

# Traditional and Therapeutic Uses of *Ocimum kilimandscharicum*

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**Abstract:** *Since ancient times, humans have depended on nature for healing, using medicinal plants as their primary source of treatment long before the introduction of modern chemical medicines. Even today, a large portion of the global population, especially in developing countries, continues to rely on herbal remedies for healthcare. Medicinal plants form the foundation of traditional medicine and are valued for their therapeutic, aromatic, and nutritional properties. They produce a variety of natural compounds that can positively influence body functions and help in maintaining overall health. Herbal formulations, often referred to as phytomedicines or phytopharmaceuticals, are prepared in different forms such as powders, tinctures, capsules, creams, and extracts.*

*The *Ocimum* genus, commonly known as “Tulsi” or “Basil,” includes more than 150 species found in tropical and subtropical regions across the world. Among them, *Ocimum kilimandscharium* Guerke—popularly known as Kapoor Tulsi or Camphor Basil—is an aromatic plant widely cultivated in southern India. It is well known for its strong camphor-like fragrance and significant medicinal properties..*

**Keywords:** *Ocimum* genus; Kapoor Tulsi; Camphor Basil; Essential oils; Camphor

## I. INTRODUCTION

Man relied on the healing properties of medicative plants, before the introduction of chemical medicines. Medicative plants, the “back bone” of ancient medication which implies over 3.3 billion folks within the less developed countries utilize medicative plants on an everyday basis. An herb could be a plant or plant structure valued for its medicative, aromatic or savoury qualities. Flavourer plants turn out and contain a spread of chemical substances that impact the body. Flavourer preparations known as “phytopharmaceuticals”, “phytomedicinal” or “phytomedicine”, square measure preparations made up of completely different components of herbs or plants. They are available in several formulations and dose forms together with tablets, capsules, elixirs, powder, tincture, cream and parenteral preparations. The World Health Organization (WHO) defines traditional medicine as: The health practices approaches, knowledge and beliefs incorporating plant, animal and mineral based medicines, spiritual therapies, manual techniques and exercises, applied singularly or in combination to treat, diagnose and prevent illnesses or maintain well-being. *Ocimum* genus includes more than 150 species which are distributed in the tropical and subtropical regions of the world and from sea level up to 6000 feet. *Ocimum sanctum* L. (Tulsi), *Ocimum gratissium* (Ram Tulsi), *Ocimum canum* (Dulal Tulsi), *Ocimum basilicum* (Ban Tulsi), *Ocimum kilimandscharium* Guerke (Kapoor Tulsi), *Ocimum Americanum*, *Ocimum camphora* and *Ocimum micranthum* are examples of known important species of genus *Ocimum* which grow in different parts of the world and are known to have medicinal properties. *Ocimum kilimandscharium* Guerke, known as ‘Kapoori Tulsi’ in Hindi and ‘Camphor Basil’ in English, is an exotic plant mainly cultivated in south India, both in plains and hilly areas. This plant attracted attention as a source of camphor. This species has a strong but less pleasant flavour. It is an aromatic under shrub with pubescent quadrangular branchlets. This plant is easily recognized by its shrubby habit,



growing up to eight feet tall . The plant kingdom includes Lamiaceae (Labiatae) family, which is also known as the Mint Family comprising of 236 genus including Ocimum, well-known as Basil .

## BOTANICAL DESCRIPTION

### Macroscopical characteristics:

Due to much higher polymorphism and cross pollination in the Ocimum genus, various types of species along with subspecies and varieties make the difficulty in maintaining appropriate botanical nomenclature. Although, some scientists have divided the Ocimum genus into two major species group i.e., Basilicum and Sanctum. Basilicum group is characterized by petiolate bracts, conspicuous flower and black and ellipsoidal seeds, which become mucilaginous in water. The Sanctum group is characterized by sessile bracts, less conspicuous flower, brownish and ellipsoidal to globose seeds, which do not become mucilaginous in water<sup>40</sup>. The morphological, chemical and genetic variability studies among

the different species of consider *O. kilimandscharicum* as a variant species of basilicum. The morphology, quantification of size and weight of plant and plant parts through principal component analysis among the various species of *Ocimum* showed clear and unambiguous identification of *O. kilimandscharicum* as tall plant, large grey-green inflorescence with camphor's smell . It is an aromatic and perennial under shrub with erect branchlet and can attain maximum height of 2 meters. The morphological characteristics of different parts of plant reported by various researchers.

### Taxonomic classification:

<b>Kingdom</b>	Plantae – Plants
<b>Subkingdom</b>	Tracheobionta – Vascular plants
<b>Division</b>	Magnoliophyta – Flowering plants
<b>Class</b>	Magnoliopsida – Dicotyledons
<b>Order</b>	Lamiales
<b>Family</b>	Lamiaceae – Mint family
<b>Genus</b>	Ocimum L. – basil

**Table 1:** Taxonomical classification

### Common Names:

<b>Sanskrit</b>	Kapura Tulasi
<b>English</b>	African Basil, Camphor Basil, Camphor-Scented Basil, Perennial Basil, Fever plant
<b>German</b>	Kampfer basilikum
<b>Hindi</b>	Kapur Tulsi, Kapuri Tulsi
<b>French</b>	Basilic Camphré, Basilic Camphre, Basilic Du Mont Kilimanjaro
<b>Portuguese</b>	Basilicão-Canforado, Basilicão-Canforado (Brazil)
<b>Russian</b>	Bazilik Kamformnyi





**Figure 1: *Ocimum kilimandscharium***

**Leaves:**

Leaves are simple, dorsiventral, petiolate, oppositely decussate arranged, elliptic, ovate or lanceolate shaped, acute to cuneate base, acute apex, serrate or deeply serrated margin, green to pale green colour, strong, pungent, aromatic or camphoraceous odour with slight bitter taste. The presence of fascicular young leaves is also reported which may be mystified with stipules at the base. Size of leaf varies from 1.5 - 6cm long and 1 - 3 cm broad while petiole is 0.4 – 1cm long. The presence of indumentums over leaf and petiole makes the surface glandular, pubescent or hairy .

**Stem:**

The new stem is green which becomes woody in nature and acquire brownish colour. The presence of white coloured ant rose glandular hairs with numerous sessile glands is common in newly formed stem. The loss of hairs starts from the base as it starts converting into woody stem. The peeling of epidermal layer makes the bark shredded. It is round to quadrangular shaped, highly branched which becomes denser on inflorescence axis .

**Inflorescence:**

The inflorescence is vertical, racemose, greenish-grey colour, composed of 4-6 flowered whorls are attached at 2-15mm apart. The size of the inflorescence axis or spike varies from 14-30cm long .

**Bracts:**

Bracts are ovate shaped, curved (like making a comma), entire margin, acuminate apex, attenuate base, cuspidate apex, covered with hairs, length 2-3.5mm and width 1-2 mm in size.

**Flowers:**

Small and dense flowers with pedicel of 2-3mm long present in hairy spike are attached in a manner showing the reduction in distance of the flower whorl towards the apex .

**Calyx:**

The calyx is downward pointing, campanulate shaped, 2-5mm long during anthesis, 3–6mm long during fruiting and bilipped. The posterior lip is broad, rounded, accrescent, with decurrent base, mucronate reflexed apex and numerous sessile glands near pedicel. The anterior lip is four toothed with open throat. The two median teeth are lanceolate,



acuminate apex, curved upwards and size similar to posterior lip. The two lateral lips are cuspidate, shorter and have deltoid teeth. Throat base have much denser ring of villose hairs than posterior lip .

**Corolla:**

White to light purple colour, funnel shaped, 7-9.5mm long (including tube) and bi-lipped. The upper or posterior lip is truncated shaped and tetra-fid. The two medians apparently joined lobes are ovate oblong and slightly longer than two lateral lobes which are broader. The lower or anterior lip is elliptic oblong and comparatively whiter than the upper lip. The lobes are pubescent dorsally .

**Stamens:**

Total of four stamens are present in two pairs, posterior, exerted, declinate, 3-5 mm long with the presence of transverse hairy projections near the base. Anther cells are confluent while filaments are free .

**Pistil:**

Ovaries are glabrous. Style is thin and bifid.

**Seed:**

Seeds of size 1-1.3 mm in diameter are black coloured, pitted with ridge and scanty mucilage layer.

**Fruits:**

Fruits are like nutlets of brownish black colour, smooth, ovoid- oblong shaped, minutely tuberculate and produce mucilage when soaked in water .

**Geographical distribution:**

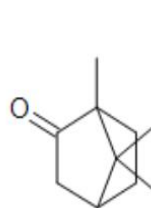
*Ocimum kilimandscharicum* Guerke (Syn. *Ocimum camphora* Guerke) belongs to family Lamiaceae. It is a native of Kenya and distributed in East Africa, India, Thailand, Uganda and Tanzania. It is extensively grown in the Tropics. In India it is cultivated on a small scale especially in West Bengal, Assam, Tamil Nadu, Karnataka, Kerala and Dehradun. Commonly the plant is called as camphor Basil, African blue basil and in Ayurveda as Karpura Tulasi .

**Chemical constituents:**

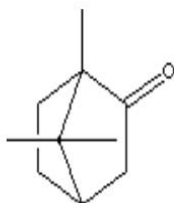
Seed oil of *Ocimum kilimandscharicum* contains  $\alpha$  – pinene (1.23%), camphene (7.32%),  $\beta$  – myrcene (1.58%), ethyl amyl carbinol ( 0.88%), 1 – phellandrene( 0.26%),  $\alpha$  – terpinene (0.33%), p – cymene (0.62%), dl – limonene(13.56%), 1,8 – cineole (0.85%),  $\beta$  – ocimene (2.00%),  $\gamma$  – terpinene (0.88%), trans-sabinene hydrate (0.49%),  $\alpha$  – terpinolene (1.33%), linalool (1.70%), cis – sabinene hydrate (0.47%), camphor (56.07%), 4 – terpineol (3.50%), myrtenol (1.24%), trans – caryophyllene (0.33%), germacrene-d(0.43%) . The essential oil of aerial parts of *Ocimum kilimandscharicum* contains  $\alpha$ -pinene(1.23%), camphene(7.32%),  $\beta$ myrcene(1.58%),  $\alpha$ -phellandrene (0.26%),  $\alpha$ -terpinene( 0.33%), p-cymene( 0.62%), DL-limonene (13.56%), 1,8-cineole (0.85%),  $\beta$ -ocimene (2.00%) $\gamma$ -terpinene (0.88%), cis-sabinene hydrate (0.47%),  $\alpha$ -terpinolene (1.33%), trans-sabinene hydrate (0.49%), linalool (1.70%), camphor (56.07%), terpinen-4-ol (3.50%), myrtenol (1.24%), trans-caryophyllene (0.33%), germacrene D (0.43%) as their constituents. Aqueous extract of leaves of *Ocimum kilimandscharicum* contains camphor, 1, 8-cineole, limonene, Trans caryophyllene, camphene, 4-terpeneol, myrtenol,  $\alpha$ -terpineol, endo-borneol, linalool. Leaves also contain flavonoids, tannins, saponins, sterols, carbohydrates, proteins and triterpenoids .

These chemical constituents are mainly responsible for various biological activities.

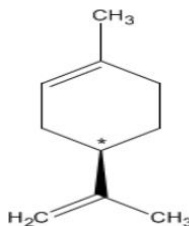




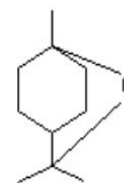
**Camphor**



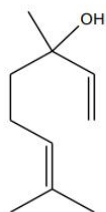
**Camphene**



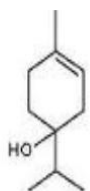
**1, 8-Cineole**



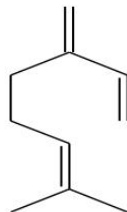
**Limonene**



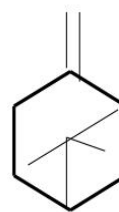
**Linalool**



**Terpine-4-ol**



**Myrcene**



**$\beta$ -pinene**



**$\alpha$ -pinene**

### Pharmacological activities:

The traditional medicinal uses of the plant have attracted the scientists across the globe to confirm the claims by performing various pharmacological activities over the different part or metabolite of the plant. The pharmacological activities like antioxidant, anticancer have been shown significant potential in various species of *Ocimum*. The foremost pharmacological experimentation over the kilimandscharicum species is insecticidal, insect repellent or mosquito repellent activity whose detailed study involving the parts of plant. The other pharmacological activities like anti-diarrhoeal, antimicrobial, antioxidant, wound healing, anticancer, immunomodulatory, toxic and irritant potential, antimalarial, neurological and polycystic inhibition activities are also summarized below. The experimental data, so established will help in the development of formulations by establishing its quality, safety and efficacy parameters .

#### 1. Anti-Diarrhoeal Activity

The aqueous extract exhibited notable anti-diarrhoeal activity in rats induced with diarrhoea using castor oil. The findings suggest that the extract helps in reducing both the frequency and severity of diarrheal episodes, possibly by regulating intestinal movement and fluid secretion .

#### 2. Anti-Bacterial Activity

The essential oil showed strong antibacterial activity against a wide range of bacterial strains including *Bacillus* sacharolyticus, *B. stearothermophilus*, *B. subtilis*, *B. thuringiensis*, *Enterococcus faecalis*, *E. faecium*, *Lactobacillus casei*, *L. plantarum*, *Listeria monocytogenes*, *L. ivanovii*, *Micrococcus glutamicus*, *Sarcina lutea*, *Staphylococcus aureus*, *S. epidermidis*, *Streptococcus mutans*, *S. pyogenes*, and *S. viridis*, as determined by the disc diffusion method . Among the essential oil metabolites, eugenol and cadinol demonstrated significant inhibitory effects against MDR and MRSA strains of *Staphylococcus aureus*. The aqueous extract also exhibited antibacterial activity against *Bacillus cereus* using the same method .



### **3. Antifungal Activity**

The essential oil possessed remarkable antifungal properties against several fungal species such as *Alternaria* sp., *Aspergillus niger*, *A. parasiticus*, *Choanephoracuratum butarum*, *Histoplasma capsulatum*, *Microsporium gypseum*, and *Rhizoctonia solani*. The antifungal effect was confirmed through the disc diffusion method .

### **4. Antioxidant Activity**

The methanolic extract displayed potent antioxidant activity as evaluated through DPPH radical scavenging; FRAP assay, superoxide anion scavenging, and  $\beta$ -carotene–linoleic acid bleaching methods. The ethyl acetate fraction of the methanolic extract also showed strong antioxidant potential in both DPPH and FRAP assays. Furthermore, the defatted hydromethanolic extract and essential oil demonstrated effective antioxidant activity when tested by the FRAP assay .

### **5. Wound Healing Activity**

Both alcoholic and aqueous extracts were assessed for their wound healing potential using incision, excision, and dead-space wound models in Wistar rats. The results revealed significant enhancement in wound contraction and tissue regeneration, confirming their effectiveness in promoting wound healing .

### **6. Anti-Cancer Activity**

The hydro-alcoholic extract exhibited promising anti-cancer potential when tested in mice exposed to gamma radiation. The treatment showed protective effects against radiation-induced damage, suggesting the extract's possible role in cancer prevention and therapy .

### **7. Immunomodulatory Activity**

The methanolic and aqueous extracts exhibited notable immunomodulatory potential. Both extracts were found to inhibit HIV-1 reverse transcriptase (RT) and Moloney murine leukemia virus reverse transcriptase (MMLV-RT), indicating their possible role in modulating immune response and showing promise as antiviral agents .

### **8. Toxic and Irritant Activity**

The essential oil was evaluated for its potential toxic and irritant effects. Tests involving immobilization of protozoa and topical application on rabbit skin were conducted to determine its safety profile. The findings helped assess the dermal tolerance and potential irritant nature of the essential oil .

### **9. Antimalarial Activity**

The dichloromethane extract demonstrated significant antimalarial activity, which was confirmed using the SYBR Green I fluorescence assay. The results suggested that the extract possesses inhibitory effects on malarial parasites, highlighting its potential as a natural source for antimalarial compounds .

## **II. CONCLUSION**

The present manuscript describing the plant attribute will help the researchers, reviewers, scholars and the common man to understand the concepts involved in the study of medicinal plant. The ethnomedicinal use along with proven facts had helped in development of exclusive products. Further investigations are required for the isolation of the phytoconstituents responsible for pharmacological activities which may help in the development of novel molecules for the treatment of diseases. Apart from medicine, the current knowledge in vast domain has also asserted its potential and utility for commercial purposes in different industries will surely amplify the economy.

This research gives an idea that the compound of the plant *Ocimum kilimandscharicum* can be used as lead compounds for designing potent drugs which can be used for treatment of various diseases such as cancer, neurological disorder, aging and other disorders. However, these studies are not sufficient to claim and hence various other pharmacological,



phytochemical and bio analytical studies followed by observational studies in humans are to be carried out in order to support the traditional importance of the stated activities.

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