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Research Article

CHEMICAL COMPOUNDS INVESTIGATION OF *LUCAS ASPERA* LEAVES – A POTENTIAL FOLKLORE MEDICINAL PLANT

A. ANANDAN[1], R. ESWARAN[1], A.DOSS[2], G. SANGEETHA[3] and S. P. ANAND[2]*

[1]Department of Genetics and Plant Breeding, Annamalai University,Annamalai Nagar - 620 001, Tamil Nadu, South India,[3]Department of Plant Pathology, Annamalai University,Annamalai Nagar - 620 001, Tamil Nadu, South India,[2]PG & Research Department of Botany, National College (Autonomous),Tiruchirappalli - 620 001, Tamil Nadu, South India.Email : dranand@gmail.com

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ABSTRACT

Lucas aspera (Willd.) Linn. is a potential folklore medicinal plant (Lamiaceae) used as an antipyretic and insecticide. In this study, fatty acid esters, fatty acid amide, triterpene, diterpene alcohols and phytol were identified as the major chemical groups in the methanol fractions of *L.aspera* leaf extracts. Their structures were elucidated, on the basis of GC-MS data, Phytol (24.55%), 9, 12, 15-Octadecatrienoic acid, methyl ester (z, z, z) - (22.97%), n-Hexadecanoic acid (17.17%), Squalene (5.28%) and 1, 2-Benzenedicarboxylic acid, bis(2-methylpropyl) ester (4.44%).

Key words: GC-MS, Fatty acids, Phytol, Methanol

INTRODUCTION

Leucas aspera (Willd.) Linn. (Family: *Lamiaceae*) commonly known as *'Thumbai* is distributed throughout India from the Himalayas down to Ceylon. *Leucas aspera* is an annual, branched, herb erecting to a height of 15-60 cm with stout and hispid acutely quadrangular stem and branches. Leaves are sub-sessile or shortly petiolate, linear or linearly lanceolate, obtuse, pubescent up to 8.0 cm long and 1.25 cm broad, with entire or crenate margin; petiole 2.5-6 mm long. Flowers are white, sessile small, in dense terminal or axillary whorls; bracts 6 mm long, linear, acute, bristle-tipped, ciliate with long slender hairs. Fruit nutlets, 2.5 mm long, oblong, brown, smooth, inner face angular and outer face rounded (Srinivasan *et al*., 2011).

The plant is used traditionally as an antipyretic and insecticide. Flowers are valued as stimulant, expectorant, aperient, diaphoretic, insecticide and emmenagogue. Leaves are considered useful in chronic rheumatism, psoriasis and other chronic skin eruptions. Bruised leaves are applied locally in snake bites. *Leucas aspera* is used for treatment of respiratory tract disorders, edema, gastrointestinal disorders, pain, and as an antidote to poison. *Lannea coromandelica* is used for treatment of gastrointestinal disorders, jaundice, pain, and heart disorders by folk medicinal practitioners. In Indian traditional medicine, the leaf juice of *Leucas aspera* is used to treat psoriasis, chronic skin eruptions, and chronic rheumatism (Kirtikar and Basu, 1991). Anti-inflammatory activity of various aerial parts of *Leucas aspera* has been reported (Goudgaon *et al*., 2003). The ethanolic extract of roots of the plant has been shown to contain antinociceptive, antioxidant and cytotoxic activities (Rahman *et al*., 2007). Leaf extract of the plant has been shown to demonstrate antiplasmodial activity against chloroquine-sensitive (3D7) strain of *Plasmodium falciparum* (Bagavan *et al*., 2010). Extracts of leaf, flower and seeds reportedly exhibited larvicidal potential against larvae of two mosquito species, namely, *Anopheles subpictus* Grassi and *Culex tritaeniorhyncus* Giles (Kamaraj *et al*., 2009). Larvicidal activity has also been reported for leaf extract of the plant against the mosquito species, *Aedes aegypti* L. and *Culex quinquefasciatus* Say (Bagavan *et al*., 2010). Diterpenes have been isolated from the plant with prostaglandin-induced contractions inhibitory activity (Sadhu *et al*., 2006). Lignans and flavonoids, isolated from the plant have also been reported to possess prostaglandin inhibitory and antioxidant activities (Sadhu *et al*., 2003). In an ethnomedicinal survey conducted in the Dharwad district of Karnataka, India, the plant has been reported to be used for treatment of tooth ache (Hebbar *et al*., 2004). Hence the present investigation was carried out to determine the possible chemical components from *Lucas aspera* leaves by Gas Chromatography and Mass Spectrum.

MATERIALS AND METHODS

Plant material

Lucas aspera was collected in Trichy District, Tamilnadu. The botanical identify of the plant was confirmed by Dr. V. Sampath kumar, Scientist C, Botanical Survey of India (Southern Circle), Coimbatore, Tamilnadu.

Plant sample extraction

50gm powdered plant material is soaked in 200ml of absolute alcohol overnight and then filtered through whatmann filter paper No.41 along with 2gm sodium sulfate to remove the sediments and traces of water in the filtrate. Before filtering, the filter paper along with sodium sulphate is wetted with absolute alcohol. The filtrate is then concentrated by bubbling nitrogen gas into the solution and reduce the volume to 1ml.The extract contains both polar and non-polar phytocomponents.

GC – MS Analysis

GC-MS analysis was carried out on a GC Clarus 500 Perkin Elmer system comprising a AOC-20i auto sampler and gas chromatograph interfaced to a mass spectrometer (GC-MS) instrument employing the following conditions: Column Elite-1 fused silica capillary column (30mm×0.25mm I.D ×1 µ M df, composed of 100% Dimethyl poly siloxane), operating in electron impact mode at 70 eV; helium (99.999%) was used as carrier gas at a constant flow of 1ml/min and an injection volume of 0.5 µ l was employed (split ratio of10:1) injector temperature 250 °C; ion-source temperature 280 °C. The oven temperature was programmed from 110 °C (isothermal for 2 min), with an increase of 10 °C/min, to 200 °C, then 5 °C/min to 280 °C, ending with a 9 min isothermal at 280 °C. Mass spectra were taken at 70 eV; a scan interval of 0.5 seconds and fragments from 45 to 450 Da. Total GC running time is 46min.

RESULTS AND DISCUSSION

The composition and identification of the main components present in the leaves of *Lucas aspera* are shown in (Table 1). Twenty-three compounds were identified in *L. aspera by* GC-MS analysis. The active principles with their retention time (RT), molecular formula, molecular weight (MW) and concentration (%) are presented in (Table 1 and Fig 1). It was found that the main constituents of leaves Phytol (24.55%), 9, 12, 15-Octadecatrienoic acid, methyl ester (z, z, z) - (22.97%), n-Hexadecanoic acid (17.17%), Squalene (5.28%) and 1, 2-Benzenedicarboxylic acid, bis (2-methylpropyl) ester (4.44%) (Fig.1).

Our results showed the presence of aliphatic acid esters, terpene, diterpene alcohol and phytol in the leaves of *L. aspera*. Diterpene alcohol was the major chemical group in *L. aspera* fractions. Phytol was the main diterpene alcohols in methanol fraction. Phytol, a diterpene alcohol was modified to several semisynthetic analogues. Some of the modifications were done logically to enhance lipophilicity of the molecule. Phytol in the methanol fractions is a diterpene alcohol which functions as a precursor for Vitamins E and K1 and an antioxidant and a preventive agent against epoxide-induced breast cancer carcinogenesis (Daniet *et al*., 2011). It's also an effective vaccine adjuvant with no adverse auto-immune effects. 9,12,15-octadecatrienoic acid, methyl ester, also known as α-linolenic acid methyl ester, is an aliphatic acid ester known to inhibit proliferation of ER-positive and ER- negative breast cancer cells. It is also a potent antiangiogenic agent in colorectal cancer and in HUVEC cells (Daniet *et al*., 2011).

Table 1: The Chemical Composition Of Leaves of *lucas aspera* (willd.) Linn

S.NO	R.T	NAME OF THE COMPOUND	MOLECULAR FORMULA	MOLECULAR WT	PEAK AREA
1	4.06	Glycerin	$C_3H_8O_3$	92	1.92
2	4.26	1-(3 methyl butyryl) pyrrolidine	$C_9H_{17}O_N$	155	0.35
3	5.42	Benzeneacetaldehyde	C_8H_8O	120	0.29
4	5.96	Propane,1,1,3-triethoxy-	$C_9H_{20}O_3$	176	0.08
5	6.10	Thymine	$C_5H_6N_2O_2$	126	0.87
6	7.59	4H-Pyran-4-one,2,3-dihydro-3,5-dihydroxy-6- methyl	$C_6H_8O_4$	144	1.09
7	8.58	4H-Pyran-4-one,3,5-dihydroxy-2- methyl	$C_6H_6O_4$	142	0.27
8	9.02	2-Furancarboxaldehyde, 5-(hydroxymethyl)-	$C_6H_6O_3$	126	0.84
9	14.80	Caryophyllene	$C_{15}H_{24}$	204	3.07
10	15.59	A-Caryophyllene (Humulene)	$C_{15}H_{24}$	204	0.35
11	16.52	Azulene	$C_{15}H_{24}$	204	0.52
12	17.476	Dodecanolic acid	$C_{12}H_{24}O_2$	200	0.09
13	17.572	Nerolidol-2	$C_{15}H_{26}O$	222	0.27
14	17.884	Delthyl Phthalate	$C_{12}H_{14}O_4$	222	0.02
15	18.51	Caryophyllene oxide	$C_{15}H_{24}O$	220	0.15
16	21.06	4-Hydroxy-2-methoxycinnamaldehyde	$C_{10}H_{10}O_3$	178	0.37
17	21.23	4-()1E)-3-Hydroxyl-1-propenyl)-2- methoxyphenol	$C_{10}H_{12}O_3$	180	3.71
18	21.88	Tetradecanoic acid	$C_{14}H_{28}O_2$	228	0.32
19	23.825	1,2-Benzenedicarboxylic acid,bis (2-methylpropyl)ester	$C_{16}H_{22}O_4$	278	4.44
20	26.04	n-Hexadecanoic acid	$C_{16}H_{32}O_2$	256	17.17
21	28.91	Phytol	$C_{20}H_{40}O$	296	24.55
22	29.382	9,12,15-Octadecatrienoic acid, methyl ester (z,z,z)-	$C_{19}H_{32}O_2$	292	22.97
23	36.69	Unknown	***	-	7.22
24	41.71	Squalene	$C_{30}H_{50}$	410	5.28
25	44.23	Unknown	***	-	3.80

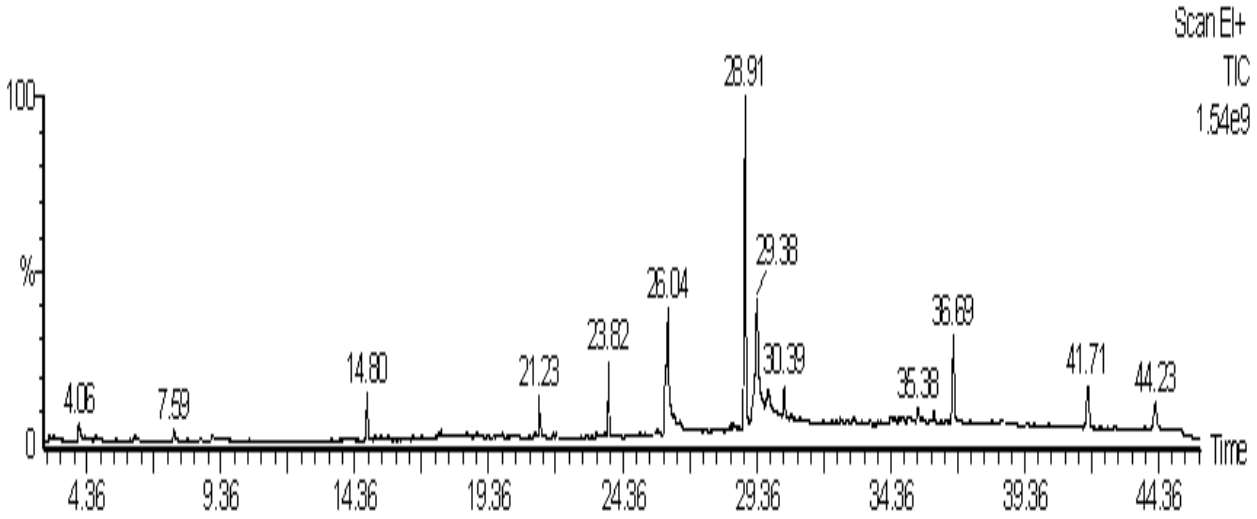

Fig. Gc-ms of of leaves of *lucas aspera* (willd.) Linn

Hexadecanoic acid methyl ester, also known as Methyl palmitate, in the methanol fraction is an aliphatic acid ester reported to cause growth inhibition and apoptosis induction in human gastric cancer cells (Daniet *et al*., 2011). *Lucas aspera* is a potential folklore medicinal plant used for many diseases and infections. Phytochemical analysis by GC-MS revealed presence of fatty acid esters, fatty acid amide, terpenoids, diterpene alcohols and phytol as major compound groups in the methanol fractions. Compositional variation in quantities, qualities and structural features may influence compounds behavior on GC-MS, as well as bioactivities of their precursor fractions.

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