



Review Article

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Leucas aspera Spreng (Dronapushpi): A Review

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ABSTRACT

Leucas aspera is a plant species belongs to the genus Leucas and the family Lamiaceae. Species has different common names depending its location and most commonly known as Tumbai or Thumba, is distributed throughout India from the Himalayas down to Ceylon. It is known for its various uses in the fields of medicine and agriculture. This article aims to provide a comprehensive review on the pharmacognostic, phytochemical, and pharmacological aspects of Leucas aspera. Traditionally different parts of the plants are used as an antipyretic, insecticide, stimulant, emmenagogue, expectorant, aperient and diaphoretic. Leaves are found to be useful in chronic rheumatism, chronic skin eruptions specially in psoriasis. In case of snake bite, bruised leaves are applied locally. The plant mainly contains triterpenoids, oleanolic acid, b-sitosterol, diterpenes, ursolic acid, nicotine, sterols, glucoside and phenolic compounds. The plant, flower extract and essential oil shows various activities like antioxidant, anti-microbial, anti-fungal and antinociceptive etc.

Keywords: Pharmacognostic, Pharmacological, Antioxidant, Emmenagogue.

INTRODUCTION

Ayurveda is an oldest system of medicine bestowed on humanity by great *rushis(sages)* of India, which has influenced all other system of medicines either directly or indirectly ^[1].

Dronapushpi (*Leucas aspera* Spreng) of Lamiaceae family ^[2], is found as a weed throughout the country ^[3], and which is easily available, less cost effective and have been described in various *Nighantus*. Various pharmacological actions like *Shopha* (swelling or inflammation), *Kamala* (jaundice), *Tamakashwasa* (bronchial asthma) and *Kasajit* (alleviates cough) are mentioned in *Kaiyadeva Nighantu* and *Bhavaparkasha Nighantu* ^[4].

Every year about 20,000 deaths are due to liver disorders. The plant origin drugs have shown to maintain the normal functional status of the liver ^[5]. About 80% of the world populations depends on traditional medicine predominantly plant origin ^[6].

Leucas aspera Spreng (Family: *Lamiaceae*) ^[7], which is distributed as a weed throughout India from the Himalayas to Ceylon. Traditionally different parts of the plants are used as an antipyretic, insecticide, stimulant, emmenagogue, expectorant, aperient and diaphoretic. Leaves are found to be useful in chronic rheumatism, chronic skin eruptions specially in psoriasis. In case of snake bite, bruised leaves are applied locally ^[8].

In *Bhhat trayi* there is no description about *Dronapushpi* but in *Astang hridaya* a plant *Mahadrone* is mentioned but its identity with *Dronapushpi* is doubtful. Even in *Dhanvantari nighantu* we do not come across *Dronapushpi*. In one context he emphasized its use in *Pakshaghata* (*hemiplgia*). *Adhadamala* commented *Dronapushpi* as *Nahula* or *Guma*. This plant is known as *Guma* in North India ^[9].

Nirukti

Its inflorescence is bowl shaped ^[10].

Botanical name – *Leucas aspera* Spreng.

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Family – Lamiaceae [11-19].

Vernacular names: In Hindi is known as Guma, Goma, Deldona, Dhurpisag, Motapati, Goma madhupati, in Telagu is Tumni, Peddatumni, Pulatumni, in Begali is called as Dandakalas, in Marati it is Tumba, Deokhumba, Kumbha, Shetvad, Bahuphul. In kannada and Malayalam commonly known as Tumble. Gujarati language it is known by names Doshi no kubo, Khetraukubo, Kubi, Kubo, Kulannuphul. In Tamil is called by Tumbari, Tumbai, Tumbay-keere. In punjab as Chatra, guldoda, Maldoda, Phuman, Sisalius, Gldora and in Assam known by Dronaphool and in oriya as Gaisa [20-23].

Synonyms- In Raja nighantu, we find chitrakshupa, chitrapatrika, deerkhapatra, devadroni, devapurnaka, devi, divyapuspa, kumbayonika, kuramba, kurambika. Acharya Bhavaprakash has mentioned drona and palindi. Acharya madanapala added chatraka, chatrani, maharanadrona, phalepushpa. In Kaiyadeva nighantu we find 3 more new Synonyms like chatrakakutumbaka, dronatumbada, kusumbaka. According to shodala nighantu, sapuspa, shadahva and in Shaligrama nighantu dronavasikundaka, Kutumbaka are few new Synonyms added by authors [24-29].

Classical Categorization

Bhavaprakasha nighantu – Guduchyadi Varga, Shaka varga

Kaiyadeva nighantu – Osadhi varga

Raja nighantu – Parpatadi varga

Priya nighantu – Shatapushpadi varga

Madanapala nighantu – Abhayadi varga

Nighantu Adrasha – Tulasyadi varga

Shaligrama nighantu - Guduchyadi Varga

Madhava Dravyaguna – Vividaushadi varga [30-38].

Taxonomical classification

Leucas aspera Spreng comes under the Kingdom: Plantae, Division: Angiosperma, Class: Dicotyledonae, Sub-class: Gamopetalae, Series: Bicarpellatae, Order: Tubiflorae, Family: Labiatae, Genus: Leucas, Species: aspera³⁹ and the Scientific name : *Leucas aspera* Spreng [40].

Leucas: Leucas R. Br. Is one of the important genera of the family *Lamiaceae*. It contains about 100 species, wide spread over Asia and Africa.

Aspera: Aspera – (Calyx mouth not villous within) calyx smooth below, ribbed and hispid above [41].

Habitat Distribution

The Species is widely distributed as weed in cultivated ground, road sides or waste places and throught the greater parts of India ascending up to 1800 m in Himalaya. Also seen in West Bengal, Kashmir, Punjab, Assam, Rajasthan. Tamil nadu, Gujarat, Maharashtra and Western Peninsula. Also occurs in Afghanistan [42-49].

Family characterization

Lamiaceae family consists of 200 genera and 3200 species worldwide. In India it includes 400 species. It is commonly known as mint family. Most of the plants are aromatic herbs or shrubs. Tree habit is seen in the Brazilian genus *Hyptis* and climbing habit in American species of *Scutellaria*. Roots are mostly tap root branched but adventitious in case of mentha. Stem is aerial, herbaceous, rectangular in cross section, rarely it is woody, hairy, underground suckers in case of mentha. Leaves are aromatic, hairy, petiolate, simple, opposite decussate, unicostate reticulate venation, rarely it is alternate, whorled, sessile, entire, pinnatifid in case of *Perovskia*. Inflorescence is verticillaster with condensed dichasial cymes at each node, very commonly grouped in tyrus form and rarely it is solitary like in *Scutellaria*. Flowers are pedicellate rarely sessile, bracteate, complete, zygomorphic, hermaphrodite rarely unisexual, pentamerous and hypogynous. Calyx are gamosepalous and persistent. Corolla is bilabiate. Generally petals will be 5, they are gamopetalous and the 5 teeth are sub equal and mostly bilabiate. Stamens are 4 which are epipetalous, didynamous and posterior stamen is reduced to a staminode. Gynoecium is bicarpellary, syncarpous, superior ovary where bilocular gynoecium becomes tetralocular by false septum. Fruits are schizocarpic, achenes, nutlets, carcerulus rarely are drupaceous and has non-endospermic seeds [50].

Varieties

According to *Raja Nighantu*, there are 2 varieties, *Drona* (*Leucas aspera*), and *Maha drona* (*L. cephalotus*) [51,52].



Botanical description

Leucas aspera Spreng has fibrous, cylindrical, zig-zag, smooth and long numerous fine wiry rootlets. The stem is rough, hairy, quadrangular in shape upto 4 mm thick, light greenish-yellow in color, with distinct nodes and internodes. The leaves are simple, shortly petiolate upto 2.5 to 6mm long or sessile, ovate-lanceolate, 3-9cm long, 1-2.5 cm wide, pubescent, subacute, crenate, serrate margin, with tapering base. The inflorescence is crowded in dense, surrounded by numerous foliaceous bracts, 1.2-1.5 cm long and 0.3-0.35 cm wide, sessile, white, thin lanceolate, acute, ciliate. Flowers are sessile in terminal and axillary whorls. Calyx are tubular upto 8-13mm long, curved tube contracted above the nutlets. The Corolla is white in color, 1cm. long; tube 5mm. long, enlarged and pubescent above, annulate about the middle; upper lip is 3mm. long, densely white woolly; lower lip is about twice as long, the middle lobe obovate, rounded, the lateral lobes small, subacute. It has smooth, brown fruits which are schizocarpic, carcerule, nutlets and the seeds of these are smooth, trigonous, oblong in shape, 0.3 cm long and 0.1 cm wide, dark brown in color [53-55].

Guna karma and Doshagnata- Dronapushpi is having katu (pungent), madhura (sweet), tikta (bitter) and lavana (salty) rasa, guru (heavy), tiksna guna (sharp properties), ushna virya (hot in potency), madhura vipaka (biotransformation) and it does amahara (alleviates indigestion), bhedini (penetrating), ruchya (gives good taste), vibandhahara (relives constipation), vishanashaka karma (alleviated poisonous effects), reduces kapha and increases vatapitta doshas [56-63]. It is mainly indicated in Kamala (jaundice), jwara (fever), krimi (worms), agnimandya (loss of appetite), kasa (cough), pandu (anemia), pakshagata (hemiplegia), prameha (diabetes mellitus), shophā (inflammation or swelling), shwasa (dyspnoea) [64-70].

Therapeutic Uses

Dronapushpi swarasa should be used as collyrium in jaundice and also given in malarial fever. In case of eye disease, the juice of Dronapushpi pounded with rice water reduces the disorder of patala (layers or tunics) in eyes [71].

Phytochemistry

Leucas aspera contains different types of phytochemicals among them the whole plant has β -Sitosterol and its glycoside, new labdane, norlabdane- and abietane-type diterpenes named leucadins A, B and C, respectively, and leucastrins A and B as two protostane-type triterpenes. Laballenic acid, adipic acid, tridecanoic acid glutaric acid and lauric acid are present in seed oil.

Parts Used : Whole plant, flower and leaf are the useful parts.

Matra Posology

The drug in powder form given 1-3 g and juice form is given 5-10 ml [72-76].

Cultivation and Propagation

Through seeds the plants are easily cultivated and during rainy seasons the plant comes out as weed in waste places and fields.

Substitutes and Adulterants

Following are used as substitute for *Dronapushpi*, *Leucas aspera* Spreng and *L. lavandulaefolia* Rees [77].

Formulation and Preparation

Mainly Sudarshan churna, Gorochandi vati and Pleehhari vatika contain Dronapushpi as one of the ingredient [78].

Pharmacological activity

Anti-fungal activity

Chloroform and ether extracts of *L. aspera* showed its antifungal activity both fungistatic and fungicidal actions against *Trichophyton* and *Microsporum gypseum* in *In Vitro* study and the minimum inhibitory concentration was found to be 5mg/ml.

Prostaglandin inhibitory and antioxidant activities

Leucas aspera showed both prostaglandin inhibitory and antioxidant activities at 3-4 g/mL in guinea pigs ileum against PGE1- and PGE2-induced contractions and a 1, 1-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging effect [80].

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

Vitex negundo and *L. aspera*, the smoke of these leaves showed more toxic than the synthetic mosquito mats to the filarial vector mosquito *Culex quinquefasciatus* [81].

Antimicrobial activity of *Leucas aspera* flowers and some essential oils.

Antibacterial activity was seen in the methanolic extract, its fraction, alkaloidal residue and the flower juice of *L. aspera*, with maximum activity for the alkaloidal residue [82].

In this study the alkaloids, triterpenoids and flavonoids compounds present in the *Leucas aspera* showed that this can be used as antimicrobial agents and also as an ingredients in the different antioxidant formulations [83].

Bacteriostatic activity was showed by essential oils from *L. aspera* against *Staphylococcus aureus*, *Pseudomonas pyocyanea*, *Escherichia coli*, *Vibrio cholerae*, *Proteus vulgaris*, *Dys. Flexneri*, *Salmonella typhi* and *Klebsiella aerogenes* [84].

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

The ethanolic extract of *L. aspera* root was subjected for screening of antinociceptive, antioxidant and cytotoxic activities in acetic acid induced writhing inhibition, 1,1-diphenyl-2-picryl hydrazyl (DPPH) free radical scavenging assay and brine shrimp lethality bioassay respectively. The results showed that, at the doses of 250 and 500 mg/kg there was significant inhibition in writhing in mice, produced a significant free radical scavenging activity with an IC_{50} of 8 μ g/ml and also there was significant lethality to brine shrimp [85].

Protease and thrombolytic activity of *Leucas aspera* leaves

The results showed significant lytic activity in *in vitro* study of the aqueous extract of *Leucas aspera* leaves which could be because of the enzyme with an approximate molecular weight, 19.89 KDa [86].

Anti-ulcer activity

The study showed that hydroalcoholic extract of *Leucas aspera* leaves contains flavonoids, tannins and saponins in phytochemical analysis and also produced gastric ulcer healing effect through the death of the bacteria by inhibiting its cell wall biosynthesis in indomethacin induced gastric ulcer and also showed its significance in reducing the ulcer area and ulcer score [87].

In this study the results of antioxidant and histopathological studies justifies the Folklore use of *L. aspera* in all gastric disorders where study concluded that the methanolic extract of *L. aspera* in all the tested ulcer models showed significant antisecretory and ulcer protective effect [88].

Free radicle scavenging and elastase inhibitory activity

The traditional use of *Leucas aspera* was supported by the anti elastase assay where it revealed that among all the extracts, the hexane extract showed remarkably highest activity with IC₅₀ of 247.42 µg/ml, at a significant level (α) <0.05 and also the highest antioxidant activity was revealed in the acetone extract of the plant *Leucas aspera* [86].

Anti-bacterial activity

In this study the anti-bacterial activity by disc diffusion method of the synthesized CuO nanoparticles using the aqueous leaf extract of *Leucas aspera* and *Morinda tinctoria* plant material showed remarkable anti-bacterial activity when compared with the standard values of the reference sample Amikacin against a few Gram-negative and Gram-positive bacteria [90].

Anti-inflammatory activity

In present study *Heliotropium indicum* Linn and *Leucas aspera* Spreng were tested for anti-inflammatory activity in the carrageenan induced hind paw oedema and cotton pellet induced granuloma models in albino rats. The result showed *Leucas aspera* was more efficacious than acetyl salicylic acid but in subacute inflammation, the plant extract were less beneficial than phenylbutazone [91].

Anti-cancer activity

In vitro cytotoxic and cell viability Assaay findings concluded that leaves of *Leucas aspera* (*wild*) Linn possess the strong antioxidant potential, this properties estimated using DPPH, hydroxyl radical and nitric oxide scavenging assays. This study also established the anti-cancer activity by MTT assay on MCF-7 cell lines with moderate concentration. These activities are attributed to flavonoids in higher amount than alkaloids⁹².

In this *in vivo* and *in vitro* study, the biochemical and histological results concluded that the ethyl acetate extracts of *L. aspera* aerial parts showed anti-cancer effect mediated through macrophage stimulation, anti-angiogenesis and free radical scavenging and also concluded that this anti-cancer effect of the ethyl acetate extracts of *L. aspera* is comparable to the standard drug 5-Flouro uracil [93].

Hepatoprotective activity

The methanol and petroleum ether extracts of *Leucas aspera* was evaluated for hepatoprotective potential by paracetamol and thioacetamide induced hepatotoxicity models. The result showed that the root extracts of *Leucas aspera* possess hepatoprotective potential [94].

Anti-asthmatic activity

In this study the methanolic extract of whole plant of *Leucas aspera* showed significant antihistamine, bronchodilatory, anti-inflammatory, mast cell stabilizing, anti- allergic and anti- spasmotic activity in various *in-vivo* and *in-vitro* anti- asthmatic models and thus concluded its significant anti-asthmatic activity [95].

Analgesic effect

The aqueous extract of *Leucas aspera* was evaluated for the antinociceptive activity in animal models. The study showed significant inhibition of writhing response in the acetic acid induced writhing model. The extract also produced significant increase in the latency in the hot plate test in a dose related manner [96].

Immunomodulatory activity

In the study ethyl extract of *Leucas aspera* evaluated for immunomodulatory activity which showed that EALA is a potent immunostimulant, stimulating both the specific and non specific immune mechanism [97].

Anthelmintic and cytotoxic activity

In this study the methanolic crude extract extract of *Leucas aspera* have shown significant cytotoxic activity and study also showed mild anthelmintic activity against the *Phertima prosthuma* in comparison with standard albendazole [98].

Anti-diabetic activity

The study concluded that *Leucas aspera* leaf extract has shown anti-diabetic potential in streptozotocin-induced diabetic Wistar albino rats *in-vivo* model [99].

Nutritional Evaluation

The study concluded that *L.aspera* flower balls can offer satiating combination of carbohydrates, fats, proteins, iron and calcium and could be good nutritious snack [100].

CNS depressant activity

In this study *Leuca aspera* showed remarkable decrease in locomotor activity of open field and whole cross tests and significant increase in the duration of immobility time of force swimming and tail suspension tests. In thiopental sodium-induced sleeping time test, the methanolic leaves extract of *Leucas aspera* notably induced the sleep at early stage and duration of sleeping time was also lengthened. The results concluded that Methanolic leaf extract of *Leucas aspera* has CNS depressant activity [101].

Anti-pyretic activity

Ethanollic extract of *Leucas aspera* and *Glycosmis pentaphylla* were studied for anti-pyretic activities in rats using Brewer's yeast induced pyrexia model. Extract of *Leucas aspera* (200mg/kg) and standard paracetamol group showed the maximum antipyretic activity throughout the test period of 6 hours probably by inhibiting the synthesis of prostaglandin in hypothalamus [102].

In this study the ethyl acetate extracts of *Leucas aspera* showed significant antipyretic activity than methonolic extracts in baker's yeast induced pyrexia method. These results confirm its traditional antipyretic activity of a plant and among different parts of plant bud has shown maximum activity [103].

Anti-hyperlipidemic Activity

The ethanolic extract of leaves of *L. aspera* Linn. was studied for Anti-hyperlipidemic activity in dexamethasone-induced hyperlipidemia. Results showed remarkable inhibition by maintaining serum TGs, cholesterol levels near to normal [104].

Anti-psoriatic activity

Petroleum ether extract of *C. juncea* and ethanol extract of *L. aspera* were studied for anti-psoriatic activity, results showed the good skin keratinocyte antiproliferative activity by inhibiting nitric oxide production and lipid peroxidation, suggesting the anti-oxidant mediated anti-psoriatic activity [105].

The skin diseases treatments with plant extracts and natural products has been reported since ancient civilizations [106].

Anti-venom activity

The present concluded that methanolic extract of *Leucas aspera* showed anti-venom activity and it can be potential source for the anti-ophidian metabolites [107].

Dynmic trajectory analysis against COVID-19 spike protein

Docking interaction of spike protein study was done on anti-viral herbs like *Curcuma longa*, *Morinda citrifolia*, *Ocimum tenniflorum*, *Leucas aspera*, *Piper longum*, *Azadirachta indica* and *Corallium rubrum* to identify the effective lead molecule. Among these, major phytoconstituents of *M. Citrifolia* and *L. aspera*, plus the molecule 4-(24-hydroxy-1-oxo-5-n-propyltetracosanyl)-phenol from *Leucas aspera* showed significant dynamic trajectory activity of forming the stable complex with S- protein and complete denaturation of spike protein than HCQ and Remdesivir against COVID-19 [108].

CONCLUSION

The literature review revealed the *Leucas aspera* is an important medicinal plant, easily available weed, less cost effective and have been described in various *Nighantus*. Different pharmacological actions like *Shopha*, *Kamala*, *Tamakashwasa* and *Kasajit* are mentioned in *Bhavaparkasha Nighantu* and *Kaiyadeva Nighantu*. *Drona pushpi* have not been described by *Brhat trayi*. But in *Astanga hrdaya* a plant *Mahadrona* is described. But its identity with *Dronapushpi* is doubtful. About 80% of the world populations residing in rural areas of developing and under developed countries rely on traditional medicine which is predominantly based on plant material. Traditionally the plant is commonly used for antipyretic and insecticidal activity. Phytochemical and pharmacological reviews on plant will give valuable information which will assist in getting advanced knowledge about a plant species and which can be investigated further and revalidated by clinical studies.

Conflict of Interest

None declared.

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