



An Eye-Catching and Comprehensive Review on *Leucas zeylanica* (Ceylon slitwort)

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ABSTRACT

The traditional system of medicine has many plants with medicinal and pharmacological importance. The primary sources of food and medicine are plants and their highly beneficial products for various animals and humans. This article mainly focuses on the complete *Leucas zeylanica* profile, which is also called Ceylon slitwort, a small, erect, annual, herbaceous, terrestrial or occasionally aromatic, hispid and tufted plant of the family Lamiaceae subfamily Lamioideae. It is widely available in several places in India and Nueva Viscaya's low altitudes open grasslands and Luzon's Bataan Provinces and Mindanao and Panay (Davao and Lanao). This article provides a comprehensive review of the complete profile of a vital plant, *Leucas zeylanica*. Traditional use of *Leucas zeylanica* in various diseases includes Antibacterial, Anti-fungal, Anti-inflammatory, nociceptive, analgesia, gout, antidiabetic a photoprotective agent in various skin diseases. The isolated components are Alkaloids, Terpenoids, Vitamins, Carbohydrates, Flavonoids, glycosides, saponins, fixed oils, and other miscellaneous compounds. Hence, this review can be a useful reference for researchers who are willing to undertake further investigation about *Leucas zeylanica*.

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INTRODUCTION

Nature reflects the creative power of God, and plants are an integral part of this nature. Plants have been used for medicinal purposes since prehistoric days. With increasing resistance to antimicrobial agents, scientists are encouraged to look for new antimicrobial agents from plants. They have been found

very efficient in treating many contagious diseases with a minimal side effect (Prabhadevi et al., 2012; Muhammad, 2014). As per the World health organization (WHO), most of the population uses herbal medicine for most diseases by altering the plant species. Natural products like medicinal plants as primary potential sources of innovative therapeutic agents through investigation and research (Malik et al., 2012; Foster et al., 2005) Lamiaceae or *Leucas zeylanica*, which is also called Ceylon slitwort, is a medicinal herb (Zhang et al., 2016), small, erect, annual, herbaceous, terrestrial or occasionally aromatic, hispid and tufted plant of the family Lamiaceae's subfamily Lamioideae which is distributed in southern regions of China. It is used to treat cold, tooth aches, rheumatic diseases and as a remedy for worms and abdominal pain. Leaves of *Leucas zeylanica* are vulnerary, stimulant, sedative, diaphoretic, and anthelmintic used in wound healing. *Leucas zeylanica*'s leaves poultice is used for treating vertigo, headaches, and itching (Dutta

et al., 2016). After childbirth, the abdomen is rubbed the entire plant, ever, jaundice, and for scorpion and snake bites (Jain *et al.*, 2010; Rajakaruna *et al.*, 2010). Hence, this review can be a useful reference for researchers who are willing to undertake further investigation about *Leucas zeylanica*.

Common names/vernacular names

The common names of the *Leucas zeylanica* in different languages have been shown in Table 1

Taxonomical classification of *Leucas zeylanica*

The Taxonomical classification of *Leucas zeylanica* (Jain *et al.*, 2010) has been shown in Table 2

Botanical description

Leucas zeylanica, which is also called Ceylon slitwort, is a small, erect, annual, herbaceous, terrestrial or occasionally aromatic, hispid, and tufted plant of the family Lamiaceae's sub-family Lamioideae. The plant grows to a height of up to 120 cm. The stem is quadrangular. Sub-sessile leaves are 2.5 to 7.5 cm long, at margins coarsely dentate, hispid, glandular, obtuse, blunt at the tip, and not divided or lobed (Jain *et al.*, 2010). Figure 1



Figure 1: *Leucas zeylanica* plant

Microscopic characteristics

Trichomes are long lignified and multicellular, upper stomata are anisocytic, Lower stomata are paracytic, starch grains are absent, Vascular tissue like xylem and phloems are present (Hossain *et al.*, 2013).

Geographical distribution

In Luzon's Bataan and Nueva Viscaya Provinces at low altitudes in open grasslands and Panay and Mindanao (Lanao and Davao) - also found in tropical Asia to Malaya.

Phytochemical constituents

Essential oil's small amount is yielded on distillation. A strong odor is emitted when herb decoration is boiled with a soda solution. On condensation, ammonia is yielded by vapors, along with in the distillate, volatile alkaloid is obtained. Furthermore, the aerial parts' methanolic extract yielded glycosides, tannins flavonoids, steroids, and alkaloids. Fifty-six components were yielded from *Leucas zeylanica*'s seed essential oil study (Rajakaruna *et al.*,

2010; Tian *et al.*, 2009). Its primary components were 2,4,6-trimethyl-1,3,6heptatriene (5.63%), caryophyllene (5.98%), 1-octene-3-ol (7.96%), hexadecanoic acid (10.36%), oleic acid (12.57%)

Physicochemical Characteristics

These parameters such as loss on drying, Moisture content, Acid soluble ash, Water-soluble ash, and Total ash (TA) were described in Table 3

Morphology

Morphological characters such as color, shape, size, odor, taste (Dubey *et al.*, 2004; Gaikwad *et al.*, 2003) were described in Table 4

Preliminary phytochemical screening of the extract

Hydroalcoholic extract of *Leucas zeylanica*'s was subjected to preliminary phytochemical screening using different methods, and the results were shown in Table 5, (Chase and Pratt, 1949; Pandey *et al.*, 1984; Geethika and Kumar, 2017)

Quantitative Microscopy

The Quantitative Microscopical characteristics like Trichomes, upper and lower stomata, starch grains and vascular tissue of *Leucas zeylanica* (Radhika *et al.*, 2017) was carried out and the results were shown in Table 6.

Ethnobotanical significance

The blended leaves of *Leucas* species are used for chronic skin diseases, diseases of eyes and nose, for treating wounds, against sores like scabies and psoriasis. They are also used to decoction against roundworm infestation, mainly for children, and against malaria. A decoction of the whole plant is used for chronic stomach problems, including Indigestion. Roots and leaves are used to treat skin diseases and used as a poultice for wounds, sores, and itches.

Operates as an aromatic, stomachic, carminative. Useful in chronic dyspepsia, Acute as well as anorexia, and flatulence. Leaves and flower extracts can be used in treating jaundice (Valsaraj *et al.*, 1997).

PHARMACOLOGICAL ACTIVITIES

CNS Depressant Activity

Leucas zeylanica has an excellent medicinal herb and has a wide variety of CNS activities. Ethanolic extract *Leucas zeylanica* CNS depressant activity was evaluated by using a hole cross test at different doses. The ethanolic extract of *L. zeylanica* has presented a critical CNS depressant action by lowering

Table 1: Vernacular/Common names of *Leucas zeylanica*

Telugu	Thummi
Kannada	Thumbe
Hindi	Gomamadupati
Bengali	Halkusha
Sanskrit	Dronapuspi
Punjabi	Guldora
Marathi	Bahuphul
Malayalam	Thumba
Oriya	Bhuthamari
Sinhala	Geta-Thumba

Table 2: Taxonomical classification of *Leucaszeylanica*

Kingdom	Plantae
Sub kingdom	Tracheophytes
Class	Dicotyledons
Subclass	Asterids
Order	Lamiales
Family	Lamiaceae
Genus	Lucas
Species	Zeylanica

Table 3: Physicochemical Characteristics of *Leucas zeylanica*

S.No	Parameter	Values Obtained (% w/w)
1	Total ash	35
2	Water-soluble ash	5
3	Acid soluble ash	10
4	Moisture content	16
5	Loss on drying	69.9

Table 4: Morphological characters of *Leucas zeylanica*

S.No	Morphological character	<i>Leucas zeylanica</i>
1	Color	Deep green
2	Shape	Oblong
3	Size	5-12 cm
4	Odor	Characteristic odor
5	Taste	Mucilaginous and Bitter

the movement of mice mostly at 60 and 120 minutes in a dose-dependent manner (Mian *et al.*, 2017).

Analgesic activity

Ethanol extract of *Leucas zeylanica* was investigated for analgesic activity by using the writhing model induced by acetic acid and paw licking and biting method induced by formalin in mice. *L. zeylanica*'s ethanol extract showed a substantial decrease in both models in a dose based manner

(84%) in paw licking and biting when compared with control and standard, and it is due to the presence of phytoconstituents like gums, tannins, and saponins (Khan *et al.*, 2010).

Antibacterial activity

A new Triterpenoid glucoside, namely *leucriterpencoside* and other two compounds from *Leucas zeylanica*, was extracted using the comprehensive spectroscopic techniques. The isolated compounds

Table 5: Hydroalcoholic extract of *Leucas zeylanica*'s preliminary phytochemical screening

S.No	Test	HAE LZ
1	Alkaloids	+
2	Steroids	+
3	Flavonoids	+
4	Tannins	+
5	Glycosides	+
6	Saponins	+
7	Phenolic Components	+
8	Reducing Sugar	-
9	Gums and Mucilage	-

Table 6: Quantitative Microscopy of *Leucas zeylanica*

Parameter	Character
Trichomes	Multicellular, Lignified
Upper Stomata	Anisocytic Stomata
Lower Stomata	Paracytic Stomata
Starch grains	Absent
Vascular Tissue	Xylem and Phloem

were tested beside several phytopathogenic bacteria *Bacillus subtilis*, *Micrococcus luteus*, *Saphylococcus aureus*, and *Bacillus cere*, *Staphylococcus Albus*, *Escherichia coli*, *Micrococcus tetragenus*. Also, leucriterpencoside-glucosidase used for determining the inhibitory activity and with the IC₅₀ value has indicated substantial activity (Chen et al., 2020).

Antidiabetic activity

Antidiabetic potential activity of aqueous leaves extracts of *Leucas zeylanica* was tested in diabetic rats induced with alloxan, and for blood, glucose 1 lowering effect was evaluated. *Leucas zeylanica* extract at 50mg/kg dose has significantly reduced the level of fasting blood glucose. Moreover, extract-treated animals were not simulated with the levels of serum insulin. Changes in liver glycogen levels and body weight were reviewed, and the aqueous extract has shown significant results (Dutta et al., 2016).

Inflammation and gout

Lipophilic extracts of the *Leucas zeylanica* were tested for key enzymes, inhibition in gout and inflammation. Xanthine Oxidase (XO), microsomal prostaglandin E2 synthase (mPGES)-1 and 5-lipoxygenase (5-LO) inhibition by *L. zeylanica*'s in various extracts was examined for determining the anti-gout and anti-inflammatory activities, respectively. In isolated human mPGES-1 and 5-LO and stimulated human neutrophil effectively inhibited 5-LO activity by *L. zeylanica*'s dichloromethane

extract. XO, mPGES-1, and 5-LO's potent inhibition and justifies *L. zeylanica* ethnopharmacological benefits as anti-gout and anti-inflammatory remedy due to the presence of bioactive constituents (Napagoda et al., 2018).

Anti-fungal activity

Ethanollic extracts of the *Leucas zeylanica* (seeds, leaves, and stems) were investigated for anti-fungal activity in various microorganisms species like *Aspergillus*, *Penicillium*, *Trichoderma*, *Mucor*, and *Rhizopus* by using the agar streaking method at the incubation period of 24-48 h. *Leucas zeylanica* has shown vigorous anti-fungal activity against *Mucor* species due to tannins, flavonoids, triterpenoids, and cardiac glycosides (Manoranjan et al., 2018; Babu et al., 2016).

Anti-inflammatory activity

A new Abietane Diterpenoid, namely leucasinoside, was isolated from aerial parts of the *Leucas zeylanica*, characterized by various spectroscopic methods like 1H and ¹³C NMR. The isolated compounds were investigated for Anti-inflammatory activity (Zhang et al., 2016) in lipopolysaccharide (LPS) induced nitric oxide model. The compounds isolated were tested on LPS-induced NO production and have shown moderate inhibitory activities with IC₅₀ values ranging from 12.6 to 18.8 μM.

Anti-oxidant activity

The Methanolic extract of *Leucas zeylanica* was

tested for antioxidant activity using H₂O₂-induced oxidative stress on isolated frog heart. In *Leucas zeylanica*'s methanolic extract presence, the examination of cardiac arrest was for 38th min, that is, for the longer time heart was protected, which specifies antioxidant activities, and then a comparison is made with the standard ascorbic acid. The antioxidant was due to cardiac glycosides, triterpenoids, flavonoids, and tannins (Swetha, 2019).

Larvicidal activity

The essential oil present in the *Leucas zeylanica* aerial parts was isolated by hydrodistillation, and GC-MS (gas chromatography-mass spectroscopy), as well as isolated components, includes phytol, 1-tetradecanol, caryophyllene oxide, β -selinene, α -humulene, germacrene D, and β -caryophyllene. For mosquito larvicidal activity, the essential oil from *Leucas zeylanica* aerial parts was investigated against *Aedes albopictus* and *Aedes aegypti*. A good larvicidal activity was shown by *Leucas zeylanica* essential oil against *ae. aegypti* and *ae. albopictus* with median lethal concentration—LC50 (24 hours) values of 44 and 67 μ g/mL, respectively. It has been concluded that for dengue virus vectors control, an environmentally benign and inexpensive agent is represented by *L. zeylanica* essential oil (Hung et al., 2019).

Hydrogen peroxide-induced oxidative stress on hepatic tissue of rats

The extract of *Leucas zeylanica* was tested for antioxidant activity by using H₂O₂-induced oxidative stress on hepatic tissue. Hepatic tissue was exposed to Fenton's reagent and ethanol for inducing oxidative stress. Effect of oxidative stress on the liver was examined by liver enzyme determination like lipid peroxide (LPO) levels, alkaline phosphatase (ALP) activity, aspartate aminotransferase (AST) activity, and alanine aminotransferase (ALT). *L. zeylanica* antioxidant activity was examined by assessing the lipid peroxide (LPO) hepatic levels inhibition abilities as an oxidative stress indicator. Presence of flavonoids and polyphenols protects against H₂O₂ and ethanol on hepatic tissue (Hossain et al., 2013; Medina and Moreno-Otero, 2005) by *L. zeylanica*.

Antibacterial activity

The *Leucas zeylanica* leaves' methanol extract was discovered to exhibit potent inhibitory activity against *Bacillus subtilis* and *Staphylococcus aureus*. Remarkably, these plant leaves are used to acquire volatile oil that exhibits high sensitivity for *Candida albicans*, *S. aureus*, *influenza*, *Haemophilus*, and *Pseudomonas aeruginosa*, but no sensitivity against *A.*

Niger, *Trichoderma vibriae*, *Neisseria gonorrhoea*, *Proteus. Vulgaris* and *Bacillus subtilis* (Das et al., 2012).

Elimination of *E.coli* and *S.aureus* *Corbicula fluminea* ("Etak") tissue

Leucas zeylanica methanolic extract can eliminate the *E.coli* and *S.aureus* and *Corbicula fluminea* ("Etak") tissue. Extraction of bacterial genomic DNA was performed and confirmed the presence of *E.coli*, *S.aureus* *Corbicula* in *etaksalai*. Antibacterial properties of *Leucas zeylanica* leaves extract was identified by using disc diffusion method and found that methanolic extract of *Leucas zeylanica* inhibits the *E.coli* and *S.aureus* in the optimum concentration found to be one of the ingredients for the preparation of *etak salai* to avoid gastrointestinal infection in consumers (Abdullah et al., 2019; Saritha et al., 2015).

Leucas zeylanica as an Acid-Base indicator

Apart from the various pharmacological activities, *Leucas zeylanica* has also played a vital role in analysis and endpoint determination. Flowers of *Leucas zeylanica* plant were recognized in producing color changes with pH values variation. A simple maceration method was used for extracting pigments by utilizing a solvent as Luke warm water. Color change in the extract was observed by inserting it into varying pH standard buffer solutions. Thus, the study has realized that *Leucas zeylanica* flower pigment can be efficiently utilized as an alternative to present indicators and factors such as precise and accurate results, good performance, and simple preparation (Abbas et al., 2018; Bhagat et al., 2008).

The photoprotective potential of *Leucas zeylanica*

Aqueous extracts of the *Leucas zeylanica* have involved evaluating photoprotective activity and have a medicinal/ traditional importance in treating the various skin diseases and improving skin complexation. Determination of UV filtering potential of *Leucas zeylanica* extract, UV absorption was measured, and the sun protection factor (SPF) was calculated according to the Mansur equation, and the antioxidant activity was evaluated by DPPH and ABTS assays. The results of the study suggest that the presence of secondary metabolites with antioxidant property could be responsible for the high UV absorbance (Napagoda et al., 2016; Duthie et al., 1999; Reuter et al., 1999).

CONCLUSION

Several parts of *Leucas zeylanica* have been reported as various traditional healers for treating various

ailments of mankind. These contain antibacterial, antifungal, antiinflammatory, nociceptive, analgesia, gout, antidiabetic, and as a photoprotective agent in various skin diseases. This review mainly focused on phytochemical and pharmacological studies, which are explained the phytoconstituents and therapeutic potential of *Leucas zeylanica* and all the pharmacological activities are due to the presence of phytoconstituents like saponins, flavonoids, steroids, tannins, and phenolic compounds.

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Conflict of Interest

The authors declare that they have no conflict of interest for this study.

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