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A Call for Bioprospecting: Potential Medical Applications of *Ocimum lamifolium* in Ethiopia

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A Call for Bioprospecting: Potential Medical Applications of *Ocimum lamifolium* in Ethiopia

Genetic Resource Access and Benefit Sharing Research LEO

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1. Introduction

The applications of herbal medicine have been a key to human and animal health, which are less costly, sustainable options, an alternative for people who are away from health care systems, and bring ancient knowledge together with contemporary scientific investigation(Yadav *et al*., 2025). These days, multiple solutions in combination and individually should be implemented to solve problems of pandemics, epidemics, and endemic diseases. Herbal medicines meet the health needs of approximately 80% of the world's population, specifically for developing countries like Ethiopia, where health care systems are not within the reach of the rural people(Megersa, 2024). Thus, in this text, the empirical importance of *Ocimum lamifolium* in the health system is presented to aware relevant stakeholders to enter into the utilization of the aforementioned plant in Ethiopia.

The international treaty, the most important component of the Convention on Biological Diversity, recognizes countries' rights to regulate and charge users for access to their biodiversity. As a result, the Nagoya Protocol is ratified as a supplementary protocol to the treaty to implement the umbrella convention. Both the treaty and the protocol, however, promote national legal framework development and implementation that addresses the degree and extent to which the state could exercise this right. Consequently, Access to the Genetic Resources and Community Knowledge, and Community Rights proclamation No.482/2006 has been ratified in Ethiopia. Furthermore, a procedural law to implement the proclamation Access to the Genetic Resources and Community Knowledge, and Community Rights Council of Ministers Regulation No. 169/2009 has been introduced. Following those international and national legal framework instruments, *Ocimum lamifolium* is appreciated and promoted in calls for access and benefit sharing in research and development and commercialization opportunities. Therefore, the implementation of the access promotion in accordance with the national and international legal frameworks is as impactful as conservation, sustainable utilization, and access and benefit-sharing goals, as long as the bioactivity potential of *Ocimum lamifolium* significantly encourages the need to promote their natural botanical resources to users and scientific society.

2. Biology of *Ocimum lamifolium*

Among the medicinal plants of Ethiopia, "Damakese" (Ocimum lamiifolium Hochst. ex Benth) is one of the well-celebrated and most widely used home remedies. It is also known among the locals by other vernacular names, including "Damakher", "Dargu," and "Korcha-michi". O. lamifolium, which belongs to Kingdom: Plantae; Subkingdom: Tracheobionta; Division: Magnoliophyta; Class: Magnoliopsida; Subclass: Asteridae; Order: Lamiales; Family: Lamiaceae; Genus: Ocimum L. Species: *Ocimum lamifolium*, is a subshrub or shrub (Fig.1) (Hedberg, 1996).

Figure 1: *Ocimum lamifolium*: Picture taken at EBI Nursery

3. Distribution of Ocimum *lamifolium*

Ocimum lamifolium is a subshrub or shrub that can grow to 0.7-3 m tall. It grows at altitude levels of 1200-2900 m obtained in clearings and edges of primary and secondary mountain forests and bushland, tall grassland, abandoned fields, with some tolerance for shadow, rarely also cultivated as an ornamental. It is widely distributed in various regions of Ethiopia, western Eritrea, and also in the region from East Africa to Malawi, in the Democratic Republic of Congo, and Cameroon(Hedberg, 1996).

4. Applications of Products of *Ocimum lamifolium*

4.1 Health System (Pharmaceutical)

Ocimum lamifolium is a potential herb to cure several diseases. Before modern medicine, ancient civilizations were almost dependent on various medicinal plants and herbs for healthcare(Yadav *et al*., 2025). Later, the discovery of antibiotics and synthetic compounds as a drug discovery source has contributed a lot to saving lives. However, even in modern times, a new challenge like antibiotic resistance has been emerging in various disease-causing microbes. As a result, nature-derived products and medicinal plants have become well accepted and effective to meet those challenges and find new sources against human and animal diseases(Fialová *et al*., 2021). *Ocimum lamifolium* is one of the medicinal plants among the most valuable sources of molecules with therapeutic potential for infectious and chronic ailments throughout the history of mankind, particularly in Ethiopia, where herbal medicine has been a major community health care system(Bitew et al., 2023; Megersa, 2024).

The potent antimicrobial and antimalarial property of extracts harvested from *Ocimum lamifolium* suggests that the plant has numerous uses in academic and health systems to address multiple human and animal infectious ailments. For instance, phytochemicals and essential oils extracted from the leaves of *Ocimum lamifolium* have shown antibacterial and antifungal properties possessing variable activity(Lulekal *et al*., 2014). The aqueous, methanol, and hexane extracts applied independently and in combination with commercial antibiotics have shown concentration-dependent inhibition against the growth of *S aureus*, *S.boydii, E. coli,* and *P. aeruginosa*. Another study on crude extract such as ethanol, n-hexane and distilled water, and the essential oil of *Ocimum lamifolium* demonstrated a significant antimicrobial activity against *S. aureus ATCC 5923, S. epidermidis ATCC 12228, S. typhimurium ATCC 13311, E. coli ATCC 5922, and C. albicans*. Similarly, the methanol extracts of this plant revealed an elevated antimicrobial activity against *S. aureus*, *E. coli,* and *Pseudomonas* spp (Gebregiorgis Amabye & Mussa, 2015). In addition, hexane extracts of this plant showed potent antimicrobial activity against *Staphylococcus aureus*(Woldeamanueal *et al*., 2025), which causes the most frequent and important skin and soft tissue infections (Fialová *et al*., 2021). Thus, the antimicrobial activity of *Ocimum lamifolium* indicates the plant contains biologically active components which could be potential sources for drugs or serves as a model compound for drug synthesis, which could be

one of proactive measure to a problem expected by 20250 10 million people live a year, and 100 trillion USD of economic risk due to the rise of drug resistant infections(O 'neill, 2016).

Ocimum lamifolium has a considerable role in non-communicable ailments such as Cardiovascular diseases, Cancer, respiratory diseases, and diabetes. According to a World Health Organization report, an estimated 19.8 million people died from cardiovascular diseases (CVDs), diseases of the heart or blood vessels, in 2022, representing approximately 32% of all global deaths (World Health Organization, 2025). Provided the risk factors are many and rapidly expanding public health issues, phytochemicals of plants, which are safe, less costly, and acceptable, in the form of traditional extracts or pure bioactive compounds, have been shown and used as alternative medication and prevention intervention for the management of the disease(Bachheti *et al*., 2022). One of the risk factors of cardiovascular disease is inflammation, where individuals with inflammatory markers are more likely to have the strongest and most significant predictor of risk of cardiovascular diseases, particularly heart attack (England, 1997; Sai Ravi Kiran et al., 2017). According to (Mequanint *et al*., 2011), The anti-inflammatory activity of *Ocimum lamifolium* under in vivo anti-inflammatory testing showed that the crude leaf aqueous and ethanol extracts have shown significant anti-inflammatory activity at p-values 0.001, 0.01, and 0.5 at different stages in the induction of inflammation. Of those extracts, the aqueous crude extract has shown as similar activity to aspirin, which is the control and the clinical measure in health care systems. In addition, extracts fractionated by water, chloroform, butanol, and r from the aqueous crude extract have proven anti-inflammatory activity p-value 0.001, 0.01, and 0.5 relative to the control. Furthermore, the water fraction's activity is as significant as aspirin at a S10.001 p-value after 2 hours of induction of inflammation. However, after 1hour of inflammation induction, the water fractionates have shown greater significance than all fractionates, including the standard drug aspirin. Other instances where this plant works as an alternative medicine are many, such as diabetes (Tesfaye et al., 2023; WM & HO, 2016), respiratory disease (Megersa, 2024).

Conclusion

In this text, although *Ocimum lamifolium* has agricultural pest control, cosmetic, and cultural significance, the empirical studies presented to demonstrate the importance of this specific plant in the prevention of infectious and non-infectious diseases reveal that it is an ancient and widely used therapeutic herb in the country. However, the available evidence is limited to preclinical *in vitro* and *in vivo* studies, and the work conducted thus far has been primarily for academic purposes, meaning it has not been developed in industrial laboratories for intensive clinical screening, which is essential for addressing real and critical problems facing humankind. The mechanisms by which the plant's products inhibit pathogenic microorganisms and treat ailments, as well as their applications in various systems, are not yet fully understood. Therefore, this review aims to raise awareness and encourage the bioprospecting of the unexplored opportunities offered by this common medicinal plant for both commercial and non-commercial benefits.

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