

A Review on Source Plants of *Dronpushpi* - *Leucas cephalotes* (Roth) Spreng and *Leucas aspera* Spreng

Review article

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Abstract

Dronpushpi is a classical medicinal plant attributed with certain specific indications like *Vishamjwara*, *Kamala*. Two different plant species of *Leucas* are taken in use in the name of *Dronpushpi*. Among them *Leucas cephalotes* (Roth) Spreng has been accepted as an official equivalent to *Dronpushpi* by the Central Council for Research in Ayurveda in its official formulary. It has also been mentioned in Unani Materia Medica. *Leucas aspera* Spreng is the most widely used substitute of *Dronpushpi* and is also equally important ethnobotanically. *Leucas cephalotes* (Roth) Spreng and *Leucas aspera* Spreng grow as a weed on wastelands and roadsides all over India from October to February. The plants are used as insecticides and indicated in traditional medicine for coughs, cold, painful swellings, chronic skin eruptions and rheumatism. Experimentally both the species have shown good antioxidant, hepatoprotective and antimicrobial activities. They contain β -sitosterol, triterpenoids, oleanolic acid, ursolic acid, phenolic compounds, diterpenes, glucosides as major chemical constituents. The current review revealed that *Leucas cephalotes* and *Leucas aspera* have number of potentials in therapeutic field.

Key words: *Dronpushpi*, *Leucas aspera*, *Leucas cephalotes*, Hepatoprotective, Anti-oxidant.

Introduction:-

Dronpushpi is botanically identified by two species of genus *Leucas* i.e. *Leucas cephalotes* (Roth) Spreng and *Leucas aspera* Spreng, belonging to family Lamiaceae. Both grow as annual herbs throughout India, Bangladesh, Afghanistan, Philippines and some other Africo-asian countries, blooming between the months of October to February. There is no reference of *Dronpushpi* in vedic literature. Ayurvedic classics refer *Dronpushpi* by various names like

Kutumbaka, *Sugandhaka*, *Kurubaka*. *Chakrapani* in his commentary on *Charak Samhita* states *Kutumbaka* as *Dronpushpi* and includes it in *Shaka varga* (edible leafy vegetables). *Dalhana* in his commentary on *Shushrut Samhita* mentions *Dronpushpi* as *Sugandhaka* and *Kutumbaka*. and includes it in *Sursadi gana*. According to available literature *Vrundamadhava* was the first to quote its therapeutic indication, in *Kamala* in the form of collyrium, by the name *Dronpushpi*. This quotation has been incorporated by *Chakradatta* in *Kamala chikitsa*. He also mentions its use in *Krimidant Chikitsa*. *Shodhala* prescribed the *Nasya* of *Dronpushpi* in *Patalgat rogas* and as *Anjana* in *Kamala*. *Sharangdhara* has indicated the use of *Dronpushpi swarasa* along with *Marich choorna* in *Vishamjwara*. The plant is used

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traditionally in fever, cold, rheumatism, psoriasis and chronic skin eruptions.(1) It has also been incorporated very frequently in number of Siddha and Unani preparations.(1)

Materials & Methods:-

Ayurvedic classics, lexicons and other compilatory treatises are reviewed for documenting the information about *Dronapushpi*.

The published works on *L cephalotes* and *L aspera* from journals and web pages are consulted to review various reported pharmacological activities.

Meaning of Synonyms :- (2)

- *Kumbhayoni*:- Flowers look like a pot or wide mouthed opening.
- *Droni*:- looks like a vessel.
- *Dronapushpi*:- Flowers are cup or pot shaped.

- *Chatrakutumbaka*:- Flowers are arranged in a circle and are having shape of a pot.
- *Koudinya*:- Useful in insect bite.
- *Deerghapatra*:- Leaves are linear and sharp
- *Kutumbika*:- Flowers look like a pot.
- *Chitrakshupa*:-The plant is bright coloured.
- *Supushpa*:- Small, beautiful flowers in bunches.
- *Chitrapatrika*:- Leaves having various shapes.
- *Kusumbhaka*:- Flowers white in colour and are of cup shaped.
- *Phalepushpa*- Flowers and fruits are arranged together or the flowers will be on the fruit.
- *Kshavapatri*:- Smell of leaves causes sneezing.

Information about *Dronpushpi* available in various lexicons is tabulated here.

Name of Nighantu	Varga	Pharmacological actions
1. Shodal Nighantu(3)	Karviriyadi	Kaphaghna, Kamlahar, Krimighna, Shophajit, Pakshaghat- vinashini.
2. Kaiyadev Nighantu(4)	Aushadi	Kaphagna, Kamalahar, Shophahara, Tamakshwasahara, Kasahara.
3.Madhava Dravyaguna(5)	Vividhoushadi	Khaphaghna, Aamhara, Kamlahara, Shothahara, Krimihara
4.Bhavprakash Nighantu(6)	Guduchyadi, Shaka	Krimihara, Prahmehahara, Jwarahara, Pittakara
5. Raj Nighantu(7)	Parpatadi	Vaata-kaphahara, Agnimandyahara
6. Raja Vallabha(8)	Nanaaushadi	Kapha, Kamala, Krimi, Shophajit
7. Shaligrama Nighantu (9)	Guduchyadi	Same as Bhavaprakasha
8. Nighantu Adarsha(10)	Tulasyadi	. -
9. Madanpal Nighantu (11)	Abhayadi	Vaata-pittahara
10. Priya Nighantu(12)	Shatpushpadi	Vishaghna, Panduhara
11. Paryaymuktavalli	Tikta-shaka	-
12. Hridaya Dipaka Nighantu	Dwipada	-

13. Sidhamantra Prakash	Kaphaghna	-
13. Dravyaguna Vijnana(13)	Vishamjwaraghna	Pittashodhaka, Shothahara, Swedajanaka. Raktashodhaka, Aartavajanaka,
14. Madhav dravyaguna	Vividha-Aushadhi	-
15 Dravyaguna vignan(14)	Tulasyadi	-

Pharmacological properties of *Dronapushpi*

Rasa	Guna	Virya	Vipaka
Katu, Lavana, Madhura, Tikta	Tikshna, Guru, Ruksha	Ushna	Madhura, Katu

Chemical constituents of *Leucas aspera*:-

Preliminary chemical examination of *L. aspera* revealed presence of triterpenoids in entire plant. Whole plant is reported to contain oleanolic acid, ursolic acid and 3-sitosterol. Aerial parts are reported to contain nicotine, sterols, α & β sitosterol, reducing sugars(galactose), glucoside, diterpenes (leucasperosides A & B, leucasperols A & B, isopimarane glycosides (leucasperosides A, B & C) together with other compounds like asperphenamate, maslinic acid, (-)-isolololide, linifoliside, nectandrin B, mesodihydroguaiaretic acid, macelignan, acacetin, apigenin 7-O-[6'-O-(p-coumaroyl)-3-D-glucoside]' chrysoeriol, apigenin, erythro-2-(4-allyl-3,6-dimethoxyphenoxy)-1-(4-hydroxy-3-methoxyphenoxy)propan-1-ol, myristargenol B, and machilin C, (-)-chicanine, (7R,8R)-and(7S,8S)-licarin A. Among the 25 compounds identified from the leaf volatiles, u-farnesene(26.4%), x-thujene(12.6%) and mentol (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. Seed is reported to contain palmitic acid(6.25%), stearic acid(2.84%), oleic acid(42.07%), linoleic acid(48.11%) and linolenic acid. The unsaponifiable fraction

contained 3-sitosterol and cetyl alcohol. Shoot contained novel phenolic compounds (4-(24-hydroxy-1-oxo-5-n-propyltetracosanyl)-phenol), aliphatic ketols (28-hydroxypentatriacontan-2-one), long chain compounds (1-hydroxytetatriacontan-4-one, 32-methyltetatriacontane-8-ol), nonatriacontane, 5-acetoxyttriacontane, β -sitosterol and dotriacontanol. Leucolactone(I), isolated from the root of *L. aspera* have been characterized as 3,3,16c-dihydroxyoleanan-28-1, 3-olide.(15)

Chemical constituents of *Leucas cephalotes*:-

Plant:

β -sitosterol and its glycoside (Bahadur and Sen, 1969), new labdane, norlabdane and abietane type diterpenes named leucasdins A, B and C respectively, and two prostostane-type triterpenes named leucastrins A and B, oleanolic acid, 7-oxositosterol, 7-oxostigmasterol, 7 α - hydroxystigmasterol, 7 α -hydroxystigmasterol, stigmasterol, 5-hydroxy-7,4'-dimethoxyflavone, pillion, gonzalitosin I, triclin, cosmosin, apigenin 7-O-beta-D-(6-O-p-coumaroyl) glucopyranoside, anisofolin A and luteolin 4'-O-beta-D-glucuronopyranoside (Miyachi *et al.*, 2006).

Seed Oil- Laballic acid (Octadeca-5, 6-dienoic acid), lauric acid, glutaric acid, tridecanoic acid, adipic acid (Sinha et al, 1978)(16).

Ethno-botanical uses of *Leucas aspera*:-

Leucas aspera's water extract is used orally as stimulant, anthelmintic, laxative, and diaphoretic.(17). It is also used orally for the treatment of headache, asthma, and bronchitis.(18) Hot water extract of entire plant i.e *Phanta* is also used to treat inflammation, dyspepsia, and jaundice.(18) The whole plant extract is used orally to treat scabies, psoriasis, and snake bite. (19) The plant is externally used as an insect repellent in the form of *Dhupan*.(20) It is externally used to fumigate dwellings.(20) The flowers are roasted in ghee and given orally (5-10 g once a day) for treatment of cough and colds.(21) The flowers are crushed and inhaled in the opposite nostril for the relief of migraine.(22) The leaf juice is used for ear pain and for pus discharge from ear as a local application.(23) The leaf paste ground with chalk is applied to tooth cavity (periodontal) to prevent decay.(24) The decoction of leaves is used nasally as an anti-venum drug.(25) Infusion of leaves is applied externally to treat scabies.(26) Leaf paste along with turmeric is used to heal wounds and boils.(27) The decoction of whole plant of *Leucas aspera* are used orally for high fevers(28), for influenza(29), and for malarial fevers(30).

Pharmacological Research studies of *Leucas aspera*:-

Acute and Sub-Acute Toxicity study

A study was carried out to evaluate the acute and sub-acute toxicity of *Leucas aspera* in established animal model. It was found that EELA on oral administration produced no mortality or toxic effects on body up to a dose level of 2000 mg/kg body weight in acute toxicity study model. It did not produced any change in

hematological parameters and induced any noteworthy damage to the vital organs. Hence, it can be concluded that at doses consumed in the traditional medicine, the ethanolic extract of *Leucas aspera* can be considered as relatively safe, as it did not caused either mortality nor it produced any severe toxicological effects on selected body organs, biochemical indices and hematological markers of rats during the acute and sub-acute periods of study.(31)

Anti-asthmatic activity:-

The anti-asthmatic effect of whole dried plant of *Leucas aspera*. This study showed that methanolic extract of the drug in the dose of 100mg/kg showed a significant bronchodilatory, anti-histaminic, anti-inflammatory, mast cell stabilization, and anti-cholinergic activity in histamine induced bronchospasm. It also showed convincing results in passive paw anaphylaxis, degranulation of mesenteric mast cell and histamine and acetylcholine induced contraction in guinea pig tracheal chain and ileum preparations models respectively. However, significant anti-allergic effect was not observed in milk induced eosinophilia. Thus, this study requires further evaluation to identify the active anti-histaminic component from methanolic extract of dried whole plant of *Leucas aspera*.(32)

Anti-hyperglycemic Activity:-

Evaluation of the anti-hyperglycemic effects of methanol extract of leaves and stem of *Leucas aspera* in oral glucose tolerance tests conducted with glucose-challenged Swiss albino mice was carried out. It was found that the leaf extract of *L aspera* was more potent in reducing serum glucose levels than stem extract.Hence the chemical constituents which are present in greater amount in leaves than stem should be found out and studied further for their anti-glycemic effect.(33)

In another study of evaluating the effect of *Leucas aspera* alcoholic extract on blood glucose level in normoglycemic and diabetic rats, it was seen that the alcoholic extract of *Leucas aspera* showed hypoglycemic activity in chronically treated normoglycemic and diabetic rats. The blood glucose level did not show any changes on single administration of the plant extract on day 0. There was an increase in levels at intervals of 30 and 60 min. But on chronic administration the extract showed significant reduction in FBS levels, and was comparable to the reference drug metformin.(34)

Antipyretic activity:-

In the following experiment the extracts of *Leucas aspera* showed significant antipyretic activity. The researcher suggested further investigations to isolate active constituents responsible for this activity and to elucidate the exact mechanisms of action.(35)

Antifungal activity:-

Leucas aspera has both fungistatic and fungicidal properties. In an *in vitro* study of chloroform and ether extracts of *L. aspera* it was revealed that *L. aspera* possess strong antifungal activity against *Trichophyton* and *Microsporum gypseum* at minimum inhibitory concentration of 5mg/mL..(36)

Antimicrobial activity:-

In a study *L. aspera* flowers were screened for its antibacterial activity in the form of its methanol extract, its fractions, the alkaloid residue and the expressed flower juice. All the groups showed good antimicrobial activity, with maximum activity in alkaloidal residue group.(37)

Essential oils from *L. aspera* were used for the trial. Bacteriostatic activity was found against *Staphylococcus aureus*, *Vibrio cholerae*, *Salmonella typhi*, *Klebsiella aerogenes*, *Escherichia coli*,

Proteus vulgaris, *Pseudomonas pyocyanea* and *Dys. Flexneri*.(38)

This experiment suggested that essential oil of *L. aspera* showed no activity against *E. coli*, *P. aeruginosa*, and *C. albicans* (MIC \geq 1250 μ g/mL). *L. aspera* oil did exhibit good activity against *S. aureus* (MIC = 625 μ g/mL), *B. cereus* (MIC = 313 μ g/mL), and *A. niger* (MIC = 313 μ g/mL), most likely attributable to the sesquiterpenes present in the oil. Both (E)-caryophyllene and α -humulene have shown antibacterial activity against *B. cereus* and *S. aureus*.(39)

In another study, the *Leucas aspera* acetone leaf extract showed good antimicrobial activity against the gram positive microorganisms..(40)

A study was planned to screen the antimicrobial activity of different parts of *L. aspera*. For this crude extracts of root, flower, leaf and stem were used as different group. The root extract showed the highest mean zone of inhibition ranging from 9.0–11.0 mm against tested microorganisms, at a concentration of 100 mg/mL.(41)

The above experiment give strong evidences to accept its classical claim of being mentioned as Krimihara. It must be noted that the potent anti-microbial activity is attributed to root and leaf. It can have good therapeutic potential against gram-positive organisms.

Anti-inflammatory effect:-

In a study anti-inflammatory activity was studied by formalin induced rat hind paw edema method with crude extract, alkaloid fraction and non-alkaloid fraction of *L. aspera* and compared with Phenylbutazone. It was found that Phenylbutazone showed highest anti-inflammatory activity followed by alkaloid fraction and crude extract. The non-alkaloid fraction did not show anti-inflammatory activity irrespective of the time intervals.(42)

The aqueous and alcoholic extracts of *Leucas aspera* were investigated for their action on experimental inflammation and on mast cell degranulation. Both the extracts exhibited significant anti-inflammatory action of acute and chronic inflammation. The mast cell degranulation induced by propranolol and Carbachol was effectively prevented by pretreatment with *Leucas aspera* extract.(43)

Antioxidant activity:-

A study was conducted to evaluate the anti-oxidant activity of different parts of *Leucas aspera*. It was found that alcoholic extracts of the plant showed moderate to potent antioxidant activity, among which the root extract demonstrated the strongest antioxidant activity with the IC₅₀ value of 6.552 µg/mL. Methanolic extract of root possessed antioxidant activity near the range of vitamin E.(41)

In another study 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 researcher found that 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 noteworthy free radical scavenging activity with an IC₅₀ of 8 µg/ml and a significant lethality to brine shrimp.(44)

Anti-arthritis:-

A study was carried out to evaluate anti-arthritis activity of *L. aspera*. Its ethanolic extract exhibited significant anti-inflammatory ($p < 0.001$) and antioxidant activity ($p < 0.001$). The drug was found safe up to a dose of 2000 mg/kg body weight. Histopathological studies also revealed cartilage regeneration in EELA2

treated arthritic rats. The researcher suggested that the anti-arthritis activity of EELA may be due to catechins (epicatechin, beta epicatechin), flavonoids (procyanidin), phytosterols (beta-sitosterol) apart from glycosides, phenolic compounds and tannins.(45)

Antihelminthic activity:-

The anthelmintic property of *Leucas aspera* was evaluated using *Pherithema posthuma* as an experimental model. Piperazine citrate was used as the standard reference. This investigation revealed that ethanol extract of *Leucas aspera* showed significant anthelmintic activity against *Pheretima posthuma* when compared aqueous extract. Ethanol extract also proved to be efficient than the standard drug. This investigation supported the ethnomedical claims of *Leucas aspera* as anthelmintic plant.(46)

Anti-ulcer activity:-

The alcoholic extract of *Leucas aspera* (ALA) was investigated for its antiulcer effect by two experimental models. A significant reduction in acid secretion and ulcer score was observed in rats after ALA treatment. The observer was of the opinion that the antiulcer effect of ALA may be due to a combination of anti-secretory effect and a protective effect on gastric mucosa.(47)

Cytotoxic activity:-

The cytotoxic properties of ethanolic extract of *Leucas aspera* (Family-Lamiaceae) were investigated in this study. The cytotoxic potential of the *L. aspera* ethanolic extract was assessed by brine shrimp lethality bioassay method. In this method LC₅₀ value of *L. aspera* ethanolic extract was found 181.68 µg/ml with 95% confidence limit where the lower and upper limits were 125.12 and 265.96 µg/ml respectively. This indicated that the extract had promising cytotoxic properties.(48)

Prostaglandin inhibitory and antioxidant activities:-

Leucas aspera was tested for its prostaglandin (PG) inhibitory and antioxidant activities. The extracts showed both activities, that is, inhibition against PGE1- and PGE2- induced contractions in guinea pig ileum at 3-4 g/mL and a 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging effect.(49)

In another study on the inhibitory action of *Leucas aspera* on prostaglandin-induced contraction in guinea pig ileum, it provided four new diterpenes, leucasperones A (1) and B (2) and leucasperols A (3) and B (4), and three new isopimarane glycosides, leucasperosides A, B, and C (5-7), together with the known compounds asperphenamate, maslinic acid, (-)-isololiolide, and linifolioside. Leucasperone A (1), leucasperosides A (5) and B (6), and linifolioside which showed inhibition of prostaglandin-induced contractions.(50)

Hepato-protection:-

To investigate the hepatoprotective action of methanolic extract of *Leucas aspera* on CCl₄ induced liver damage in male Wistar rats a study was carried out. It was observed that the groups pretreated with *L aspera* and silymarin showed significantly decreased elevation of marker enzymes than the other groups. Hence it can be inferred that methanolic extract of *L aspera* showed hepatoprotective activity against CCl₄ induced toxicity. It also suggested that the flavonoids present in *L aspera* is responsible for this activity.(51)

In another study of validating the hepatoprotective and antioxidant potential of methanolic extract of *L aspera* in CCl₄ induced hepatotoxicity, convincing results were found supporting its hepatoprotective activity. Histological studies also supported the good recovery in MELA and standard pre-treated groups.

From this can be concluded that *L aspera* could be used for the development of phytomedicines against hepatic disorders. The hepatoprotective nature could be attributed to the presence of β - sitosterol, alkaloids and flavonoids in it.(52)

Larvicidal Activity:-

The present study was carried to evaluate larvicidal activity of aqueous and chloroform leaf extract of *Leucas aspera* (willd.) against mosquito larvae *Culex quinquefasciatus*. Larvicidal effect on I, II, III and IV instar larvae of mosquito species *Culex quinquefasciatus* was investigated in a dose dependant manner for 48 hours. The concentration of the *Leucas aspera* extracts used was 1.0%, 3.0% and 5.0%. The Lethal concentration (LC₅₀ and LC₉₀) of both aqueous and chloroform extract were recorded. The results indicated that 100% mortality of I, II, III instar larvae of *C.quinquefasciatus* was observed at 5% concentration of *Leucas aspera* extract whereas, 1.0% concentration of chloroform extract exhibited 100% mortality rate against all the four instar larvae of *Culex quinquefasciatus*. The results were statistically significant at P< 0.05 level. From the results it was inferred that the chloroform extract of *Leucas aspera* showed good larvicidal activity even at low concentrations compared to aqueous leaf extract of *Leucas aspera*.(53)

Another study concluded that 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.(54)

In another study it was investigated for larvicidal and pupicidal activity against the first to fourth instar larvae and pupae of the laboratory-reared mosquitoes, *A. stephensi*. The plant extract showed larvicidal and pupicidal effects after 24 h of exposure. All larval instars and pupae had considerably moderate mortality;

however, the highest larval mortality was found with ethanolic extract of whole plant of *L. aspera* against all the stages. The present study suggested that the ethanolic extracts of *L. aspera* and *B. sphaericus* can provide an excellent potential for controlling of malarial vector, *A. stephensi*.(55)

Ethno-botanical uses of *Leucas cephalotes*:-

The decoction of dried aerial parts of *L. cephalotes* cures diarrhea and fever(56), (57). The water extract of entire plant (India) acts as a good appetizer.(58) The Poultice of its flowers and leaves are applied externally to treat headache.(59) The decoction of flower heads is used orally in Nepal to treat jaundice.(60) Its flower's decoction is used orally in India as an emmenagogue.(61) Hot water extract of dried flowers in India is used orally for cough and cold.(62),(63) The juice of unripe fruits (India) is applied externally to treat scabies.(64) The juice of leaves is used nasally as an antivenin.(65) The juice of leaves is used externally as an antivenin.(66) The dried leaves when administered internally act as a blood purifier.(67)

Pharmacological study on *Leucas cephalotes*:-

Antioxidant, analgesic and anti-inflammatory activities:-

Evaluation for the Antioxidant, analgesic and anti-inflammatory activities of *L. cephalotes* was carried out. Methanolic extract from the whole plant of the *Leucas cephalotes* was screened for in vitro antioxidant (using the DPPH method), in vivo analgesic (using hot plate test in mice) and anti-inflammatory (using rat paw edema test) activities. The methanolic extract of *Leucas cephalotes* (MELC) scavenged the DPPH radicals in a dose-dependent manner. The IC₅₀ value to scavenge DPPH radicals was found to be

421.3µg/ml. A significant ($p < 0.0005$) analgesic activity was observed at 60 min with 200 mg/kg, and 400 mg/kg exhibited maximum activity. The maximum anti-inflammatory response was produced at 3 hr and 2 hr with doses of 200 and 400 mg/kg, respectively. These results suggest that the methanolic extract from *Leucas cephalotes* exerts significant analgesic and anti-inflammatory effects, which were comparable with standard drugs.(68)

Anti-Inflammatory activity:-

Another study evaluated the anti-inflammatory activity of different fractions and extracts of *L. cephalotes* in dose-dependent manner. The results showed that alkaloidal fractions of the leaves causes significant reduction in inflammation i.e 80 % (100 mg/kg) followed by crude methanol extract i.e 61 % (100 mg/kg), aqueous extract i.e 58 % (100 mg/kg) compared to standard anti-inflammatory drug aspirin i.e 68.62% (25 mg/kg). This study provided evidence that the alkaloidal fraction and methanol extract of *Leucas cephalotes* acts as potent anti-inflammatory agent in rats in acute inflammation model.(69)

Anti-bacterial:-

The anti-bacterial activity of *L. cephalotes* was evaluated. It showed that organic leaf extracts from methanol, hexane, ethylacetate and dichloromethane showed prominent antibacterial activity. The methanol and hexane extracts were found more potent against pathogenic strains of *S.aureus*, *E.coli* and *Ps. Aeruginosa* as compared to dichloromethane and ethylacetate.(70)

Anthelmintic activity:-

In a study preliminary phytochemical screening of alcoholic extract was done which revealed the presence of anthraquinone glycosides, phenolic compounds and steroids. The aqueous extract showed presence of

glycosides and phenolic compounds. The alcoholic extract of leaves of *Leucas cephalotes* demonstrated paralysis as well as death of worms in lesser time as compared to Piperazine citrate especially at higher concentration of 100 mg/ml. Water extract also showed significant activity. It is assumed that phenolic content in the extracts of *Leucas cephalotes* is responsible for its antihelminthic effects.(71)

Hepatoprotective effect:-

1. This study investigated *Leucas cephalotes* for its anti-oxidant and hepatoprotective activity against CCL4 induced hepatitis. It concluded that the plant of *Leucas cephalotes* produced a variety of antioxidants against molecular damage from reactive oxygen species [ROS], produced by macrophages. The researcher is of the opinion that hepato-protective and antioxidant activity of *Leucas cephalotes* might be due to the presence of flavonoids in the methanolic extract.(72)
2. According to another study on *L cephalotes*, it possessed significant degree of hepato-protective effect against carbon tetrachloride induced hepatotoxicity. The drug probably produced effect by inhibition of oxidative stress, because it is proposed that carbon tetrachloride causes hepatic damage via oxidative degeneration.(73)

Diabetes mellitus:-

The study was aimed at evaluating the hypoglycaemic effect of ethanol extract of leaves of *Leucas cephalotes*. EELA was administered in increasing dose of 150, 300 and 450 mg/ kg of bw to diabetes induced (IDDM and NIDDM) rats and carbohydrate, lipid, antioxidant, urea and creatinine profiles were assessed. All the three doses of extract decreased plasma

glucose and lipid profiles and improved the antioxidant status of both types of diabetic rats. The extract administration improved hepatic glycogen content and hexokinase activity, decreased glucose-6-phosphatase activity, blood urea, creatinine contents and decreased lipid peroxidation in diabetic rats. The dose of 450 mg kg(-1)bw dose was found to be more potent in its effects as compared to glibenclamide and metformin. Hence it can be said that *L cephalotes* produces a pronounced effect on carbohydrate and fat metabolism.(74)

Carbonic Anhydrase I and II Inhibition:-

The methanolic extract of *Leucas cephalotes* was tested for human carbonic anhydrase (HCA) I and II inhibition study. The study concluded that *Leucas cephalotes* is a weak inhibitor of carbonic anhydrase.(75)

Discussion:-

Dronapushpi is a classical ayurvedic herb indicated in various ayurvedic works which were documented during 1000 BC to 1800 AD. The herb is indicated in conditions namely *Kamala* (Jaundice), *Jwara* (Fever), *Krimi* (worm infestation), *Shopha* (painful inflammatory conditions), *Kasa* (cough), *Tamakashwasa* (Bronchial asthma), *Pandu* (Anaemia) and *Prameha* (Urinary disorders). *Dronapushpi* is attributed with *Vatahara*, *Kaphaghna*, *Vishaghna* and *Swedala* activities.

Botanical source includes two varieties of *Leucas* genus i.e *L cephalotes* and *L aspera*. While majority of floras compiled during the 20th century suggested *L aspera* is the source plant of *Dronapushpi*, the official formulary of Ayush quoted *Leucas cephalotes* as the classical *Dronapushpi*. Various compendia indicate internal administration of *Dronapushpi* in *Vishamajwara* (fever including malaria) and its corryllium for

the management of *Kamala* (jaundice) and *Patalgata* rogas (eye disorders like cataract). A scientific validation has already documented with regard to its role in ccl4 induced Hepatitis.

Ethnomedicinal uses of *L. cephalotes* include the usage of entire plant in the treatment of diarrhoea and fever. Flowers are employed as emmenagogue and prescribed for flu. Fruits are externally applied for scabies and leaves for snake bites. *L. aspera* leaf is administered internally in skin diseases like scabies and psoriasis, snake bite poison, bronchial asthma, headache and cough. Roasted flowers are administered to treat cold and cough. The paste of leaves is applied on wound along with turmeric. Leaf paste is also ground with chalk and filled in tooth cavity to prevent its decay.

The information of ethno-medicine clearly indicates that the two species which are considered as the botanical sources of Dronapushpi are applied in various conditions which are all referred in Ayurvedic texts. This part of information is a good source to explore the potentialities of these plants scientifically which may contribute new herbal leads in medicine.

Conclusion:-

Leucas cephalotes and *Leucas aspera* have been evaluated extensively for different pharmacological activities like anti-bacterial, antipyretic, hepatoprotective, analgesic activities and studies reported significant effect. Its ethno-botanical claims also suggest its use in fever, jaundice, rheumatism and skin disorders.

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