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'The GC MS Analysis of Ethyl Acetate Extract of One Herbal Plant, Cleome Gynandra ('Gynandropsispentaphylla')

Ganesan Muruga Perumal[1], Prabhu K[2], Rao MRK[3*]. Janaki C. S.[4], Kalaivannan J[5], Kavimani M[1]

[1]Professor, Department of Anatomy, SreeBalaji Medical College and Hospital, Chennai, Tamil Nadu, India.
[2] Associate Professor, Department of Anatomy, SreeBalaji Medical College and Hospital, Chennai, Tamil Nadu, India.
[3] Consultant Scientist, M/s. Noahs Laboratories, No, 8/1, Old Mahabalipuram Road, Thiruporur, Tamil Nadu 603110, India.
[4] Associate Professor, Department of Anatomy, Bhaarath Medical College and Hospital, Chennai, Tamil nadu, India.
[5]Associate Professor, Department of Anatomy, Vinayaka Mission's Medical College and Hospital, Karikal, Vinayaka Mission's Research foundation, Salem, Tamil nadu, India.

Abstract

The present study deals with the GC MS analysis of one medicinal plant, '*Cleome gynandra'.* This plant has many ethno-medicinal uses such as such as immune-modulator, antioxidant, anti-carcinogenic, analgesic, worm infection, ear infections. The plant *Cleome gynandra*was collected from the nearby paddy fields at Chengalpattu, Tamil Nadu. The ethyl acetate extract of the aerial parts of the plant was subjected to GC MS study following standard protocols. I was observed that some very important molecules such as n-Hexadecanoic acid, 4-(2,4-Dimethylcyclohex-3-enyl)but-3-en-2-one, 3,7,11,15-Tetramethyl-2-hexadecen-1-ol, 9,12,15-Octadecatrienoic acid, methyl ester, (Z,Z,Z)-, 2-((Octan-2-yloxy)carbonyl)benzoic acid, Methyl stearidonate, dl-.alpha.-Tocopherol, Campesterol, Stigmasterol, .beta.-Sitosterol, i-Propyl 9,12,15-octadecatrienoate, which have important medicinal roles. The presence of these molecules helps the plant in curing the diseases that are claimed by ethno-medicine. Further work is needed to establish the molecular mechanism of action of these metabolites.

Keywords: GC MS, Ethyl acetate, n-Hexadecanoic acid, 4-(2,4-Dimethylcyclohex-3-enyl)but-3-en-2-one, 3,7,11,15-Tetramethyl-2-hexadecen-1-ol, 9,12,15-Octadecatrienoic acid, methyl ester, (Z,Z,Z)-, 2-((Octan-2-yloxy)carbonyl)benzoic acid, Methyl stearidonate, dl-.alpha.-Tocopherol, Campesterol, Stigmasterol, .beta.-Sitosterol, i-Propyl 9,12,15-octadecatrienoate.

INTRODUCTION

Gynandropsispentaphylla is post rainy season weed with characteristic white flowers, known as Cat's whiskers. This plant has many medicinal roles, such as immune-modulator, antioxidant, anti-carcinogenic, analgesic, worm infection, ear infections. Mishra *et al*, 2011 and Adhikari*et al*, 2018; Adhikari*et al,* 2014, have reviewed the various pharmacological roles of this plant. The antinociceptive and anti-inflammatory activities of leaves of this plant were reported by Mule *et al,* 2008. The anticancer activity of this plant on Ehrlich's ascites carcinoma was studied by Bala*et al*, 2010. Saravanan*et al*, 2017 have studied the GC MS pattern, cytotoxic and antioxidant roles of ethyl acetate extract of this plant. The immune-modulatory role of*Cleome gynandra* was reported by Kori*et al,* 2009. The present work reports the GC MS pattern of the ethyl acetate extracts of *Cleome gynandra*whole plant. This is in continuation of our endeavour to establish the medicinal efficacy of the herbal and traditional systems of Ayurveda, Sidhha and Unani of medicine (Priyadarshini*et al,* 2017; Jayakumari*et al*, 2017; Rao*et al,* 2018; Vijayalakshmi and Rao, 2019; Yuvaraj*et al*, 2019;

Mutteviet al, 2019, Raoet al, 2019; Mutteviet al, 2020; Vijayalakshmi and Rao, 2020; Janakiet al, 2021).

MATERIALS AND METHODS

The plant *Cleome gynandra*was collected from the nearby paddy fields at Chengalpattu, Tamil Nadu. The plant was identified by a qualified botanist at Chennai. The ethyl acetate extract of the shade dried whole plant was collected after 48 h of soaking. The extract was evaporated and the dried powder was used for GC-MS analysis by standard procedures.

GC-MS Procedure

Instrument: GC (Agilent: GC: (G3440A) 7890A. MS/MS: 7000 Triple Quad GCMS) was equipped with MS detector.

Sample Preparation

About 100 ml sample was dissolved in 1 ml of suitable solvents. The solution was stirred vigorously using vortex stirrer for 10 s. The clear extract was determined using GC for analysis.

GC-MS Protocol

Column DB5 MS (30 mm × 0.25 mm ID ×0.25 µm, composed of 5% phenyl 95% methylpolysiloxane), electron impact mode at 70 eV; helium (99.999%) was used as carrier gas at a constant flow of 1 ml/min injector temperature 280°C; auxilary temperature: 290°C ion-source temperature 280°C.

The oven temperature was programmed from 50°C (isothermal for 1.0 min), with an increase of 40°C/min, to 170°C C (isothermal for 4.0 min), then 10°C/min to 310°C (isothermal for 10 min) fragments from 45 to 450 Da. Total GC running time is 32.02 min. The compounds are identified by GC-MS Library (NIST and WILEY).

RESULTS AND DISCUSSION

The results of the GC-MS analysis of the whole plant ethyl acetate extract, along with the possible medicinal role of each molecule of*Cleome gynandra*extract are tabulated in Table 1. Figure 1 represents the GC-MS profile of ethyl acetate extract of the whole plant of *Cleome gynandra.* The identification of metabolites was accomplished by comparison of retention time and fragmentation pattern with mass spectra in the NIST spectral library stored in the computer software (version 1.10 beta, Shimadzu) of the GC-MS along with the possible pharmaceutical roles of each bio molecule as per Dr. Duke's Phytochemical and ethnobotanical data base (National Agriculture Library, USA) and others as shown in Table 1.The results indicates in Table 1 clearly indicate the presence of some important biomolecules, such as n-Hexadecanoic acid, 4-(2,4-Dimethylcyclohex-3-enyl)but-3-en-2-one, 3,7,11,15-Tetramethyl-2-hexadecen-1-ol, 9,12,15-Octadecatrienoic acid, methyl ester, (Z,Z,Z)-, 2-((Octan-2-yloxy)carbonyl)benzoic acid, Methyl stearidonate, dl-.alpha.-Tocopherol, Campesterol, Stigmasterol, .beta.-Sitosterol, i-Propyl 9,12,15-octadecatrienoate. These molecules have far reaching medicinal role which corroborate well with the medicinal properties of *Cleome gynandra*.

CONCLUSION

The GC MS profile indicated the presence of some important biomolecules which could contribute to the medicinal role of *Cleome gynandra.*

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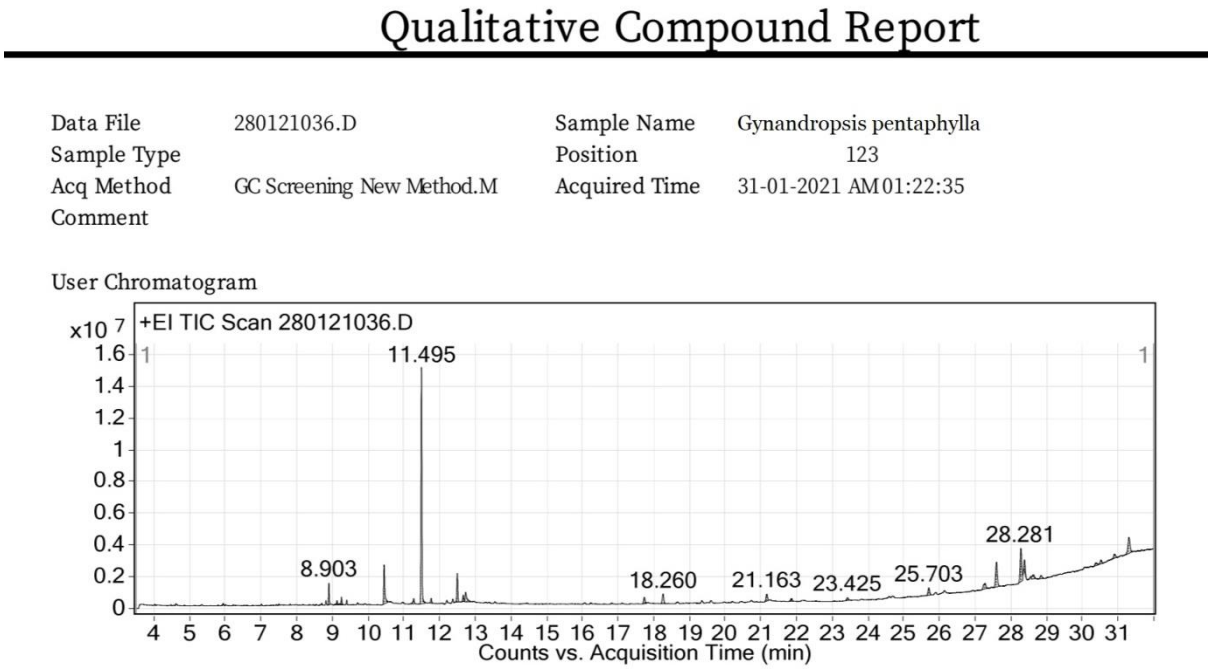

Figure 1. Shows the GC MS profile graph of ethyl acetate extract of*Cleome gynadra*

Table1. Indicates the retentions time, types of possible compound, molecular formula, molecular mass, percentage peak area and the possible medicinal roles of each compound as shown in the GC MS profile of*Cleome gynadra*

Ret. Time	Compound	Mol. Formula	Mol. Mass	% Peak area	Possible Medicinal role
8.90	Bicyclo[3.1.1]heptane, 2,6,6-trimethyl-	C10H18	138.1	2.83	Not Known
10.45	n-Hexadecanoic acid	C16H32O2	256.2	7.40	Acidifier, Arachidonic acid Inhibitor, Increases

					Aromatic Amino acid decarboxylase activity, Inhibits production of uric acid, Urine acidifier, Anaphylactic, Arylamine N acetyltransferase inhibitor, decreases norepinephrine production, Down regulates nuclear and cytosol androgen reuptake, GABA-nergic, Increase NK cell activity, inhibits production of tumor necrosis factor, Myo-neuro-stimulator
11.28	4-(2,4-Dimethylcyclohex-3-enyl)but-3-en-2-one	C12H18O	178.1	1.11	Decreases endothlial Leukocyte adhesion, Decreases endothelial Platelet adhesion, endocrine tonic, endothelium derived relaxing factor promoter, enter relaxant, entero-motility enhancer
11.50	Cyclohexanol, 5-methyl-2-(1-methylethyl)-, (1.alpha.,2.beta.,5.alpha.)-(.+/-.)-	C10H20O	156.2	37.67	Not Known
12.66	Ethyl 9,12,15-octadecatrienoate	C20H34O2	306.3	1.14	Not known
12.73	9,12,15-Octadecatrienoic acid, methyl ester, (Z,Z,Z)-	C19H32O2	292.2	2.81	Acidifier, Arachidonic acid Inhibitor, Increases Aromatic Amino acid decarboxylase activity, Inhibits production of uric acid, Urine acidifier,
17.74	Methyl 16-hydroxy-hexadecanoate	C17H34O3	286.3	1.61	Catechol-O-Methyl-Transfearse inhibitor, Increases Glutathione-s-Transferase Activity, Decrease Glutamate Oxaloacetate transaminase activity, Decreases Glutamate pyruvate transaminase, Glycosyltransferase inhibitor, Glutathione-S-Transfearse inhibitor, Increases glyoxalate

					transamination, Reverse transcriptase inhibitor,
18.26	2-((Octan-2-yloxy)carbonyl)benzoic acid	C16H22O4	278.2	2.38	Acidifier, Arachidonic acid Inhibitor, Increases Aromatic Amino acid decarboxylase activity, Inhibits production of uric acid, Urine acidifier,
21.16	Methyl stearidonate	C19H30O2	290.2	1.91	Catechol-O-Methyl-Transfearse inhibitor, Methyl donor
25.70	dl-.alpha.-Tocopherol	C29H50O2	430.4	2.08	Tocopherol synergist, 5 alpha reductase inhibitor, Alpha agonist, Alpha amylase inhibitor, Alpha glucosidase inhibitor, HIF-1 alpha inhibitor, Ikappa B-alpha phosphorylation inhibitor, Increase alpha mannosidase activity, Interleukin 1-alpha inhibitor, Testosterone-5-Alpha-Reductase-Inhibitor, TNF- alpha inhibitor
27.28	Campesterol	C28H48O	400.4	2.43	Plant steroid use as food additive and has cholesterol lowering role
27.60	Stigmasterol	C29H48O	412.4	7.49	Precursor of progesterone act as intermediate in the biosynthesis of androgens and estrogens Antiosteoarthritic, antihypercholestrolemic, cytotoxic, antitumor, hypoglycaemic, antimutagenic, antioxidant, anti-inflammatory, Analgesic.
28.28	.beta.-Sitosterol	C29H50O	414.4	9.48	17 beta dehydrogenase inhibitor, androgen blocker, anti-amyloid beta, anticancer, Anti TGF beta, Beta 2- receptor, beta blocker, beta-galactosidase inhibitor, beta-glucuronidase inhibitor
28.38	3,7,11,15-Tetramethyl-2-hexadecen-1-ol	C20H40O	296.3	7.26	Catechol-O-Methyl-Transfearse inhibitor, Methyl donar
28.6	Phytonadione	C31H46	450.	1.53	Not Known

3		O2	4		
28.85	Cholest-5-en-3-ol, 24-propylidene-, (3.beta.)-	C30H50O	426.4	1.01	Not Known
31.31	i-Propyl 9,12,15-octadecatrienoate	C21H36O2	320.3	5.69	11Beta HSD inhibitor, 17-beta-hydroxysteroid dehydrogenase inhibitor, 5 HETE inhibitor, 5 HT inhibitor, 8 HETE inhibitor, Anti 5-HT, 5-Lipoxygenase-Inhibitor, 8-HETE-Inhibitor, Aldehyde-Oxidase-Inhibitor, Alcohol-Dehydrogenase-Inhibitor, AHH-Inhibitor, Akt-Inhibitor, Adenylate-Cyclase-Inhibitor, AChE-Inhibitor, Acetyl-CoA-Carboxylase-Inhibitor, ACE-Inhibitor, ABeta-Inhibitor