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GC-MS Study of a Steam Volatile Matter from *Aglaia lawii* leaves

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Abstract: Ayurveda is a 5000 year-old system of natural healing that has its origins in the Vedic culture of India. In the last few decades there has been an exponential growth in the field of herbal medicine. Medicinal plants and herbs contain substances known to modern and ancient civilizations for their healing properties. They were the sole source of active principles capable of curing man's ailments. Thus natural products have been a major source of drugs for centuries. *Aglaia lawii* is a medicinally important plant of family meliaceae. All parts of the tree have medicinal properties. Taking into consideration the medicinal importance of the plant, the volatile organic matter from the leaves of this plant was analyzed for the first time using GC-MS and the structures were confirmed by genesis. The results of the GC-MS analysis confirmed the presence of twelve compounds. The major constituents were 3,7-cyclodecadene-1-methanol,Veridiflorol,4,1-isopropyl-1,6-dimethyl-1,2,3, Cyclohexa methanol, 4- ethenyl-α-α 4-trimethyl-, Globulol etc. The presence of various bioactive compounds justifies the use of *A. lawii* leaves for various ailments by traditional practitioners.
Keywords: *Aglaia lawii*, GC-MS, Steam distillation, Globulol.

Introduction

Natural remedies from medicinal plants are found to be safe and effective. Many plants species have been used in folkloric medicine to treat various ailments. Even today compounds from plants continue to play a major role in primary health care as therapeutic remedies in many developing countries[1].Standardization of plant materials is the need of the day. Several pharmacopoeia containing monographs of the plant materials describe only the physicochemical parameters. Hence the modern methods describing the identification and quantification of active constituents in the plant material may be useful for proper standardization of herbals and its formulations. Also, the WHO has emphasized the need to ensure the quality of medicinal plants products using modern controlled techniques and applying suitable standards[2]. GC-MS is the best technique to identify the bioactive constituents of long chain hydrocarbons, alcohols, acids, esters, alkaloids, steroids, amino and nitro compounds etc[3].

Aglaia lawii is distributed from India, through Burma (Myanmar), Thailand, Indo-China and throughout Malaysia towards the Solomon Islands.[4-6] *A. Lawii* is a traditional medicinal plant having been used for the treatment of bacterial infection, liver, tumour diseases and headaches.[7] Its medicinal properties have yet to be studied systematically and scientifically. All parts of the plants are reported to be medicinally important for the treatment of various diseases in Ayurveda[8]. The pharmacological studies have shown that Aglaia species possesses various notable biological activities such as anthelmintic, antimicrobial, analgesic, anti-inflammatory, immunimodulatory, antifungal etc[9].

Taking into consideration of the medicinal importance of this plant, the steam volatile mass was analyzed for the first time using GC-MS. Persual of literature reveals that information on the GC-MS analysis of *Aglaia lawii* is totally lacking. Hence, the objective of the present study is to identify the phytochemical constitutents with the GC-MS technique.

With reference to the above facts, the leaves has been examined to know the constituent of volatile organic matter. One of the ways by which essential oils or the volatile organic matter is extracted from plant material is through steam distillation[10].

In the present study, steam volatile organic matter of the leaves sample of plant was analyzed for the first time. This work will help to identify the compounds, which may be used in body products or of therapeutic value. GC-MS is one of the best techniques to identify the constituents of steam volatile matter, long chain, branched chain hydrocarbons, alcohols acids, esters etc.

Materials and Methods

Sample collection and Identification of plant materials:-

The plant material was collected from Mulshi district of Pune, Maharashtra, India. It was authenticated at Botanical survey of India, Pune, Maharashtra, India. Its Authentication No. is BSI/WRC/Tech/2010/1028, Pune, India.

Steam distillation of air shade dried powdered leaves material (100 g) was carried out with distilled water (1000 ml) to collect the distillate. This aqueous layer was then extracted with solvent ether to separate the volatile organic matter. It was analyzed using GC-MS.

GC-MS analysis

Instumentation

The powerful tool, GC-MS, was used to study the steam volatile components of *Aglaia lawii* leaves was examined. It is a very valuable method for analysis of non polar components and volatile oil**.** The identification of the chemical constituents was done in the comparison of their mass spectra with those of authentic standards of mass spectra of NIST and WILEY libraries of GC-MS instrument. These experiments were executed on two different columns and conditions of gas chromatography coupled with mass spectrometers instruments as **A** & **B,** whose specifications are mentioned**:**

A: The gas chromatographic analysis was performed by Agilent 6890N with FID using HP-5 capillary column. GC-MS analysis was carried out using a Shimadzu QP 5050A mass spectrometer coupled to a Shimadzu 17 A gas chromatograph fitted with a split- splitless injector and D8-5 fused silica capillary column(30mx0.25 i. d ., 0.25µm film thickness).

Helium was used as a carrier gas at a flow rate of 1.0 ml/min. The injection port is maintained at 250ºC, and the split ratio was 40:1 Oven temperature programming was completed from 50 to 280ºC at 10 ºC/min, it was kept at 280ºC for 5 min. Interface temperature was kept at 250ºC. Ionization mode was electron impact ionization and the scanning range was from 40 amu to 400 amu. Mass spectra were obtained at 0.5 sec. interval.

B: GC-MS was performed using a Thermo ISQ mass spectrometer coupled with Thermo Focus gas chromatograph fitted with a split-split less injector and a TG-5MS fused silica capillary column (10m x 0.1 mm i.e. 0.1µm film thickness). Helium was used as a carrier gas at a flow rate of 1.3 ml/ min .The injection port was maintained at 250ºc, and the split ratio was 500:1. Oven temperature performing was done from 50ºC for 0.2 min to 250ºC, at 10ºC/ min and kept at 250ºC for 1.9 min. Interface temperature was kept at 250ºC. Ionization mode was electron impact ionization and the scanning range was from 40 to 400 amu. Mass spectra were obtained at 0.5 sec. interval for all gaseous moieties**.**

The spectra of the compounds were matched with NIST and Wiley library. Their structures were defined by the % similarity values.

Results and Discussion

Volatile organic materials are products of the secondary metabolism of plants, and are generally consisting of complex mixtures of mono-, sesqui-, di-, tri-terpene hydrocarbons, and oxygenated materials biogenically derived from them.

Steam distillation of leaves sample yielded 0.19 % of volatile organic matter. Use of GC-MS enabled identification of chemical constituents present in it. Some of the compounds identified are listed in **Table 1**. The major constituents were 3,7-cyclodecadene-1-methanol, Veridiflorol,4,1-isopropyl-1,6-dimethyl-1,2,3, Cyclo hexamethanol, 4-ethenyl-α-α 4-trimethyl-, Globulol etc. Mass Spectrum of some of the compounds is given below.

Table 1. GC – MS of the Steam Volatile

No.	Compound	R.T. (min.)	% Similarity	M^+ ion amu	Base peak amu
1.	3,7-cyclodecadene-1- methanol	12.9	95	222	93
2.	Veridiflorol	13.4	92	222	43
3.	4,1-isopropyl-1,6-dimethyl-1,2,3	13.9	93	222	43
4.	Cyclohexamethanol,4-ethenyl-α-α4-trimethyl-	1.82	94	222	59
5.	Globulol	1.89	95	222	95
6.	1-h-cycloprop[e]azulene-4-ol,decahydro-1,1,4,7-tetramethyl -	1.91	95	222	43
7.	Cadinol	2.0	93	222	43
8.	Cyclohexane,1-ethenyl-1-1-methyl-2,4-bis91-met	8.97	96	204	43
9.	1H-cycloprop[e]azulene	9.7	97	204	91
10.	α--cubebene	9.942	90	204	161
11.	1,5-cyclodecadiene	10.10	91	204	121
12.	Cedrene	10.35	88	204	69

Spectral data

Fig. 1 Naphthalene 1,2,3,4-tetrahydro-1-6-dimethyl-4-, $C_{15}H_{22,}$ R.T. 12.7 min

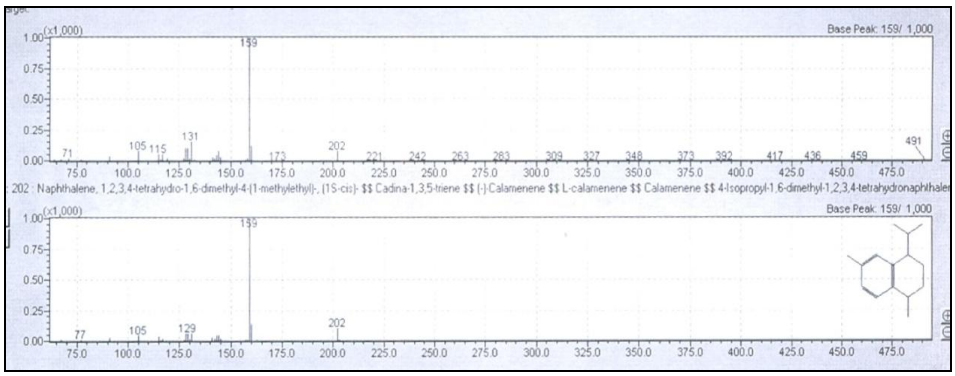


Fig. 2 Globulol, $C_{15}H_{26}O$, R.T. 13.9 min.

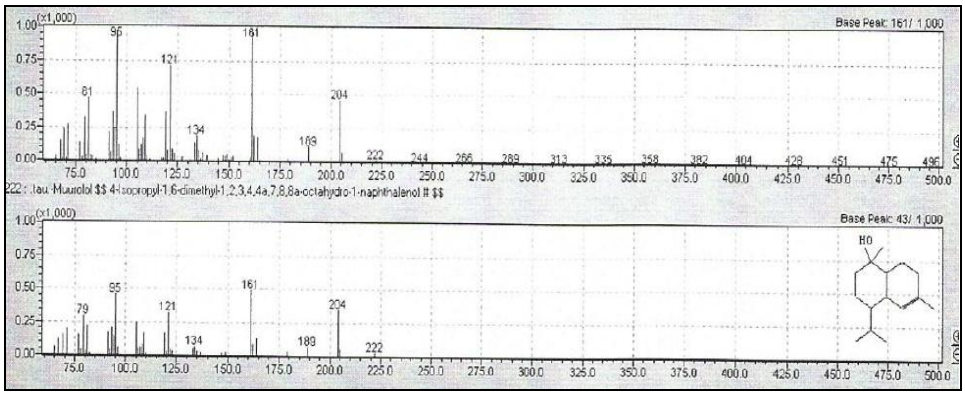


Fig.3 Varidiflorene, $C_{15}H_{24,}$ R.T. 1.72 min.

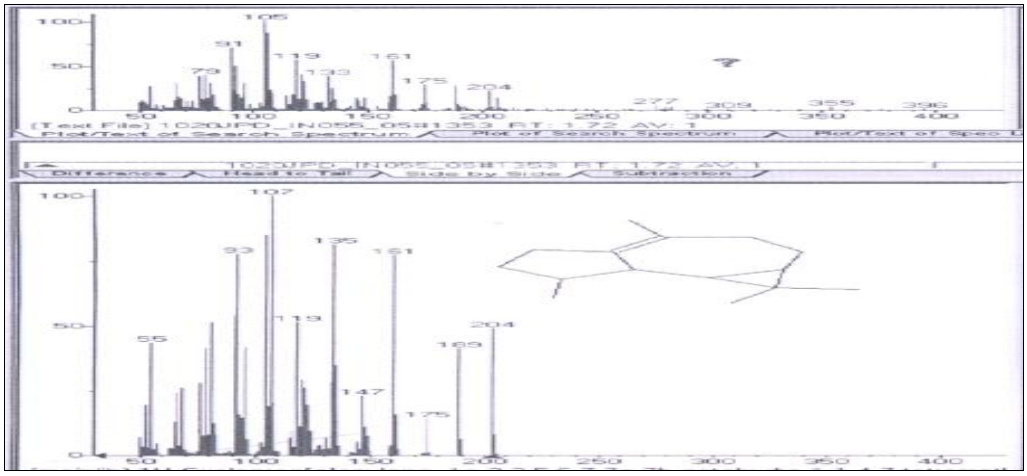


Fig. 4 Spathulenol, $C_{15}H_{24}O$, R.T. 1.87 min.

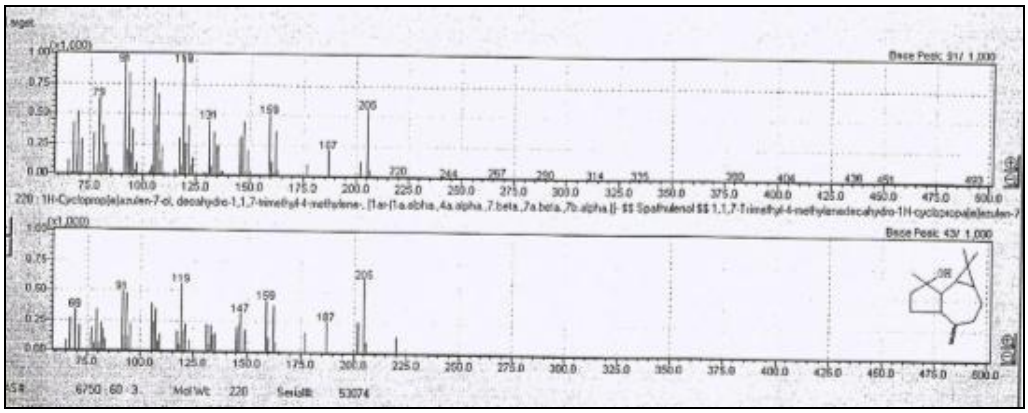


Fig.5 Cyclohexane 1-ethynyl-1-methyl-2,4-bis (1 methyl ethyl)-, $C_{15}H_{24}$, R.T. 8.975 min.

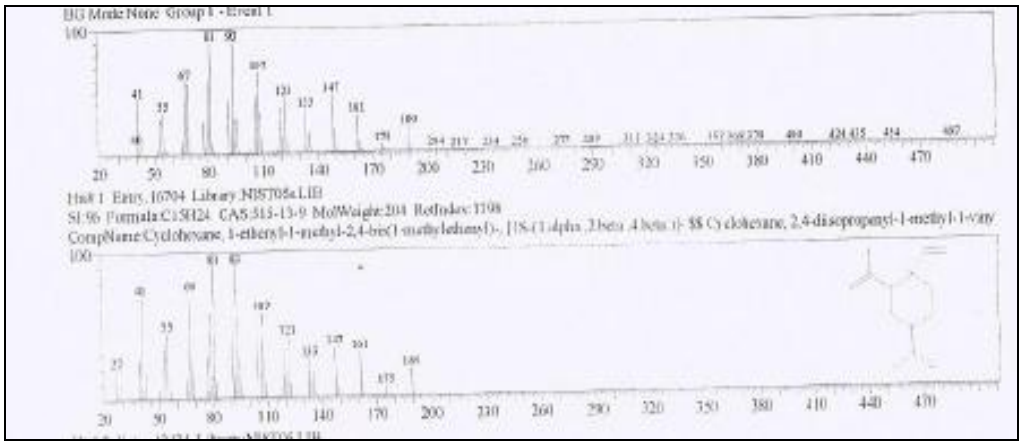


Fig. 6 Elemol, $C_{15}H_{26}O$, R.T. 1.82 min

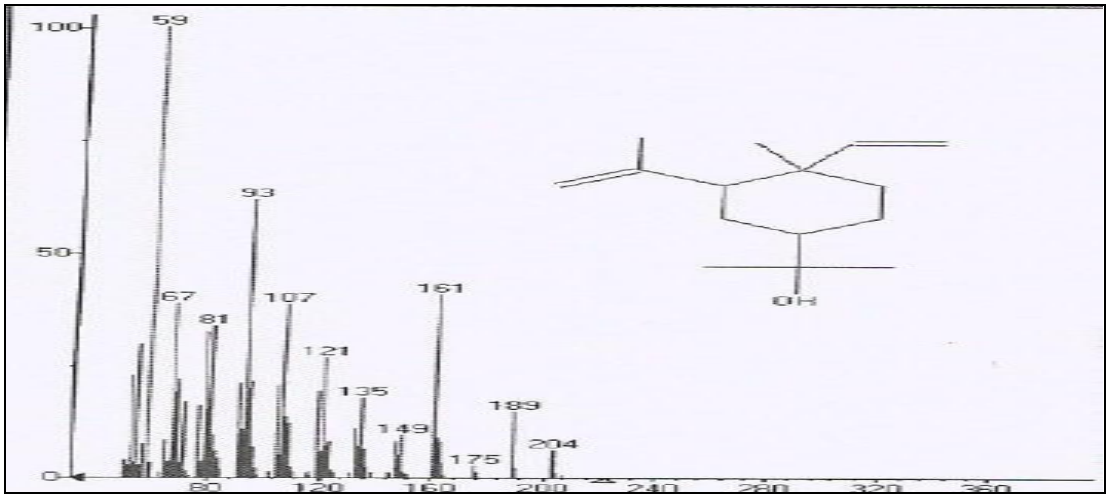


Fig. 7 Cadine1, 3, 5triene, $C_{15}H_{22,}$ R.T. 1.77 min

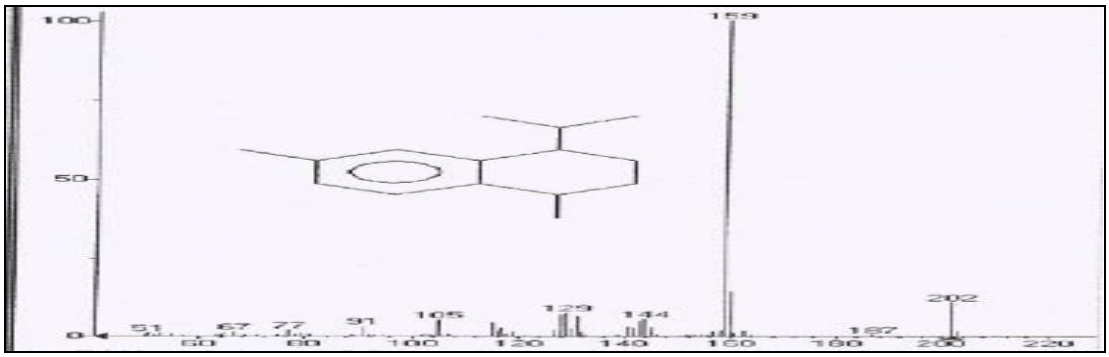


Fig.8 Phthalic acid 6-ethyl-3-octyl butyl ester, $C_{22}H_{34}O_{4,}$ R.T.15.182 min.

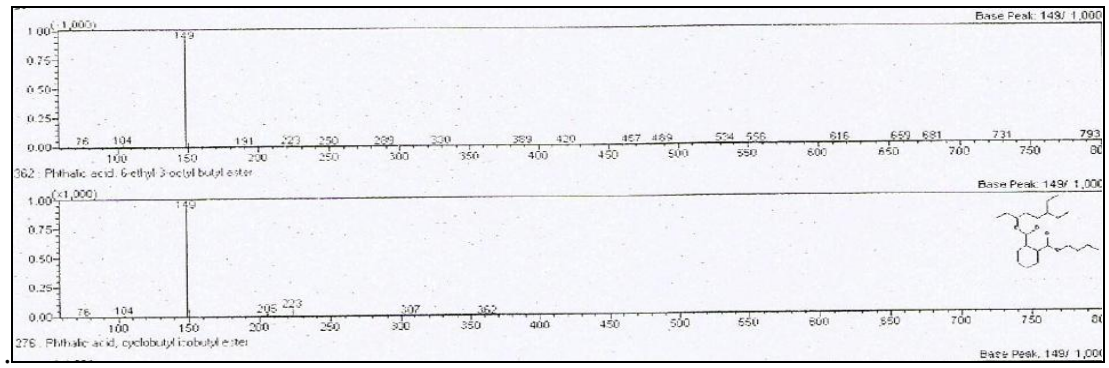


Fig. 9 Hexadecane, $C_{16}H_{34,}$ R.T. 16.727min.

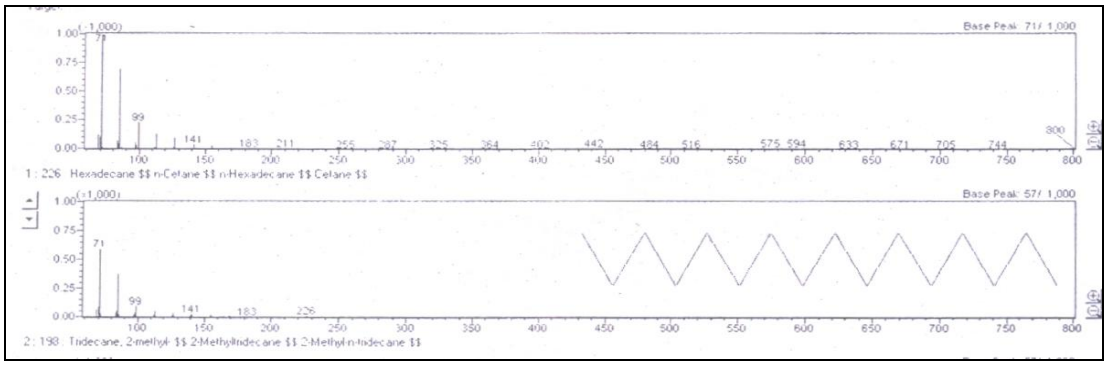
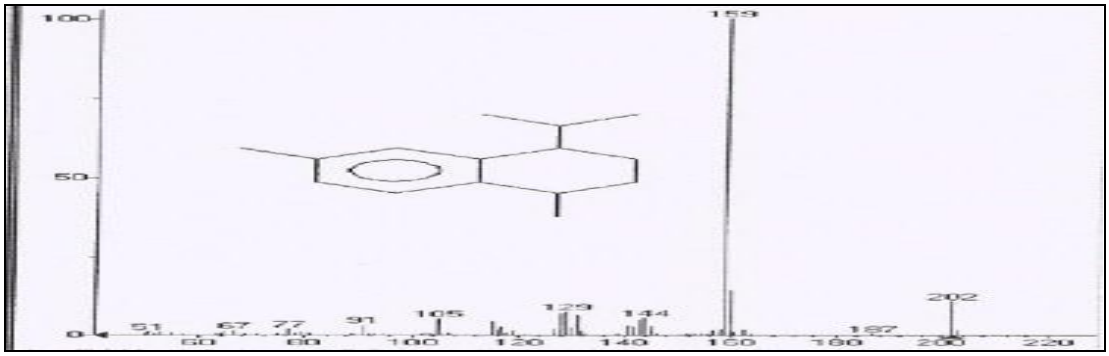


Fig.10 Calamenene, C15H22, R.T. 1.77 min.



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