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MEDICINALLY AND ECOLOGICALLY IMPORTANT SPECIES OF LAMIACEAE IN INDIA

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ABSTRACT

The family Lamiaceae represents one of the most significant groups of flowering plants with immense medicinal, ecological, and economic value in India. The present study provides a comprehensive information of 15 medicinally important species of Lamiaceae, along with their ethnomedicinal uses and ecological significance in the Indian context. The data was collected through field survey during 2024-2025 in selected states of India. Standard methods of field survey and ethnomedicinal data collection was used. The survey revealed that leaves of enumerated species are widely utilized in traditional healthcare systems by rural and tribal communities for the treatment of ailments such as fever, cough, diarrhoea, intestinal worms, wounds and mental disorders. In addition to their medicinal importance, ecological significances are discussed in details as they support pollinator populations such as bees and butterflies through nectar-rich flowers, thereby contributing to pollination services and agricultural productivity. Despite their importance, many Lamiaceae species face threats due to habitat degradation, overexploitation, and climate change. Therefore, the study emphasizes the need for conservation strategies, sustainable utilization, and documentation of traditional knowledge associated with these plants.

Keywords : Biodiversity, conservation, ecological significance, ethnomedicine, medicinal plants.

Introduction

The family Lamiaceae, commonly known as the mint family, comprises a diverse group of aromatic plants distributed across tropical, subtropical, and temperate regions of the world (Zamljen *et al.*, 2024). About 7,000 species globally, this family includes several economically and medicinally important genera such as *Ocimum*, *Mentha*, *Salvia*, *Leucas* and *Coleus* (Sim *et al.*, 2019). In India, Lamiaceae species are widely represented across different ecological zones, from the Himalayan region to peninsular landscapes (Barman *et al.*, 2024). These plants are characterized by distinct morphological features such as

quadrangular stems, opposite leaves, and bilabiate flowers, along with the presence of essential oils that impart strong aromatic properties and therapeutic value (Ramos da Silva *et al.*, 2021). Lamiaceae plants have been an integral part of traditional healthcare systems in India, including Ayurveda, Siddha, and various indigenous folk practices (Mugendhiran *et al.*, 2020). A large number of species are used for treating common ailments such as fever, cough, pain, digestive disorders, skin infections, and inflammatory conditions (Mugendhiran *et al.*, 2020; Uritu *et al.*, 2018). Their widespread use among rural and tribal communities highlights their accessibility, affordability, and

effectiveness. In addition, the rich phytochemical composition of these plants comprising essential oils, flavonoids, phenolics, and terpenoids has attracted scientific interest for their pharmacological potential, including antimicrobial, antioxidant, and anti-inflammatory activities (Afzal *et al.*, 2025; Maoz *et al.*, 2026). Beyond their medicinal importance, Lamiaceae species play a significant ecological role in maintaining ecosystem stability and resilience. They support pollinator communities by providing nectar and pollen, thereby enhancing pollination services and biodiversity (Trethowan *et al.*, 2022; Zharkova *et al.*, 2023). Many species contribute to soil conservation through their root systems and organic matter addition, while others exhibit natural pest-repellent properties that support sustainable agriculture. Their adaptability to harsh environmental conditions, including drought and poor soils, makes them valuable for ecological restoration and climate-resilient landscapes (Haas *et al.*, 2024; Slam *et al.*, 2022). Despite their immense importance, Lamiaceae species are increasingly threatened by habitat degradation, overharvesting, and loss of traditional knowledge. In this context, there is a pressing need to systematically document their medicinal uses and ecological contributions. The present study aims to compile and analyse 15 medicinally important species of Lamiaceae in India, highlighting their ethnobotanical relevance and ecological services. This work is significant as it not only contributes to the scientific understanding of this important plant family but also supports conservation planning, sustainable utilization, and the preservation of indigenous knowledge systems.

Materials and Methods

An ethnobotanical survey was conducted to document medicinally important species of the Lamiaceae family across four Indian states (Haryana, Uttarakhand, Maharashtra and Odisha). These regions were selected to represent diverse agro-climatic zones, including plains, semi-arid regions, hilly terrains, and tropical forest ecosystems. Field surveys were carried out during 2024–2025 through periodic visits to rural and forest-adjacent communities using standard methods (Jain 2021; Kumar *et al.*, 2013; Pradhan *et al.*, 2025). Informants included local healers, tribal practitioners, elderly villagers, and other knowledgeable community members. Prior informed consent was obtained before conducting interviews, and data were collected using semi-structured questionnaires, informal discussions, and direct observations (Jena *et al.*, 2026). The collected data were compiled and analysed to identify commonly

used species, patterns of utilization, and their ecological significance (Sahu *et al.*, 2026).

Results and Discussion

The ethnobotanical survey documented a total of 15 medicinally important species belonging to the family Lamiaceae across the selected regions of Haryana, Uttarakhand, Maharashtra, and Odisha (Table 1). Some medicinally important Lamiaceae are shown in Fig. 2. The results indicate that these species are widely utilized in traditional healthcare practices, particularly among rural and tribal communities. The majority of remedies are plant-based, affordable, and locally accessible, highlighting the continued dependence on indigenous knowledge systems. Among the documented species, *Ocimum tenuiflorum* L., *Leucas aspera* (Willd.) Link., and *Coleus amboinicus* (Lour.) Spreng.) were found to be the most frequently used due to their easy availability and broad therapeutic applications. Analysis of plant parts used revealed that leaves were the most commonly utilized component, accounting for the majority of preparations. Leaves were typically used in the form of decoctions, juices, and pastes for treating ailments such as fever, cough, diarrhoea, wounds, and intestinal infections (Fig. 1). This preference may be attributed to the high concentration of bioactive compounds in leaves, including essential oils and phenolic constituents. The dominance of simple preparation methods reflects the practical knowledge and resource limitations of local communities, while also ensuring ease of application and effectiveness. The study also highlights the strong correlation between traditional knowledge and ecological availability of species. Regions with forest cover, particularly in Odisha and Uttarakhand, showed higher diversity and usage of Lamiaceae species. In contrast, cultivated or semi-wild species such as *Ocimum basilicum* L. and *Mesosphaerum suaveolens* (L.) Kuntze. were commonly reported from agricultural landscapes in Haryana and Maharashtra. This distribution pattern suggests that both wild and cultivated species play complementary roles in traditional medicine.

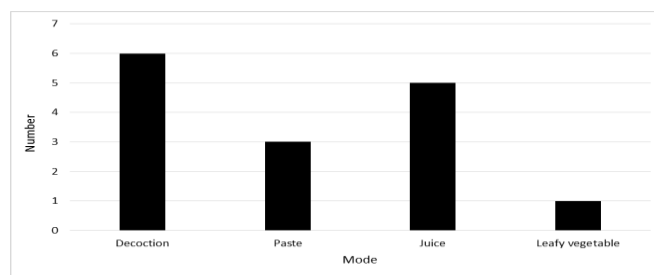


Fig. 1: Distribution of use categories and corresponding frequency.

Table 1: Medicinally important species of Lamiaceae of India

Plant name	Common Name	Parts used	Mode of uses
<i>Anisomeles indica</i> (L.) Kuntze	Indian Catmint	Leaves	Leaves paste is prepared and applied externally to reduce muscular swellings.
<i>Colebrookea oppositifolia</i> G.Lodd.	Indian Squirrel Tail	Leaves	Fresh leaf paste is applied topically to cuts as an antiseptic agent by Mankirdia tribal community of Similipal Biosphere Reserve, India
<i>Coleus amboinicus</i> Lour.	Mexican mint	Leaves	Leaves decoction is used to remove cough.
<i>Coleus strobilifer</i> (Roxb.) A.J.Paton	Thick-leaved Lavender	Leaves	Juice of fresh leaves are prepared with water and given once in morning to treat cough.
<i>Gomphostemma parviflorum</i> Wall. ex Benth.	Small Horn-Flower	Leaves	Leaves juice is taken 2 times to cure fever.
<i>Leonotis nepetifolia</i> (L.) R.Br.	Lion's ear	Leaves	Leaves decoction is taken to treat coughs.
<i>Leucas aspera</i> (Willd.) Link	Common Leucas	Leaves	Leaves decoction is used for treating intestinal worms by Munda tribal community of Odisha state.
<i>Leucas cephalotes</i> (Roth) Spreng.	Head Leucas	Leaves	Leaves are used as leafy vegetable to get sound health.
<i>Mesosphaerum suaveolens</i> (L.) Kuntze	American Mint	Leaves	Leaf decoctions are used to treat diarrhoea.
<i>Ocimum americanum</i> L.	Hoary Basil	Leaves	Leaves are macerated and taken the juice in spoon and taken 3 times to cure fever.
<i>Ocimum basilicum</i> L.	Sweet Basil	Leaves	Leaves are macerated and taken the juice in spoon and taken 3 times to cure fever.
<i>Ocimum tenuiflorum</i> L.	Holy Basil	Leaves	Leaves are macerated and taken the juice in spoon and taken 3 times to cure fever.
<i>Platostoma elongatum</i> (Benth.) A.J.Paton	Elongated Spike Mint	Leaves	Leaves paste is used as antiseptic agent.
<i>Platostoma hispidum</i> (L.) A.J.Paton	Hairy Gomphrena	Leaves	Decoction of leaves is used to cure sore throats.
<i>Nepeta leucolaena</i> Benth. ex Hook.f.	Salvia-Leaved Catmint	Leaves	Leaves decoction is useful to cure mental instability.

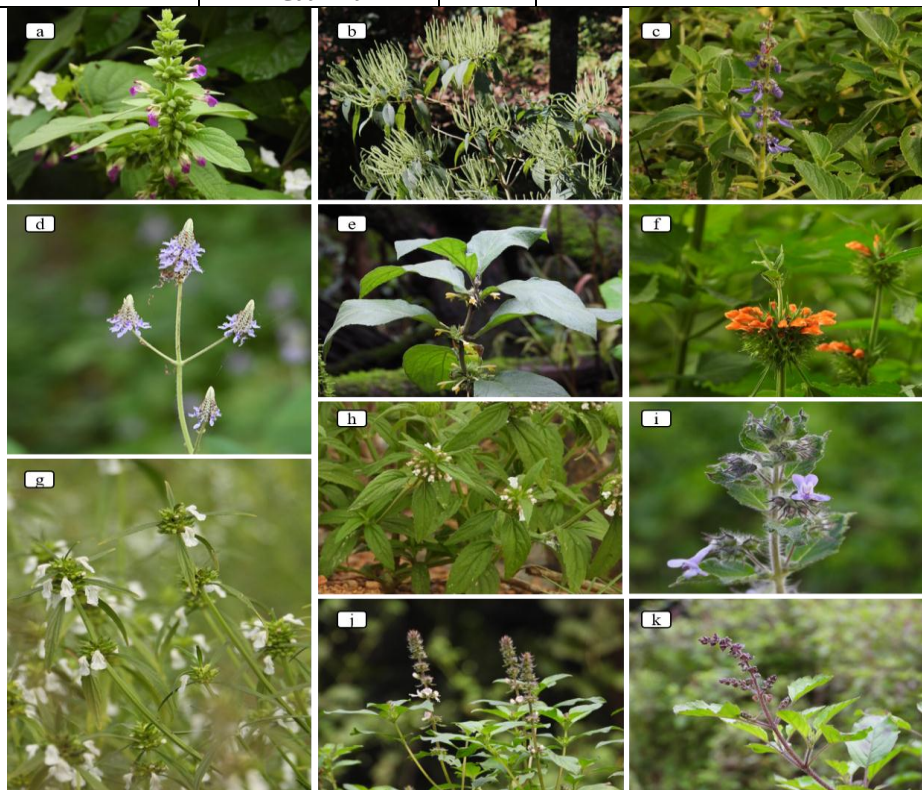


Fig. 2: Common medicinally and ecologically important species of Lamiaceae family; a) *Anisomeles indica*, b) *Colebrookea oppositifolia*, c) *Coleus amboinicus*, d) *Coleus strobilifer*, e) *Gomphostemma parviflorum*, f) *Leonotis nepetifolia*, g) *Leucas aspera*, h) *Leucas cephalotes*, i) *Mesosphaerum suaveolens*, j) *Ocimum americanum*, k) *Ocimum sanctum*

Furthermore, certain species were found to have multiple uses, indicating their importance in local healthcare systems. From an ecological perspective, the documented Lamiaceae species contribute significantly to ecosystem functioning. Their role in supporting pollinators, improving soil health, and acting as natural pest repellents reinforces their ecological value beyond medicinal uses. The findings emphasize that the conservation of these species is essential not only for preserving traditional knowledge but also for maintaining ecological balance. However, increasing anthropogenic pressures such as habitat loss and overharvesting may threaten their sustainability, underscoring the need for integrated conservation and sustainable utilization strategies.

Ecological services of Lamiaceae

There are number of ecological potentials are observed during different floristic survey by the authors in study areas. Details are discussed below in different subheadings.

Support for pollinators: Plants of the Lamiaceae family, such as *Ocimum basilicum* and *Lavandula*, are highly valued for their role in supporting pollinators. Their flowers are typically rich in nectar and pollen, making them attractive to bees, butterflies, and other beneficial insects. The characteristic bilabiate (two-lipped) flower structure helps ensure effective pollination by guiding insects toward reproductive parts.

Role in biodiversity conservation: Lamiaceae plants, including *Salvia* and *Mentha*, enhance biodiversity by providing food and habitat for a wide range of organisms. They support insects, small herbivores, and microorganisms, forming an essential part of food webs. Their presence in natural and semi-natural habitats helps maintain species richness and ecological balance, thereby contributing to the conservation of diverse ecosystems.

Soil protection and improvement: Many Lamiaceae species act as effective ground cover, helping to prevent soil erosion and maintain soil stability. Their root systems bind soil particles together, reducing the impact of wind and water erosion. As these plants shed leaves and organic matter, they enrich the soil with nutrients and improve its structure. This makes them important contributors to soil fertility and sustainable land management.

Adaptation to harsh environments: Lamiaceae plants are well adapted to grow in dry, nutrient-poor, and harsh environmental conditions. Their leaves often contain essential oils that reduce water loss and deter

herbivores. These adaptations allow them to survive in drought-prone areas and disturbed habitats. As a result, they are frequently used in ecological restoration projects and play a role in stabilizing fragile ecosystems.

Natural pest control: Many plants in the Lamiaceae family produce aromatic compounds that act as natural insect repellents. Species like *Rosmarinus officinalis* and basil are commonly used in gardens for companion planting to deter harmful pests. These natural defences help reduce reliance on synthetic pesticides, promoting environmentally friendly agricultural practices and supporting sustainable pest management.

Contribution to ecosystem services: Lamiaceae plants provide a range of ecosystem services, including improving air quality through photosynthesis and contributing to carbon sequestration. They also have economic and medicinal value, as many species are used in traditional medicine, culinary practices, and essential oil production. By supporting both ecological balance and human needs, these plants play a vital role in sustaining healthy ecosystems and livelihoods.

Works of other researchers across India are also reviewed and found that Barman et al., documented 64 species across 26 genera of Lamiaceae plants from Assam along with their distribution and significant ethnobotanical uses among local communities, particularly for medicinal and economic purposes (Barman et al., 2024). Similarly, a regional review of the subfamily Lamioideae in the Indian Western Himalaya reported 59 species under 23 genera, with notable diversity in genera such as *Leucas* and highlighted their ecological distribution along altitudinal gradients as well as their medicinal relevance (Singh et al., 2025). Focused taxonomic analysis of the genus *Nepeta* further revealed 49 taxa with considerable endemism and high-altitude adaptation, underlining its importance as a medicinal, ornamental, and bio-pesticidal resource. Ethnomedicinal studies from the Nilgiris documented 24 species used in homeopathy, demonstrating the continued reliance on Lamiaceae plants in traditional healthcare systems and their therapeutic applications across various ailments (Masta et al., 2025). Complementing these regional and ethnobotanical studies, recent pharmacological reviews provide a broader scientific basis by identifying key bioactive compounds such as flavonoids, terpenoids, and phenolics responsible for antioxidant, anti-inflammatory, antimicrobial, and anticancer activities, thus reinforcing the clinical potential of Lamiaceae species (Mugendhiran et al., 2020). Overall, above mentioned studies collectively establish Lamiaceae as

a highly diverse and economically significant plant family with immense scope for conservation, sustainable utilization, and future pharmacological exploration.

Conclusion

The present study systematically documents 15 medicinally and ecologically significant species of the family Lamiaceae across diverse phytogeographical regions of India, highlighting their integral role in traditional healthcare systems and ecosystem functioning. The predominance of leaf-based remedies, coupled with the widespread use of simple preparation methods, underscores the efficiency and accessibility of indigenous ethnomedicinal practices. Furthermore, the ecological contributions of these species particularly in pollinator support, soil stabilization, and natural pest regulation demonstrate their multifaceted importance in sustaining ecosystem services. However, increasing anthropogenic pressures and erosion of traditional knowledge pose significant threats to their persistence. Therefore, the study strongly advocates for evidence-based conservation strategies, sustainable harvesting practices, and systematic documentation of ethnobotanical knowledge to ensure the long-term preservation and utilization of Lamiaceae diversity in India.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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