LEUCAS ASPERA: MEDICINAL PLANT REVIEW

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Abstract:
Plants is being used from more than 1000 years to treat diseases. The healing properties of plants has been transferred within the human communities for over the centuries. Leucas aspera commonly known as “Thumbai”, “Gumma” is found all over India. The Plant is used to treat many diseases such as cough, cold diarrhea, inflammatory diseases. The plants have been reported to have Anti-inflammatory, analgesic, anti-diarrheal, antimicrobial, antioxidant, and insecticidal activities. Bioactive components have been isolated such as Lignin, flavonoids, coumarins, steroids, terpenes, fatty acids, and aliphatic long-chain compounds. There are many other bioactive components identified on further studies mainly triterpenoids, oleanolic acid, ursolic acid and b-sitosterol, nicotine, sterols, glucoside, diterpenes, phenolic compounds (4-(24-hydroxy-1-oxo-5-n-propyltetraicosanyl)-phenol).

Key Words: Leucas aspera, Bioactive constituents, Pharmacological activity, Miscellaneous activity.

Introduction:
Plants being used to treat diseases is old as the mankind. Leucas aspera is widely used to cure many diseased conditions, which connote that Leucas aspera has infinite capability for the discovery of new drugs. Leucas genus embrace 80 species. (Hedge IC, 1990). 43 species are available in India (Mukherjee, 1940). Leucas aspera plants is mostly shrubs, subshrubs, annual herbs, or perennial herbs with woody root and/or stem base and the Leaves of this plants are opposite, entire, or with spiky lobes, oval shaped with tapered end, petiolated, or sometimes without intervening stalk. The axillary or terminal inflorescence is usually with indeterminate augmentation. Bracteoles are roughly erect. The calyx shape varies within the genus (often tuberlar shape); sometimes calyx enlarges into fruits. Calyx comprises of five connate sepals (one upper, two lateral, and two lower) and 5–20 secondary lobes.

Vernacular Names:
Sanskrit: Dronapushpi, Chitrpathrika, Chitrakshup
Punjabi: Guldor
Bengali: Darunaphula, Hulkasha
Gujarati: Kulnnphul
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
Bioactive Components Divulged in Leucas Aspera:

Preliminary exams of Leucas aspera revealed the presence of Triterpenoids in whole plant (Kamat and Singh, 1994). Terpenes are the largest secondary metabolite groups, and these are mostly responsible in flavours, fragrance and bioactivity (Humphrey, et al., 2006). Leucas aspera is rich in terpenes. The essential oils from the leaves and flowers fraction of Leucas aspera contained high amount of afarnesene, a-thujene, and menthol (Gerrige, et al., 2007). Leucas asperones A and B; Leucasasperols A and B a new diterpenes has been found in Leucas aspera (Sadhu, et al., 2006). The entire plant contains ursoic acid, oleanolic acid, and 3-sitosterol. Chaudhury and Ghosh, 1969. Aerial part of the Leucas aspera plants found to contain nicotine (Mangathayaru, et al., 2006) sterols (Khaleque, et al., 1970). Two new alkaloids (compound A m.p. 61-2°C, α-sitosterol and β-sitosterol) (m.p. 183-4°C), reducing sugars (galactose), glucoside (230-1°C), (Chatterjee and Majumdar, 1969). The isopimarane-type diterpenoidal glycosides ‘leucasperosides A, B, C’ and linifolioside has been found in Leucas aspera and Leucas linifolia. (Mahato and Pal, 1986; Chandrasekar, et al., 2005). Compounds like asperphenamate, maslinic acid, (-)-isololioside, linifolioside is reported in Leucas aspera (Sadhu, et al., 2006). Other bioactive compounds present in Leucas aspera are nectandrin B, meso-dihydroguaiaretic acid, macelignan, acacetin, apigenin 7-O-glucoside, chrysoeriol, apigenin, erythro-2-(4-allyl-2,6-dimethoxyphenoyo)-1-(4-hydroxy-3-methoxyphenyl)propan-1-ol, myristargenol B, and machilin C, (-)-chicanine, (7R,8R)-and(75,85)-licaricin A from entire plant methanol extracts (Sadhu SK et al., 2003). The flower of Leucas aspera contains 10 compounds; Amyl propionate (15.2%) and Isoamyl propionate (14.4%) is rich in flower (Kalachaveedu, et al., 2006). Seed has been investigated, contain palmitic acid (6.25%), stearic acid (2.84%), oleic acid (42.07%), linoleic acid (48.11%), and linolenic acid (0.65%). Shoot of Leucas aspera is being reported to have (4-(2-hydroxy-1-oxo-5-npropyltetracosanyl)-phenol), it’s a phenolic compound (Misra, et al., 1995) aliphatic ketols (28-hydroxypentriacontan-7-one, 7-hydroxydotriacontan-2-one) (Misra, et al., 1992) long-chain compounds (1-hydroxytetriacontan-4-one, 32-methyltetriacontan-8-ol) (Misra, et al., 1992) Nonatriacantone (Misra, et al., 1995) 5-acetoxytriacontane, β-sitosterol (Misra, et al., 1992) dotriacontanol hydroxytetriacontan-4-one, 32-methyltetriacontane were reported in Leucas aspera (Misra, et al., 1992). Free flavonoid baicalein was reported in the ethereal fraction of hydro-methanolic extract of Leucas aspera flower. Baicalein a flavonoid was reported in Leucas aspera flower (Manivannana and Sukumar, 2007). Root contain Leucolactone (I) which has been characterized as 3, 3, 16c-dihydroxyoleanan-28-1,3-olide. (Pradhan, et al., 1990).

Pharmacological Review:

Antibacterial Activity:

Alkaloid fractions and total methanol extracts of Leucas aspera flowers showed antimicrobial activity (Mangathayaru, et al., 2007). Antibacterial activity of Leucas aspera root, flower, leaf and stem showed good antibacterial activity against Staphylococcus aureus, Escherichia coli, Pseudomonas aeruginosa, Salmonella typhimurium, Salmonella choleraesuis, Shigella flexneri. (Ai lan, et al., 2012). 80% ethanolic extracts of Leucas aspera showed good activity against Staphylococcus aureus and Bacillus subtilis (Rajakaruna, et al., 2002; Valsaraj, et al., 1997). Volatile oil of Leucas aspera plants showed good antibacterial activity against Pseudomonas aeruginosa, Haemophilus influenza, Staphylococcus aureus, and Candida albicans but didn’t showed antibacterial activity against.
against Bacillus subtilis, Proteus vulgaris, Neisseria gonorrhoea, Tricoderma virbriae (Gerige, et al., 2007). The dichloromethane fraction of the methanol extract of Leucas aspera leaves had strong antibacterial whereas the ethyl acetate fraction exhibited significant bactericidal activity against only Gram-positive bacterial strains done by Disc diffusion method (Sayed Alam, et al., 2014). Antibacterial activity of Leucas aspera spreng was done by defatting with hexane and discarded. The marc was obtained after defatting was then successfully extracted with ethyl acetate and methanol and was evaporated under vacuum to yield ethyl acetate and methanol extracts. Both the extracts showed antibacterial activity against bacteria. Methanol extracts showed good antibacterial activity against Escherichia coli whereas Ethanol extracts showed good activity against Staphylococcus epidermidis and Klebsiella pneumonia (Ilango, et al., 2008). Leucas aspera leaves methanol extracts showed high activity than ethanolic extracts and petroleum ether extracts. Methanol extracts showed high activity against Pseudomonas aeruginosa. Ethanol extracts showed high activity against Shigella dysenteriae, it did not showed activity against Escherichia coli and vibrio cholera (Akter, et al., 2012).

**Antifungal Activity**:
Chloroform and ethanol extracts of Leucas aspera showed antifungal activity against Trichophyton and Microsporum gypseum. Leucas aspera reported to have both fungicidal and fungistatic action (Thakur, et al., 1987).

**Anti-Inflammatory Activity**:
Leucas aspera plants reported to show anti inflammatory activity. The extracts showed compelling anti inflammatory activity for acute and chronic inflammation. Leucas aspera showed activity against mast cell degranulations induced by propranolol and carbachol (Reddy, et al., 1986). Leucas aspera showed anti inflammatory activity in both acute and sub acute inflammation. Leucas aspera was more effective in acute inflammation than ascorbic acid. The extracts were less effective than phenyl butazone in sub acute inflammation (Srinivas, et al., 2000). Leucas aspera spreng reported to have anti inflammatory activity. Four different crude extracts petroleum ether, chloroform, ethanol and water of Leucas aspera were investigated for anti inflammatory activity. Ethanol extract and distilled water extracts reported to have significant anti-inflammatory activity (Saundane, et al., 2000). Alkaloid fraction of the crude ethanolic extract of Leucas aspera showed to have anti-inflammatory activity (Goudgaon, et al., 2003).

**Antioxidant Activity**:
Ethanolic extracts of Leucas aspera roots showed significant antioxidant activity (IC50 = 7.5 μg/ml) (Rahman, et al., 2007). The extracts of Leucas aspera roots exhibited high free radical scavenging activity with the mean percentage of (32.36±1.19)%. Scavenging activity of flower leaf and stem extracts (26.39±0.07)%, (17.04±0.82)% and (13.42±0.56)%, respectively. The scavenging activity of these extracts was lower compared with both antioxidants, BHT (65.67±0.58)% and vitamin E (41.67±0.58)% (Ai Lan, et al., 2012). Leucas aspera extract significantly elevated antioxidant enzymes like superoxide dismutase, catalase, glutathione peroxidase and decreased lipid peroxidation levels in liver. The total phenolic and flavonoid content in Leucas aspera aqueous extract was found to be 28.33 ± 0.19 gallic acid equivalents mg/g of extract and 3.96 ± 0.57 rutin equivalent mg/g of extract, respectively (Banu, et al., 2012). Ethanolic extracts of Leucas aspera linn. showed significant DPPH free radical scavenging effect when compared with standard drug - ascorbic acid. IC50 value of ascorbic acid and ethanolic extract was found to be 1.25 μg/ml and 99.58 μg/ml, respectively (Talha, et al., 2012). Antioxidant activity of n-
hexane, ethyl acetate and ethanol extracts were done by DPPH free radical scavenging assay. Total antioxidant capacity and total phenol capacity were as standards, ethanol extract exhibiting more antioxidant activity than ethyl acetate and n-Hexane extracts (Das, et al., 2011). In vitro antioxidant activity of methanolic extracts of Leucas aspera leaves was done by DPPH radical scavenging; reducing power, total phenol and total flavonoid content determination assays. The reducing power of this crude extract increase with the increase of concentration; IC50 values of DPPH scavenging activity was 150µg/ml; Total phenol and total flavonoid content was 131.15 and 135.85 mg/ml respectively (Sekendar, et al., 2013). The crude methanol extract of Leucas aspera leaves showed strong 1,1-diphenyl-2-picrylhydrazyl (DPPH) and superoxide radical scavenging activities compared to other polarity-based extracted fractions (Meghashri, et al., 2010).

**Antidiabetic Activity:**
Leucas aspera ethanol and petroleum ether extracts exhibited significant anti hyperglycemic activities in alloxan induced as well as streptozotocin induced hyperglycemic rats (Gupta, et al., 2015). The study was done to evaluate the effect of Leucas aspera leaves on experimental diabetes mellitus in rats. The study revealed that experimental diabetes have good effect in lowering the blood glucose levels in dose dependent manner and experimental diabetes mellitus (type 1) induced patho-biochemical changes were more effective by ethanolic extract of Leucas aspera in dose dependent manner (Tukaram, et al., 2011). The methanol extract of Leucas aspera was conducted in streptozotocin-induced diabetic rats for anti-hyperglycemic activity. The oral administration of the extract at the doses of 100, 200, and 400 mg/kg b. w. The doses 100, 200, 400 mg/kg b. w were showed significant decrease in (P<0.05) blood glucose levels. 400 mg/kg b. W dose was effective with the highest glycemic change of 34.45 % at 8 hour of extract administration (Atchut kumar, et al., 2013).

**Anticancer Activity:**
Brine shrimp lethality assay was used to study anticancer activity of the hydro alcoholic extract of Leucas aspera whole plant exhibited cytotoxicity (Krishnaraju, et al., 2005) and this activity was more in root extract (LC50 = 52.8 µg/mL) (Rahman, et al., 2007). In brine shrimp lethality bioassay, the Leucas aspera ethanolic extract showed the LC50 value as (181.68±2.15) µg/mL which was statistically significant (P<0.01) compared to positive control vincristine sulfate [LC50=(0.76±0.04) µg/mL]. (Atiar Rahman and Saiful Islam, 2013).

**Hepato-Protective Activity:**
The cold methanolic extract of the whole plant of Leucas aspera was reported to have significant hepatoprotection in CCl4-induced liver damage (Mangathayarau, et al., 2005). Leucas aspera leaves fresh juice was tested against carbon tetrachloride (CCl4) induced liver damage. The evaluation markers used were GGT, GPT, Alkaline phosphate, glucose, bilirubin, cholesterol and total protein. Silymarin was used as a standard for comparison. The fresh juice showed good result against liver disorders (Shirish and Pingale, 2010) Hepatoprotective activity of hydroalcoholic leaf extract of Leucas aspera on male albino wistar rats was investigated, hydroalcoholic leaf extract of Leucas aspera have shown hepatoprotective activity (Thenmozhi, et al., 2013).

**Insecticidal Repellent Activity:**
Leucas aspera is used for mosquito repellent and as an insecticide (Kirtikar, et al., 1990). Leucas aspera leaf extract exhibited significant larvicidal activity against first, second, third, and fourth instar larvae of Culex quinquefasciatus (Muthukrishnan, et al., 1997). Leucas aspera leaf extract (4% solution) showed 90% death of the fourth instar larvae.
(Murugan and Jayabalan, 1997) and 100% death after 24 h were recorded for the third instar larvae of Anopheles stephensi (Vinayagam, et al., 2008). The petroleum ether extract of the leaves of Leucas aspera showed LC50 between 100 to 200 ppm against the fourth instar larvae of C. quinquefasciatus, A. stephensi, and Aedes aefypti (Sakthivadivel and Daniel, 2007) the highest mortality was seen during the moulting, melanization, and tanning processes, which are controlled by hormones (Mawangi and Rembold, 1988). Hence, the above findings suggest that the larvicidal activity of the plant may be due to disturbance in hormonal and metabolic process of larvae. The seed oil obtained from Leucas cephalotes and Leucas urticifolia failed to show repellent/anti-feedant activity against adult Tribolium castaneum Herbs insect (Khan, et al., 1983).

Central Nervous System Activity
Ethanollic extract of Leucas aspera root showed significant peripheral antinociceptive activity at a dose of 400 mg/kg (Rahman, et al., 2007). The ethanollic extract of Leucas aspera root was studied for its effect on the central nervous system (CNS) using pentobarbitone induced sleeping time test, the open field test and the hole cross test in Swiss albino mice. The results support proved that Leucas aspera root may possess biologically active constituent(s) having CNS activity (Shafiu, et al., 2006).

Miscellaneous Activity:
The protective role of Leucas aspera against the snake (cobra) venom poisoning was studied in mice. The study showed that Leucas aspera alcoholic extract treatment significantly improved the survival time, which may be due to the stabilization of mast cells and inhibition of the secretion of platelet activating factor and histamine (Reddy, et al., 1993).

Conclusion:
Leucas aspera from the literature exhibited good antimicrobial, antioxidant, anticancer, anti-inflammatory, anti-diabetic and miscellaneous activities. Leucas aspera being used traditionally due to their immense therapeutic potential to treat/cure various diseases. Phenolics, glycoside, terpenes present in Leucas aspera exhibit significant biological activity. The studies showed significant anti-inflammatory activity against acute and chronic inflammation. Thus, there remains a tremendous scope for further scientific exploration of Leucas aspera to establish their therapeutic efficacy and commercial exploitation.

Reference: