



PHYTOCHEMICAL AND BIOLOGICAL STUDIES ON *LEUCAS ASPERA*- REVIEW

Battu Ganga Rao*, Anupoju Asha Naga Sai, Devarakonda Ramadevi, Battu Heera

A.U College of Pharmaceutical Sciences, Andhra University, Visakhapatnam, India

Article Info

Key words

Leucas aspera,
Dronapushpi, Phyto
constituents,
triterpenoids



ABSTRACT

Plants are being used from more than 1000 years to treat many diseases. *Leucas aspera* commonly known as “Thumbai” or Gumma is found all over India. The plant is taken in use in the name as Dronapushpi. The plant is used traditionally as an antipyretic and insecticide. The plant had been reported to have anti diarrheal, anti inflammatory, analgesic, anti microbial, anti oxidant and insecticidal activities. It shows cytotoxic activity and as an antidote to snake venom. Bio active compounds such as lignans, flavanoids, coumarins, steroids, terpenes, fatty acids and aliphatic long chain compounds have been isolated. This review emphasizes the current literature on *L. aspera* and explains its taxonomical classification, botanical, phyto constituents and pharmacological outcomes.

INTRODUCTION

Medicinal plants are the only source for the treatment of diseases in ancient days and since then numerous herbs and plants have been recognised as a medicinal plants because of their potency to cure ailments [1]. The newly discovered and the existing medicinal plants are being screened for many diseases and to identify significant therapeutic importance [2]. *Leucas aspera*, is a herb is widely distributed in Tropical Asia, Africa and grows in highland crop fields, homesteads, fallow lands and roadsides [3]. *Leucas aspera* commonly known as Thumbai is widely distributed throughout India from the Himalayas down to Ceylon. The plant is used traditionally as an antipyretic and insecticide. Flowers are used as stimulant, expectorant and diaphoretic. Leaves are considered useful in chronic rheumatism, psoriasis and other chronic skin eruptions. Bruised leaves are applied locally in snake

bites [4]. Many phyto chemicals belong to the class of terpenoids, fatty acids, glycosides, flavanoids, lignans and alkaloids were identified and isolated by using different extraction methods [5-6].



Vernacular names [7]

Sanskrit: Dronapushpi, Chitrapathrika,
Chitrakshup

Punjab : Guldor

Bengali: Darunaphula, Hulkasha

Gujarat: Kulnphul

Hindi : Goma madhupati

Sindhi : Kubo

Maharashtra : Bahuphul

Telugu : Thummichittu

Taxonomical classification [8]

Kingdom : Plantae, plant

Sub kingdom : Tracheobionta, vascular

plant Super division : Spermatophyta, seed plant

Division : Angiosperma

Class : Dicotyledonae

Subclass : Gamopetalae

Series : Bicarpellatae

Order : Tubiflorae

Family : Labiatae

Genus : Leucas

Species : aspera

Botanical description [7, 9-10]

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: Yellowish green, 3-9 cm long, 1-2.5 cm wide, ovate or ovate-lanceolate, sub acute, more or less pubescent, crenate, serrate, pungent.

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

Calyx: Calyx variable, tubular, 8-13mm 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 woody; lower lip about twice as long, the middle lobe obviate, rounded, the lateral lobes small and sub acute.

Fruit: Schizocarpic carcerule, smooth, brown. **Seed:** 0.3 cm long, 0.1 cm wide, oblong, smooth, trigonous and dark brown.

Habitat and Distribution

L. aspera, a species within the Leucas genus is an aromatic herb widely distributed in tropical Asia, Africa, and grows as a competitive weed in highland crop fields, homesteads, fallow lands and roadsides [3].

Some other species of Leucas[11]

- *L. abyssicica*
- *L. biflora*
- *L. capensis*
- *L. capitata*
- *L. cephalotes*
- *L. ciliate*
- *L. deflexa*
- *L. hirta*
- *L. indica*
- *L. jamesii*
- *L. lanata*
- *L. linifolia*
- *L. lavandulaefolia*
- *L. martinicensis*
- *L. molissima*
- *L. plikenetti*
- *L. stricta*
- *L. urticaefolia*
- *L. Zeylanica*

Past work on phyto chemistry

Preliminary phyto chemical examination of *L. aspera* revealed the presence of triterpenoids in whole plant[12]. The entire plant is reported to contain ursolic acid, oleanolic acid and 3-sitosterol[13]. Aerial parts are reported to contain nicotine, sterols (α sitosterol and β sitosterol)[14]. Reducing sugars (galactose), diterpenes such as Leucasperones A and B, Leucasperols A and B, isopimarane glycosides (leucasperosides A, B and C) were reported[15]. Other compounds like asperphenamate, maslinic acid, linifolioside, nectandrin B, meso-dihydroguaiaretic acid, macelignan, acacetin, apigenin, chrysoeriol, apigenin, licarin, machilin C, chicarin, erythro-2-(4-

allyl-2,6-dimethoxyphenoxy)-1-(4-hydroxy-3-methoxyphenyl) propan-1-ol, myristargenol B[16]. X-thujene, u-farnesene and menthol were the major leaf volatiles identified. The flower is reported to contain amyl propionate, isoamyl propionate. Seed is reported to contain palmitic acid, stearic acid, oleic acid, linolenic acid[17]. Shoot is reported to contain phenolic compounds (4-(24-hydroxyl- 1-oxo-5-n-propyltetracosanyl)-phenol)[18], aliphatic ketols, long chain compounds (1-hydroxytetratriacontan-4-one,32-methyltetracontan-8-ol)[20], 5-acetoxytriacontane, β sitosterol[19] and dotriacontanol. Leucolaton isolated from the root of *L. Aspera* have been characterised as 3,3,16 c-dihydroxyoleanan-28-1, 3-olide[21].

Past work on phyto pharmacology

Antifungal activity: Chloroform and ether extract of *Leucas aspera* revealed its antifungal activity against *Trichophyton* and *Micropsorum gypseum*. *L. Aspera* reported to have both fungicidal and fungistatic action[22].

Anti-Inflammatory activity: *Leucas aspera* were investigated for anti inflammatory activity. Ethanol and distilled water extracts reported to have significant anti inflammatory activity. The extracts showed compelling anti inflammatory activity for acute and chronic inflammation. It showed activity against mast cell degranulation induced by propancolol and carbachol. Four different crude extracts petroleum ether, chloroform, ethanol, water were investigated. Ethanol and water extract showed significant anti inflammatory activity[23]. The anti inflammatory activity was also studied by formalin induced rat hind paw edema method with crude extract, alkaloid portion and non alkaloid portions of *L. aspera* and compared with phenyl butazone, it showed highest ant inflammatory activity followed by alkaloid portion and crude extract. The

non alkaloid did not show anti inflammatory activity.

Antioxidant activity: Ethanolic extracts of *L. aspera* roots showed significant antioxidant activity. The extracts of *Leucas aspera* roots exhibited high free radical scavenging activity. The extract significantly elevated antioxidant enzymes like superoxidase dismutase, catalase, glutathione peroxidase and decreased lipid peroxidation levels in liver[23]. In another study ethanolic extracts was subjected to acetic acid induced writhing inhibition, 1,1-diphenyl-2-picryl hydrazyl (DPPH) free radical scavenging assay and brine shrimp lethality bio assay for the screenin of anti nociceptive, anti oxidant, and cytotoxic activity respectively. Methanolic extract of root possessed anti oxidant activity near the range of vitamin E.

Hepato-protective activity: The cold methanolic extract of the whole plant of *Leucas aspera* was reported to have significant hepato-protection in CCl_4 induced liver damage. The elevation markers used were GOT, GPT, Alkaline phosphate, glucose, bilirubin, cholesterol and total protein. Silymarin was used as standard for comparison. The fresh juice showed good result against liver disorders[23]. Histological studies also supported the good recovery in MELA nd standard pre-treated groups.

Insecticidal repellent activity: *Leucas aspera* is used for mosquito repellent and as insecticide. The extract showed larvicidal activity against first, second, third, fourth instar larvae of culex quinquefasciatu[23].

Anti diabetic activity: Ethanol and petroleum ether extracts showed significant anti hyperglycaemic activity in alloxan induced rats as well as streptozocin induced hyperglycemic rats. The study was done to evaluate the effect of *L.aspera* leaves on experimental diabetes mellitus in rats. The study revealed the good

experimental results in lowering the blood glucose levels in a dose dependant manner and experimental diabetes mellitus induced patho-biological changes were more effective by ethanolic extract of *L.aspera* in dose dependant manner. The methanol extracts of *L. Aspera* was conducted in streptozocin induced diabetic rats for anti-hyperglycemic activity[23]. The oral administration of the extract at the doses of 100, 200 and 400 mg/kg body weight. The doses 100, 200, 400 body weight were showed significant decrease in blood glucose levels.400 mg/kg body weight dose was effective with the highest glycemic change of 34.45% at 8 hour of extract administration.

Central Nervous System Activity:

Ethanolic extract of *L. aspera* showed significant peripheral nociceptive activity at a dose of 400 mg/kg. The study was done by using pentobarbitone induced sleeping time test, the open field test and the hole cross test in Swiss albino mice. The results proved that the root possess biologically active constituents having CNS activity[23].

Miscellaneous Activity: The protective role of *L. aspera* against the snake venom poisoning was studied in mice. The study showed that the alcoholic extract treatment improved the survival time, which may be due to the stabilization of mast cells and inhibition of the secretion of platelet activating factor and the histamine[23].

CONCLUSION

Literature survey suggests the medicinal importance of *L. aspera*. Phyto chemical investigation revealed the presence of various chemical constituents like terpenes, sterols, glycosides, lignans, flavanoids and long chain compounds. Pharmacological studies revealed that *L. aspera* is having anti inflammatory, anti oxidant, antimicrobial, anticancer, anti diabetic, anti venom and phytotoxic activity. Thus there remains a tremendous

scope for further scientific exploration of *Leucas aspera* to establish their therapeutic efficacy and commercial exploitation.

Acknowledgement: The authors are thankful to Prof. B. Ganga Rao, Head Of Department, Pharmacognosy and Phytochemistry, AU college of Pharmaceutical Sciences, Visakhapatnam, for his valuable suggestions throughout the research work and Dr. D. Rama Devi madam, Post Doctral fellow for their kindly support to my work.

Conflicts of interest: There are no conflicts of interest.

REFERENCES:

1. B.B. petrovska, Historical review of medicinal plants' usage, Pharmacogn Rev. 6 (2012) 1-5, doi:10.4103/09737847.95849
2. A.G. Desai, G.N. Quazi, R.K. Ganju, M. El- Tamar, J. Singh, A.K. Saxena, et al., Medicinal plants and cancer chemo prevention, Curr. Drug Metab. 9 (2008) 581-591.
3. A.K.M. Mominul Islam, O. Ohno, K. Suenaga, H. Kato-Noguchi, Two novel phytotoxic substances from *Leucas aspera*, J. Plant physiol. 171 (2014) 877-883, doi: 10.1016/j. Jpiph.2014.03.003.
4. Trease GE, Evans WC. A taxonomic approach on medicinal plants and animal derived drugs. Trease and Evans pharmacognosy. Singapore: Harcourt Brace and company Asia Pvt.ltd 2002.p.20,33.
5. M.S. Prajapati, J. B. Patel, K. Modi, M.B. Shah, *Leucas aspera*: A review, Pharmacogn. Rev. 4 (2010) 85-87.

6. G. Sabri, Y. Vimala, P. Mandlik, *Leucas aspera*: Medicinal plant review, IRJMS.1 (2015) 1-8.
7. R. Srinivasan, B. Ravali, P. Suvarchala, A. Honey, A. Tejaswini, P. neeraja, *Leucas aspera*- Medicinal plant: A review. IJPBS.2 (2011)P-153-p-159.
8. G. Vijay Kumar, N. Deevana, An update of *Leucas aspera*- A medicinal plant review vol:5, Issue :1.
9. The Ayurvedic Pharmacopoeia of India, part-I, volume-2, first edition, pp. 37-39.
10. V. Raj, M. Agarwal, A.K. Agnihotri, S. Khatoon, A.K.S. rawat, S. Mehotra, Pharmacognostical evaluation of *Leucas aspera*. Natural product sciences. 11 (2005) 109-114.
11. Khaleque A, Huq MS, Mansoor MH. Chemical investigation on *Leucas aspera*. Isolation of compound A, 3 –sitosterol and et-sitosterol from the aerial parts. Scientific res 1970.
12. Kamat M. Singh, TP. Preliminary chemical examination of some compounds in different parts of *Leucas* genus Geobios 1994.
13. Chaudhury NA, Gosh D. Insecticidal plants; chemical examination of *Leucas aspera*. J Indian chem.. Soc 1969.
14. Mangathayaru K, Thurumurugan D, Patel PS Pratap DV, David DJ, Karthekeyan J. Isolation and identification of nicotine from *Leucas aspera*.
15. Sadhu Sk, okuyama E, Fujimoto H, IShibashi M. Diterpenes from *Leucas aspera* inhibiting prostaglandin induced contractions. J nat prod 2006.
16. Sadhu Sk, okuyama E, Fujimoto H, IShibashi M. Seperation of *Leucas aspera*, a medicinal plant of Bangladesh guided by prostaglandin inhibitory and anti oxidant activities. Chempharm bull (Tokyo)2003.
17. Kalachaveedu M, Gosh a, ranjan R, Vedam venkat K. Volatile constituents of *leucas aspera* . j essent oil res 2006.
18. Misra TN, Singh RS, Pandey HS, Singh S. A novel phenolic compound from *Leucas aspera*. Indian j chem.. Br 1995.
19. Misra TN, Singh RS, Prasad c, Singh S. Two aliphatic ketols from *Leucas aspera*. Phytochemistry 1992.
20. Misra TN, Singh RS, Pandey HS, Singh S. Long chain compounds from *Leucas aspera*. Phytochemistry 1992.
21. Pradhan B, Chakraborty D, Subba G. A triterpenoid lactone from *Leucas aspera*. Phytochemistry 1990.
22. Thakur Dk, Misra Sk, Choudhuri PC. In vitro trails of plant extracts and chemicals for their anti fungal activity. Indidn J animal health 1987.
23. Gulnazz sabri, Dr Y. Vimala, Pooja mandlik. International journal of multidisciplinary studies *Leucas aspera*: medicinal plant review, volume-I, issue-III, ISSN :2454-8499.