Leucas aspera: A review

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ABSTRACT

Leucas aspera commonly known as 'Thumbai' is distributed throughout India from the Himalayas down to Ceylon. 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. Further, studies reveal the presence of various phytochemical constituents mainly triterpenoids, oleanolic acid, ursolic acid and β-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.

Key words: Antimicrobial activity, lamiaceae, *Leucas aspera*, triterpenoid

INTRODUCTION

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

OTHER NAMES[1]

Sanskrit: Dronapushpi, Chitrapathrika, Chitrak-shupa
Punjabi: Guldora
Bengali: Darunaphula, Hulkasha
Gujarati: Kulnnphul
Hindi: Goma madhupati
Sindhi: Kubo
Maharashtra: Bahuphul
Bombay: Tumba
Telugu: Tunni

TAXONOMICAL CLASSIFICATION[4]

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*

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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 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 white, sessile small, in dense terminal or axillary whorls; bracts 6 mm long, linear, acute, bristle-tipped, ciliate with long slender hairs; 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 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 nutlets, 2.5 mm long, oblong, brown, smooth, inner face angular and outer face rounded.[5,6]

MICROSCOPIC DESCRIPTION[7]

Stem

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.

Leaf

TS 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.

PHYTOCHEMICAL STUDIES

Preliminary chemical examination of *L. aspera* revealed presence of triterpenoids in entire plant.[8] Whole plant is reported to contain oleanolic acid, ursolic acid and 3-sitosterol.[9] Aerial parts are reported to contain nicotine,[10] sterols,[11] two new alkaloids (compound A m.p. 61-2°, α-sitosterol and β-sitosterol) (m.p. 183-4°), reducing sugars (galactose), glucoside (230-1°),[12] 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,[13] 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 (75,85)-licarin A.[14] 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.[15] 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.[16,17] Shoot contained novel phenolic compounds (4-(24-hydroxy-1-oxo-5-n-propyltetracosanyl)-phenol),[18] aliphatic ketols (28-hydroxypentatriacontan-7-one, 7-hydroxydotriacontan-2-one),[19] long-chain compounds (1-hydroxytetratriacontan-4-one, 32-methyltetratriacontan-8-ol),[20] nonatriacontane,[18] 5-acetoxytriacontane, β-sitosterol[19] and dotriacontanol.[20] Leucolactone (I), isolated from the root of *L. aspera* have been characterized as 3,3,16c-dihydroxyoleanan-28-1,3-olide.[21]

PHARMACOLOGICAL STUDIES

Antifungal activity

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.[22]

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 (75,85)-licarin A.[14]

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.[23]

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.[24]

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*.[25]

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_{50} of 8 μg/ml. The extract showed significant lethality to brine shrimp.[26].

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