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GC- MS analysis of secondary metabolites from acetone and chloroform extract of *Dicranopteris linearis* (burm. F.) Underw.

J. Vijayakumari and T. Leon Stephan Raj*
Plant Molecular Biology Research Unit, Department of Botany, St. Xavier's College (Autonomous), Palayamkottai- 627002,
Affiliated to Manonmaniam Sundaranar University, Abhisekapatti Tirunelveli, Tamil Nadu, India
leostephanraj@gmail.com

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Abstract

In the present study, the possible bioactive compounds recognized by gas chromatography and mass spectrometry (GC-MS) analysis in aerial parts of acetone and chloroform extract of Dicranopteris linearis (burm.f.) Under was investigated. The acetone and chloroform extract of D. linearis were explored thirteen bioactive compounds. The prevailing compounds in acetone extract were 3-Ethoxyacrylonitrile (61.93%), Indole-2-one, 2, 3-dihydro-N-hydroxy-4-methoxy-3, 3-dimethyl- (10.78%), Silicic acid, diethyl bis (trimethylsilyl) ester (14.43%) and 2-Ethylacridine (12.85%). The prevailing compounds in chloroform extract were 1H-Inden-1-ol, 2,3-dihydro- (2.88%), Phenol, 2,5-bis(1,1-dimethylethyl)- (6.48%), Heptacosane (2.20%), Di-n-decylsulfone (6.43%), Ethanone, 2-(2-benzothiazolylthio)-1-(3,5-dimethylpyrazolyl)- (15.24%), 1-Bromoeicosane (15.11%), Methoxyacetic acid, 2-tridecyl ester (19.05%), Octadecane, 3-ethyl-5-(2-ethylbutyl)- (20.59%) and 1,2,4-Benzene tricarboxylic acid, 4-dodecyl dimethyl ester (12.02%). The outcome of the present work may be useful in metabolomics research, nutraceuticals, and phytopharmaceuticals to evaluate their quality.

Keywords: GC-MS analysis, *Dicranopteris linearis,* bioactive compounds, Methoxyacetic acid and Acetone extract.

Introduction

Therapeutic vegetation contain part of living beings for the reason that ages due to their medical prospective and has been converted into an essential constituent of health care organization. Our country is the biggest manufacturer of medicinal plants and is properly called the herbal plot of the world. Pteridophytes are primitive vascular plants, which can adopt well in terrestrial habitat. With the introduction of ethno-botany, many attempts have been made on the study of relationships of plants particularly for medicinal value of pteridophytes[1]. Mass spectrometry combined with Gas chromatography is generally occurring in direct investigation of mechanism easy to get in conventional vegetation. In fresh period the gas chromatographic techniques have been gradually increase for the study of therapeutic flora[2]. It is an influential tool often used for equivalence and to manage the value of mutually the unprocessed objects and done with product[3]. It is the most excellent procedure to recognize the secondary metabolites. *Dicranopteris linearis* (Burm.f.) Underw is a terrestrial fern belongs to the family Gleicheniaceae. It is a unique terrestrial fern with long creeping, dichotomously branched rhizome. This plant shows some economic importance an anthelmintic, asthma, fluid extracted from fronds shows antibacterial activity[4]. In the current work aimed the gas chromatography and mass spectrometry analysis of *D. linearis*. This study will be helpful in the identification of phytoconstituents that can be an alternative for the sourcing of bioactive compounds.

Materials and methods

Collection of plant: The experimental plant of *Dicranopteris linearis* (Burm.f.) Underw. was collected from Marthandam, Kanyakumari district. Identification of plant the species have been confirmed with the help of pteridophytic floras[5].

Extraction: The experimental plant was thoroughly washed with tap water and shade dried. The shade dried plant was ground to a fine powder. About 30gm of plant powder was taken in Soxhlet apparatus and extracts were obtained separately with acetone and chloroform. The acetone and chloroform extract were then stored at 4°C for further analysis.

GC- MS analysis: The phytochemical investigations of acetone and chloroform extracts were analyzed using GC-MS analyzer. For quantification of compounds Mass Spectra are recorded in the Selective Iron Monitoring (SIM) mode use NIST library.

Compound Identification: Bioactive compounds of the acetone and chloroform extracts were recognized by evaluation of their accumulation spectrum and maintenance index with those available in the journalism and enclosed in the NIST '98 MS computer library (Wiley).

Result and discussion

Gas Chromatography-Mass Spectroscopy profile of *D. linearis* confirmed the presence of various phytochemical compounds in

acetone and chloroform extract. There are thirteen chloroform extracts of *D. linearis*. The compounds were phytoconstituents were obtained from the acetone and recognized following the contrast by GC-MS analysis.

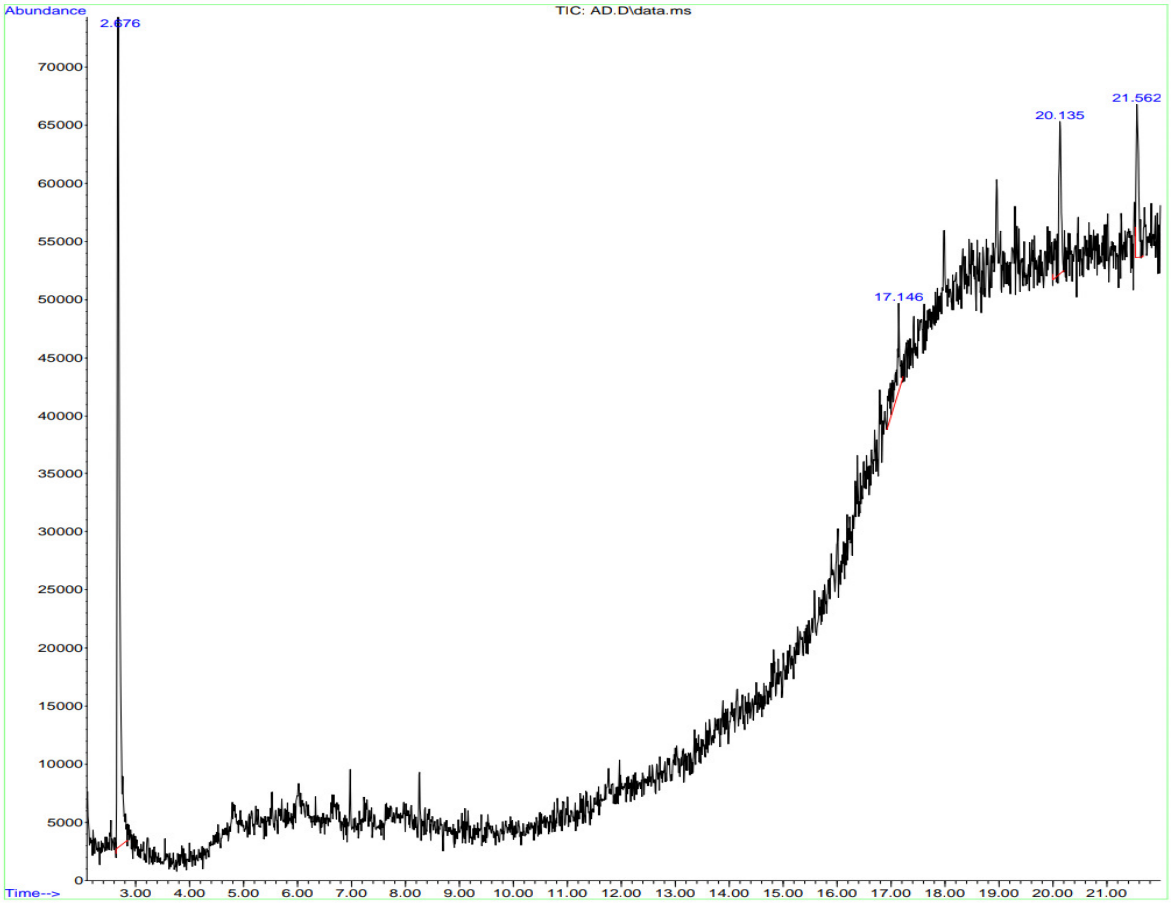
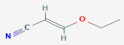
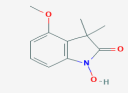
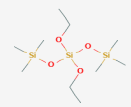
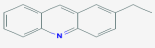


Figure-1: GC-MS Chromatogram of acetone extract of *Dicranopteris linearis*.

Table-1: GC-MS analyses of acetone extract of *Dicranopteris linearis*

Retention time (min)	Name of compound	Molecular Formula	Molecular Weight	Structure	Biological Activity
2.673	3-Ethoxyacrylonitrile	C_5H_7NO	97.117 g/mol		Antimicrobial, antibacterial and antifungal
17.149	Indole-2-one, 2,3-dihydro-N-hydroxy-4-methoxy-3,3-dimethyl-	$C_{11}H_{13}NO_3$	207.229 g/mol		Antimicrobial
20.137	Silicic acid, diethyl bis(trimethylsilyl) ester	$C_{10}H_{28}O_4Si_3$	296.585 g/mol		Antioxidant, antimicrobial
21.565	2-Ethylacridine	$C_{15}H_{13}N$	207.276 g/mol		Antimicrobial and antitumor

Spectrum of acetone extracts *D. linearis* showed 4 different major peaks which indicated the presence of 4 compounds were observed in Figure-1. The active principles with their retention time (RT), molecular formula, molecular weight, and peak area (%) in the ethanolic extracts of the *D. linearis* studied are presented in Tables-1. The existing compounds of acetone extract on 3-Ethoxyacrylonitrile (61.93%), Indole-2-one, 2, 3-dihydro-N-hydroxy-4-methoxy-3, 3-dimethyl- (10.78%), Silicic acid, diethyl bis (trimethylsilyl) ester (14.43%) and 2-Ethylacridine (12.85%). The spectrum of GC-MS established the acetone extract was found in four major components with retention time 2.673min, 17.149min, 20.137min and 21.565min respectively. In previous study, the behavior of a number of plant constituent through composite background of some secondary metabolites are used for many biological activity reported by Kumar *et al* [6].

GC-MS spectrum of chloroform extracts *D. linearis* showed 9 different major peaks which indicated the presence of 9 compounds in Figure-2. The prevailing compounds in chloroform extract were 1H-Inden-1-ol, 2,3-dihydro-(2.88%), Phenol, 2,5-bis(1,1-dimethylethyl)-(6.48%), Heptacosane (2.20%), Di-n-decylsulfone (6.43%), Ethanone, 2-(2-benzothiazolylthio)-1-(3,5-dimethylpyrazolyl)-(15.24%), 1-Bromoeicosane (15.11%), Methoxyacetic acid, 2-tridecyl ester (19.05%), Octadecane, 3-ethyl-5-(2-ethylbutyl)-(20.59%) and 1,2,4-Benzene tricarboxylic acid, 4-dodecyl dimethyl ester (12.02%) and the spectrum of GC-MS confirmed the presence of nine major components with retention time 3.865min, 6.975min, 15.589min, 16.383min, 17.149min, 17.981min, 18.965min, 20.137min and 21.574min respectively in Table-2. GC-MS investigation of chloroform extracts in flowers, stems and roots of *Tripleurospermum callosum* showing the detection of 93 compounds[7]. In up to date reports GC-MS analysis was conceded out the ethanolic extract of *Canthium parviflorum* yielded 22 compounds[8].

Gas Chromatography in combination with Mass Spectrometry can discover several chemicals including sugars, sugar alcohols, organic acids, amino acids, fatty acids and etc[9]. A range of volatile components (especially oils) has been identified in different *Rhododendron* species other than *R. arboreum*[10]. It is a well-organized way to examine the metabolic fingerprinting of phytomedicine and to evaluate the overall chemical difference in medicinal plants that provides high separation[11]. Bodoprost and Rosemeyer[12] revealed that Dodecanoic acid, Tetrdecanoic acid and n-Hexadecanoic acid have the possessions of anti oxidant and antimicrobial activities among the recognized bioactive compounds. A lot of therapeutic plant lives are rich resource of secondary metabolites such as alkaloids, phenol, cardiac glycosides, flavonoids, tannins and terpenoids determined by GC-MS analysis[13,14]. Olagunju *et al*[15] exposed that secondary metabolites manipulate a extensive variety of organic or natural activities on physiological system.

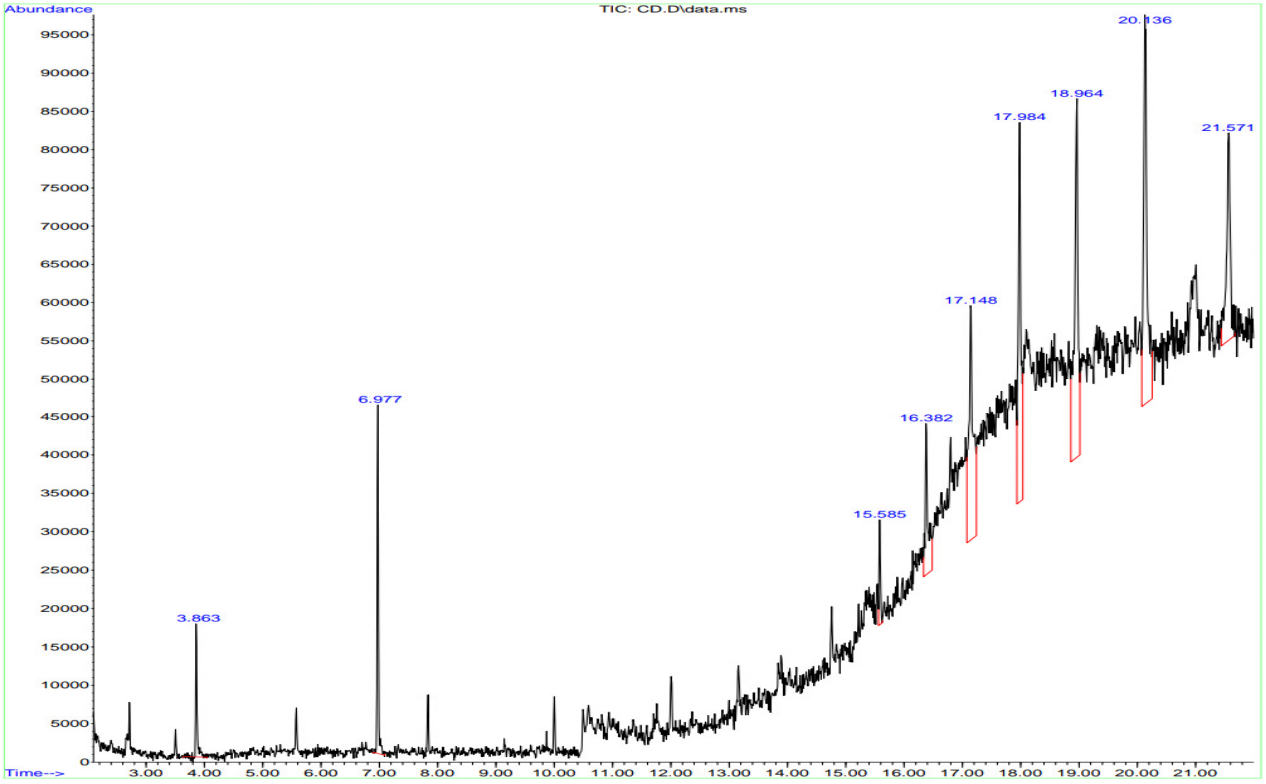
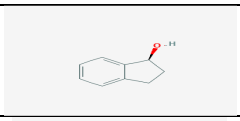
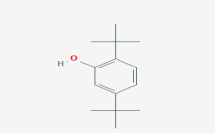
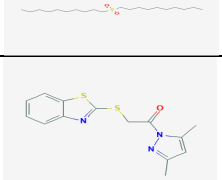
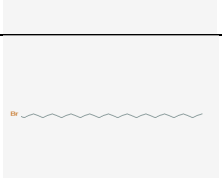
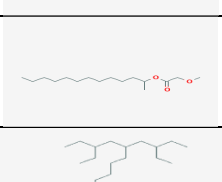
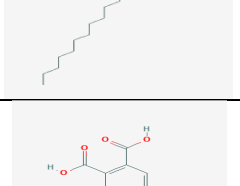
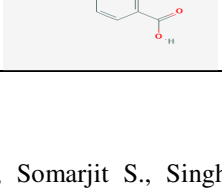


Figure-2: GC-MS Chromatogram of chloroform extract of *Dicranopteris linearis*.

Table-2: GC-MS analysis of chloroform extract of *Dicranopteris linearis.*

Retention time (min)	Name of compound	Molecular Formula	Molecular Weight	Structure	Biological activity
3.865	1H-Inden-1-ol, 2,3-dihydro-	$C_9H_{10}O$	134.178 g/mol		Antimicrobial
6.975	Phenol,2,5-bis (1,1-dimethylethyl)-	$C_{14}H_{22}O$	206.329 g/mol		Antimitotic, antiproliferative, antimicrobial and antioxidant
15.589	Heptacosane	$C_{27}H_{56}$	380.745 g/mol		Antimicrobial
16.383	Di-n-decylsulfone	$C_{20}H_{42}O_2S$	346.614 g/mol		Antimicrobial and anticancer
17.149	Ethanone, 2-(2-benzo thiazolylthio)-1-(3,5-dimethylpyrazolyl)-	$C_{14}H_{13}N_3OS_2$	303.398 g/mol		Antioxidant and *antimicrobial*
17.981	1-Bromoeicosane	$C_{20}H_{41}Br$	361.452 g/mol		Anticancer and anti-inflammatory
18.965	Methoxyacetic acid, 2-tridecyl ester	$C_{16}H_{32}O_3$	272.429 g/mol		Anti-tuberculosis and , *antibacterial*
20.137	Octadecane, 3-ethyl-5-(2-ethylbutyl)-	$C_{26}H_{54}$	366.718 g/mol		*Antibacterial*, antioxidant antidiabetic and antitumor
21.574	1,2,4-Benzenetri carboxylic acid, 4-dodecyl dimethyl ester	$C_9H_6O_6$	210.141 g/mol		Estrogenic *activity and antimicrobial.*

Conclusion

The current research explored the thirteen phytoconstituents from the acetone and chloroform extract of *D. linearis* in GC-MS profile studies. The results of the present study was established in these bioactive compounds may be used as source of antimicrobial, antibiotic, antioxidant, anti-inflammatory, antitumor, anticancer properties and pharmaceutical industries used for drug formulation, in metabolomics research, nutraceuticals and etc. The extraction process can be implied for the sourcing of the compounds of commercial and medicinal importance. This plant solvent extracts were indicated the phytochemical element has large prospective for food source and undernourishment of individual being physical condition.

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