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Gas chromatography-Mass spectrometry (GC-MS) profiling of bioactive compounds from the whole plant ethanolic extract of *Cynodon dactylon* (L.) Pers.

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Abstract

Plants have been an important source of medicine with qualities for thousands of years. Plants are the traditional sources for many chemicals used as pharmaceutical biochemicals, fragrances, food colours and flavours in different countries especially in India. *Cynodon dactylon* (L) Pers commonly known as Bermuda grass belongs to the family Poaceae. In ethnomedicinal practices, the plant *Cynodon dactylon* is used to treat various diseases and has many potential pharmacological actions. The objective of the study was to investigate the phyto-components present in the ethanolic extract of *Cynodon dactylon* (L.) Pers by GC-MS analysis to ascertain its usage by the local community as a plant possessing medicinal properties. A total 31 compounds were identified from ethanolic extract of *C dectylon*. The major constituents were Turmerone (0.23%), Octadecanoic acid (0.96%), n-hexadecanoic acid (13.63%), Lidocaine (3.87%) Tetradecanoic acid (0.28%), Neophytadiene (0.37%), Tetracosanol (1.64%), Phytol (1.64%), Stigmasterol (2.99%). These findings support the traditional use of *Cynodon dactylon* in various disorders. The detected Phytoconstituents encourage future isolation of these remarkable substances for potential usage in the pharmaceutical industry

Introduction

Medicinal plants are of great interest to drug industries, as herbal medicines and their derivative products are often prepared from crude plant extracts, which comprise a complex mixture of

different phytochemical constituents. The development of herbal remedies is more popular nowadays due to fewer side effects and the easy availability of medicinal plants.

Cynodon dactylon is commonly known as bermuda grass, belongs to family Poaceae. *C. dactylon* is native to East Africa, Asia, Australia by Southern Europe. *Cynodon dactylon* has various medicinal properties. The plant is traditionally used as an agent to control diabetes. The extract of plant has been reported has antidiabetic, antioxidant & hypolipidemic efficacy. The plant also possesses antiviral and antimicrobial activity. The plant is an astringent, sweet, cooling, haemostatic, depurative, vulnerable constipating, diuretic tonic [1].

In the present study, we evaluated the phytochemicals, and constituents of ethanolic extract of *Cynodon dactylon* by gas chromatography and Mass spectrometry (GC-MS) to provide the scientific information to develop potential phytomedicine.

Material and methods

Plants contain different phytochemicals, also known as secondary metabolites. Phytochemicals are useful in the treatment of certain disorders by their individual, additive, or synergic actions to improve health [2-3]. Phytochemicals are vital in the pharmaceutical industry for the development of new drugs and the preparation of therapeutic agents [4]. The development of new drugs starts with the identification of active principles from natural sources. The screening of plant extracts is a new approach to find out the therapeutically active compounds in various plant species [1,4]

Plant material & preparation of extract

The whole plant of *Cynodon dactylon* was collected from the surrounding areas of Akal College of Pharmacy and Technical Education, Mastuana Sahib Sangrur, in the month of November 2021. The plant was authenticated from CSIR-NIScPR, New Delhi having authentication No- NISc PR/RHMD/Consult 2021/3890-91. Whole plant of *Cynodon dactylon* was shade-dried and coarsely powdered. The 500gm of powdered plant material is treated with various solvent by successive solvent extraction method. The extracts obtained were filtered & concentrated by using rota evaporator [5-6].

GC-MS analysis

The ethanol extract of *Cynodon dactylon* was subjected to GC-MS detection. The detection was carried out with Gas chromatograph coupled with Mass spectrophotometer (GC-MS, Shimadzu QP 2010 Mass spectrophotometer). Helium was employed as the carrier and its flow rate was adjusted to 1.2 ml/min. The analytical column connected to the system was an RTx-5 capillary column. The column head pressure was adjusted to 100 Kpa. Column temperature programmed from 40 °C. The injector Temperature was set at 230 °C. The mass Spectra were screened range of M/Z 40-600amu. Compounds were identified by comparing mass spectra with library of the National Institute of Standard and Technology [7]. 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 Compound Name, Molecular weight of the test material was ascertained [8].

Results and Discussion

GC-MS Analysis of ethanol extract of *C. dectylon* whole plant

The analysis and extraction of plant material play an important role in the development and quality control of herbal formulation. Hence, present study was aimed to find out the bioactive compounds present in the ethanolic extract of *Cynodon dactylon* by using Gas chromatography and Mass spectroscopy. The active compounds with their peak number concentration (Peak area %) and retention time (RT) were presented in figure 1 and table 1 which showed the presence of 31 compounds in the ethanolic extract of *Cynodon dactylon*. The prevailing components were Lidocaine (Rt-32.534), Phytol (Rt-36.898), Stigmasterol (Rt-55.012), Neophytidine (Rt-31.314) and aR-turmerone (Rt-27.418).

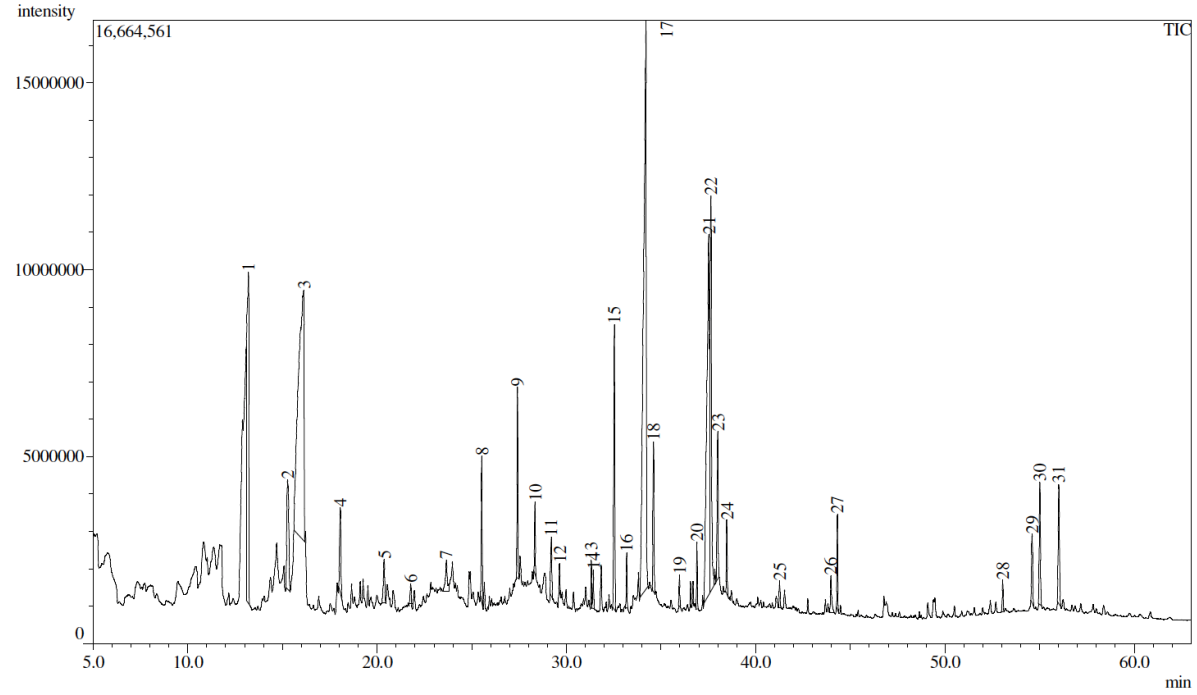

Figure 1: GC-MS chromatogram of methanol extract of *Cynodon dactylon* (L.) Pers.

Table 1: GC-MS spectral analysis of Ethanol extract of *Cynodon dactylon* (L.) Pers.

Peak#	Retention Time	Area%	Compound
1.	13.205	8.30	V 4H-Pyran-4-one, 2,3-dihydro-3,5-dihy
2.	15.271	2.95	4-Vinylphenol
3.	16.129	19.11	5-Hydroxymethylfurfural
4.	18.049	1.48	2-Methoxy-4-vinylphenol
5.	20.370	0.79	DL-Proline, 5-oxo-, methyl ester
6.	21.773	0.21	2-Isopropyl-5-methyl-6-oxabicyclo[3
7.	23.659	0.82	2-Hydroxy-1-(1-pyrrolidiyl)-1-buten-
8.	25.527	1.69	Diethyl Phthalate
9.	27.418	2.13	aR-Turmerone

10.	28.336	0.79	Curlone
11.	29.200	0.88	(E)-4-(3-Hydroxyprop-1-en-1-yl)-2-m
12.	29.639	0.28	Tetradecanoic acid
13.	31.314	0.51	Neophytadiene
14.	31.419	0.40	2-Pentadecanone, 6,10,14-trimethyl-
15.	32.534	3.87	Lidocaine
16.	33.184	0.58	Hexadecanoic acid, methyl ester
17.	34.205	21.40	n-Hexadecanoic acid
18.	34.598	1.80	Hexadecanoic acid, ethyl ester
19.	35.970	0.35	Octadecanoic acid
20.	36.898	0.76	Phytol
21.	37.518	12.59	10E,122-Octadecadienoic acid
22.	37.631	7.66	7-Tetradecenal, (Z)
23.	37.996	2.36	Octadecanoic acid
24.	38.471	0.81	Octadecanoic acid, ethyl ester
25.	41.262	0.32	4,8,12,16-Tetramethylheptadecan-4-o
26.	43.971	0.62	Hexadecanoic acid, 2-hydroxy-1-(hyd
27.	44.313	1.05	Bis(2-ethylhexyl) phthalate
28.	53.046	0.42	Vitamin E
29.	54.600	1.13	Ergost-5-en-3-ol, (3.beta)-
30.	55.012	1.92	Stigmasterol
31.	56.018	2.04	gamma-Sitosterol

Stigmasterol ($C_{29}H_{48}O$), a naturally occurring steroid derivative, is found in many plants. Stigmasterol has various pharmacological effects such as anticancer, anti-osteoarthritis, anti-inflammatory, anti-diabetic, immunomodulatory, antiparasitic, antifungal, antibacterial, antioxidant, and neuroprotective properties [9]. It is reported that Stigmasterol can effectively reduce neurological deficits and infarct damage induced by the ischemic/reperfusion injury, improve histopathology changes, and restore the levels of the endogenous antioxidant defense system in a dose–response mode [10]. Lidocaine has historically been used as a pretreatment in TBI as it was believed to lessen the sympathetic stimulation associated with rapid sequence intubation (RSI) [11]. Recent investigations with Phytol demonstrated anxiolytic, metabolism-modulating, cytotoxic, antioxidant, autophagy- and apoptosis-inducing, antinociceptive, anti-inflammatory, immune-modulating, and antimicrobial effects [12]. Medicinal plants containing Neophytidine (NPT) are used in the treatment of headaches, rheumatism, and some skin diseases, whereas NPT has shown analgesic, antipyretic, anti-inflammatory, and antioxidant properties [13]. aR-Tumerones are aromatic turmerones and they display a variety of activities, such as antimutagenicity, anti-hyperglycemic, cell proliferative and anti-inflammatory actions [14]. It has been also suggested that aR-turmerone inhibits microglia activation, a property that may be useful in treating neurodegenerative disease [15].

Conclusion

The demand in the study of plants, which is one of the richest sources of promising versatile chemical compounds, is growing persistently throughout the world during the last few decades. Therefore, the data generated from these experiments provide the chemical basis for the wide use of the plants as therapeutic agent for treating various ailments. In the present work, GCMS analysis of ethanolic extract of *C. dectylon* was done. GCMS analysis revealed 31 phytoconstituents in ethanolic extract of *Cynodon dactylon*. From the above analysis, it was concluded that main constituents i.e., Lidocaine, Phytol, Stigmasterol, Neophytidine can be used in the management of neurogenerative disorders in neuronal ischemia as anti-inflammatory, antiulcer, antioxidant and anticancer. This study reported a neuroprotective effect of aR-turmerone for providing new insights into the potential therapeutic applications of aR-turmerone for neurological disorders.

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