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Research Article

Phytochemical Analysis of *Ficus arnottiana* (Miq.) Miq. Leaf Extract Using GC-MS Analysis

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ABSTRACT
The medically important plant *Ficus arnottiana* (Miq.) Miq. belongs to the family 'Moraceae' have been used extensively by ayurvedic practitioners in India to treat various ailments. The plant was investigated for GC MS (Gas Chromatography Mass Spectroscopy) analysis to identify the chemical composition present in chloroform and ethanol leaf extract of *F. arnottiana*. A total of twelve and sixteen bioactive compound, were observed in chloroform and ethanol leaf extract respectively. Maximum peak area was observed for Tritetracontane (24.29%), 2, 6-lutidine 3,5-dichloro-4-dodecylthio (12.78%).All the components identified possess various degrees of pharmacological properties. Further these compounds need investigation on toxicological properties before the development of potential lead molecule for therapeutic importance.

Keywords: *Ficus arnottiana* (Miq.) Miq., GC-MS analysis, Secondary metabolite, bioactive compounds.

INTRODUCTION

Plants are used as a source of medicine that has been inherited as one of the important component of the health care system. India is the largest producer of medicinal herbs and is appropriately called the botanical garden of the world[1,2]. Plants used for traditional medicine contain a wide range of substances that can be used to treat chronic as well as infectious disease[3,4].

Ficus arnottiana (Miq.) Miq. (Moraceae) is an important traditional medicinal plant distributed throughout India, mostly in rocky hills of 1,350 m elevations[5]. It is commonly known asParaspipal and Kodiarasu. The fruits of the plant contain β sitosterol, gluanol acetate and glucose, friedelin[6]. Sterols, alkaloids, carbohydrates, tannins, phenols etc., are present in the bark extracts[7]. Bark and leaf extract of this plant is being used in the traditional medicine. Bark of the plant is used as astringent, aphrodisiac, demulcent, depurative and emollient. It is also useful against inflammation, diarrhea and diabetes, burning sensation, leprosy, ulcer, scabies, wounds and skin diseases[8].

In the past few years, Gas chromatography Mass spectrometry (GC-MS) is used as one of the technological platform for finger print analysis of secondary metabolites in both plant and non-plant species[9]. A detailed literature survey on this plant has shown that so for there are no detailed reports worldwide, related to the nature of bioactive components contained in *F. arnottiana.* The present study is to identify the phytochemical constituents by preparing the chloroform and ethanol leaf extract and identification of the constituents by subjecting it to GC-MS analysis. The unknown organic compounds in a complex mixture could be determined by interpretation and also by matching the spectra with reference spectra. Hence, the objective is to identify the phytochemical constituents using polar and non-polar solvent with the aid of GC-MS technique.

MATERIALS AND METHODS

Plant Collection

The healthy mature plants of *F. arnottiana were* collected during the month of April and May, from Thuthipattu and Karuvatchi village of Villupuram District, Tamil Nadu. Identification of the plant was authenticated at the Botanical Survey of India, Southern Regional Centre, Coimbatore- 641003. Herbarium voucher has been deposited in the departmental herbarium.

Extraction of Bioactive compound from plant material

The fresh leaves were collected and washed with running tap water, chopped into small pieces and then kept in shade dry for 30 days and then grounded using electric blender. 50g of powdered leaves were extracted with 300ml of chloroform and ethanol in soxhlet apparatus for 6 hours. The extract was then concentrated at reduced pressure using rotary evaporator and stored in vials at 4°C until further analysis[10].

GC-MS analysis

The chemical composition of the ethanol and chloroform leaf extract of *F.arnottiana* was established by GC-MS analysis. The analysis was performed on a Clarus 680 GC-MS system in Mass Spectrometer Clarus 600 (EI), Software Turbo Mass ver 5.4.2. The injector temperature was set at 260˚C during the chromatographic run. The 1µl of extract sample injected into a split ratio of 1/10, the instrument the oven temperature was as follows: 60˚C (2

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Table 1: Phyto – compounds identified in *Ficus arnottiana* (Miq.) Miq. of leaf extract.

	Name of the compound	Retention Time	Peak %	Molecular Weight	Molecular formula
Chloroform	3,7,11,15-TETRAMETHYL-2-HEXADECEN-1-OL	16.654	4.791	296	$C_{20}H_{40}O$
	EICOSANOIC ACID	18.505	4.266	312	$C_{20}H_{40}O_2$
	TETRATRIACONTANE	25.202	3.561	478	$C_{34}H_{70}$
	SULFUROUS ACID, OCTADECYL 2-PROPYL ESTER	25.883	1.859	376	$C_{21}H_{44}O_3S$
	TRITETRACONTANE	26.608	24.299	604	$C_{43}H_{88}$
	OCTADECANE, 3-ETHYL-5-(2-ETHYLBUTYL)-	27.403	3.036	366	$C_{26}H_{54}$
	OXIRANE, HEPTADECYL	27.933	4.695	282	$C_{19}H_{38}O$
	TRITRIACONTANE	28.364	10.096	464	$C_{33}H_{68}$
	CYCLOTRISILOXANE, HEXAMETHYL	28.979	3.005	222	$C_6H_{18}O_3Si$
	HOP-22(29)-EN-3.BETA.-OL	29.524	17.053	426	$C_{30}H_{50}O$
	PENTADECANAL	30.289	11.277	226	$C_{15}H_{30}O$
	LUP-20(29)-EN-3-OL, ACETATE, (3.BETA.)-	30.890	12.061	468	$C_{32}H_{52}O_2$
Ethanol	2-HYDROXYETHYLHYDRAZINE	2.823	11.070	76	$C_2H_8ON_2$
	3,7,11,15-TETRAMETHYL-2-HEXADECEN-1-OL	16.579	4.353	296	$C_{20}H_{40}O$
	2,6-LUTIDINE 3,5-DICHLORO-4-DODECYLTHIO	25.903	1.702	375	$C_{19}H_{31}NCl_2S$
	CYCLOTRISILOXANE, HEXAMETHYL	26.318	3.615	222	$C_6H_{18}O_3Si$
	TETRATRIACONTANE	26.613	9.384	478	$C_{34}H_{70}$
	TRIMETHYL[4-(2-METHYL-4-OXO-2-PENTYL)PHENOXY]SILANE	26.828	5.325	264	$C_{15}H_{24}O_2Si$
	2,6-LUTIDINE 3,5-DICHLORO-4-DODECYLTHIO	27.428	12.781	375	$C_{19}H_{31}NCl_2S$
	TRIMETHYL(4-TERT.-BUTYLPHENOXY)SILANE	28.399	8.393	222	$C_{13}H_{22}OSi$
	4,4,6A,6B,8A,11,11,14B-OCTAMETHYL-1,4,4A,5,6,6A,6B,7,8,8A,9,10,11,12,12A,14,14A,	29.549	10.117	424	$C_{30}H_{48}O$
	1,2-BIS(TRIMETHYLSILYL)BENZENE	29.994	2.554	504	$C_{14}H_{44}O_6Si_7$
	LUP-20(29)-EN-3-OL, ACETATE, (3.BETA.)-	30.940	11.232	468	$C_{32}H_{52}O_2$

min); followed by 300˚C at the rate of 10˚C min⁻1; and 300˚C, where it was held for 6 min. The mass detector conditions were: transfer line temperature 240˚C; ion source temperature 240˚C; and ionization mode electron impact at 70 eV, a scan time 0.2 sec and scan interval of 0.1 sec. The fragments from 40 to 600 Da. The spectrums of the components were compared with the database of spectrum of known components stored in the GC-MS NIST (2008) library. The name, molecular weight and structure of the components of the test materials were ascertained.

RESULTS AND DISCUSSION

The GC MS chromatogram analysis of chloroform and ethanol leaf extracts of *Ficus arnottiana* (Miq.) Miq. Showed various peaks which indicate the presence of phytochemical constituents (Figure 1&2).The spectrum of the unknown component were 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.

In chloroform leaf extract out of twelve components identified by GC-MS four compounds was found to be similar with the ethanol fraction. Whereas the sixteen identified compounds from ethanol leaf extract, nine compounds are similar to the chloroform extract. GC-MS

Table 2: Biological activity of compounds identified in the leaf extract of *Ficus arnottiana* (Miq.) Miq. by GC-MS.

S. No	Name of the Compound	Compound Nature	Biological Activity*
1	3,7,11,15-TETRAMETHYL-2-HEXADECEN-1-OL	Terpene alcohol	Anti-inflammatory, Antimicrobial, Anti-inflammatory[11]
2	EICOSANOIC ACID	-	Anticancer activity (Pubchem)
3	TETRATRIACONTANE	Alkane hydrocarbon	Hypoglycaemic, Antioxidant activities [12]
4	SULFUROUS ACID, OCTADECYL 2-PROPYL ESTER	Ester compound	Antibacterial
5	TRITETRACONTANE	-	-
6	OCTADECANE, 3-ETHYL-5-(2-ETHYLBUTYL)-	-	anti-oxidant and anti-inflammatory effect
7	OXIRANE, HEPTADECYL	-	-
8	TRITRIACONTANE	Alkane hydrocarbon	No activity reported
9	CYCLOTRISILOXANE, HEXAMETHYL	-	-
10	HOP-22(29)-EN-3.BETA.-OL	-	Antibacterial,anticancer[13]
11	PENTADECANAL	Aliphatic hydrocarbon	Nutrient, Stabilizers, Surfactants and Emulsifier,Antibacterial, antioxidant [14]
12	LUP-20(29)-EN-3-OL, ACETATE, (3.BETA.)-	-	-
13	2-HYDROXYETHYLHYDRAZINE	-	-
14	2,6-LUTIDINE 3,5-DICHLORO-4-DODECYLTHIO	-	-
15	TRIMETHYL[4-(2-METHYL-4-OXO-2-PENTYL)PHENOXY]SILANE	Methyl ether	Vitamin D, rickets and antioxidants
16	TRIMETHYL(4-TERT.-BUTYLPHENOXY)SILANE	-	-
17	4,4,6A,6B,8A,11,11,14B-OCTAMETHYL-1,4,4A,5,6,6A,6B,7,8,8A,9,10,11,12,12A,14,14A,	-	-
18	1,2-BIS(TRIMETHYLSILYL)BENZENE	-	-

* Source: Dr. Duke's phytochemical and Ethanobotanical Database.

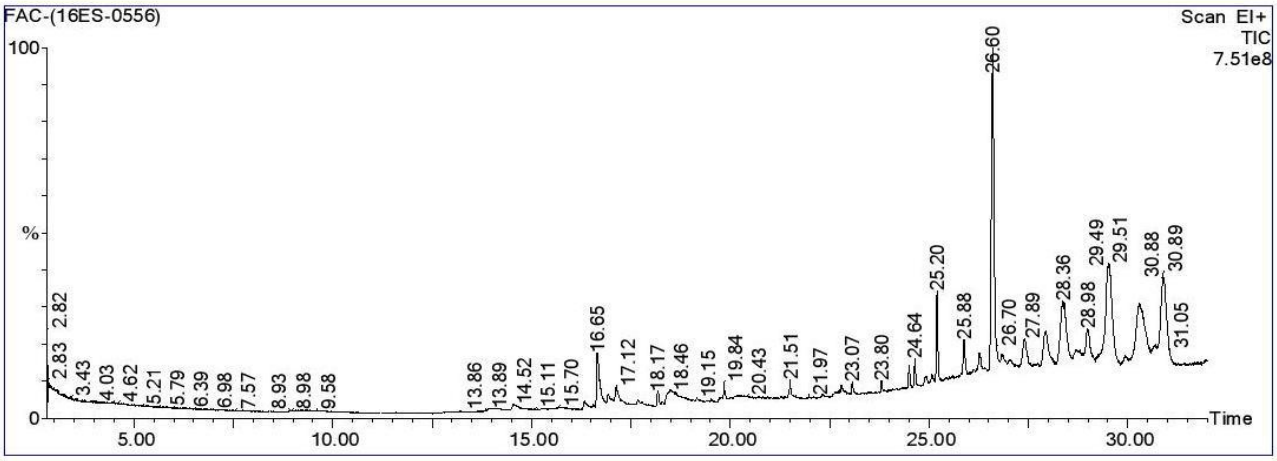

Figure 1: GC-MS Chromatogram of chloroform leaf extract of *Ficus arnottiana*(Miq.)Miq.

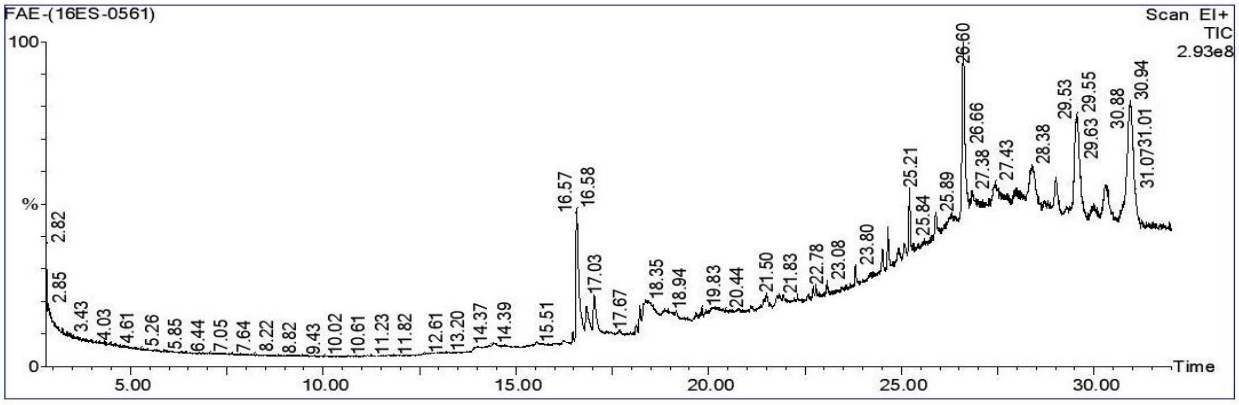

Figure 2: GC-MS Chromatogram of ethanol leaf extract of *Ficus arnottiana* (Miq.) Miq.

analysis of *F. arnottiana* resulted the occurrence of eighteen new components from both the extracts leaving the similar compounds. (Table-1).

Amount the 12 compounds from chloroform leaf extract, the most prevailing compounds wasTritetracontaneshowed a maximum peak area of 24.229, retention time of 26.608. Mean while out of 16 compounds identified from ethanol leaf extract, 2, 6-Lutidine 3,5-dichloro-4-dodecylthio showed a maximum peak area of 12.781 with a Retention time of 27.428.

Among identified components,3,7,11,15-Tetramethyl-2-hexadecen-1-ol was found to be prominent component present in most of the plants reported elsewhere from other species[11]. Identified compounds have a wide range of biological properties.

In accordance with the previous findings, most of the identified compounds from this study have also been reported elsewhere in other species.Most of the compounds identified were reported to have biological activity, based on Dr. Duke's phytochemical and ethnobotanical Databases by Dr. Jim Duke of Agricultural Research Service, USDA(Table - 3)[13].

The presence of various bioactive compounds in *F. arnottiana* justifies the use of this plant by traditional healers for treating various ailments. However, isolation of individual bioactive constituents and subjecting it to bioactivity will definitely give fruitful results. Based on the results, it is concluded that *F. arnottiana* contains various bioactive components. Hence, it is recommended as a plant of phytopharmaceutical importance.

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