Determination of Bioactive Components of *Cynodon dactylon* by GC-MS Analysis

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Abstract: *Cynodon dactylon* (L.) Pers. (family –Poaceae), is traditionally used for curing different aliments. Hence the present investigation was carried out to determine the possible chemical components from *C.dactylon* leaves by GC-MS Technique. This analysis revealed that *C.dactylon* leaves contain Glycerin (38.49%), 9, 12-Octadecadienoyl chloride,(Z,Z)-(15.61%), Hexadecanoic acid , ethyl ester (9.50%), Ethyl α-d-glucopyranoside (8.42%), Linoleic acid,ethyl ester(5.32%), and Phytol (4.89%) justifying the use of this plant to treat many aliments in folk and herbal medicine.
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Keywords: *Cynodon dactylon*, GC-MS analysis, Phytol, Bioactivity of phytoconstituents.

1. Introduction

Most traditional medicines are developed from nature. Plants are rich source of secondary metabolites with interesting biological activities. Distinguished example of these compounds include flavonoids, phenols, saponins and cyanogenic glycosides. (Shahidi, 2000 and Shahidi *et al.*, 2008)

Cynodon dactylon (L.) Pers. (family – Poaceae), commonly known as Bermuda grass or Durva in Hindi is a weed .It is traditionally used for diabetes (Kirtikar *et al.*, 1980), anti-inflammatory, kidney problems, urinary disease, gastrointestinal disorder constipation, abdominal pain and as a blood purifying agent (Ahmed *et al.*, 1994). Whole plant is used for-diuretic, dropsy, syphilis, wound infection, piles (Chopra *et al.*, 1982). The juice of the plant is astringent and is applied externally to fresh cuts and wounds. It is used in the treatment of catarrhal opthalmia, hysteria, epilepsy, insanity, chronic diarrhea and dysentery. The plant is folk remedy for calcus, carbuncles, cough, hypertension, snake bites and gout (Chopra *et al.*, 1999 and Vaidyaratnam, 2003). The ethanolic extract of aerial parts of *C. dactylon* showed marked protection against convulsions induced by chemo convulsive agents in mice (Dilip Kumar Pal., 2009).Ethanol extract of aerial parts of *C. dactylon* has marked CNS depressant (Pal, 2008), and antioxidant activity (Pal *et al.*, 2008). Since there is no report on the phytoconstituents of *C. dactylon* leaves it was chosen as the subject of this study. The aim of this paper is to determine the organic compounds present in the leaves of *C. dactylon* with the aid of GC-MS Technique, which may provide an insight in its use in folklore medicine.

2. Material and Methods

Plant material and extraction procedure

Cynodon dactylon was collected from the local market in Chennai, Tamil Nadu, India. The powered leaf material (20g) was soaked in 50ml of 80% alcohol for 12 hours and then filtered through Whatmann filter paper No.41 along with 2g sodium sulphate to remove the sediments and traces of water in the filtrate. Before filtering the filter paper along with sodium sulphate was wetted with absolute alcohol. The filtrate was then concentrated by bubbling nitrogen gas into the solution and concentrated to 1 ml.

Gas Chromatography- Mass Spectrum Analysis (GC-MS)

GC-MS technique was used in this study to identify the phytocomponents present in the extract. GC-MS technique was carried out at Indian Institute of Crop Processing Technology (IICPT) Thanjavor, Tamil Nadu. GC-MS analysis of this extract was performed using aPerkin Elmer GC Claurus 500 system and gas chromatograph interfaced to a Mass Spectrometer (GC-MS) equipped with Elite-1 fused silica capillary column (30 m x 1µ Mdf. Composed of 100% Dimethyl poly siloxane). For GC-MS detection, an electron ionization energy system with ionization energy of 70eV was used .Helium gas (99.999%) was used as the carrier gas at a constant flow rate of 1ml/min. and an injection volume of 2µl was employed (split ratio of 10:1). Injector temperature 250°C; Ion-source temperature 280°C. The oven temperature was programmed from 110°C (isothermal for2 min.), with an increase of 10°C /min, to200°C ,then 5°C/ min. to 280°C, ending with a 9min. isothermal at 280°C. Mass spectra were taken at 70eV; a scan interval of 0.5 seconds and fragments from 45 to450 Da. Total GC running time was 36

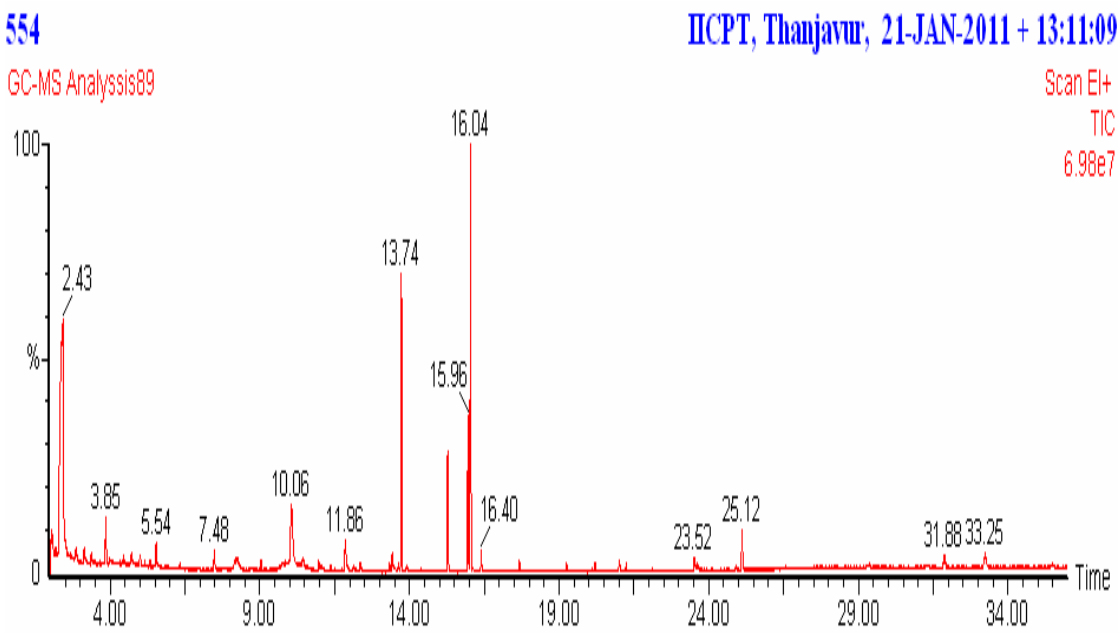
min. The relative percentage amount of each component was calculated by comparing its average peak area to the total areas. Software adopted to handle mass spectra and chromatograms was a TurboMass Ver5.2.0.

Identification of components

Interpretation of mass spectrum GC-MS was conducted using the database of National Institute Standard and Technique (NIST) having more than 62,000 patterns. The spectrum of the unknown component was compared with the spectrum of the known components stored in the NIST library. The Name, Molecular weight, Structure of the component of the test material was ascertained.

Twenty four compounds were identified in *C.dactylon* leaves extract by GC-MS analysis. The active principle Molecular Weight (MW), Concentration (%), Molecular Formula (MF), Retention Time (RT) and their bioactivity are presented in Figure 1, Table1&2. The prevailing compounds were Glycerin (38.49%), 9, 12-Octadecadienoyl chloride, (Z,Z)-(15.61%), Hexadecanoic acid, ethyl ester (9.50%), Ethyl α-d-glucopyranoside (8.42%), Linoleic acid,ethyl ester(5.32%), and Phytol(4.89%).

Figure 1: Chromatogram obtained from the GC- MS with the extract of *Cynodon dactylon*



3. Result and Discussion:

Table 1: Total ionic chromatogram (GC-MS) of *Cynodon dactylon* obtained with 70eV using an Elite -1 fused silica capillary column with He gas as the carrier.

No.	RT	Name of the compound	Molecular Formula	MW	Peak Area %
1.	2.43	Glycerin	$C_3H_8O_3$	92	38.49
2.	3.85	4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl-	$C_6H_8O_4$	144	2.16
3.	5.54	Thymol	$C_{10}H_{14}O$	150	1.15
4.	7.48	Conhydrin	$C_8H_{17}NO$	143	0.79
5.	8.24	1,2-Cyclopentanediol, 3-methyl-	$C_6H_{12}O_2$	116	1.65
6.	9.04	Benzenepropanol, 4-hydroxy-à-methyl-, (R)-	$C_{10}H_{14}O_2$	166	0.36
7.	10.06	Ethyl à-d-glucopyranoside	$C_8H_{16}O_6$	208	8.42
8.	11.86	3,7,11,15-Tetramethyl-2-hexadecen-1-ol	$C_{20}H_{40}O$	296	2.01
9.	13.42	n-Hexadecanoic acid	$C_{16}H_{32}O_2$	256	1.01
10.	13.74	Hexadecanoic acid, ethyl ester	$C_{18}H_{36}O_2$	284	9.50
11.	15.28	Phytol	$C_{20}H_{40}O$	296	4.89
12.	15.96	Linoleic acid ethyl ester	$C_{20}H_{36}O_2$	308	5.32
13.	16.04	9,12-Octadecadienoyl chloride, (Z,Z)-	$C_{18}H_{31}ClO$	298	15.61
14.	16.40	Octadecanoic acid, ethyl ester	$C_{20}H_{40}O_2$	312	0.72
15.	17.67	Pentanal, 2-methyl-	$C_6H_{12}O$	100	0.58
16.	19.26	1-(Cyclopropyl-nitro-methyl)-cyclopentanol	$C_9H_{15}NO_3$	185	0.29
17.	20.21	2-Propenamide, N-[2-(dimethylamino)ethyl]-	$C_7H_{14}N_2O$	142	0.36
18.	21.01	Hexadecanoic acid, 2-hydroxy-1-(hydroxymethyl)ethyl ester	$C_{19}H_{38}O_4$	330	0.43
19.	21.24	Didodecyl phthalate	$C_{32}H_{54}O_4$	502	0.29
20.	23.52	13-Tetradece-11-yn-1-ol	$C_{14}H_{24}O$	208	1.01
21.	23.63	10-Undecyn-1-ol	$C_{11}H_{20}O$	168	0.43
22.	25.12	Squalene	$C_{30}H_{50}$	410	1.94
23.	31.88	9,12-Octadecadienoic acid (Z,Z)-, phenylmethyl ester	$C_{25}H_{38}O_2$	370	1.15
24.	33.25	Diazoprogesterone	$C_{21}H_{30}N_4$	338	1.44

Table 2: Biological activity of Phytocomponents identified in *Cynodon dactylon*

No.	Name of the compound	Molecular Formula	Compound Nature	**Activity
1.	Glycerin	$C_3H_8O_3$	Alcohol	Antimicrobial,Antiinflammatory
2.	4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl-	$C_6H_8O_4$	Flavonoid fraction	Antimicrobial,Antiinflammatory
3.	Thymol	$C_{10}H_{14}O$		Antimicrobial,Antiinflammatory Analgesic,Antiseptic,Antioxidant Anticarcinogenic,Antiacne Antisalmonella
4.	Conhydrin	$C_8H_{17}NO$	Alkaloid	Anticoronary
5.	1,2-Cyclopentanediol, 3-methyl-	$C_6H_{12}O_2$	Alcoholic compound	Antimicrobial
6.	Benzenepropanol, 4-hydroxy-à-methyl-, (R)-	$C_{10}H_{14}O_2$	Aromatic compound	Antimicrobial,Antioxidant

7.	Ethyl à-d-glucopyranoside	$C_8H_{16}O_6$	Sugar moiety	Preservative
8.	3,7,11,15-Tetramethyl-2-hexadecen-1-ol	$C_{20}H_{40}O$	Terpene alcohol	Antimicrobial,Antiinflammatory
9.	n-Hexadecanoic acid	$C_{16}H_{32}O_2$	Palmitic acid	Antioxidant,Hypocholesterolemic Nematicide, Pesticide, Anti androgenic, Flavor Hemolytic,5-Alpha reductase inhibitor
10.	Hexadecanoic acid, ethyl ester	$C_{18}H_{36}O_2$	Palmitic acid ester	-do-
11.	Phytol	$C_{20}H_{40}O$	Diterpene	Antimicrobial,Antiinflammatory Anticancer,Diuretic
12.	Linoleic acid ethyl ester	$C_{20}H_{36}O_2$	Fatty acid ester	Hypocholesterolemic,Nematicide Antiarthritic,Hepatoprotective Antiandrogenic,Hypocholesterolemic Nematicide,5-Alpha reductase inhibitor,Antihistaminic,Anticoronary Insectifuge,Antieczemic,Antiacne
13.	9,12-Octadecadienoyl chloride, (Z,Z)-	$C_{18}H_{31}ClO$	Linoleic acid chloride	No activity reported
14.	Octadecanoic acid, ethyl ester	$C_{20}H_{40}O_2$	Stearic acid ester	No activity reported
15.	Pentanal, 2-methyl-	$C_6H_{12}O$	Aldehyde compound	Antimicrobial
16.	1-(Cyclopropyl-nitro-methyl)-cyclopentanol	$C_9H_{15}NO_3$	Nitrogen compound	Antimicrobial
17.	2-Propenamide, N-[2-(dimethylamino)ethyl]-	$C_7H_{14}N_2O$	Amide compound	Antimicrobial
18.	Hexadecanoic acid, 2-hydroxy-1-(hydroxymethyl)ethyl ester	$C_{19}H_{38}O_4$	Fatty acid ester compound	No activity reported
19.	Didodecyl phthalate	$C_{32}H_{54}O_4$	Plasticizer compound	Antimicrobial Antifouling
20.	13-Tetradece-11-yn-1-ol	$C_{14}H_{24}O$	Alcoholic compound	Antimicrobial
21.	10-Undecyn-1-ol	$C_{11}H_{20}O$	Alcoholic compound	Antimicrobial
22.	Squalene	$C_{30}H_{50}$	Triterpene	Anticancer,Antimicrobial,Antioxidant Chemo preventive,Pesticide Anti- tumor and Sunscreen
23.	9,12-Octadecadienoic acid (Z,Z)-, phenylmethyl ester	$C_{25}H_{38}O_2$	Linoleic acid ester compound	Hypocholesterolemic, Nematicide Antiarthritic, Hepatoprotective Anti androgenic,Hypocholesterolemic Nematicide, 5-Alpha reductase inhibitor,Antihistaminic,Anticoronary Insectifuge,Antieczemic,Antiacne
24.	Diazoprogesterone	$C_{21}H_{30}N_4$	Nitrogen compound	Antimicrobial

**Activity source: Dr. Duke's Phytochemical and Ethnobotanical Database

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References

1. Shahidi F,"Antioxidant factors in plant foods and selected oilseeds. BioFactor 2000; 13: 179-185.
2. Shahidi F, McDonald J, Chandrasekara A, Zhong Y, Phytochemicals of foods, beverages and fruit vinegars: chemistry and health effects. Asia Pacific J. Clin. Nutr. 2008; 17: 380-382.
3. Kirtikar KK, Basu BD, Indian Medicinal Plants. 2nd edition, Lalit Mohan Publication, India, 1980: 2650.
4. Ahmed S, Reza MS, Jabbar A. Antimicrobial activity of *Cynodon dactylon*. Fitoterpia. 1994; 65: 463-464.
5. Chopra RN, Handa KL, Indigenous Drugs of India, 2nd edition, Academic Publishers, India, 1982: 504.
6. Chopra RN, Nayer SL, Chopra IC, Glossary of Indian Medicinal Plants. CSIR, New Delhi: Publication and Information Directorate, 1999: 88.
7. VaidyaratnamPSV. Arya Vaidya Sala, Kottakkal, Vol. II, Orient Longham Publication, Chennai, 2003: 289.
8. Dilip Kumar Pal, Determination of brain biogenic amines in *Cynodon dactylon* Pers. and *Cypres rotundus* L. treated mice. International Journal of Pharmacy and Pharmaceutical Science 2009; 1(1): 190-197.
9. Pal DK. Evaluation of CNS activities of aerial parts of *Cynodon dactylon* Per. in mice. Acta Pol Pharm-Drug Res. 2008; 65:37-43
10. Pal DK, Kumar M,Chakrabarty P, Kumar S. Evaluation of the antioxidant activity of aerial parts of *Cynodon dactylon*. Asian J. Chemistry 2008; 20:2479-2481.

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