

Review Article

# Damakase (*Ocimum lamiifolium* Hochest ex Benth): A Medicinal Plant Used in Ethiopian Traditional Medicine: A Critical Review

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## Abstract

Damakase (*Ocimum lamiifolium* Hochest ex Benth) is a traditional medicinal plant belonging to the Lamiaceae family and a popular home remedy in Ethiopia. It is a well-known and widely used ancient therapeutic herb in various regions of the nation. The utilization of plant leaves for medicinal purposes is primarily due to their rich content of bioactive compounds with therapeutic properties. Consequently, this plant is employed in the management of a condition referred to as 'Mich' in Ethiopia. Additionally, it is frequently used to address diverse health conditions, including gastrointestinal disorders, inflammatory conditions, pyrexia, and respiratory ailments. Moreover, the essential oil derived from *Ocimum lamiifolium* consists of specific chemical constituents, such as alkaloids, sterols, carbohydrates, glycosides, tannins, flavonoids, bornyl acetate, p-cymene, camphene,  $\alpha$ -pinene, and sabinene. Bioactive constituents, such as phenolics, flavonoids, and terpenoids, exhibit antibacterial, antioxidant, and anti-inflammatory properties. Furthermore, the potential applications of damakase essential oils as natural preservatives in the food and cosmetic sectors have been recognized. The essential oil is deemed safe and non-hazardous, displaying no mutagenic or cytotoxic effects. Despite the extensive historical use of this traditional medicinal plant in Ethiopia, the limited scientific investigations on its genetic improvement, cultivation practices, and integration into modern healthcare pose a notable challenge. This review aims to furnish a comprehensive discourse on the historical and contemporary applications of traditional damakase in Ethiopian traditional medicine.

## Keywords

Bioactive, Essential Oil, Home Remedy, Mich

## 1. Introduction

Damakase (*Ocimum lamiifolium* Hochest ex Benth.) is a traditional medicinal plant belonging to the Lamiaceae family and a popular home remedy in Ethiopia. The plant is an indigenous shrub or sub-shrub that can grow at altitudes ranging from 1200 to 3000 m a.s.l. It grows naturally in clearings, mountain forest borders, and in abandoned fields. However,

these plants are rarely cultivated as decorative plants. This medicinal plant is widely distributed in various parts of Ethiopia and is abundant in neighboring countries extending from the eastern continent [1, 2].

Damakase is a well-known and widely used ancient medication in humans from various locations in Ethiopia. This

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plant is well-known in many vernacular Ethiopian languages. It is a widely used traditional medicinal plant in different areas of the country for the treatment of known diseases called 'Mich' [1]. A study by these authors showed that the plant has been used to treat the common cold and cough by sniffing the crushed leaves or inhaling steam after boiling together with the leaves, where the patient drank the decoction. In addition, the compound found in damakase has been used as an anti-bacterial agent against different diseases. Plants are often used in local veterinary care to heal hyena bites [1].

Leaves are the most widely used damakase in medical applications owing to their medicinal properties and economically important essential oils [3]. However, the lack of detailed scientific studies on variety development, plant growth, agronomic management, and uses in modern medicine is the main bottleneck in Ethiopia despite its wider traditional medicinal uses. Therefore, the main aim of this review is to discuss the traditional use of damakase (*Ocimum lamiifolium* Hochest ex Benth) in Ethiopia.

## 2. Damakase Taxonomy, Origin, and Distribution

*Ocimum lamiifolium* Hochest. ex Benth. belongs to the subgenus *Nautochilus*, family *Lamiaceae*, and subfamily *Nepetoideae*. The genus *Ocimum* comprises more than 150 species that are distributed from tropical to subtropical regions. It is a versatile aromatic genus that is well known for its medicinal properties and its economically important essential oils [4, 2]. The plant is an indigenous plant to Ethiopia and has different names in the vernacular languages of Ethiopia, like 'damakase' by Amharic, 'Anchabi/Qoricha michi' by Afan Oromo, Akawayya by Gumzegna, and 'Guluu-wa/Desha-dunkiya' by Dawuro [1, 4, 2]. The plant is commonly found and widely distributed in various parts of Ethiopia and East African countries and extends from Kenya to Malawi, the Democratic Republic of the Congo, Cameroon, and many other countries [2].

### 2.1. Damakase Morphological Characteristics

Damakase (*Ocimum lamiifolium* Hochest ex Benth.) is an erect, perennial plant with hairy stems. It has a woody stem, opposite leaves with toothed margins, and small tubular flowers that are white or pale. Its leaves have distinct petioles, are oval, sharp, regularly crenate, between 2.4 and 2.8 cm long, and have mild pubescence on both sides. These leaves emit a strong and pleasant aroma when crushed. The flower of the plant is a raceme that is long, lax, and has branches at its base. There are several whorls of flowers, and the bracts are broadly ovate, cuspidate, deciduous, and vividly colored. It has a long calyx, the upper tooth of which is ovate, obtuse, and shorter than the tube. The corolla tube is as long as the calyx. The filaments of the two upper penicillate above the base and the stamens are both prominently exerted [5-7].

### 2.2. Damakase Growth and Environmental Requirements

Damakase is a strong plant that can tolerate a wide range of environmental conditions. It thrives in tropical and subtropical climates, making it suitable for cultivation in various regions of Ethiopia. Plants can be propagated from the seeds or stem cuttings for further multiplication. It grows best in well-drained soils, and prefers sunny areas. In addition, it can be grown in home gardens or found as a wild plant on forest edges.

## 3. Ethiopia's Traditional Medicinal Plants and Their Uses

Traditional medicinal plants are an integral part of primary healthcare and have been used extensively as traditional treatments for both humans and animals in developing countries [2, 4]. The World Health Organization (WHO) has verified that medicinal plants meet the health needs of approximately 80% of the world's population, especially in the rural areas of developing countries such as Ethiopia [8] (WHO, 2001). According to a review by the WHO in 2004, Ethiopia has led all nations, with 90% of its population using traditional medicine for primary health care [9]. As the country is rich in plant biodiversity, more than 1000 species of medicinal plants have been identified, including *Ocimum lamiifolium* Hochest ex Benth [10]. Thus, the use of traditional medicine for healthcare purposes is an integral part of the culture, belief structure, and lifestyle of Ethiopian people [11, 12].

Despite the increased popularity of traditional medicine in the healthcare system, damakase has not received much attention from Ethiopia's agricultural industries, healthcare institutions, or scientific research. Since then, the lack of focus coupled with population pressure, agricultural expansion, and land deforestation has led to the loss of medicinal plants, including damakase, in the country. According to Agize *et al.* [13], most medicinal plants used by Ethiopians are collected from the wild, without replacement. This accelerated the pace of loss of medicinal plant species in the country and placed them on the red extinction watch lists. Additionally, the reported study by Bekele [14] noted that Ethiopia's destructive harvesting (leaf, root, and bark collection) and overuse of medicinal plants put their conservation at risk. However, focusing on traditional medicinal plants, particularly damakase, is an essential effort because of its importance as a potential source of future drugs, as well as the reliance of the Ethiopian healthcare system on traditional medicine [15].

### 3.1. Traditional Medicinal Uses of Damakase

In Ethiopia, the traditional use of medicinal herbs for the treatment and prevention of ailments has long been widespread [16]. As a result, damakase (*Ocimum lamiifolium* Hochest ex

Benth.) has been one of the most important and widely used raw forms for treating different diseases in traditional medicine by Ethiopians for a long period [1, 15]. It is commonly used to treat gastrointestinal disorders (diarrhea, stomach cramps, and diarrhea), inflammation, fever, malaria, respiratory problems (coughs, colds, and bronchitis), skin infections (wounds, burns, and fungal infections), and pain and inflammation (headaches, burns, and joint pain) [17, 18]. It is also widely used in societies to treat inflammatory and infectious diseases known locally as 'mitch,' which are characterized by headaches, fever, inflammation, joint pain, back pain, chills, sweats, loss of appetite, and, in severe cases, diarrhea. According to these authors showed, 'Mitch' is believed to occur when someone is exposed to strong smells and smoke during the roasting of cereals and heating of red pepper and spices. The authors also added a different form of "mitch" called "Girifat," which is characterized by the development of blisters, mainly on the lip's corner, inflammation of the outer parts of the lips and gums, soreness of the tongue, whitening, and inflammation of the mouth. It is thought that exposure to strong sunlight after consuming oily food, drinking coffee, or chewing khat causes this form of 'mitch.' Alemtshay *et al.* [16] also reported that indigenous communities in the Gurage Zone rely heavily on traditional medicinal plant use, including damakase, as a primary source of healthcare. Furthermore, the plant has traditionally been used to treat infections of the sores (expansions) and painful areas around the reproductive organs and urinary tract in women giving birth [3]. *Ocimum* spp. and their essential oils have traditionally been used to kill or repel insects [2]. Moreover, the broad-spectrum bactericidal and fungicidal potential of the oil, as well as its free radical scavenging activity, support its traditionally claimed medicinal value [1]. Damakase is a specialty shop and Internet-ordered item in the United States, and it is not widely used among the population [18].

### 3.1.1. Methods of Traditional Damakase Preparation and Uses

*Ocimum lamiifolium* has a long history of use for the treatment of various diseases. In many areas, the leaves of the plant are harvested and manually hand rubbed to extract the juice, which is then used as a rinse for the eyes to treat eye infections and inhaled to alleviate symptoms of the common cold and cough [1, 18, 19]. According to these authors, damakase juice has been used to treat various ailments such as cough, influenza, common cold, headache, eye infection, hematuria, and mich (fever with headache), by either drinking the juice with coffee or tea, or by boiling its leaves in an iron pan and inhaling the vapor. Hence, there is a common belief among communities in various local areas about the color of the squeezed damakase juice; as the juices turn red, they believe the person has 'mich,' but if it turns green, it is not much. In certain areas, mothers or daughters apply the extracted juice. Additionally, crushed damakase leaves have been directly inserted into the nose and massaged on the face to treat influenza, cold, and fever with headaches [1, 2, 18, 19]. According to Gedif and Hahn's [20] study report, fresh leaf water

extract is drunk to treat diarrhea, amoeba (diarrhea with blood), and cough/cold. According to Stark *et al.* [21], water extracts of the fresh leaves of *Vernonia amygdalina* and *Clutia abyssinica*, when combined with the roots of *Ocimum lamiifolium*, showed synergistic activity against these diseases. In addition, the Sheko ethnic group uses *Ocimum lamiifolium* to treat skin and gastrointestinal problems, which has greater healing capabilities than other remedies [2, 22]. Traditionally, *Ocimum lamiifolium* leaves have been used for their antimalarial activity [2]. Furthermore, thermal expulsion and direct burning of the leaf proved to be significant repellents against the main malaria vectors [2, 23]. Moreover, Nerio *et al.* [24] reported that essential oils from *Ocimum* spp. were effective insect repellents. Under laboratory conditions, ethnobotanical plant extracts have insecticidal effects on *Anopheles arabiensis* [25].

### 3.1.2. Culinary Uses of Damakase

Damakase is used as a culinary herb in Ethiopian cuisine in addition to its medicinal properties. Fresh or dried leaves are used in a variety of dishes because of their distinct flavors and aromas. The plant is especially popular in the preparation of traditional stews known as "wots." [18]. According to Gedif and Hahn [20], *Ocimum* spp. and their essential oils have historically been used to flavor foods and oral products, fragrances, folk medicines, and condiments.

## 3.2. Essential Oil Content and Chemical Composition of Damakase

The variable presence of essential oils in the leaves of *Ocimum lamiifolium* is a common observation. A study on oil extracted from *Ocimum Lamiifolium* showed a wide range of beneficial chemical compounds. Nevertheless, the composition, quantity, and strength of the essential oil can fluctuate due to numerous factors such as the type of plant, growth stage, harvest time, distillation technique, location, and weather conditions.

### 3.2.1. Damakase Harvesting and Essential Oil Extraction

Damakase leaves are typically harvested during the flowering season, when the essential oil content of the plant peaks. The leaves were collected and steam-distilled to extract essential oils [26]. The oil obtained by distillation was a pale-yellow liquid with a strong, pleasant aroma.

### 3.2.2. Damakase Essential Oil Composition

The essential oil extracted from *Ocimum lamiifolium* contains certain chemical compounds such as alkaloids, sterols, carbohydrates, glycosides, tannins, flavonoids, bornyl acetate, p-cymene, camphene, a-pinene, and sabinene [27]. It was also discovered that the essential oil extracted from the leaves contained a variety of bioactive compounds with therapeutic

potential. Kifle *et al.* [1] studied the essential oil composition of damakase and discovered several important constituents including eugenol, which is known for its antimicrobial and antioxidant properties. These authors further investigated antimicrobial and free-radical-scavenging properties of the damakase essential oil. They found that this essential oil exhibits broad-spectrum antimicrobial and potent antioxidant properties. Another study on *Ocimum urticifolium*, a related species, by Alemayehu *et al.* [4] discovered the presence of additional chemical constituents such as linalool and 1,8-cineole, both of which have antimicrobial and anti-inflammatory properties.

Essential oils of this plant contain a diverse range of chemical constituents with important biological activities. The following are some of the major compounds discovered in essential oil: Thymol is a natural monoterpene phenol with antimicrobial and antioxidant properties. Carvacrol is another antimicrobial monoterpene phenol. P-cymene is a natural aromatic hydrocarbon with both anti-inflammatory and antioxidant properties. Terpinene is an antimicrobial and antioxidant monoterpene hydrocarbon compound. These chemical components contribute to the overall pharmacological activity of the drugs [1].

### 3.2.3. Damakase Essential Oil Applications

Damakase essential oil has many applications because of its antimicrobial, antioxidant, and anti-inflammatory properties [1]. Essential oils have potential applications as natural preservatives in food and cosmetic industries. In addition, it is a part of the topical cream and ointment used to treat skin infections and inflammation. One potential application of oil is in aromatherapy, which has calming and soothing properties. It can also be used as a natural treatment for respiratory and gastrointestinal problems and wounds [28].

### 3.2.4. Damakase Essential Oil Safety and Toxicity

The safety and toxicity of damakase essential oil have been investigated in several studies. Thus, the essential oil appears to be safe and non-toxic with no mutagenicity or cytotoxicity. However, it is important to note that individual reactions to essential oils can vary and caution should be exercised when using them, particularly in sensitive populations such as pregnant women, children, and individuals with allergies [1, 29].

## 4. Summary

Damakase (*Ocimum lamiifolium* Hochst. ex Benth.) is an important medicinal plant in traditional Ethiopian medicine, with antimicrobial, free-radical scavenging, and antioxidant properties. Plant research has confirmed many of its traditional uses and has revealed safe and potential new applications in medicine. However, research on damakase and its essential oils may reveal additional health benefits and potential applications, contributing to the ongoing development

and recognition of Ethiopian traditional medicine practices. As the demand for herbal remedies increases, it is critical to prioritize damakase conservation, sustainable use, and cultivation to ensure their continued availability and potential benefits for future generations. By doing so, we can help preserve and promote Ethiopia's rich cultural heritage in traditional medicine, as well as harness its potential for traditional medicine.

## 5. Future Line of Work

Damakase is a valuable medicinal plant in Ethiopia and efforts should be made to conserve and sustainably manage its population. This can be done by encouraging damakase cultivation in home gardens and community forests, and by educating local communities about the importance of medicinal plants and their habitats. In addition, sustainable harvesting practices are being implemented to ensure that they are available for future generations.

## Author Contributions

Habtamu Gudisa Megersa is the sole author. The author read and approved the final manuscript.

## Data Access Statement

Data sharing is not applicable to this review article as no new data were created or analyzed in this review.

## Public Interest Statement

Damakase (*Ocimum lamiifolium* Hochst. ex Benth.), a medicinal plant used in Ethiopian traditional medicine, possesses antimicrobial, free-radical scavenging, and antioxidant properties. This review aims to discuss the traditional use of damakase in Ethiopia. According to the literature, the plant has been used in traditional medicine across the country for a long period of time, and its herbal remedy has gained popularity in society, revealing potential new applications in medicine. This review will aid researchers in identifying critical areas for integrating plants into modern medicine.

## Conflicts of Interest

The authors declare no conflicts of interest.

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## Biography



I am **Habtamu Gudisa Megersa**, and I hold a master's degree in horticulture from Jimma University. Over the past decade, I have been employed as a horticulture researcher at the Ethiopian Institute of Agricultural Research in Wondo Genet Agricultural Research Center, specializing in tropical and subtropical fruits, warm and cool season vegetables, and medicinal and aromatic plants. My current research interests are in these areas. I am currently affiliated with the Ethiopian Institute of Agricultural Research; Wondo Genet Agricultural Research Center.