Research Article

The gas chromatography–mass spectrometry study of leaf extract of one herbal plant, *Tarenna asiatica* (L.)

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ABSTRACT

Objective: The objective of this study was to find the biomolecules present in the leaf aqueous extracts of one wild herbal plant, *Tarenna asiatica* (L.) by gas chromatography–mass spectrometry (GC–MS) analysis. **Methods:** The GC–MS study of one leaf aqueous extracts of one wild herbal plant, *T. asiatica* was subjected to GC–MS analysis by standard procedures.**Results:** It was observed that some important biomolecule present in the GC–MS profile such as N-benzyl-2-phenethylamine, tridecanoic acid, methyl ester, pentanoic acid, phytol, 2-methylheptanoic acid, heptafluorobutyric acid, 2-naphthyl ester, 2(1H)-pyridinone, and 1-[2-deoxy-3,5-bis-O-(4-methylbenzoyl)-.beta.-D-erythro-pentofuranosyl]- had the medicinal roles which correspond well with medicinal roles of the plant as claimed ethnobotanically and by scientific reports. **Conclusion:** The GC–MS profile of *T. asiatica* clearly indicates the medicinal roles ascribed to it.

KEY WORDS: 2(1H)-pyridinone, 2-naphthyl ester, Aqueous, Gas chromatography–mass spectrometry, Heptafluorobutyric acid, Methyl ester, N-Benzyl-2-phenethylamine, Pentanoic acid, Phytol, 2-Methylheptanoic acid, *Tarenna asiatica*, Tridecanoic acid

INTRODUCTION

Tarenna asiatica (L.) is a wild herb with many medicinal roles. Ethnobotanically is used for a treatment of a number of ailments such as wound healing, antidote, paralysis, and anti-inflammatory, for eye infection and to stop vomiting. Its antioxidant and antimicrobial activities have been reported by many authors (Karthikkumaran *et al.*, 2014; Amutha *et al.*, 2012; Ramabharathi *et al.*, 2014; Anjanadevi *et al.*, 2014).[1-4] Deborah *et al.*, 2017, have reported the anticancer activity of the fruit extract against human breast cancer. The present study is to know the biomolecules present in the leaf extract of this plant by gas chromatography–mass spectrometry (GC–MS) analysis.[5] This knowledge could throw some light on the possible mechanisms for the medicinal roles of this plant. It is high time that herbal medicines should be thoroughly analyzed in the light of modern medical parameters to establish their efficacy.[6-15]

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METHODS

T. asiatica plant was procured from the nearby hill at Chengalpattu and was identified by a qualified botanist from Madras University, Chennai. The leaves were collected and thoroughly washed and aqueous extracts were prepared. The extract was then dried and the powder obtained was subjected to GC–MS analysis by standard procedure.

Instrument: Gas chromatography (Agilent: GC: (G3440A) 7890A. MS/MS: 7000 Triple Quad GC–MS) was equipped with mass spectrometry 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 gas chromatography for analysis.

GC–MS protocol

Column DB5 MS (30 mm × 0.25 mm ID × 0.25 µm, composed of 5% phenyl 95% methyl polysiloxane), electron impact mode at 70 eV; helium (99.999%) was used as carrier gas at a constant flow of 1 ml/min injector

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temperature 280°C; axillary 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 (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 GC–MS study are shown in Table 1 and Figure 1. The medicinal roles of some of the molecules are mentioned in Table 2 as per Dr. Duke's Phytochemical Database. Most of the compounds such as N-benzyl-2-phenethylamine, tridecanoic acid, methyl ester, pentanoic acid, phytol, 2-methylheptanoic acid, heptafluorobutyric acid, 2-naphthyl ester, 2(1H)-pyridinone, and 1-[2-deoxy-3,5-bis-O-(4-methylbenzoyl)-.beta.-D-erythro-pentofuranosyl]- indicated similar medicinal roles such as catechol-o-methyltransferase inhibitor, catechol-o-methyltransferase inhibitor, methyl donor, methylguanidine inhibitor, acidifier, acidulant, arachidonic acid inhibitor, arachidonic acid inhibitor, increase aromatic amino acid decarboxylase activity, inhibit production of uric acid, and urinary acidulant. It is interesting to note that the medicinal roles indicate mostly antioxidant, antibacterial, and anti-inflammatory properties which auger well with the various reports on the ethnobotanical medicinal roles of this plant. The medicinal roles of some

Table 1: The molecules present in the gas chromatography–mass spectrometry analysis of *Tarenna asiatica* (L.) with retention time, molecular formula, peak area, peak height, and molecular mass

Retention time	Name of molecule	Formula	Area	Height	Mass
3.84	Hexane, 3,3-dimethyl-	C_8H_{18}	46,697,484	7,331,565	114.1
3.94	Bicyclo[3.2.0]hepta-2,6-diene	C_7H_8	11,529,718	3,860,079	92.1
4.45	N-Benzyl-2-phenethylamine	$C_{15}H_{17}N$	34,798,275	10,042,429	211.1
4.95	-Acetoxy-3-methoxystyrene	$C_{11}H_{12}O_3$	15,725,171	4,722,140	192.1
5.83	Trimethylsilyloxycyclobutane	$C_7H_{16}OSi$	11,916,451	3,661,847	144.1
6.18	tert-Butyldimethylsilyl acetate	$C_8H_{18}O_2Si$	7,188,985	3,761,014	174.1
6.26	Silane, [(1,1-dimethyl-2-propenyl) oxy] dimethyl-	$C_7H_{16}OSi$	15,880,722	3,257,561	144.1
6.52	Silanol, trimethyl-, acetate	$C_5H_{12}O_2Si$	2,764,788	1,109,385	132.1
7.14	2-Cyclopentylethanol	$C_7H_{14}O$	7,310,809	1,645,030	114.1
7.59	Tridecanoic acid, methyl ester	$C_{14}H_{28}O_2$	53,903,498	10,830,913	228.2
7.76	Pentanoic acid	$C_5H_{10}O_2$	3,067,517	6,79,733	102.1
8.74	1,3-Methanopentalene, octahydro-	C_9H_{14}	14,463,477	1,766,693	122.1
8.82	Phytol	$C_{20}H_{40}O$	185,438,903	12,787,752	296.3
8.91	2-Methylheptanoic acid	$C_8H_{16}O_2$	14,679,645	419,204	144.1
15.21	Trifluoroacetyl-lavandulol	$C_{12}H_{17}F_3O_2$	37,908,253	8,690,639	250.1
19.90	Phosphorus pentafluoride	F^5P	3,314,002	587,768	126
19.98	1-Formyl-2, 2,6-trimethyl-3-cis-(3-methylbut-2-enyl)-5-cyclohexene	$C_{15}H_{24}O$	156,468,515	5,380,676	220.2
20.09	1,2-Benzenediol, O-(5-chlorovaleryl)-O-(2-methylbenzoyl)-	$C_{19}H_{19}ClO_4$	4,295,898	546,676	346.1
20.21	Cyanogen bromide	CBrN	17,334,408	802,572	104.9
20.26	Heptafluorobutyric acid, 2-naphthyl ester	$C_{14}H_7F_7O_2$	8,062,021	1,142,331	340
21.41	2 (1H)-Pyridinone, 1-[2-deoxy-3,5-bis-O-(4-methylbenzoyl)-. beta.-D-erythro-pentofuranosyl]-	$C_{26}H_{25}NO_6$	16,786,819	689,592	447.2
21.53	Carbamic acid, monoammonium salt	$CH_6N_2O_2$	16,399,689	1,032,531	78
21.65	10,10-Dimethyl-2,6-dimethylenebicyclo[7.2.0] undecan-5.beta.-ol	$C_{15}H_{24}O$	434,334,261	7,742,701	220.2
21.72	Diazoprogesterone	$C_{21}H_30N_4$	266,789,484	6,968,207	338.2
21.92	6.beta.Bicyclo[4.3.0]nonane, 5.beta.-iodomethyl-1. beta.-isopropenyl-4.alpha.,5.alpha.-dimethyl-,	$C_{15}H_{25}I$	435,887,101	7,595,792	332.1
22.02	Isophthalic acid, di (2-methylprop-2-en-1-yl) ester	$C_{16}H_{18}O_4$	3,887,503	1,425,098	274.1
22.30	Silane, diethylethoxy (2-methylpent-3-yloxy)-	$C^{12}H_{28}O_2Si$	50,952,957	5,367,612	232.2
22.38	1,3-Dioxolane-2-methanol	$C_4H_8O_3$	207,269,6787	7,084,043	104
22.73	4-Methyl-2,4-bis (4'-trimethylsilyloxyphenyl) pentene-1	$C_{24}H_{36}O_2Si_2$	2,411,901,296	9,202,952	412.2
22.74	1,3-Dimethyl-5-propyl-7-(propene-1-yl) adamantane	$C_{18}H_30$	314,811,708	10,822,038	246.2
23.42	Tricyclo[3.3.1.1 (3,7)]decanone, 4-iodo-, (1.alpha.,3. beta.,4.alpha.,5.alpha.,7.beta.)-	$C_{10}H_{13}IO$	151,769,235	3,488,103	276
23.75	1,3-Benzenediol, o-(2-methoxybenzoyl)-o'-ethoxycarbonyl-	$C_{17}H_{16}O_6$	6,016,367	1,691,039	316.1
24.55	1,2-Benzenediol, o-(4-methoxybezoyl)-o'-(5-chlorovaleryl)-	$C_{19}H_{19}ClO_5$	14,306,322	1,718,256	362.1

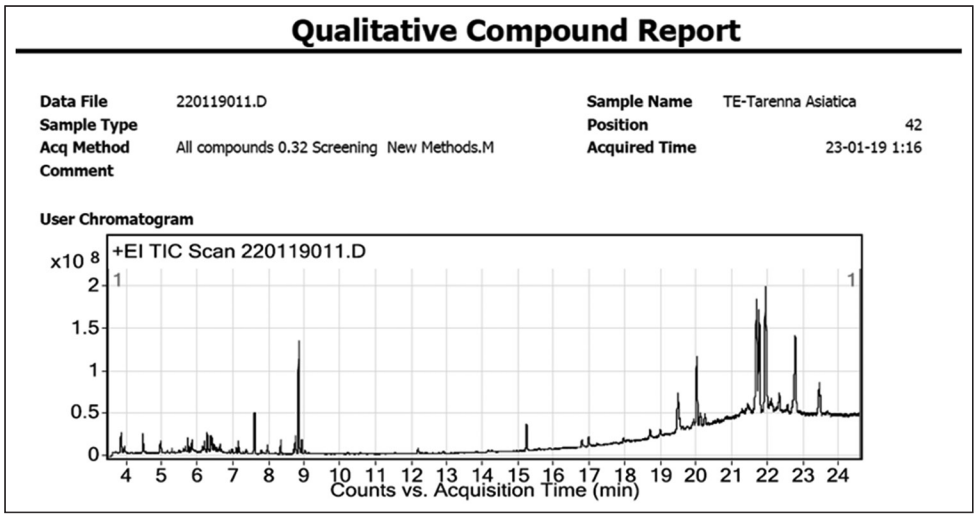

Figure 1: The gas chromatography–mass spectrometry graph for *Tarenna asiatica* (L.) leaf extracts

Table 2: The medicinal roles of some of the molecules as found in gas chromatography–mass spectrometry analysis of *Tarenna asiatica*

Molecules	Medicinal role
Hexane, 3,3-dimethyl-	Not known
Bicyclo[3.2.0]hepta-2,6-diene	Not known
N-Benzyl-2-phenethylamine	Anaphylactic, arylamine n-acetyltransferase inhibitor, decrease norepinephrine production, GABAnergic, increase NK cell activity, inhibit tumor necrosis factor, myoneurostimulant, NADH oxidase inhibitor, CNS depressant
4-Acetoxy-3-methoxystyrene	Not known
Trimethylsilyloxycyclobutane	Not known
tert-Butyldimethylsilyl acetate	Not known
Silane, [(1,1-dimethyl-2-propenyl) oxy] dimethyl-	Oxytocic
Silanol, trimethyl-, acetate	Not known
2-Cyclopentylethanol	Not known
Tridecanoic acid, methyl ester	Catechol-o-methyltransferase inhibitor, catechol-o-methyltransferase inhibitor, methyl donor, methylguanidine inhibitor, acidifier, acidulant, arachidonic acid inhibitor, arachidonic acid inhibitor, increase aromatic amino acid decarboxylase activity, inhibit production of uric acid, urinary acidulant
Pentanoic acid	Acidifier, arachidonic acid inhibitor, increase aromatic amino acid decarboxylase activity, increase uric acid production
1,3-Methanopentalene, octahydro	-
Phytol	Antimicrobial, anti-inflammatory, antioxidant, diuretic
2-Methylheptanoic acid 2-Methylheptanoic acid	Acidifier, arachidonic acid inhibitor, increase aromatic amino acid decarboxylase activity, increase uric acid production
Trifluoroacetyl-lavandulol	Not known
Phosphorus pentafluoride	Not known
1-Formyl-2,2, 6-trimethyl-3-cis-(3-methylbut-2-enyl)-5-cyclohexene	Not known
1,2-Benzenediol, O-(5-chlorovaleryl)-O-(2-methylbenzoyl)-	Not known
Cyanogen bromide	Cyanogenic toxic
Heptafluorobutyric acid, 2-naphthyl ester	Acidifier, arachidonic acid inhibitor, increase aromatic amino acid decarboxylase activity, increase uric acid production
2 (1H)-Pyridinone, 1-[2-deoxy-3,5-bis-O-(4-methylbenzoyl)-. beta.-D-erythro-pentofuranosyl]-	Acidifier, arachidonic acid inhibitor, increase aromatic amino acid decarboxylase activity, increase uric acid production

(Contd...)

Table 2: ***(Continued)***

Molecules	Medicinal role
Carbamic acid, monoammonium salt	Acidifier, arachidonic acid inhibitor, increase aromatic amino acid decarboxylase activity, increase uric acid production
10,10-Dimethyl-2,6-dimethylenebicyclo[7.2.0]undecan-5. beta.-ol	Acidifier, arachidonic acid inhibitor, increase aromatic amino acid decarboxylase activity, increase uric acid production
Diazoprogesterone	Not known
6.beta.Bicyclo[4.3.0]nonane, 5.beta.-iodomethyl-1. beta.-isopropenyl-4.alpha.,5.alpha.-dimethyl-,	Not known
Isophthalic acid, di (2-methylprop-2-en-1-yl) ester	Acidifier, arachidonic acid inhibitor, increase aromatic amino acid decarboxylase activity, increase uric acid production
Silane, diethylethoxy (2-methylpent-3-yloxy)-	Not known
1,3-Dioxolane-2-methanol	Not known
4-Methyl-2,4-bis (4'-trimethylsilyloxyphenyl) pentene-1	Catechol–o-methyltransferase inhibitor, methyl donar, methylguanidine inhibitor.
1,3-Dimethyl-5-propyl-7-(propene-1-yl) adamantane	Not known
Tricyclo[3.3.1.1 (3,7)]decanone, 4-iodo-, (1.alpha.,3. beta.,4.alpha.,5.alpha.,7.beta.)-	Not known
1,3-Benzenediol, o-(2-methoxybenzoyl)-o'-ethoxycarbonyl-	Not known
1,2-Benzenediol, o-(4-methoxybezoyl)-o'-(5-chlorovaleryl)-	Not known

of the molecules such as hexane, 3, 3-dimethyl-, bicyclo[3.2.0]hepta-2,6-diene, 4-acetoxy-3-methoxystyrene, trimethylsilyloxycyclobutane, tert-Butyldimethylsilyl acetate, Silanol, trimethyl-, acetate, 2-cyclopentylethanol, 1,3-methanopentalene, octahydro, trifluoroacetyl-lavandulol, phosphorus pentafluoride, 1-formyl-2,2,6-trimethyl-3-cis-(3-methylbut-2-enyl)-5-cyclohexene, 1,2-benzenediol, o-(5-chlorovaleryl)-o-(2-methylbenzoyl)-, diazoprogesterone, 6.beta.bicyclo[4.3.0]nonane, 5.beta.-iodomethyl-1.beta.-isopropenyl-4.alpha.,5.alpha.-dimethyl-, 1,3-dioxolane-2-methanol, tricyclo[3.3.1.1(3,7)]decanone, 4-iodo-, (1.alpha.,3.beta.,4.alpha.,5.alpha.,7.beta.)-, 1,3-benzenediol, o-(2-methoxybenzoyl)-o'-ethoxycarbonyl-, 1,2-benzenediol, and o-(4-methoxybezoyl)-o'-(5-chlorovaleryl)- are not reported yet which must be worked out.

CONCLUSION

From the above results and discussion, it is clear that GC–MS profile of aqueous extract of leaves of *T. asiatica* (L.) indicted the presence of some very important molecules having medicinal roles supporting the ethnobotanical claims of this plant being an excellent medicinal plant.

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