
A COMPARATIVE REVIEW OF LEUCAS ASPERA ON ITS PHYTOCHEMICAL PROFILE AND ANTI MICROBIAL ACTIVITY AS AN HERBAL EAR DROPS

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Abstract

The way healthcare is provided has changed with time. It is now based more on patients taking charge of their own health. One important part of this is people using over-the-counter (OTC) drugs to treat their own illnesses. OTC medications are considered safe and effective when used correctly. However, their global regulation is divided into many different parts, which makes it difficult to monitor APIs in different places and situations. The lack of consistent oversight can lead to different people using it in different ways, which can be dangerous to public health if it's not managed properly. This paper provides a comprehensive review of the global OTC landscape. It looks at how self-medication practices can change based on different things, like digital and physiological factors that lead to self-diagnosis. It also suggests a plan that brings together different sectors to deal with potential public health risks while also letting patients be involved in healthcare decisions.

Keywords: Self-medication, Over-the-Counter (OTC) drugs, Pharmaceutical regulation, Global health surveillance, Self-care.

1. Introduction

Otitis media (external and chronic suppurative) is an important cause of morbidity in the world. Most of the infections are due to bacterial and fungal pathogens that can lead to pain, inflammation, hearing loss and recurrent infection. The development of resistance of infective organisms to anti-microbial drugs is a serious problem in the treatment of ear disorders.

The popularity of herbal medicines as therapeutic agents is increasing because of their low cost, availability and relative absence of side effects. Use of herbal ear drops with plant-based bioactive compounds may offer antimicrobial and anti-inflammatory properties, and reduce the risk of resistance.

Leucas aspera, popularly known as “Thumbai” or “Dronapushpi”, is a medicinal plant which is employed in various indigenous systems of medicine. Squeeze the juice out of the fresh leaf and

instill it in the ear to treat earache and ear discharge. The phytochemical profile and the antimicrobial activity reported for it indicate that it is a good candidate to develop herbal ear drops.

1.1. Botanical profile and ethnomedicinal uses:

Leucas aspera (Willd.) The family of Link's is Lamiaceae. Erect annual herb found in India, Sri Lanka, Bangladesh and other tropical countries throughout. It is abundant in wastelands, roadsides and cultivated fields. Most parts of the plant are traditionally used for treating fever, cough, skin infections, wounds, insect bites, inflammation and ear disorders. Frequently the juice of fresh leaves is used as a folk medicine in the treatment of earache and otorrhoea, which indicates its use in ear infections¹

Table 1. Botanical Profile of *Leucas aspera*

Parameter	Description
Family	Lamiaceae
.Scientific Name	<i>Leucas aspera</i> (Willd.) Link
Common Names	Thumbai, Dronapushpi
Habit	Annual herb
Distribution	India, Sri Lanka, Bangladesh

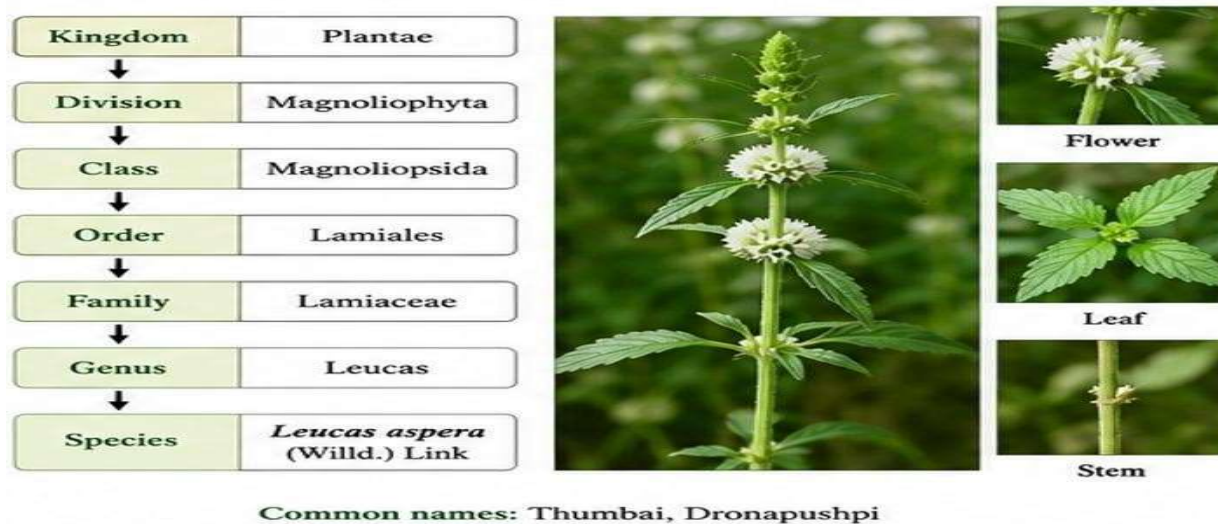


Figure 1 Botanical Profile / Taxonomical Classification of *Leucas aspera*

1.2 Phytochemical Profile

1.2.1 Triterpenoids

The triterpenoids are one of the most significant groups of compounds found in *Leucas aspera*. The leaves and aerial parts contain a large amount of triterpenoids, in particular ursolic acid, oleanolic

¹ Prajapati MS, Patel JB, Modi K, Shah MB. Pharmacognostic and phytochemical studies on *Leucas aspera*

acid and maslinic acid. These compounds have anti-inflammatory, anti-microbial, antioxidant and wound healing properties²

1.2.2 Flavonoids

In the plant, flavonoids like apigenin, chrysoeriol and glycosides have been detected. These compounds have antioxidant properties and play major roles in antimicrobial and antiinflammatory properties.³

Table 2. Major Phytoconstituents Reported from *Leucas aspera*

Phytochemical Class	Major Compounds	Reported Activity
Triterpenoids	Ursolic acid, Oleanolic acid	Antimicrobial, Anti-inflammatory
Flavonoids	Apigenin, Chrysoeriol	Antioxidant, Antimicrobial
Phenolics	Phenolic acids	Antioxidant
Sterols	β -Sitosterol	Anti-inflammatory
Essential Oils	β -Caryophyllene	Antimicrobial

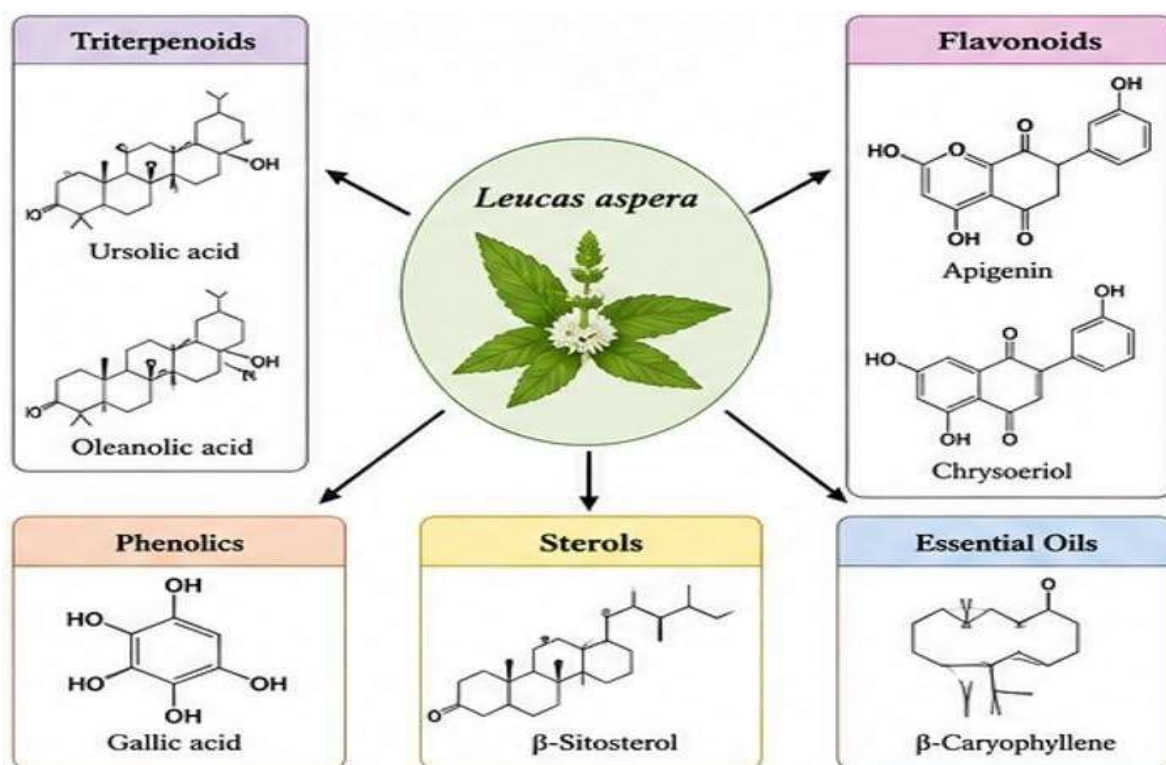


Figure 2. Major Phytochemical Classes Present in *Leucas aspera*

² Chew YL et al. Antioxidant and antimicrobial properties of *Leucas aspera* extracts

³ Alam MK et al. Antimicrobial activity of *Leucas aspera* against pathogenic microorganisms

1.2.3 Phenolics

The extracts of *Leucas aspera* contain phenolic compounds such as gallic acid derivatives. These compounds are known to have free radical scavenging and antimicrobial properties, which can aid in tissue repair and infection management⁴

1.2.4 Sterols

The major sterol in the plant is considered to be β -Sitosterol. The anti-inflammatory and immunomodulatory activities of plant sterols can also be beneficial in the therapeutic effect of *Leucas aspera*.

1.2.5 Essential Oils

The compounds found in essential oils extracted from the flowers and leaves include β caryophyllene, menthol-like compounds and different terpenes. Such volatile compounds have antimicrobial and anti-inflammatory properties.

1.3 Comparative Analysis of Phytochemicals

Leucas aspera shows variation in their phytochemical content depending on various factors such as: plant part, extraction solvent, geographical location and the time of collection. Leaves generally have more of the triterpenoids, flavonoids, and phenolics than stems or roots. Methanolic and ethanolic extracts contain higher amount of bioactive compounds than aqueous extracts. Plants harvested in the flowering stage may have a higher phytochemical content. These differences emphasize the need for standardisation in the process of production of herbal products⁵

Table 3. Comparative Phytochemical Distribution in Different Plant Parts

Plant Part	Major Constituents	Relative Abundance
Leaves	Flavonoids, Triterpenoids	High
Flowers	Essential Oils	High
Stems	Sterols	Moderate
Roots	Fatty acids	Low–Moderate

2. Antimicrobial Activity

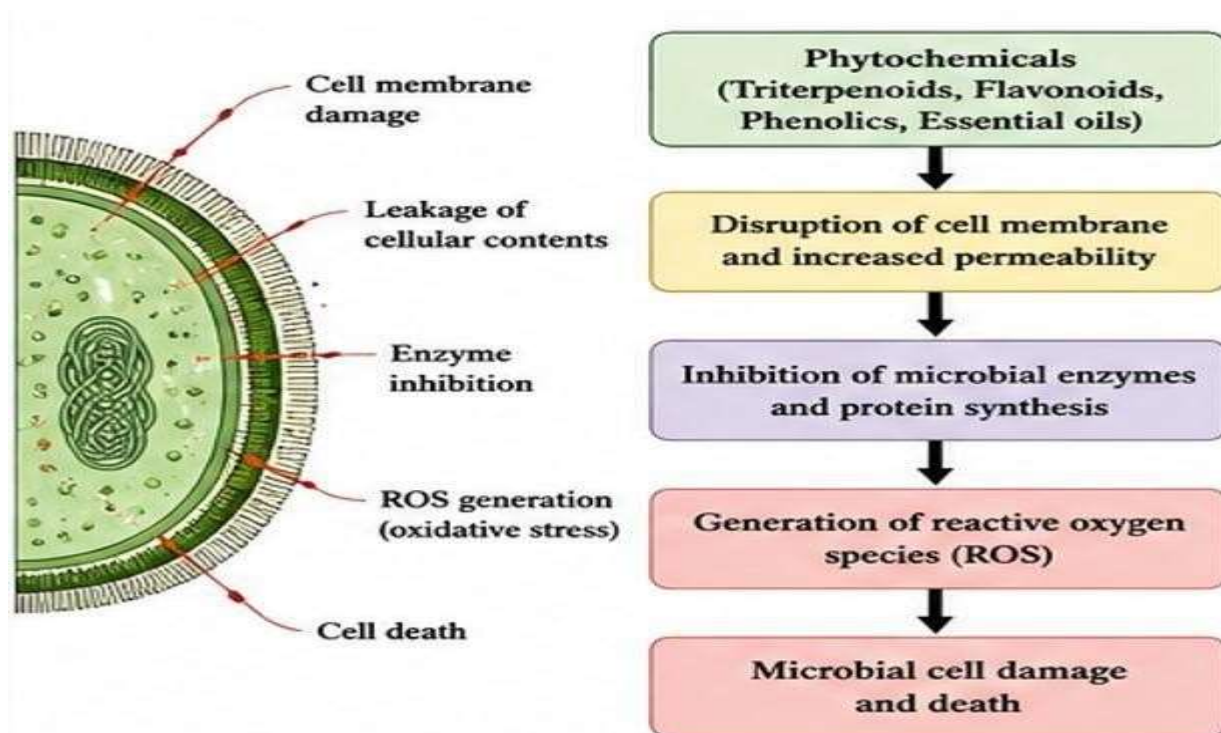
2.1 Activity Against *Staphylococcus aureus*

The extracts of *Leucas aspera* have been shown to have significant antibacterial activity against

⁴ World Health Organization. Antimicrobial Resistance Report.

⁵ Sharma A, Singh R. Medicinal plants used in ear infections: A review

Staphylococcus aureus in several studies. In general, larger inhibition zones are observed with methanolic leaf extracts than aqueous extracts, suggesting that the methanolic extracts contain



potent antimicrobial constituents⁶

2.2 Activity Against *Pseudomonas aeruginosa*

Pseudomonas aeruginosa is one of the major pathogens that causes ear infections. Experimental studies have been reported of moderate to strong inhibitory activity of *Leucas aspera* extracts against this organism and thus could be useful in topical preparations for ears.

2.3 Activity against *Escherichia coli*:

Leucas aspera extracts were found to be inhibitory towards *Escherichia coli*. Flavonoids, triterpenoids and phenolics are commonly thought to work in synergy to exert the antimicrobial effect⁷

2.4 Activity Against Fungal Pathogens

Less studies have been conducted on antifungal activity, but those that exist indicate that they are inhibitory to *Candida* species and *Aspergillus* species. Because fungal pathogens often play a role in otomycosis, additional research should be conducted⁸

Potential as Herbal Ear Drops

⁶Gupta D, Kumar M. Herbal formulations for otic infections: Current developments.

⁷ Indian Pharmacopoeia Commission. Quality standards for herbal medicines.

Sharma A, Singh R. Medicinal plants used in ear infections: A review. Gupta D, Kumar M. Herbal formulations for otic infections: Current developments.

⁸ Indian Pharmacopoeia Commission. Quality standards for herbal medicines.

Leaves of *Leucas aspera* have been traditionally used for treating ear ailments, thereby supporting the development and formulation of *Leucas aspera* herbal ear drop. The overall antimicrobial, anti-inflammatory, antioxidant and wound-healing properties indicate therapeutic potential. Local application via ear drops can ensure local action in the infected area, with lower systemic side effects⁹

Table 4. Advantages and Limitations of *Leucas aspera* Herbal Ear Drops

Advantages	Limitations
Natural source	Lack of clinical trials
Broad antimicrobial activity	Standardization issues
Traditional use evidence	Ototoxicity studies lacking
Cost-effective	Stability concerns

Figure 4. Development Pathway of *Leucas aspera* Herbal Ear Drop



Safety and Toxicity considerations:

Although there is wide-spread traditional use, there is limited scientific information on ototoxicity and long-term safety. Standardized extracts must be tested for local irritation, sensitization, microbial contamination, heavy metals, pesticide residues, and potentially on auditory structures prior to clinical application. To ensure safety, thorough toxicological evaluations are crucial.¹⁰

Research Gaps and Future Perspectives

Existing studies consist mostly of in vitro studies and crude extracts. Future studies should be

⁹ Kirtikar KR, Basu BD. Indian Medicinal Plants

¹⁰ Ghosh PK, Gaba A. Phyto-extracts in wound healing and antimicrobial applications: A review. Pharmacognosy Reviews. 2013;7(14):118–125.

conducted on:

Standardization of extracts.

Identification of active marker compounds.

\Evaluation for clinically isolated otopathogens.

- Detailed antifungal studies.
- Ototoxicity assessment.
- Formulation & stability studies.
- Animal and clinical trials.

These investigations will help in developing scientifically validated ear drop formulation of *Leucas aspera*.¹¹

Conclusion

Leucas aspera is an ethnomedicinal important medicinal plant with wide variety of phytochemical composition. Its wide antimicrobial activity is attributed to the presence of triterpenoids, flavonoids, phenolics, sterols, and essential oils. There is some existing evidence that supports its traditional application in ear disorders, as well as for its potential as a herbal ear drop. Further research on standardization, safety, formulation and therapeutic efficacy is, however, necessary to fully define therapeutic application.

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¹¹ Cowan MM. Plant products as antimicrobial agents. *Clinical Microbiology Reviews*. 1999;12(4):564–582.