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Research Article

GC-MS ANALYSIS OF BIOACTIVE COMPOUNDS IN THE METHANOLIC LEAF EXTRACT OF *Memecylon edule* Roxb. FROM AUTHUKURICHI SACRED GROVE, TAMILNADU, INDIA

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Abstract

Memecylon edule Roxb. is a member of Melastomataceae and a valuable Indian ethnomedicinal plant, was investigated to determine the phytochemical constituents present in various extracts of the leaves through GC-MS (Gas Chromatography - Mass Spectrometry) analysis. Powdered leaf plant materials were subjected to successive extraction with organic solvents such as methanol by Soxhlet extraction method. In the present study, a total of 28 different compounds identified by GC-MS analysis using methanolic leaf extract, all the identified compounds were medicinally valuable for the treatment of various human ailments. In addition, all the phytochemical compounds were needed for further investigations on toxicological aspects for the development of new lead of therapeutic interest.

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Key words: Phytochemical profile, Bioactive compound, *Memecylon edule* and GC-MS analysis.

1. Introduction

The genus *Memecylon* L., belonging to the family Melastomataceae, was represented world over by around 250 species of shrubs and trees (Henry *et al*., 1989) in the paleotropical region. Of which, 30 species has been reported from India (Santapu and Henry, 1973) and 16 species from Tamilnadu (Nair *et al*., 1983). The genus *Memecylon* was represented by 39 species of which 21 are endemic to the country and the Western Ghats was reported to host 29 species (Rajendraprasad *et al*., 2006). They are distributed in all types of habitats (Sivu *at al*., 2013). Memecylon species are utilized worldwide as timbers, ornamentals, source of edible fruits and yellow dye in addition to their medicinal properties (Mabberley *et al*., 2005).

The leaves of *M. edule* was said to heal the burning wounds without scar. The anti-inflammatory, analgesic and antioxidant activities of the leaves used in traditional medicine in reliving inflammation and pain (Nualkew *et al*., 2009). Decoction of stem has also been relief fever symptoms of common diseases such as common cold, measles and chicken box (Karuppasamy, 2007). The antibacterial activity of seeds was evaluated (Elavazhagan and Arunachalam, 2010). After pursuit of published literature, so far meager work has been done regarding the phytochemical evaluation on this selected plant. Hence, in the present study GC-MS analysis was carried out with methanol extracts of

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the leaves of *Memecylon edule* to examine the chemical constituents present in it.

2. Materials and methods

Collection of plant materials and preparation of the extract

The fresh leaves of *Memecylon edule* were collected from the sacred grove of Silambur (Lat, 11.35 ºN; Long, 79.31ºE), Ariyalur District, Tamil Nadu, India. The specimen was botanically identified and confirmed by Rapinat Herbarium, St. Joseph's College, Tiruchirappalli. The preserved plant specimens were submitted to the Department of Botany, Annamalai University, Annamalainagar, Tamilnadu for further reference. The leaves were chopped into small pieces, shade-dried and coarsely powdered by using a pulverizor. The powdered leaf was then subjected to successive extraction with organic solvents such as hexane chloroform and ethanol by Soxhlet method (Catherine *et al*., 1997). The extracts were then collected and distilled off on a water bath at atmospheric pressure and the last trace of the solvents was removed in vacuum and stored at 4 ˚C. They were used for GC-MS analysis.

Gas chromatography- mass spectrometry (GC-MS) analysis

GC-MS analysis was performed with GC-MS Clarus 500 Perkin Elmer Equipment. Compounds were separated on Elite-5 capillary column (Crossbond 5 % Phenyl 95 % dimethylpolysiloxane) Oven temperature was programmed as follows: isothermal temperature at 60 ºC then increased to 200 ºC at the rate of 10 ºC/min, then increased upto 280 ºC at the rate of 5 ºC/min held for 9 min. Ionization of the sample components was performed in the Electron energy (70 eV). The helium was used as gas carrier (1 ml/min.), and 1.0 µL of sample was injected. The detector was Mass detector Turbomass gold Perkin Elmer. The total running time for GC was 36 min and software Turbomass 5.2.0 was used in this GC-MS study (Manjamalai *et al*., 2010).

Identification of compounds

All the compounds were identified from methanol extracts based on direct comparison of the retention times and their mass spectra with the spectra of known compounds stored in the spectral database, National Institute Standard and technology (NIST) (Version year 2005).

3. Results and Discussion

The chemical constituents identified by the GC-MS analysis on various extracts of the leaves of *Memecylon edule* were enumerated along with Molecular Formula (MF), Molecular Weight (MW), Retention Time (RT) and Peak area and Peak area (%) was presented in Table - 2. More than seven major compounds were identified in the extracts being 1, 2, 3-Benzenetriol (29.27 %), D-Allose (15.25 %), 2-Furancarboxaldehyde, 5-(hydroxymethyl) - (13.48 %), Hydroquinone (7.31 %), Furfural (5.59 %), n-Hexadecanoic acid (5.16 %) and 1, 2-Butanediol, 1-phenyl - (4.20 %) respectively along with other minor constituents. The identified compounds in the leaf of methanol extract of *Memecylon edule.*

Plants serve as vast source for varied phytoconstituents exhibiting varied pharmacological property. Identifying such potential plants is of significance in medicine. In this connection, in the present study the methanolic leaf extract of *M. edule* was examined. Secondary metabolites have proven to be medicinal in nature. They have various protective and therapeutic effects which prevent diseases and maintain a state of well-being (Oyetayo, 2007).

Table - 1: GC-MS analysis of methanolic leaf extract of *Memecylon edule*

S.No.	Peak Name	Retention Time	Peak Area	% Peak area
1.	Name: Furfural Formula: $C_5H_4O_2$ MW: 96	4.05	5817848	5.5959
2.	Name: 2-Cyclopenten-1-one, 2-hydroxy- Formula: $C_5H_6O_2$ MW: 98	5.83	3422707	0.3292
3.	Name: 1-Benzoyl-3-amino-4-cyano-3-pyrroline Formula: $C_{12}H_{11}N_3O$ MW: 213	6.26	9222706	0.8871
4.	Name: 2(3H)-Furanone, 3-acetyldihydro- Formula: $C_6H_8O_3$ MW: 128	6.91	2364052	0.2274
5.	Name: Phentermin-propionyl Formula: $C_{13}H_{19}NO$ MW: 205	7.11	6600468	0.6349
6.	Name: cis-1,2-Dihydrocatechol Formula: $C_6H_8O_2$ MW: 112	7.39	4075486	0.3920
7.	Name: 1,2-Butanediol, 1-phenyl- Formula: $C_{10}H_{14}O_2$ MW: 166	7.88	4374243	4.2074
8.	Name: Hydrouracil, 1-methyl- Formula: $C_5H_8N_2O_2$ MW: 128	8.58	9973383	0.9593
9.	Name: Methyl 2-furoate Formula: $C_6H_6O_3$ MW: 126	8.73	9219279	0.8868
10.	Name: Levoglucosenone Formula: $C_6H_6O_3$ MW: 126	9.22	2350919	2.2612
11.	Name: 1-Deoxy-d-altritol Formula: $C_6H_{14}O_5$ MW: 166	9.74	2329068	0.2240
12.	Name: 4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl- Formula: $C_6H_8O_4$	10.09	2743836	2.6392

S.No.	Peak Name	Retention Time	Peak Area	% Peak area
	MW: 144			
13.	Name: Benzoic acid, 2-hydroxy-, methyl ester Formula: $C_8H_8O_3$ MW: 152	10.58	1108930	0.1067
14.	Name: 1,4:3,6-Dianhydro-à-d-glucopyranose Formula: $C_6H_8O_4$ MW: 144	11.52	1506170	1.4487
15.	Name: 2-Furancarboxaldehyde, 5-(hydroxymethyl)- Formula: $C_6H_6O_3$ MW: 126	11.94	1402348	13.4886
16.	Name: 2-Methoxy-4-vinylphenol Formula: $C_9H_{10}O_2$ MW: 150	12.90	3369993	0.3241
17.	Name: Hydroquinone Formula: $C_6H_6O_2$ MW: 110	13.82	7601206	7.3113
18.	Name: Methyl-à-d-ribofuranoside Formula: $C_6H_{12}O_5$ MW: 164	15.15	7201470	0.6927
19.	Name: 1,2,3-Benzenetriol Formula: $C_6H_6O_3$ MW: 126	15.78	3043928	29.2782
20.	Name: 1,3-Cyclohexanediol, 4,6-dimethyl-2-nitro-, diacetate (ester), (1à,2á,3à,4á,6á)- Formula: $C_{12}H_{19}NO_6$ MW: 273	16.76	4121060	0.3964
21.	Name: Dodecanoic acid Formula: $C_{12}H_{24}O_2$ MW: 200	16.86	2974437	0.2861
22.	Name: D-Allose Formula: $C_6H_{12}O_6$ MW: 180	17.52	1586133	15.2563
23.	Name: Benzeneacetic acid, 4-hydroxy-3-methoxy- Formula: $C_9H_{10}O_4$ MW: 182	18.48	2831705	2.7237

S.No.	Peak Name	Retention Time	Peak Area	% Peak area
24.	Name: 2-Cyclohexen-1-one, 4-(3-hydroxybutyl)-3,5,5-trimethyl- Formula: $C_{13}H_{22}O_2$ MW: 210	19.19	2044206	1.9662
25.	Name: 3,7,11,15-Tetramethyl-2-hexadecen-1-ol Formula: $C_{20}H_{40}O$ MW: 296	20.20	6831596	0.6571
26.	Name: 3,5-Dimethoxy-4-hydroxyphenylacetic acid Formula: $C_{10}H_{12}O_5$ MW: 212	21.82	7012779	0.6745
27.	Name: n-Hexadecanoic acid Formula: $C_{16}H_{32}O_2$ MW: 256	22.42	5372974	5.1680
28.	Name: cis-9-Hexadecenal Formula: $C_{16}H_{30}O$ MW: 238	25.89	1015834	0.9771

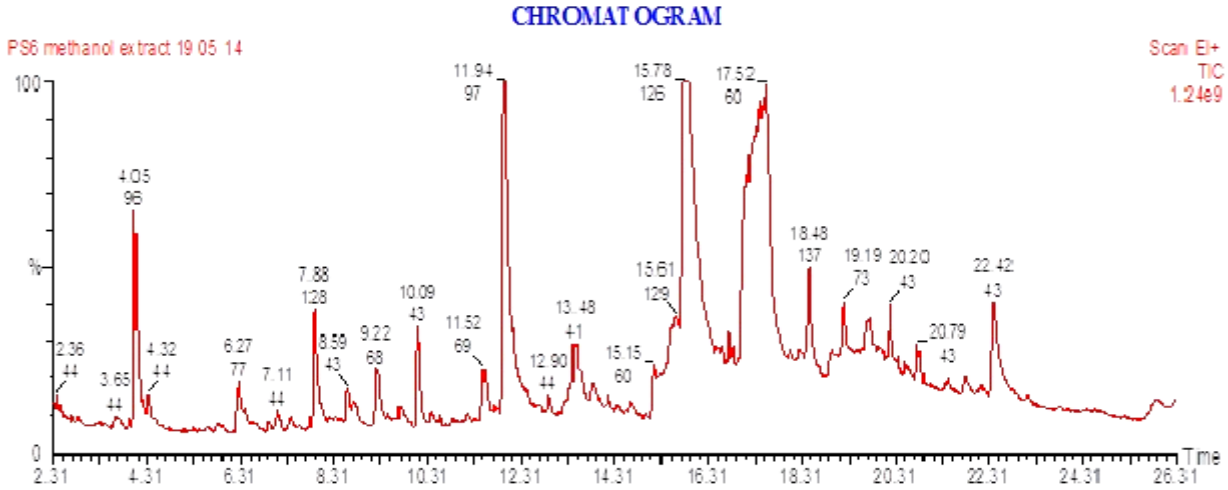

Figure - 1: GC-MS Chromatogram of Methanolic leaf extract of *Memecylon edule*

These compounds are known to be biologically active. Tannins have been found to form irreversible complexes with proline - rich proteins (Hagerman and Butler, 1981) resulting in the inhibition of the cell protein synthesis. Tannins have important roles such as stable and potent antioxidants (Treas and Evens, 1983). Herbs that have tannins as their main component are astringent in nature and are used for treating intestinal disorders such as diarrhoea and dysentery (Subhuti Dharmananda, 2005). Presence of Hexadecanoic acid, showing Antioxidant, Antiandrogenic, Hypocholesterolemic activities and used as nematicide, pesticide, lubricant, also it is an hemolytic 5-Alpha reductase inhibitor. Flavonoids have been referred to as nature's biological response modifiers because of strong experimental evidence of their inherent ability to modify the body's reaction to allergen, virus and carcinogens. They show anti-allergic, anti-inflammatory, anti-microbial and anti-cancer activity (Cushnie and Lamb, 2005; De Sousa *et al*., 2007).

Tannins are known to possess general antimicrobial and antioxidant activities (Rievere *et al*., 2009). Recent reports show that tannins may have potential value as cytotoxic and antineoplastic agents (Aguinaldo *et al*., 2005). Other compounds like saponins also have anti-fungal properties (Mohanta *et al*., 2005). Saponins are a mild detergent used in intracellular histochemistry staining to allow antibody access to intracellular proteins. In medicine, it is used in hyper cholestrolaemia, hyperglycemia, antioxidant, anticancer, anti-inflammatory and weight loss, etc. It is also known to have anti-fungal properties (De Lucca *et al*., 2005). Saponins have been implicated as bioactive antibacterial agents of plants (Mandal *et al*., 2005; Manjunatha *et al*., 2006). Plant steroids are known to be important for their cardiotonic activities, possess insecticidal and anti- microbial properties. Plant derived natural products such as flavonoids, terpenoids and steroids etc have received considerable attention in recent years due to their diverse pharmacological properties including antioxidant and antitumor activity. Phenolic phytochemicals have antioxidative, antidiabetic anticarcinogenic, antimicrobial, antiallergic, antimutagenic and anti-inflammtory (Arts *et al*., 2005; Scalbert *et al*., 2005). The present report correlates along with the above bioactivities and phytocompounds by the earlier reports in the leaf extracts of *Memecylon umbellatum* (Murugesan *et al*., 2011; Bharathi *et al*., 2015).

4. Conclusion

The presence of various bioactive compounds justifies the use of the whole plant for various ailments by traditional practitioners. However isolation of individual phytochemical constituents and subjecting it to biological activity will definitely give fruitful results. It could be concluded that *Memcylon edule* contains various bioactive compounds. So it is recommended as a plant of phytopharmaceutical importance. However, further studies will need to be undertaken to ascertain fully its bioactivity, toxicity profile, effect on the ecosystem and agricultural products.

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