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Chemical composition of essential oil from the leaves of *Gmelina asiatica* L.

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Abstract
In the present investigation essential oils from the leaves of *Gmelina asiatica* L. was extracted and its fatty acids composition was determined by GC-MS analysis. Leaves of *Gmelina asiatica* were collected, shade dried and its essential oil was extracted by hydrodistillation method using Clevenger apparatus. Analysis was done using Gas Chromatography-Mass Spectrometer apparatus, the constituents as well as the percentage of components present in the oil. Eight bio-active compounds were identified as E-11-Hexadecanoic acid (3.69%); Hexadecanoic acid (14.10%); Linoleic acid (14.57%); (E)-9-Octadecanoic acid (56.65%); Heptadecanoic acid (10.10%); 1,2-Benzenedicarboxylic acid (0.27%); Benzene, (1-butylhexadecyl) (0.24%) and Cholesterol trimethylsilyl ether (0.37%). The bioactive compounds resulted from the leaves were used to cure various ailments by the traditional practitioners.

Keywords: *Gmelina asiatica*, Verbenaceae, essential oil components, hydrodistillation.

1. Introduction
Essential oils from herbaceous plants were used extensively because of the bioactive compounds even before thousands years in food preservation, pharmaceuticals, alternative medicines and natural therapies [1, 2]. Essential oils are aromatic, or odorous, oily liquids which contain highly volatile substances that are extracted from different parts of aromatic crops through hydrodistillation. Volatile (essential) oils are the reservoir of biologically active compounds and are of benefit to protect human beings from pathogens and also to endorse the immune system [3]. Essential oils are used for food preservation, flavouring, antimicrobial, analgesic, sedative, anti-inflammatory, spasmolytic and locally anesthetic remedies [4, 5]. Literature survey showed that the absence of information about the essential oil components of *G. asiatica* till now. Therefore the present investigation is aimed to identify the volatile oil from *G. asiatica* leaves.

2. Materials and Methods
2.1 Collection and Identification
Leaves of *G. asiatica* were collected from Scott Christian College Campus, Nagercoil, Kanyakumari District, South Tamilnadu, India. The plants were identified using Gamble and Fisher [6].

2.2 Extraction of essential oil
The dried *G. asiatica* leaves were powdered using a mechanical grinder. Hydrodistillation method is followed to extract the essential oil from the leaves using Clevenger apparatus. The process was carried out continuously with a heating mantle at the temperature of 60-80 ˚C until no further oil was extracted. Then it was dried over anhydrous sodium sulphate and allowed for GC-MS analysis.

2.3 Identification of essential oil constituents: The mass spectrum obtained from GC-MS analysis was referred using the database of National Institute Standard and Technology (NIST) having more than 62,000 patterns. The constituents of the oil were identified by the spectrum of the unknown component and compared with the spectra of the known components stored in the NIST library. The name, molecular weight and structure of the components of the test materials were ascertained.

3. Results
The GC-MS Analysis of essential oil obtained from *G. asiatica* leaves showed 8 major peaks including E-11-Hexadecanoic acid (3.69%); Hexadecanoic acid (14.10%); Linoleic acid

(14.57%); (E)-9-Octadecanoic acid (56.65%); Heptadecanoic acid (10.10%); 1, 2-Benzenedicarboxylic acid (0.27%); Benzene, (1-butylhexadecyl) (0.24%) and Cholesterol trimethylsilyl ether (0.37%) (Table 1 and Fig. 1).

Table 1: Major compounds identified in the essential oil of *Gmelina asiatica* leaf by GC-MS analysis

Peak	Name of the compounds	Retention time	Area	Area %	Molecular weight	Molecular formula	Structure
1	E-11-Hexadecanoic acid, ethyl ester	37.421	464840	3.69	282	$C_{18}H_{34}O_2$	
2	Hexadecanoic acid, ethyl ester	37.925	1778456	14.10	284	$C_{18}H_{36}O_2$	
3	Linoleic acid, ethyl ester	42.029	1836718	14.57	308	$C_{20}H_{36}O_2$	
4	(E)-9-Octadecnoic acid, ethyl ester	42.137	7143895	56.65	310	$C_{20}H_{38}O_2$	
5	Heptadecanoic acid, ethyl ester	42.608	1274155	10.10	298	$C_{19}H_{38}O_2$	
6	1,2-Benzene dicarboxylic acid, Diisooctyl ester	47.030	33831	0.27	390	$C_{24}H_{38}O_4$	
7	Benzene, (1-butylhexadecyl)	50.635	30730	0.24	358	$C_{26}H_{46}$	
8	Cholesterol trimethylsilyl ether	54.389	46979	0.37	458	$C_{30}H_{24}OSi$	
			12609604	100.00			

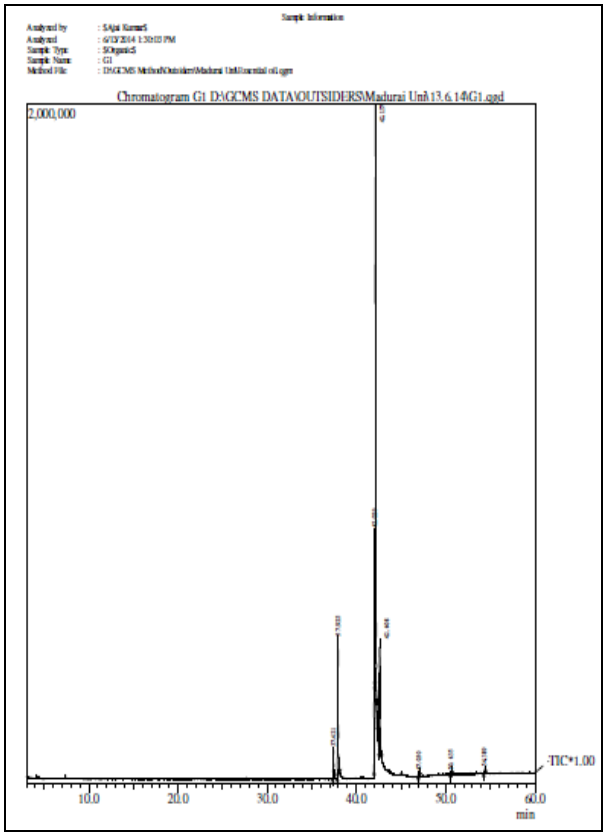

Fig 1: GC-MS Chromatogram of essential oil of *Gmelina asiatica* leaf

4. Discussion

GC-MS analysis allows the identification of the specific natural compounds found in an essential oil by comparing their relative retention times and their mass spectra [7]. In the present study, eight phytochemical constituents have been identified from the essential oil of *G. asiatica* leaf by GC-MS analysis (Table.1). They are E-11-hexadecanoic acid; hexadecanoic acid; linoleic acid; (E)-9-octadecanoic acid; heptadecanoic acid; 1,2-benzenedicarboxylic acid; benzene, (1-butylhexadecyl) and cholesterol trimethylsilyl ether.

Linoleic acid, ethyl ester is suggested to be a linoleic acid ester and it may employed as anti-inflammatory, cancer preventive, hepatoprotective, nematicide, insectifuge, antihistaminic, anti-eczemic, antiacne, 5-alpha reductase inhibitor and hypocholesterolemic agent. (E)-9-Octadecanoic acid has the property of antimicrobial, antioxidant, hypocholesterolemic, anti-androgenic, 5-Alpha reductase inhibitor, insectifuge, nematicide, hepatoprotective, anti-histiminic, anti-eczemic, anti-arthritic and anti-coronary. Hexadecanoic acid, ethyl ester is suggested to be a palmitic acid ester and it may employed as antioxidant, flavor, pesticide, nematicide, lubricant, anti-androgenic, anti-hemolytic, 5-alpha reductase inhibitor, hypocholesterolemic agent and larvicidal activities [8]. Similar results were obtained by Moronkola *et al*. in the fruit oil of *G. arborea*, who identified one hundred and twenty four trace compounds which was accounted for 92% of total oil [9]. Adeyeye *et al*. analysed the seed oil of *G. arborea* and *Tectona grandis* [10]. He identified fatty acid compounds such as oleic acids and linoleic acids. Basumatary *et al*. [11] reported six chemical components used in the preparation of biodiesel from *G. arborea* seed oil. Likewise, hexadecanoic acid was isolated from *Lippia multiflora* stem, root and fresh leaves, flowers and dried fruits of *Vitex negundo* [12-14]. Gunstone and Quresh reported the occurrence of chemical components from the seed oil of *G. asiatica* containing 10.1% of triglycerides and 2 monoglycerides (1.6%) [15]. Previous studies reported that the chemical composition of essential oil on geographical origin of plants [16] by genetic factors [17-19], environmental conditions [20,21], nutritional status [22], effects of mechanical damage [23] or herbivory [24], climatic, soil phase of vegetation, harvesting season, solvent types, methods of extraction, plant age and anatomical part of plant [25-28]. The type and concentration of chemical compounds in plant extract in each region is different whereas, the chemical composition of essential oil differs also in different species [29-31]. The results of this study showed that the *G. asiatica* leaf oil contains a variety of fatty acids with various biological activities.

5. Conclusion

The present investigation reported eight fatty oil compounds of *G. asiatica* leaf and this plant oil has many biological properties. (E)-9-Octadecanoic acid is natural essential oil compound which constitutes 56.65 percent of the fatty acid content among the fatty acids which is strong candidate drugs for prevention and treatment of various diseases. Therefore, more concentration is required to explore its value in future studies.

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