



REVIEW ARTICLE

NATURAL CHEMISTRY

**LEUCAS ASPERA - MEDICINAL PLANT : A REVIEW****R. SRINIVASAN\*, B. RAVALI, P. SUVARCHALA, A. HONEY,  
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**ABSTRACT**

*Leucas aspera* commonly known as 'Thummichittu' is distributed throughout India and in the plains of Mauritius, java and philippines. The plant is used traditionally as an antipyretic and insecticide. Medicinally, it has been proven to possess various pharmacological activities like antifungal, antioxidant, antimicrobial, antinociceptive and cytotoxic activity and as an antidote to snake venom. *Leucas* leaves are used in chronic rheumatism. Further studies reveal the presence of various phytochemical constituents mainly triterpenoids, oleanolic acid, ursolic acid and b-sitosterol, nicotine, sterols, glucoside, diterpenes, phenolic compounds (4-(24-hydroxy-1-oxo-5-n-propyltetracosanyl)-phenol). These studies reveal that *L. aspera* is a source of medicinally active compounds and have various pharmacological effects; hence, this drug encourage finding its new therapeutic uses.

## KEYWORDS

Antimicrobial activity, Lamiaceae, *Leucas aspera*, triterpenoid

## INTRODUCTION

*Leucas aspera* (Willd.) Linn. (Family: *Lamiaceae*) commonly known as 'Thumbai' <sup>[1]</sup> is distributed throughout India from the Himalayas down to Ceylon. <sup>[2]</sup> 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. <sup>[1],[3]</sup>

### VERNACULAR NAMES :

Sanskrit: Dronapushpi, Chitrapathrika, Chitrakshup

Punjabi: Guldor

Bengali: Darunaphula, Hulkasha

Gujarati: Kulnphul

Hindi: Goma madhupati

Sindhi: Kubo

Maharashtra: Bahuphul

Bombay: Tumba

Telugu: Thummichittu.

### TAXONOMICAL CLASSIFICATION:

Kingdom: Plantae, Plant

Subkingdom: Tracheobionta, Vascular plant

Super division: Spermatophyta, Seed plant

Division: Angiosperma

Class: Dicotyledonae

Sub-class: Gamopetalae

Series: Bicarpellatae

Order: Tubiflorae

Family: Labiatae

Genus: *Leucas*

Species: *aspera*



**Figure 1**  
**View of *Leucas Aspera* whole plant**

**BOTANICAL DESCRIPTION**

*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:** 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.

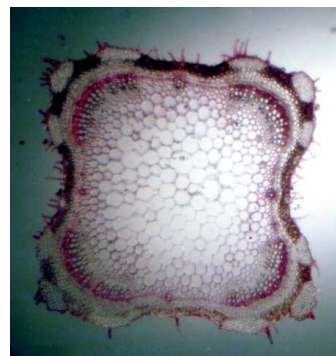
**FLOWERS:** Flowers are white, sessile small, in dense terminal or axillary whorls; bracts 6 mm long, linear, acute, bristle-tipped, ciliate with long slender hairs

**CALYX:** Calyx variable, tubular, 8-13 mm long; tube curved, contracted above the nutlets, the

lower half usually glabrous and membranous, the upper half ribbed and hispid; mouth small, very oblique, not villous, the upper part produced forward; teeth small, triangular, bristle-tipped, ciliate, the upper tooth being the largest.

**COROLLA:** Corolla 1 cm long; tube 5 mm long and pubescent above, annulate in the middle; upper lip 3 mm long, densely white-woolly; lower lip about twice as long, the middle lobe obviate, rounded, the lateral lobes small, subacute.

**FRUIT:** Fruit nutlets, 2.5 mm long, oblong, brown, smooth, inner face angular and outer face rounded. <sup>[5], [6]</sup>

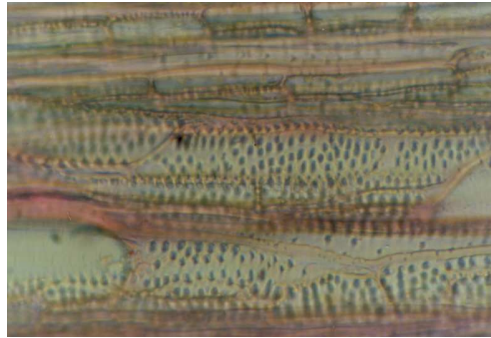
**MICROSCOPIC DESCRIPTION : [7]****Stem**

**Figure 2 & 3**  
**T. S Side view, front view**

Diagrammatic TS of young stem is quadrangular in outline with four distinct collenchymatous ridges, covered with hairs. It shows a narrow cortex and a ring of vascular tissue encircling the wide stele. Detailed TS shows an epidermis covered with thick cuticle, traversed occasionally with stomata and bears simple, multicellular (three to four-celled) uniseriate lignified trichomes and sessile, glandular trichomes with multicellular head; narrow parenchymatous cortex, except under the ridges where it is collenchymatous,

distinct endodermis and parenchymatous pericycle, especially; stellar region consisting of a ring of vascular bundles connected with interfascicular sclerenchymatous band; very narrow parenchymatous phloem, and radially arranged xylem tissue.

In old stem, trichomes are few, phloem tissue is wide and found on either side of the wide xylem band; pith is parenchymatous, wide and embedded with acicular crystals of calcium oxalate.



**Figure 4**  
**T. S of Xylem & Phloem**  
**Leaf**

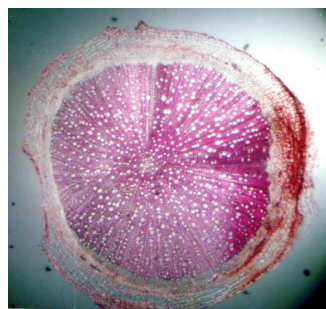


**Figure 5**  
**T. S of Trichome of leaf**

T.S of leaf passing through the midrib is broadly convex on the lower side and slightly grooved or flat on the upper side, a centrally located conjoint and collateral meristele associated with a parenchymatous pericycle layer on lower side, collenchymatous tissue underneath both the epidermis; dorsiventral

lamina epidermis covered with thick cuticle, traversed with stomata, bears simple and glandular trichomes of the same type as found on stem, 1 to 2 layered palisade tissue occupying the major area of the section and spongy parenchyma.

**Root:**



**Figure 6 & 7**  
**T. S of Root side & front view**



TS of root shows narrow, elongated and closely packed epidermal cells with thin walls, flattened walls are straight. Glandular trichomes with unicellular head and short unicellular stalk are observed.

Cortex consists of thick walled polygonal parenchyma with inter cellular spaces. Parenchyma cells of cortex contain abundant starch grains. Endodermis is uniseriate and longitudinally elongated. Narrow medullary rays with thick walled, pitted, lignified sclerides are also observed in the cortex as well as in the pericycle region. Vascular system consist of phloem in the form of strands which is separated from the xylem by the cambium. Xylem cells are globose to subglobose.

### PHYTOCHEMICAL STUDIES

Preliminary chemical examination of *L. aspera* revealed presence of triterpenoids in entire plant.<sup>[8]</sup> Whole plant is reported to contain oleanolic acid, ursolic acid and 3-sitosterol.<sup>[9]</sup> Aerial parts are reported to contain nicotine,<sup>[10]</sup> sterols,<sup>[11]</sup> two new alkaloids (compound A m.p. 61-2°,  $\alpha$ -sitosterol and  $\beta$ -sitosterol) (m.p. 183-4 °), reducing sugars (galactose), glucoside (230-1 °),<sup>[12]</sup> diterpenes (leucasperones A and B, leucasperols A and B, isopimarane glycosides (leucasperosides A, B and C), together with other compounds like asperphenamate, maslinic acid, (-)-isololiolide, linifolioside,<sup>[13]</sup> nectandrin B, meso-dihydroguaiaretic acid, macelignan, acacetin, apigenin 7-O-[6'-O-(p-coumaroyl)-3-D-glucoside], chrysoeriol, apigenin, erythro-2-(4-allyl-2,6-dimethoxyphenoxy)-1-(4-hydroxy-3-methoxyphenyl)propan-1-ol, myristargenol B, and machilin C, (-)-chicanine, (7R,8R)- and (7S,8S)-licarin A.<sup>[14]</sup> Among the 25 compounds identified from the leaf volatiles, u-farnesene (26.4%), x-thujene (12.6%) and menthol (11.3%) were the major constituents. The flower is reported to contain 10 compounds; among them amyl propionate (15.2%) and isoamyl propionate (14.4%) were dominant.<sup>[15]</sup> Seed is reported to contain palmitic acid (6.25%), stearic acid (2.84%), oleic acid (42.07%), linoleic acid (48.11%), and linolenic acid (0.65%). The unsaponifiable fraction contained 3-sitosterol and

ceryl alcohol.<sup>[16],[17]</sup> Shoot contained novel phenolic compounds (4-(24-hydroxy-1-oxo-5-n-propyltetracosanyl)-phenol),<sup>[18]</sup> aliphatic ketols (28-hydroxypentatriacontan-7-one, 7-hydroxydotriacontan-2-one),<sup>[19]</sup> long-chain compounds (1-hydroxytetatriacontan-4-one, 32-methyltetatriacontan-8-ol),<sup>[20]</sup> nonatriacontane,<sup>[18]</sup> 5-acetoxytriacontane,  $\beta$ -sitosterol<sup>[19]</sup> and dotriacontanol.<sup>[20]</sup> Leucolactone (I), isolated from the root of *L. aspera* have been characterized as 3, 3, 16c-dihydroxyoleanan-28-1,3-olide.<sup>[21]</sup>

### PHARMACOLOGICAL

#### Antifungal

*In vitro* study of chloroform and ether extracts of *L. aspera* revealed its antifungal activity against *Trichophyton* and *Microsporum gypseum*. The minimum inhibitory concentration was found to be 5mg/mL. *Leucas aspera* had both fungistatic and fungicidal actions.<sup>[22]</sup>

#### Anti-inflammatory

The juice of the leaves is used as local application for psoriasis, chronic skin eruptions and chronic rheumatism<sup>1</sup>. In the present investigation, we have fractionated the crude extract and studied the antiinflammatory activity of crude, alkaloid and non alkaloid fractions of *L. aspera*. The plant *L. aspera* Spreng. was collected from the area around Gulbarga, Karnataka, India during the period September-October 1999 and authenticated at the Herbarium, Department of Botany, Gulbarga University, Gulbarga. The shoot system of the plant including stem, leaves and flower were shade dried and chopped into small pieces. The shade-dried plant was powdered (200 g) and extracted with ethanol (95%, 3 liters) in a soxhlet extractor exhaustively for 20-24 h. The extract was concentrated to dryness under reduced pressure and controlled temperature (40-50°C) using a roto evaporator. The extract obtained was dark green, gummy solid (22 g). The extract was subjected to various phytochemical tests and showed the presence

### STUDIES: activity

### agents



of alkaloids, steroids and glycosides. Crude ethanolic plant extract (20 g) of *L. aspera* was successively defatted with petroleum ether (200 ml) and filtered. The air-dried residue was washed successively with methanol (60 ml) and filtered. To the residue, water (10 ml) and HCl (2 N, 10 ml) were added, stirred and ether (100 ml) was added to extract tannins and other impurities. The aqueous layer was neutralized by adding 10% Na<sub>2</sub>CO<sub>3</sub> (10 ml) solution and kept for 5 days in a freezer and filtered. The solid fraction (10 g) was shown to contain the presence of alkaloids by chemical tests (alkaloid fraction, gave positive test for Meyers reagent, Dragendorff reagent and Wagner reagent). The ethereal fraction was separated and concentrated to dryness to provide the gummy residue (1 g), which gave negative test for alkaloids (non-alkaloid fraction). All these fractions were kept in a dessicator and stored in a freezer till the conduct of experiments. The test doses were prepared in Tween-80 (1%) suspension in distilled water for each fraction to get the desired concentration of the extract.

#### **Prostaglandin inhibitory and antioxidant activities**

*Leucas aspera* was tested for its prostaglandin (PG) inhibitory and antioxidant activities. The ext. showed both activities, that is, inhibition at 3-4 g/mL against PGE1- and PGE2-induced contractions in guinea pig ileum and a 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging effect. Phytochemical investigation suggested the presence of nectandrin B, meso-dihydroguaiaretic acid, macelignan, acacetin, apigenin 7-O-[6'-O-(p-coumaroyl)-3-D-glucoside], chrysoeriol, apigenin, erythro-2-(4-allyl-2,6-dimethoxyphenoxy)-1-(4-hydroxy-3-methoxyphenyl)propan-1-ol, myristargenol B and machilin C, (-)-chicanine, (7R,8R)- and (7S,8S)-licarin A.<sup>[14]</sup>

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#### **Toxicity evaluation of herbal smoke and synthetic mosquito mat on *Culex quinquefasciatus***

The smoke of leaves of *Vitex negundo* and *L. aspera* are more toxic to the filarial vector mosquito, *Culex quinquefasciatus* than the synthetic mosquito mats, which contain 4% d-allethrin.<sup>[23]</sup>

#### **Antimicrobial activity of *Leucas aspera* flowers**

The methanol extract of *L. aspera* flowers, its fractions, the alkaloidal residue and the expressed flower juice showed good antibacterial activity for methanol extract and methanol fraction with maximum activity for the alkaloidal residue.<sup>[24]</sup>

#### **Antimicrobial action of some essential oils.**

The essential oils from *L. aspera* possessed bacteriostatic activity against *Staphylococcus aureus*, *Vibrio cholerae*, *Salmonella typhi*, *Klebsiella aerogenes*, *Escherichia coli*, *Proteus vulgaris*, *Pseudomonas pyocyanea* and *Dys. Flexneri*.<sup>[25]</sup>

#### **Antinociceptive, antioxidant and cytotoxic activities of *Leucas aspera* root**

The ethanolic extract was subjected to acetic acid induced writhing inhibition, 1,1-diphenyl-2-picryl hydrazyl (DPPH) free radical scavenging assay and brine shrimp lethality bioassay for screening of antinociceptive, antioxidant and cytotoxic activity, respectively. The ethanolic extract of *L. aspera* root produced significant inhibition in acetic acid induced writhing in mice at the doses of 250 and 500 mg/kg. The extract showed a significant free radical scavenging activity with an IC<sub>50</sub> of 8 µg/ml. The extract showed significant lethality to brine shrimp.<sup>[26]</sup>

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