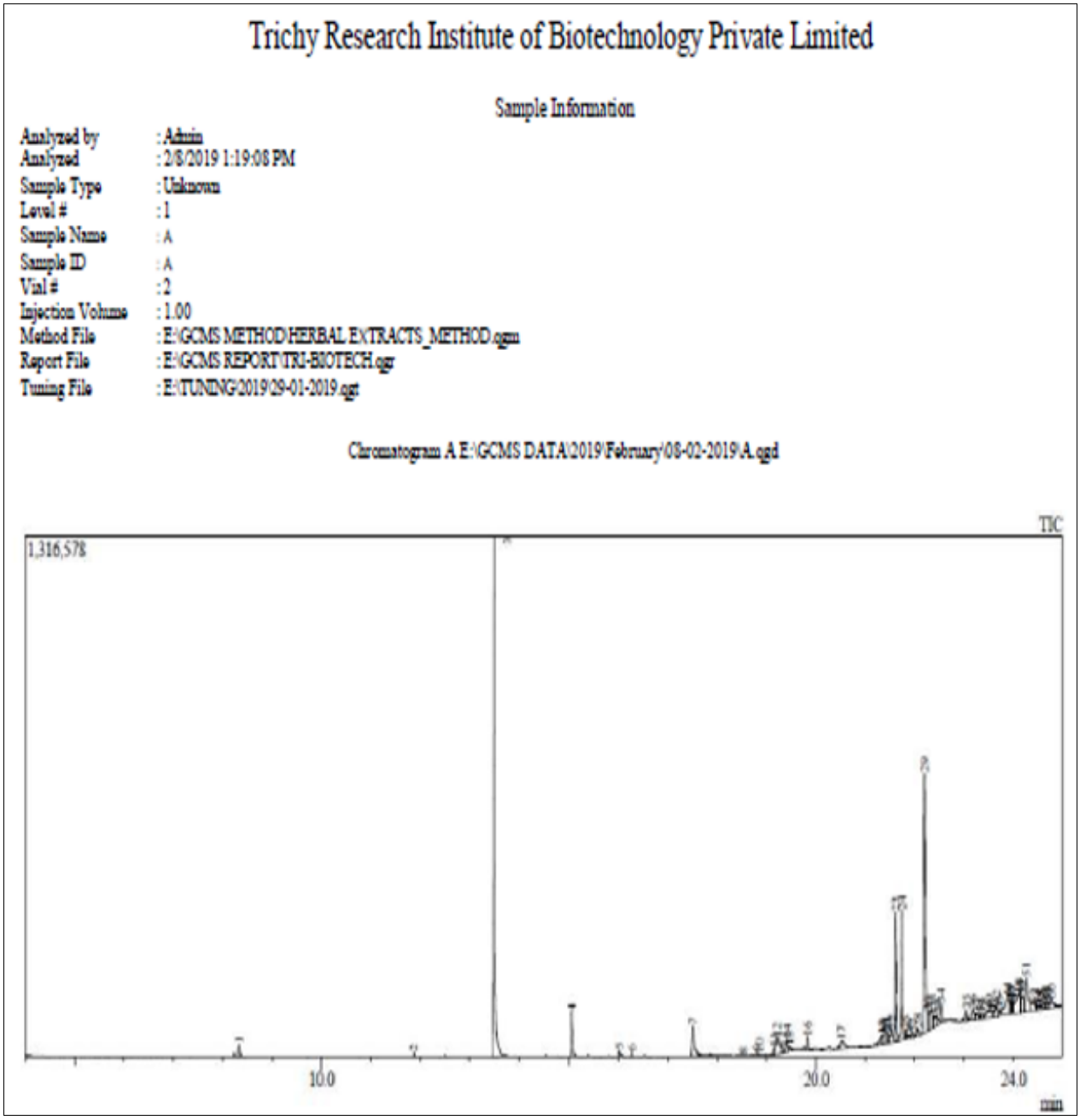

Fig 2: Phytochemical analysis of *C.procumbens* with methanolic extract of GC-MS

Table 2: GCMS analysis of methanolic extract of *C.procumbens*

S. No	Retention time	Compound name	Molecular formula	Molecular weight (g/mol)	Biological properties
1	8.325	Methyl salicylate	$C_8H_8O_3$	152	Cytotoxicity, antimicrobial, antioxidant
2	11.875	2,2,7,7-Tetramethyl-3,6-Octanedione	$C_{12}H_{22}O_2$	198	Antimicrobial activity
3	15.075	Phenol, 2-(1-phenylethyl)-	$C_{14}H_{14}O$	198	Antioxidant activity, antimitotic, antiproliferative activity
4	16.010	(Z)-CIS-9,10-Epoxyheptadec-6-ene	$C_{17}H_{32}O$	252	Antispasmodic and antioxidant properties
5	17.500	l-(+)-Ascorbic acid 2,6-dihexadecanoate	$C_{38}H_{68}O_8$	652	Anti-cancer *activity*, antimicrobial activity
6	18.525	Isobutyl vinylacetate	$C_8H_{14}O_2$	142	Antimicrobial activity, hepatoprotective activity, anticancer activity
7	18.795	Cyclohexanepropanol-	$C_9H_{18}O$	142	*Antimicrobial activity, Antioxidant activity*
8	18.855	1-Hexyl-2-nitrocyclohexane	$C_{12}H_{23}NO_2$	213	Antidiabetic, anti-inflammatory,
9	19.145	Dicyclomine	$C_{19}H_{35}NO_2$	309	*Antimicrobial, Pharmacological action*
10	19.210	1,2-Oxathiane, 6-dodecyl-, 2,2-dioxide	$C_{16}H_{32}O_3S$	304	*Antimicrobial activity*
11	19.335	Methanamine, N-(1-methylbutylidene)-	$C_6H_{13}N$	99	Analgesic, Anti-inflammatory, *Antibacterial Activities*
12	19.410	9,12-Octadecadienoic acid (Z,Z)-	$C_{18}H_{32}O_2$	280	Anticancer, Anti-inflammatory, *Antimicrobial*, Diuretic, Hepatoprotective, Anti-arthritic

13	19.460	Pyrrolidin-2-one, 5-[2-propionylethyl]-	$C_9H_{15}NO_2$	169	Antimicrobial activity, antioxidant activity
14	19.825	Heptadecyl acetate	$C_{19}H_{38}O_2$	298	Antimicrobial activity,
15	20.515	Des-N-solasodine	$C_{27}H_42O_2$	398	Cytotoxic *activity, pharmacological activity*
16	21.335	6,6-Dimethyl-9-methylene-undec-3-ene-2,5,10-trione	$C_{14}H_{20}O_3$	236	anti- inflammatory activity, antitumor, anticancer
17	21.375	1-Chloromethyl-4,4-dimethyl-2,8,9-trioxa-5-aza-1-sila-bicyclo[3.3.3]undecane	$C_9H_{18}ClNO_3Si$	251	Anticancer, Anti-inflammatory, *Antimicrobial*, Diuretic, Hepatoprotective
18	21.430	Chloroacetic acid, hexyl ester	$C_8H_{15}ClO_2$	178	Anticancer, Anti-inflammatory,
19	21.450	2-Fluorobenzoic acid, 2-methylpentyl ester	$C_{13}H_{17}FO_2$	224	anti-inflammatory antioxidant, hypocholesterolemic, antibacterial
20	21.535	1-Tetradecyl acetate	$C_{16}H_{32}O_2$	256	Insecticidal *activity, antibacterial activity.*
21	21.615	Phenol, 2,4-bis(1-phenylethyl)-	$C_{22}H_{22}O$	302	Antimitotic, antiproliferative activity, antimetastatic
22	21.745	Phenol, 2,4-bis(1-phenylethyl)-	$C_{22}H_{22}O$	302	Antimitotic, antiproliferative activity, antimetastatic, antioxidant activity
23	21.825	1,3-Diphenyl-1-(2-hydroxyphenyl)butane	$C_{22}H_{22}O$	302	antioxidant and *antimicrobial activity,*
24	21.875	2H-Pyran, 3,6-dihydro-4-methyl-2-(2-methyl-1-propenyl)-	$C_{10}H_{16}O$	152	*antibacterial*, antifungal, Anti-inflammatory *activity*
25	21.975	Acetonyl laurate	$C_{15}H_{28}O_3$	256	Anticancer, Antimicrobial, Anti-inflammatory activity
26	22.065	Phosphorochloridic acid, propyl dodecyl ester	$C_{15}H_{32}ClO_3P$	326	Anticancer, Antimicrobial activity
27	22.200	Phenol, 2,4-bis(1-phenylethyl)-	$C_{22}H_{22}O$	302	Antimitotic, antiproliferative activity, antimetastatic, antioxidant activity
28	22.270	1,3-Dioxolane, 2-heptyl-4-octadecyloxymethyl-	$C_{29}H_{58}O_3$	454	Anticancer, Antimicrobial activity
29	22.335	Nonadecyl pentafluoropropionate	$C_{22}H_{39}F_5O_2$	430	*Pharmacological activity*, *Antimicrobial activity*
30	22.410	Hexadecanoic acid, 2-hydroxy-1-(hydroxymethyl)ethyl ester	$C_{19}H_{38}O_4$	330	Anticancer, Anti-inflammatory, *Antimicrobial*, Diuretic, Hepatoprotective, Anti-arthritic, Antiasthma
31	22.460	Glutaric acid, 2-methylpent-3-yl 2-tert-butylcyclohexyl ester	$C_{21}H_{38}O_4$	354	Dermatology study
32	22.540	Diisooctyl phthalate	$C_{24}H_{38}O_4$	390	*Antimicrobial* activity,
33	23.045	Terephthalic acid, but-3-enyl heptadecyl ester	$C_{29}H_{46}O_4$	458	*antibacterial and* antifungal *activity*
34	23.175	Spirost-5-en-3-ol, acetate, (3.beta.,25R)-	$C_{29}H_{44}O_4$	456	Cytotoxicity, antiproliferative, *antimicrobial*, antiglioma activity
35	23.265	1-Dichloromethyl(dimethyl) silyloxybutane	$C_7H_{16}Cl_2OSi$	214	*Antibacterial and* antifungal *activity*
36	23.340	1-Triethylsilyloxyheptadecane	$C_{23}H_{50}OSi$	370	*Antibacterial and* antifungal *activity*
37	23.380	Octadecanoic acid, benzyldimethylsilyl ester	$C_{27}H_{48}O_2Si$	432	Anticancer, Anti-inflammatory, *Antimicrobial*, Diuretic
38	23.510	Chlorogenin diacetate	$C_{27}H_{42}O_3$	414	*Antibacterial and* antifungal *activity*
39	23.575	Hexadecanoic acid, (2-pentadecyl-1,3-dioxolan-4-yl)methyl ester	$C_{35}H_{68}O_4$	552	*Antibacterial and* antifungal *activity*
40	23.660	1H-Indole-3-Ethanamine, 2-(1H-Indol-3-YL)ethanamine 2-(1H-indol-3-YL)ethanamine (amino-2 ethyl)	$C_{10}H_{12}N_2$	160	*Antibacterial and* antifungal *activity*
41	23.725	1,3-Dioxane, 2-(chloromethyl)-	$C_5H_9ClO_2$	136	fungicides, antimycotic agents, antibacterial agents
42	23.890	Stigmasta-3,5-diene	C29H48	396	*Antibacterial and* antifungal *activity*
43	23.940	decanamide, N-(2,6-dihydroxyphenyl)-	$C_{16}H_{25}NO_3$	279	Anticancer, Anti-inflammatory, *Antimicrobial*, Diuretic
44	23.970	E-11,13-Tetradecadienal	$C_{14}H_{24}O$	208	*Antibacterial and* antifungal *activity*
45	23.995	Cyclooctanecarboxylic acid, 4,5-dimethyl-, methyl ester	$C_{12}H_{22}O_2$	198	Anticancer, Anti-inflammatory, *Antimicrobial*, Diuretic, antioxidant activity
46	24.115	Cholestan-3-one, cyclic 1,2-ethanediyl aetal, (5.beta.)-	$C_{29}H_{50}O_2$	430	Antioxidant activity, antimicrobial activity, anti-inflammatory activity
47	24.145	Fumaric acid, 2-methoxyphenyl 8-chlorooctyl ester	$C_{19}H_{25}ClO_5$	368	Antioxidant activity, antimicrobial activity, anti-inflammatory activity
48	24.180	Ethanone, 1-(3,3-dimethylbicyclo[2.2.1]hept-2-yl)-, exo-	$C_{11}H_{18}O$	166	Anticancer, Anti-inflammatory, *Antimicrobial*, Diuretic, antioxidant activity
49	24.270	1,4-Benzenedicarboxylic acid, bis(2-ethylhexyl) ester	$C_{24}H_{38}O_4$	390	Mutagenic *activity*, antimicrobial activity
50	24.425	1,4-Methanobenzocyclodecene, tetradecahydro-	$C_{15}H_{26}$	206	antimicrobial activity, anti-inflammatory activity
51	24.465	2,2,3,5,6,6,7-Heptamethyl[1,4,2,3,5,6,7] dioxapentasilepane	$C_7H_{24}O_2Si_5$	280	Cytotoxicity activity, antimicrobial activity, antioxidant activity
52	24.505	Naphtho[2,1-b]furan, dodecahydro-	$C_{16}H_{28}O$	236	Cytotoxicity activity, antimicrobial activity,

		3a,6,6,9a-tetramethyl-			antioxidant activity
53	24.555	Hexanamide, 2-butyl-2-hydroxy-N-(2-pyridyl)-	$C_{15}H_{24}N_2O_2$	264	Antimicrobial activity, antioxidant activity, hepatoprotective activity
54	24.585	Succinic acid, tridec-2-yn-1-yl 2,2,3,4,4,4-hexafluorobutyl ester	$C_{21}H_{30}F_6O_4$	460	Anticancer, Anti-inflammatory, *Antimicrobial*, Diuretic
55	24.650	1-Oxaspiro[4.5]dec-3-en-2-one, 6-isopropyl-9-methyl-	$C_{13}H_{20}O_2$	208	Mutagenic *activity*, antimicrobial activity
56	24.685	Undecanoic acid, 11-Phenoxy- 11-phenoxyundecanoic acid	$C_{17}H_{26}O_3$	278	Antimicrobial activity, cytotoxicity activity, anti-inflammatory activity, pharmacological activity, hepatoprotective activity
57	24.715	Butane, 1,3-dibromo-	$C_4H_8Br_2$	214	Anticancer, Anti-inflammatory, *Antimicrobial*, Diuretic activity
58	24.775	Naphtho [2,1-b] furan, dodecahydro-3a,6,6,9a-tetramethyl-	$C_{16}H_{28}O$	236	Cytotoxicity activity, Anti-inflammatory activity, Pharmacological activity, Hepatoprotective activity

Concusion

In this study, they identify some bioactive metabolites in aerial parts of *Coldenia procumbens* Linn. Totally 58 compounds revealed and these compounds responsible for the therapeutic properties and also to provide some pharmacologically basis for its ethno pharmacological uses in the treatment and prevention of various diseases and disorders. This could be exploited for precise drug targeting against various pathological diseases.

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