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Study on phytoconstituents from *Moringa oleifera* leaves

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ABSTRACT

Plants have been very important source of drugs for majority of the world population. The phytocomponents in Moringa oleifera are used in folk remedies for tumors. The present study to evaluate chemical constituents from ethyl acetate extract of Moringa oleifera leaves. This study was determined by using Gas Chromatography –Mass spectrometry, while the mass spectra of the compounds found in the extract was matched with the National Institute of Standards and Technology (NIST) library. The GC-MS analysis of ethyl acetate extract led to identification of 28 compounds. This analysis revealed to contains the presence of Linalool oxide, Upiol, Adenine, Palmitic acid. The compounds were identified by comparing their retention time and peak area with that of literature and by interpretation of mass spectra. Many of them are used in industry for various applications like anti-bacterial agent, food additive, pesticides, flavors and fragrances.

Key words: Antibacterial activity, Chromatography, Upiol, Adenine, Pesticides.

INTRODUCTION

Medicinal plants have been used by human being, since ages in traditional medicine due to their therapeutic potential and the search on medicinal plants have led to the discovery of novel drug candidates used against diverse diseases [1]. The Moringaceae is a single genus family with fourteen known species of these, M.oleifera Lam is the most widely known and utilized species [2]. M.oleifera is a small tree and mainly distributed in India, Arabia and possibly Africa and the East Indies. It was widely cultivated and naturalized in tropical Africa, Malaysia, Philippine Islandas, Mexico, Malabar and Srilanka [3].

It was commonly reffered to as the “drumstick tree” or the “horseradish tree”, whereas in others it is known as the kelor tree [4]. The crushed leaves of M.oleifera are used to clean cooking utensils or even walls [5]. Moringa provides wind protection and shad. It grows very quickly and if cuttings are planted close together they will form a fence that livestock cannot get through in just three months [6]. *Moringa oleifera* wood is light and is a food fuel for cooking. However, it is not suitable for building.

The bark can be beaten into a fibre that can be used to make rope or mats and the wood produces a blue dye. Chippings of wood can be used to make a good quality paper. The tree also produces viscose resin that is used in the textile industry [7]. Leaves were used for rubbed against the temple can relieve headaches, to stop bleeding from a shallow cut, apply a poultice of fresh leaves, anti-bacterial, anti-inflammatory effect. Its extracts can used for against bacterial or fungal skin complaints [8]. The objective of the present study is to identify the possible phytoconstituents present in the ethyl acetate extract of *Moringa oleifera* using GC-MS study.

MATERIALS AND METHODS

Plant material

The leaves of the plant *Moringa oleifera* collected from Thanjavur district of Tamil Nadu. The botanical identify of the plant was confirmed by Dr. John Britto, Rapinet Herbarium, St .Joseph's College, Tiruchirappalli. The leaves were cleaned, dried in shadow and crushed into powder.

Preparation of extract

The powder (1kg) was extracted with petroleum ether followed by ethyl acetate at room temperature for 48h. The extracts were filtered and concentrated under reduced pressure in a rotary evaporator. The ethyl acetate extract were subjected to GC-MS analysis.

GC-MS analysis

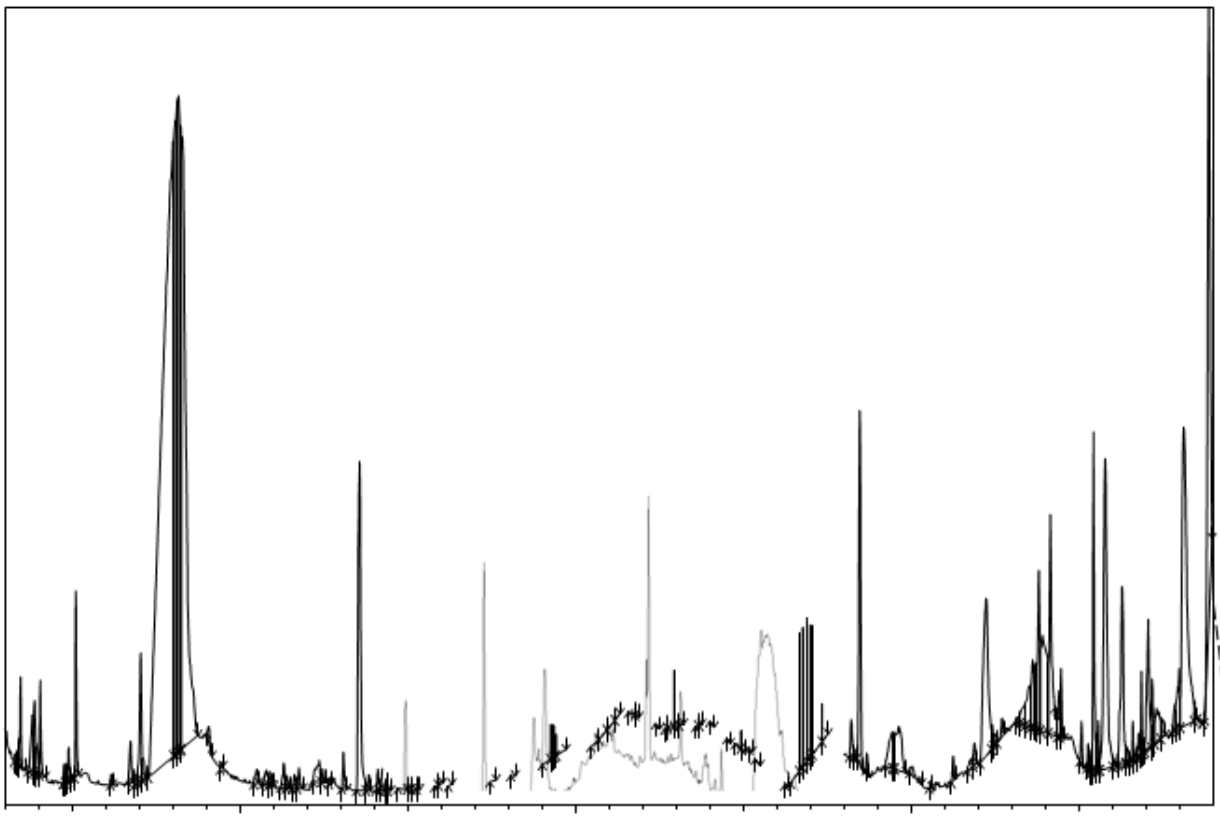
Instruments and chromatographic conditions

GC-MS analysis was carried out on GC-MS-QP2010 Shimadzu system comprising a gas chromatograph interfaced to a mass spectrometer instrument employing the following conditions : column VF-5MS fussed silica capillary column (30.0m x 0.25mm x 0.25µm, composed of 5% phenyl/95% dimethylpolysiloxane), operating in electron impact mode at 70ev; helium (99.999%) was used as carrier gas at a constant flow of 1. ml/min and an injection volume of 0.5µl was employed (split ratio of 10:1) injector temperature 240 ^{0}C ion-source temperature 200 ^{0}C. The oven temperature was programmed from 70 ^{0}C (isothermal for 3 min), with an increase of 10 ^{0}C/min, to 240 ^{0}C, ending with a 9min isothermal at 280 ^{0}C. Mass spectra were taken at 70ev; a scan interval of 0.5 seconds and fragments from 40 to 440Da. Total GC running time is 40min.

Identification of compounds

Interpretation of mass spectrum GC-MS was conducted using the database of National Institute Standard and Technology (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 and structure of the components of the test materials were ascertained.

Fig.1 GC-MS Chromatogram of ethyl acetate extract of *Moringa oleifera*



RESULTS AND DISCUSSION

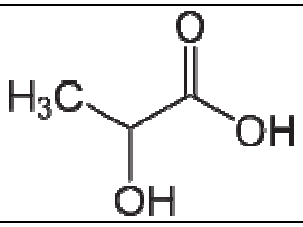
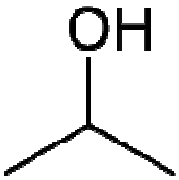
The results pertaining to GC-MS analysis led to the identification of number of compounds from the ethyl acetate extract of *Moringa oleifera* leaves.

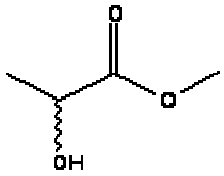
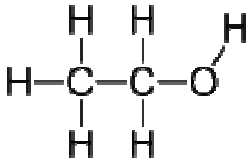
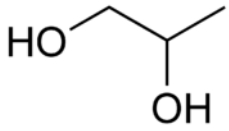
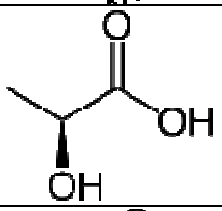
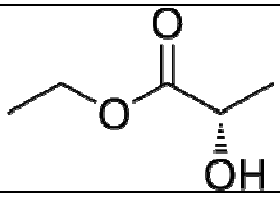
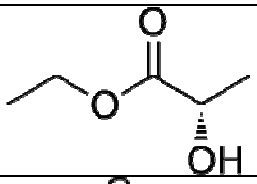
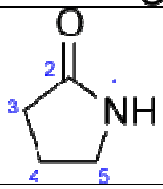
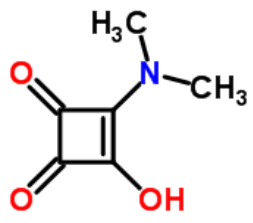
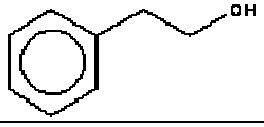
GC-MS chromatogram showed 28 peaks, indicating the presence of 28 compounds (fig.1).

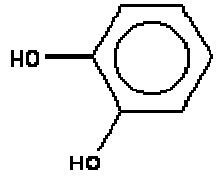
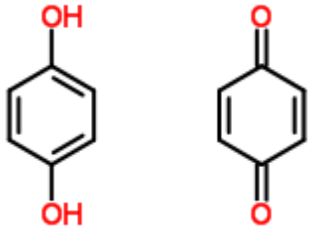
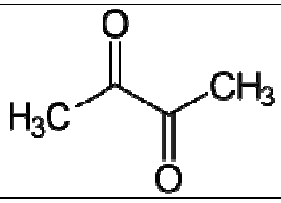
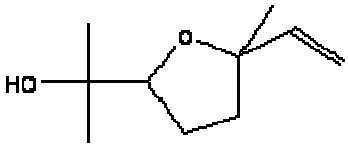
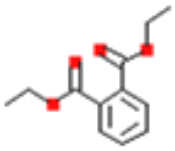
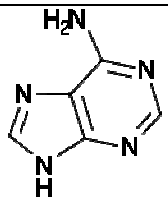
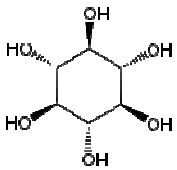
Table.1 Phyto-components identified for *Moringa oleifera*.

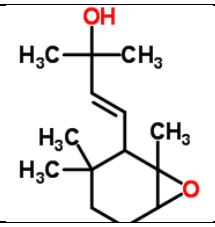
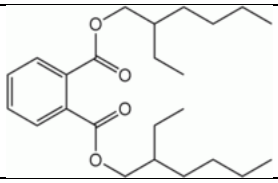
Compound Name	RT	Peak Area %	Molecular Formula	Molecular Weight	Compound nature
L(+)Milchsaure	8.017	21.07	C3 H6 O3	90	alcohol
2-Propanol	8.017	21.07	C3 H8 O	60	alcohol
Methyl lactate	8.017	21.07	C4 H8 O3	104	Fatty acid ester
Ethyl alcohol	8.017	21.07	C2 H6 O	46	alcohol
Propylene glycol	8.075	3.58	C3 H8 O2	76	alcohol
Nitrosomethane	8.075	3.58	C H3 N O	45	Nitro compound
Lactic acid	8.142	3.23	C3 H6 O3	90	Acid compound
ethyl 2-hydroxypropanoate (lactate)	8.182	3.66	C5 H10 O3	118	lactic acid ethyl ester
Methyl butyl ether	8.242	2.20	C5 H12 O	88	Ether compound
ethyl 2-hydroxypropanoate (lactate)	8.292	7.97	C5 H10 O3	118	lactic acid ethyl ester
2-Pyrrolidinone	13.568	2.51	C4 H7 N O	85	organic compound
Cyclobuten-3,4-Dione, 1-Dimethylamino-2-Hydroxy-	13.568	2.51	C6 H7 N O3	141	Ketone compound
Phenethyl alcohol	14.900	1.03	C8 H10 O	122	Alcoholic compound
Pyrocatechol	17.509	1.25	C6 H6 O2	110	organic compound
Quinhydrone	17.509	1.25	C12 H10 O4	218	Ketone compound
2,3-Butanedione	19.530	1.18	C4 H6 O2	86	vicinal diketone
2-[(2-acetoxyethyl)-sufinyl]aniline	19.530	1.18	C4 H6 O2	86	Nitro compound
Linalool Oxide (2)	22.979	1.08	C10 H18 O2	170	terpene alcohol
Trans-Linaloloxide	22.979	1.08	C10 H18 O2	170	Terpene alcohol
Heptanol	26.633	1.87	C7 H16 O	116	alcohol
(2-Amino-Cyclohexyl)-Phenyl-Methanol	26.724	1.18	C13 H19 N O	205	Alcohol compound
1,2-Benzenedicarboxylic acid, diethyl ester	28.462	1.90	C12 H14 O4	222	Fatty acid ester
Upiol	28.462	1.90	C8 H6 N4 O5	238	pesticide
Adenine	32.227	2.35	C5 H5 N5	135	nucleobase
Scyllitol	33.907	1.74	C6 H12 O6	180	inositol
3-Buten-2-Ol,2-Methyl-4-(1,3,3-Trimethyl-7-Oxabicyclo[4.1.0]Hept-2-Yl)-	34.140	1.66	C14 H24 O2	224	Alcohol compound
Palmitic acid	35.423	1.33	C16 H32 O2	256	fatty acid
1,2-Benzenedicarboxylic acid, bis(2-ethylhexyl) ester	35.771	3.23	C24 H38 O4	390	organic compound

Table.2 Biological activity of chloroform extract of *Moringa oleifera*

S. No	Compound Name	Structure	Function
1	L(+)Milchsaure		No activity reported
2	Isopropyl alcohol		Antibacterial, antiseptic, anesthetic, surfactant, neurolytic.

3	Methyl lactate		no activity reported
4	Ethyl alcohol		Antibacterial, antiseptic, anesthetic, surfactant
5	Propylene glycol		used in pharmaceutical
6	Nitrosomethane		no activity reported
7	Lactic acid		anti-bacterial agent, food additive
8	ethyl 2-hydroxypropanoate (lactate)		food additives
9	Butane, 1-methoxy- (CAS) Methyl butyl ether		no activity reported
10	ethyl 2-hydroxypropanoate (lactate)		food additives
11	Pyrrolidone		no activity reported
12	Cyclobuten-3,4-Dione, 1-Dimethylamino-2-Hydroxy-		no activity reported
13	Phenethyl alcohol		antimicrobial

14	Pyrocatechol		pesticides, flavors, and fragrances
15	Quinhydrone		no activity reported
16	2,3-Butanedione (CAS) Diacetyl		Use as flavors, fragrances and alcoholic beverages
17	2-[(2-acetoxyethyl)-sufinyl]aniline	-	no activity reported
18	Linalool Oxide (2)		Antioxidant, antimicrobial
19	Trans-Linaloloxide		Antioxidant, antimicrobial
20	Heptanol		used in cosmetics for its fragrance
21	(2-Amino-Cyclohexyl)-Phenyl-Methanol	-	no activity reported
22	1,2-Benzenedicarboxylic acid, diethyl ester (CAS) Ethyl phthalate		use as plasticizers, antimicrobial activity
23	Upiol	-	No activity reported
24	Adenine		Antiviral, diuretic, antianemic, insectifu
25	Scyllitol		No activity reported

26	3-Buten-2-Ol, 2-Methyl-4-(1,3,3-Trimethyl-7-Oxabicyclo[4.1.0]Hept-2-Yl)-		No activity reported
27	Palmitic acid		Antioxidant, pesticide, antimicrobial, lubricant
28	1,2-Benzenedicarboxylic acid, bis(2-ethylhexyl) ester		antimicrobial

On comparison of the mass spectra of the constituents with the NIST library, the 28 phytoconstituents were characterized and identified, which are listed with their retention time (RT), molecular formula, molecular weight (MW) and concentration % in Table 1. The major phytochemical constituents and their biological activities obtained through the GC-MS study of M. oleifera are listed in Table 2.

Some of the photochemicals detected in the present studies are of pharmaceutical importance. The data was derived from Dr. Duke's phytochemical and ethnobotanical database [9]. The phytoconstituent obtained from GC-MS may act as an antioxidant, flavor agent, antimicrobial, pesticide, lubricant. According to peak area, the major components present in M.oleifera in propanol, ethanol was mainly used as a solvent for coatings or for industrial processes, pharmaceutical applications, personal care products and gasoline additive and motor fuel, fuel additives for aircrafts.

Moringa extract can be used against bacterial of fungal skin complaints due to presence of 1, 2-Benzene-di-carboxylic acid, diethyl ester, palmitic acid and linalool oxide. The present study results were confirmed by the many essential oils have been reported from M.oleifera, these essential oils are rich in fatty acid and also supported and then supplemented the previous observation [2-8]. Several preliminary phytochemical screening studies have been carried out in different extract of the world using GC-MS [10-15].

CONCLUSION

The source of many plants can often be identified from the peak pattern of the chromatograms obtained directly from headspace analysis. The present study, which reveals the presence of components in M.oleifera suggest that the contribution of these compounds on the pharmacological activity should be evaluated.

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