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GC-MS ANALYSIS OF ETHANOL EXTRACT OF ROOT OF *MALLOTUS PHILIPPENSIS* (LAM.) MUELL. ARG. VAR. *PHILIPPENSIS*

Velanganni, J.^{1*},
Kadamban, D.¹, Ramamoorthy, D²

¹Post Graduate Department of Botany, Kanchi Mamunivar Centre for Post Graduate studies, Lawspet, Pondicherry 605 008, South India.

²Department of Ecology and Environmental Sciences, Pondicherry University, Kalapet, Puducherry-605014

ABSTRACT

An important medicinal plant, *Mallotus philippensis* (Lam.) Muell. Arg., var. *philippensis* was undertaken for GC-MS (Gas Chromatography-Mass Spectrometry) analysis to investigate the chemical composition present in ethanol extract of root. Powdered plant materials were subjected to successive extraction individually with organic solvents of increasing polarity such as hexane, chloroform and ethanol respectively by Soxhlet method. All the extracts were subjected to determine the successive values. The present study revealed that totally 14 compounds was found in root. Medicinal potential of those compounds needs further research on toxicological aspects to develop safe drug.

Correspondence to Author

J. Velanganni

Post Graduate Department of
Botany, Kanchi Mamunivar
Centre for Post Graduate studies,
Lawspet, Pondicherry 605 008,
South India.

Email

velanganni1680@gmail.com

Key Words

India, Medicinal Plant, *Mallotus philippensis* var. *philippensis*, constituent, GC-MS analysis

INTRODUCTION

Plants have been utilized as medicines for thousands of years and also a hallmark in the search of new medicine^{1, 2}. World Health Organization estimated that 80% of world populations rely on medicinal plants for their primary health care needs³. At least 25% of the prescription drugs issued in the USA and Canada contain bioactive compounds that are derived from or modeled from plant natural products⁴. Medicinal plants would be the best source to obtain a variety of drugs and therefore such plants should be investigated to understand better about their properties, safety and efficacy⁵. Medicinal plants are major sources of obtaining antimicrobial drugs⁶.

The genus *Mallotus* Lour., (Euphorbiaceae) comprises of about 150 species in the world, of which 20 species has been reported from India⁷ and 11 species with 2 varieties were reported from Tamil Nadu state⁸. An Indian medicinal plant, *Mallotus philippensis* (Lam.) Muell. Arg., var. *philippensis* locally known as *Kapilapodi* has been used medicinally for long time throughout India. Medicinally, the root was used for skin diseases, rheumatism, tonic, spermatorrhea, bleeding and purgative^{9, 10, 11}. Phytochemically, hydrocyanic acid was isolated from root¹⁰.

After scrutiny of published literature, so far no sufficient work has been done regarding the chemical composition on this selected plant. The active principles of many drugs found in plants are secondary metabolites¹¹ and so the phytochemical investigation on the extracts for their main phytochemicals is very vital. Hence in the present study, the hexane, chloroform and ethanol extracts of roots of *M. philippensis* was analysed for Gas Chromatography-Mass Spectrometry (GC-MS) to determine the chemical constituents present in it.

MATERIALS AND METHODS

Plant Material and Preparation of extract

Plant material of root of *Mallotus philippensis* (Lam.) Muell, Arg. (Euphorbiaceae) was collected from the Marakanam Reserve Forest, Tamil Nadu and its botanical identity was confirmed at French Institute Herbarium, Pondicherry. The herbarium specimen was

deposited at Bio-Science Research Foundation, Pondicherry for further reference (Voucher no. ACTDKVJ42).

Plant material root was chopped separately into small pieces, shade-dried and powdered. The obtained powder was then subjected to successive extraction individually with organic solvents of increasing polarity such as hexane, chloroform and ethanol by Soxhlet method. The extracts were then collected and distilled at atmospheric pressure and the last trace of the solvents was removed *in vacuo* and stored at 4°C. Only ethanol extracts were subjected to GC-MS analysis.

Determination of Successive Extractive values

All the successive extracts of root were subjected to determine the Successive extractive values by following the standard methods¹².

Gas Chromatography-Mass spectrometry (GC-MS) analysis

GC-MS analysis was performed with GC Clarus 500 Perkin Elmer equipment. Compounds were separated on Elite-1 capillary column (100% Dimethylpolysiloxane). Oven temperature was programmed as follows: isothermal temperature at 50°C for 2 min, then increased to 200°C at the rate of 10°C/min, then increased up to 280°C at the rate of 5°C/min held for 9 min. Ionization of the sample components was performed in the EI mode (70 eV). The carrier gas was helium (1ml/min) and the sample injected was 2 µl. The detector was Mass detector turbo mass gold-Perkin Elmer. The total running time for GC was 36 min and software used was Turbomass 5.2.

Identification of Compounds

The individual compounds were identified from ethanol extracts based on direct comparison of the retention times and their mass spectra with the spectra of known compounds stored in the spectral database, NIST (version year 2005).

RESULTS

The successive extraction values of root are given in the Table 1. The successive extractive values recorded in root were hexane (15%), chloroform (10%), ethanol (13.5%) respectively.

Table 1. Successive extractive values of root of *Mallotus philippensis* var. *philippensis*.

Parts used	Solvents	Successive extractive values
Root	Hexane	15.0%
	Chloroform	10.0%
	Ethanol	13.5%

The results of GC-MS analysis on ethanol extracts of root was given in the Table 2. In root, 14 compounds were identified, of which, 4 compounds were belonged to aromatic groups and 10 compounds were belonged

Table 2. Chemical constituents of ethanol extract of root of *Mallotus philippensis* var. *philippensis*.

S. No.	Name of the Compounds	Molecular Formula	Retention time (mm)	Molecular weight	Peak area%
1. Aromatic groups					
(i) Organic ester					
1	Methyl salicylate	C ₉ H ₈ O ₃	6.30	152	2.03
2	Benzoic acid, 2-hydroxy-, ethyl ester	C ₉ H ₁₀ O ₃	7.39	166	0.03
3	Diethyl phthalate	C ₁₂ H ₁₄ O ₄	11.25	222	93.81
(ii) Terpenes					
4	Benzene, 1-(1,5-dimethyl-4-hexenyl)-4-methyl-	C ₁₅ H ₂₂	10.02	202	0.01
2. Aliphatic groups					
(i) Fatty acids					
5	Nonanoic acid	C ₉ H ₁₈ O ₂	10.95	158	0.01
6	9,12-Octadecadienoic acid (Z, Z)-	C ₁₈ H ₃₂ O ₂	18.73	280	0.13
7	Oleic acid	C ₁₈ H ₃₄ O ₂	18.81	282	0.14
8	Methyl ricinoleate	C ₁₉ H ₃₆ O ₃	20.93	312	0.15
9	Ricinoleic acid	C ₁₈ H ₃₄ O ₃	21.94	298	3.25
10	1,2-Benzenedicarboxylic acid, diisooctyl ester	C ₂₄ H ₃₈ O ₄	24.66	390	0.05
11	n-Hexadecanoic acid	C ₁₆ H ₃₂ O ₂	16.16	256	0.26
12	Hexadecanoic acid, ethyl ester	C ₁₈ H ₃₆ O ₂	16.46	284	0.02
13	Octadecanoic acid, ethyl ester	C ₂₀ H ₄₀ O ₂	19.45	312	0.02
(ii) Fatty alcohol					
14	Gingerol	C ₁₇ H ₂₆ O ₄	21.11	294	0.10

to aliphatic groups. In aromatic groups, 3 compounds were belonged to the class organic esters and one compound was belonged to the class terpenes. In this group, diethyl phthalate found to be present as major constituent with the peak area 93.81% and retention time 11.25, followed by methyl salicylate with peak area 2.03% and retention time 6.30 and benzoic acid, 2-hydroxy-ethyl ester with the peak are 0.03% and retention time 7.39 respectively. In aliphatic groups, 9 compounds were belonged to the class fatty acids and one compound was belonged to the class fatty alcohol. In this group, ricinoleic acid was found to be present as major constituent with the peak area 3.25%, and retention time 21.94, followed by n-hexadecanoic acid with the peak are 0.26% and retention time 16.16 and nonanoic acid was found to be present in least quantity with the peak are 0.01% and retention time 10.95 respectively.

DISCUSSION

Secondary metabolites in plant products are responsible for several biological activities in man and animals⁶. Successive extractive values indicated the amount of matter present extracted from the plant. The compounds identified by GC-MS in ethanol extract are medicinally valuable and possess various pharmaceutical applications.

Some compounds are medicinally potent even in minimal doses and thus the compound gingerol could possess potential anti-invasive activity against hepatoma cells¹³, antibacterial activity against periodontal bacteria¹⁴, renoprotective potential against cisplatin-induced oxidative stress and renal dysfunction in rats¹⁵. Duke phytochemical database showed wide range of pharmacological activities for the isolated plant compounds such as anti-inflammatory, anti-leukotriene-d₄, carcinogenic, prostaglandinogenic, secretagogue, spermicide for ricinoleic acid, 5-alpha-reductase-inhibitor, allergenic, alpha-reductase-inhibitor, anemiagenic, anti-alopecic, anti-androgenic, anti-inflammatory, anti-leukotriene-d₄, cancer-preventive, choleric, dermatitogenic, hypocholesterolemic, insectifuge for oleic acid, allergenic, analgesic, anaphrodisiac, anti-inflammatory, anti-oxidant, anti-pyretic, anti-radicular, anti-rheumatologic, anti-septic, anti-tartar, cancer-preventive, carminative, counterirritant, dentifrice, fungicide, herpetifuge, insectifuge, pesticide for methyl salicylate. Thus in the present study, the compounds identified by GC-MS analysis showed number of biological activities to develop drug of pharmaceutical interest. At the same time, all the compounds identified needs further research on toxicological aspects for safety drug.

CONCLUSION

From the present study, it is concluded that the plant *Mallotus philippensis* are highly valuable in medicinal usage for the treatment of various human ailments along with the chemical constituents present in it. The compounds needs further research on toxicological aspects to develop safe drug.

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