

REVIEW ARTICLE

OCIMUM KILIMANDSCHARICUM : A SYSTEMATIC REVIEW

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ABSTRACT:

The medicinal plants are widely used by the traditional medical practitioners for curing various diseases in their day to day practice. The genus *Ocimum* belongs to the family Labiatae and one of the most popular culinary herb known for its medicinal properties. It includes at least 150 species and numerous cultivars. *Ocimum kilimandscharicum* Guerke is an aromatic under shrub with pubescent quadrangular branchlets. The leaves of *Ocimum kilimandscharicum* Guerke are acrid, thermogenic, aromatic, anti-bacterial, insecticidal, antiviral, appetizing, ophthalmic and deodorant. This review summarizes the most interesting studies on the various pharmacognosy and pharmacological works done on the *Ocimum kilimandscharicum* Guerke.

Keywords: *Ocimum* species, Kapoor Tulsi, Pharmacognostic study, Phytochemical study, Pharmacological activity.

INTRODUCTION:

Plants are one of the most important sources of medicines. The large numbers of drugs are derived today from plants, like morphine from *Papaver somniferum*, ashwagandha from *Withania somnifera*, ephedrine from *Ephedra vulgaris*, atropine from *Atropa belladonna*, reserpine from *Roulphia serpentina* etc. The medicinal plants are considered to be very rich sources of secondary metabolites (which are potential sources of drugs) and essential oils which are of therapeutic importance. The important advantages claimed for therapeutic uses of medicinal plants in various ailments are their safety besides being expensive, efficacy and their easy availability throughout the world^{1,2,3}. Because of these advantages the medicinal plants have been widely used by the traditional medical practitioners in their day to day practice.

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.

According to a survey of World Health Organization (WHO), the practitioners of traditional system of medicine treat about 80% of patients in India, 85% in Burma and 90% in Bangladesh^{4,5}. In traditional systems of medicine the Indian medicinal plants have been used in successful management of various disease conditions like bronchial asthma, chronic fever, cold, cough, malaria, dysentery, convulsions, diabetes, diarrhoea, arthritis, emetic syndrome, skin diseases, insect bite etc. and in treatment of gastric, hepatic, cardiovascular & immunological disorders^{1,4,6,7,8,9}

Ocimum genus includes more than 150 species which are distributed in the tropical and subtropical regions of the world and from sea level upto 6000 feet. *Ocimum*

sanctum L. (Tulsi), *Ocimum gratissimum* (Ram Tulsi), *Ocimum canum* (Dulal Tulsi), *Ocimum basilicum* (Ban Tulsi), *Ocimum kilimandscharicum* Guerke (Kapoor Tulsi), *Ocimum ammericanum*, *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 properties¹⁰.

Ocimum kilimandscharicum Guerke, known as 'Kapoor 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 flavor. It is an aromatic under shrub with pubescent quadrangular branchlets. This plant is easily recognized by its shrubby habit, growing up to eight feet tall¹¹.



Figure 1: *Ocimum kilimandscharicum*

COMMON NAMES:

Sanskrit: Kapura Tulasi¹². **English:** African Basil, Camphor Basil, Camphor-Scented Basil, Hoary Basil, Kilimanjaro Basil, Perennial Basil, Fever plant. **German:** Kamferbasilikum **Hindi:** Kapur Tulsi, Kapuri Tulsi.

French: Basilic Camphré, Basilic Camphre, Basilic Du Mont Kilimanjaro
Portuguese: Basilicão-Canforado, Basilicão-Canforado (Brazil)
Russian: Bazilik

Kamfornyi. **Thai:** Ka Phrao India (Prachin Buri), Ka Phrao Khaek (Bangkok)¹³.

TAXONOMY HIERARCHY:

Kingdom	Plantae – Plants
Subkingdom	Tracheobionta – Vascular plants
Super division	Spermatophyta – Seed plants
Division	Magnoliophyta – Flowering plants
Class	Magnoliopsida – Dicotyledons
Subclass	Asteridae
Order	Lamiales
Family	Lamiaceae – Mint family
Genus	<i>Ocimum L. – basil</i>
Species	<i>Ocimum kilimandscharicum</i> Guerke – hoary basil ¹⁴

GEOGRAPHICAL DISTRIBUTION:

Ocimum kilimandscharicum Guerke is a native of Kenya (East Africa)¹⁵. Its occurrence has been reported in Rwanda¹⁶, Athens¹⁷, Nigeria, Sudan¹⁸ Ghana & India. In India it is being cultivated in U.P, West Bengal, Dehradun, Maharashtra, Mysore, Kerala, Jammu and Darjeeling^{19,20}.

AGRONOMICAL STUDIES:

Ocimum kilimandscharicum Guerke can be propagated by seeds and cuttings.

1. Establishing an *Ocimum kilimandscharicum* Guerke seedbed nursery

Seedlings are raised in seedbeds which are prepared by using specific equipment that depends on the land characteristics. Seedbeds can be prepared in nurseries at farmer and the nursery should be prepared by observing hygienic and careful seedling production that involves seed selection, site selection, and tillage and seed propagation.

a) Seed selection and preparation

Ocimum kilimandscharicum Guerke seeds are collected from mature plants. The seed is prepared hygienically by drying under shade, threshing, winnowing and storing.

b) Site selection

The site selected for raising a nursery should be free from contamination, too much manure and convenient enough to minimise any possible damage to the seeds or seedlings and can be easily accessed.

c) Land preparation

The seedbed should be firm and smooth and prepared properly to produce a suitable medium for seedling germination, establishment and growth.

The land is prepared in two successive stages that are primary and secondary tillage.

i. Primary tillage

This is undertaken to break-up the soil compaction, loosen the size of the soil clods and invert plant residues to decompose them. The soil moisture should be sufficient

enough so that it crumbles when worked by farm implements. The selected site should be cleared to free the land from previous crops and other vegetation. Size of the nursery required on the land should be marked out first then using hoes as tillage implements; the marked land is prepared by digging and cross digging. The land should be free for a few days to allow the waste vegetation to rot.

ii. Secondary tillage

This is done to remove all kinds of waste materials on the tilled land, level it properly and prepare beds for plant propagation. By using forked hoes as tillage implements, the tilled land should be prepared by cross digging to remove all wastes. Seedbeds are raised and constructed measuring 1000 mm wide and of any convenient length; the implements are used to establish smoothness on the seedbeds land. Before sowing, the soils are improved by incorporating compost manure with the top layer of the soil.

Sowing the *Ocimum kilimandscharicum* Guerke seeds in the seedbed

The seeds of *Ocimum kilimandscharicum* Guerke cannot be sown directly to the soil because of its size so dry clean seeds are mixed with dry powdered soil and using the edge of a board or the back of a rake, make shallow furrows or drills or 'valleys' in the seedbed at a spacing of 150 mm. Sow the mixed seeds uniformly in the drills and do not cover with soil after sowing.

d) Sowing the *Ocimum kilimandscharicum* Guerke seeds in the seedbed

The seeds of *Ocimum kilimandscharicum* Guerke cannot be sown directly to the soil because of its size so dry clean seeds are mixed with dry powdered soil and using the edge of a board or the back of a rake, make shallow furrows or drills or 'valleys' in the seedbed at a spacing of 150 mm. Sow the mixed seeds uniformly in the drills and do not cover with soil after sowing.

After sowing the seeds, the soil is covered with dry mulch using either grass or soft banana leaves. The cover ensures protection from birds and direct sunlight, and also improves germination and growth. Germination is noticed

after 7-10 days and after a few days, removes the mulch cover and construct a shade over the seedbed.

e) Seedbed management Protection

❖ Watering

For *Ocimum kilimandscharicum* Guerke germination and growth sufficient water is required. Water should be applied by fine sprinkling of water in the early evening for the first one week and from the second week onwards, water should be applied for 3 days per week. Watering during sunlight should be avoided.

❖ Aftercare

Germinating seedlings should not be mistaken with weeds so weeding hand should be done by hand regularly. Weeds are removed using a knife by cutting just below the ground level that appear in the seedbed.

❖ Drainage

The pathways between seedbeds should be slightly sloped to ensure good drainage of water. The slope ensures that water logging does not occur in and around the beds.

f) Transplanting *Ocimum kilimandscharicum* Guerke seedlings

Once the seeds have germinated, the plant grows rapidly above the ground after 2 months and is ready for transplanting after 5-7 weeks in the seedbed. The land where the plants will be transplanted should be well prepared and free of waste materials. The seedlings are removed from the seedbed and moved to the transplanting site where they are kept in a shade for a day. Transplanting should be done when it is not too sunny, preferably in the evening and after transplanting, the maturation period of the plant is 4-6 months before the first harvest commences¹⁹.

2. Growth and development of *Ocimum kilimandscharicum* Guerke plant

- *Ocimum kilimandscharicum* Guerke requires minimal care and pesticide control. Minimal clean manure should be applied. Records of any pre and post manure applications on the plots should be kept and a calendar of any manure applications prepared to ascertain consistency and yields changes. Once mature, it thrives as a perennial, and can be harvested 3 times in a year for more than 3 years.

TABLE I: MANURE AND NUTRIENT REQUIREMENTS INCLUDING TIME AND METHOD OF APPLICATION¹¹

Fertilizer	FYM	Nitrogen	Phosphate	Potash
Amounts/acre	4t	60 kg	32 kg	32 kg
Applications	All basal	¼ basal	All basal	All basal

The remaining Nitrogen is applied in three split doses by broadcast method after each of the three cuttings. Diseases, insect pests, nematodes, physiological disorders, if any and their control measures: Incidence of attack by seasonal mealy bugs and leaf rollers has been reported. The insects can be controlled by spraying 0.2% Malathion, or 10g of Asataf per 10L of water.

3. Harvest, post-harvest handling and processing of a) *Ocimum kilimandscharicum* Guerke plant leaves

During harvesting, the plants are cut 50 - 75 mm above the ground and collected in heaps where the leaves are plucked and air-dried under shade²¹. Harvesting should be undertaken very early in the morning before sunrise to minimize wilting of leaves and loss of oil from volatilisation when it is hot. After 5 years, the shrub can be cut off and the farm replanted but the experience shows that too much manure results in good leaf harvests with low content of oil. The yield of wet and dry leaves of *Ocimum kilimandscharicum* Guerke depends on the agronomic, soil, environmental and post harvest handling factors. It is concluded from literature that yields of cultivated *Ocimum kilimandscharicum* Guerke dry leaves range between 2,200 - 5,500 Kg per hectare per annum²¹. Oil from the plant leaves is extracted using steam hydro distillation method.

AYURVEDIC PROPERTIES :

- Rasa : Tikta, Katu

- Guna : Lakhu, Rooksha, Teekshna
- Virya : Ushna
- Vipaka : Katu²²

PHARMACOGNOSTIC STUDY:

Organoleptic Study:

Ocimum kilimandscharicum Guerke - Perennial herbs up to 1m tall.

Leaves: Green colour, odor aromatic, taste slightly bitter, Simple, elliptic-ovate (25-40 & 10-20mm) decussate, 3-4cm long, 8-1.2 cm broad¹¹, apex obtuse or acute, based obtuse or cuneate, margin serrate, pubescent with white hairs on both sides, much denser and longer on veins beneath, veins grooved above raised beneath; petiole 10-20mm long, hirsute with white long spreading hairs. Shown in figure 2.

Stem: Round-quadrangular, hirsute with sessile glands; indumentums of white long spreading hairs, becoming denser on inflorescence axis.

Inflorescence: Dense, verticils 2-10mm apart ; bracts ovate 3-3.5 x 2-2.5 mm, apex acuminate, base attenuate, margin serrate with long white hairs; pedicel 2-3mm long in fruit± the same length as calyx ; hirsute with white long hairs. Shown in figure 3.

Calyx: 2-3.5mm long at anthesis, 3-4.5 mm long in fruit: posterior lip rounded pubescent inside, glabrous on back with yellow sessile glands confined at base near pedicel; anterior lip with 2 median lanceolate teeth curved upwards, longer than the 2 lateral teeth, more or less equal to posterior, throat open, tube pubescent outside with or without sessile glands, with a ring of hairs at throat inside.



Figure 2: Leaves of *Ocimum kilimandscharicum* Guerke

Corolla: White with purple tinted, 3-4mm long, lobes pubescent on back ; posterior lip with 2 ovate- oblong median lobes slightly larger than the 2 lateral lobes ; anterior lip oblong ; tube glabrous both sides.

Stamens: Posterior pair having a transverse hairy process near base.

Nutlet: Black ovoid, smooth or minutely tuberculate, producing mucilage when wet²³.

b) Histological Study:

➤ *Transverse section:*

Leaf shows isobilateral lamina covered with cuticle; glandular trichomes with multicellular head and multi cellular warty covering trichomes. Mid rib with arc shaped vascular bundle consisting of xylem and phloem. Three to four layers of collenchymatous tissue present on upper side of vascular bundle¹¹. Given in figure 3:

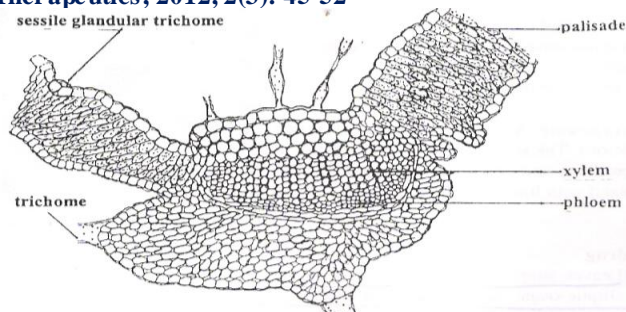


Figure 3: Transverse section of Leaf of *Ocimum kilimandscharicum* Guerke

➤ *Powder microscopy:*

Greenish; microscopy shows multicellular and warty covering trichomes, diacytic stomata, sessile glandular trichomes and vessels with spiral thickenings and fragment of lamina¹¹.

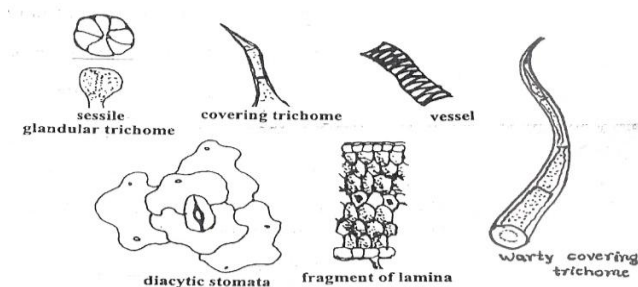


Figure 4: Powder microscopy of *Ocimum kilimandscharicum* Guerke

CHEMICAL CONSTITUENTS:

Ocimum kilimandscharicum Guerke is characterized by presence of high amount of camphor in essential oil⁴. It is pale yellow in color and its content varies in different samples from 61 to 80.5%. Leaves contain the maximum amount of camphor and oil followed by flowers; stems contain only minute quantities. It contains d-camphor, d- α -pinene, d- limonene, terpinolene and unidentified sesquiterpenes and sesquiterpenes of alcohols.

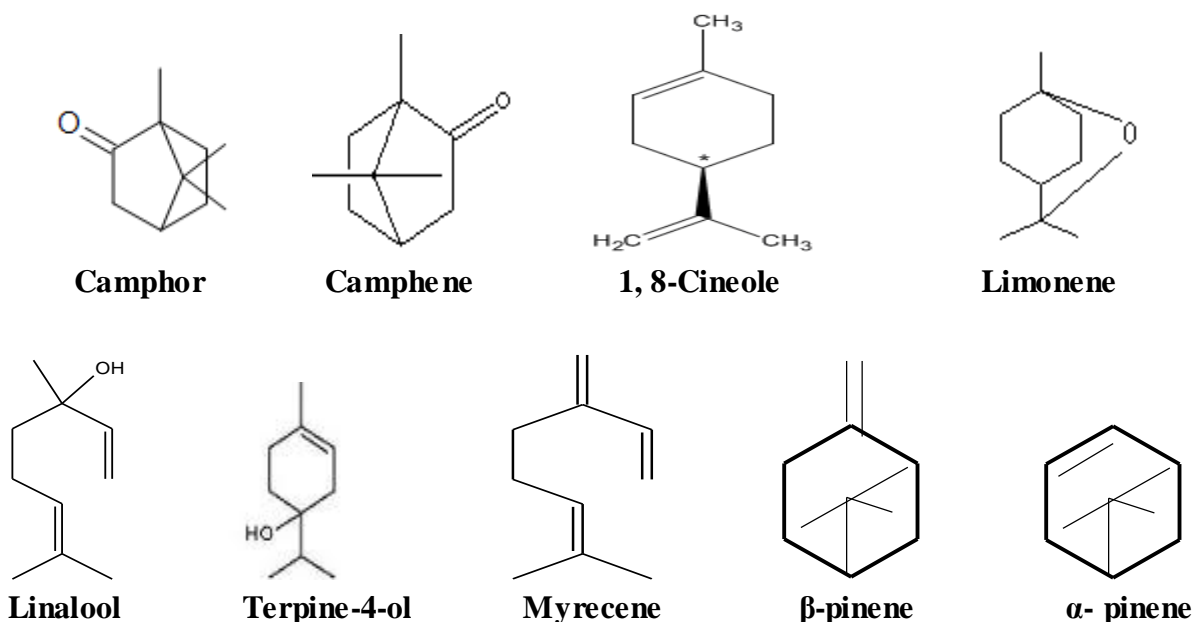


Figure 5: Structures of Chemical constituents of *Ocimum kilimandscharicum* Guerke

Table 2: Yields and Characteristics Of Essential Oils Grown In Different Localities In India²⁰.

	Partly decamphorized by chilling			Total distillate			
	Kanpur	Trivandrum	Jammu	Bangalore	Sukna	Mahatpur	Mysore
Yield% (dried mat.)	3.0 – 4.8	3.8	2.27	3.3	4.00-5.46	2.56 – 3.17	1.1-2.2
Sp. gr.	0.9209 (at 20°)	0.9387 (at 30°)	0.90004 (at 30°)	0.9680 (at 30°)	0.923 (at 33°)	0.9215 (at 29.5°)	0.9436 (at 90°/90°)
Acid val.	1.22	3.7	1.2	....	1.12	1.16	0.55
Ester val.	12.65	...	...	...	6.9	11.3	...
Ester val. After acetylation	75.7	...	...	...	...	...	...
Ketones (as camphor), %	39.47 (52-60)†	39.33 (62.13)†	40.5 (70.5)†	70	80.50	61.66	...
Phenols (as eugenol)	Nil	...	1.66	Nil	...	...	14

† Figures within brackets indicate camphor content of the total distillate

Analysis of Essential Oil: Analysis of the essential oil of *Ocimum kilimandscharicum* Guerke was done by Charles and Simon. Seventeen constituents were identified in the oils obtained from leaves and flowers, the compositions

of which were quite similar with linalool as the major constituent. This study demonstrated the occurrence of a linalool- camphor type of *Ocimum kilimandscharicum* Guerke¹⁸, composition of constituents given in Table III.

Table 3: The Constituents Of Essential Oil From Leaves And Flowers Of *Ocimum Kilimandscharicum* Guerke²⁴:

Peak no.	Constituents ▲	Percentage composition of leaves †	Percentage composition of flowers †
1	α-pinene	0.64 ± 0.11	0.33±0.05
2	Camphene	1.59±0.23	1.32±0.10
3	β-pinene	3.83±0.48	1.23±0.18
4	Myrcene	0.12±0.01	-
5	1,8-cineole	10.18±0.83	6.38±0.62
6	Limonene	5.09±0.41	3.21±0.30
7	Linalool	41.94±3.39	58.85±5.99
8	Camphor	17.02±1.33	15.82±2.29
9	Terpinen-4-ol	1.14±0.28	0.55±0.17
10	α-terpineol	0.84±0.18	0.48±0.06
11	Bornyl acetate	0.62±0.06	0.18±0.07
12	Eugenol	0.28±0.05	-
13	β-caryophyllene	1.34±0.14	1.75±1.63
14	α-humulene	0.26±0.16	0.36±0.47
15	γ-murolene	2.67±0.21	4.26±3.11
16	Germacrene B	1.42±0.24	1.24±0.61
17	Epi-α-cadinol	1.78±0.73	1.28±0.73

▲- Compounds listed in order of elution
 †- Values represent mean a standard deviation.

Analysis of the Seeds: Analysis of the seeds (dry) of *Ocimum kilimandscharicum* Guerke gave the following values:

Table 4: Analytical Value Of The Seeds Of *Ocimum Kilimandscharicum* Guerke

	Moisture	Crude protein	Carbohydrates	Ether extract	Crude fiber	Ash
Yield %	6.4	18.8	23.8	17.4	27.0	6.5

Analysis of the Seed Oil²⁰: The seed oil (yield 12.5%) is pale yellow and has the following characteristics:

Table 5: Characteristics of Seed Oil Of *Ocimum Kilimandscharicum* Guerke

Yield	colour	n ₂₅	Iodine Value	Saponification Value	Free fatty acid (as oleic)	Unsaponification Matter
12.5%	Pale yellow	1.4852	192.6	292.0	1.2%	0.4%

The component fatty acids of the oil are: palmitic, 8.2; arachidic, 5.3; oleic, 5.3; linoleic, 12.5; octadecdienoic (conjugated), 3.7; linolenic, 64.5; and octadecatrienoic, 0.5%. For use in paints, the seed oil is superior to linseed oil: the film obtained is hard with a bright finish¹⁸. The residual oil, after the removal of camphor, suspended impurities and moistures, was an orange coloured liquid with camphoraceous odor and possessed the physicochemical constants given in the Table VI²⁵:

Table 6: Physicochemical Constant Of Residual Oil

1.	Specific gravity at 34°C	0.9190
2.	$[\alpha]_D^{28}$ in 10% sol. of alcohol (95%)	+34.7°
3.	Refractive index at 34°C	1.4734
4.	Acid value	2.19
5.	Saponification Value	17.02
6.	Saponification Value after acetylation	45.06

ETHNOBOTANICAL USES:

1. Pesticidal activity- Some local farmers also commonly mix stored foodstuff with dry leaves of *Ocimum* plant for protection against pests^{26,27}.

2. Central nervous system activity- Ethnobotanical data base showed that *Ocimum kilimandscharicum* Guerke. has various CNS activities like: neurotoxic, antineuralgic, CNS stimulant, tranquilizer, anti-alzheimerian, sedative²⁸.

3. Other activities –

(a) The leaves of *Ocimum kilimandscharicum* Guerke have traditionally been used in East Africa for the treatment of various ailments including cold & cough, abdominal pains, measles and diarrhoea²⁸.

(b) *Ocimum kilimandscharicum* Guerke also have following activities against various organisms i.e. fungicide, antibacterial, insectifuge, insecticide, irritant, nematocidal, antifeedant and herbicide²⁸.

(c) The oil of *Ocimum kilimandscharicum* Guerke also possesses antibacterial and antifungal properties²⁰.

(d) The leaves of *Ocimum kilimandscharicum* Guerke are acrid, thermogenic, aromatic, insecticidal, antiviral, appetizing, ophthalmic and deodorant. It is useful in cough, bronchitis, foul ulcers and wounds, ophthalmopathy and vitiated conditions of 'vata'^{7,9,20,29}.

(e) Ethnobotanical data base showed that *Ocimum kilimandscharicum* Guerke has various other activities like: analgesic, antiviral, antiseptic, anti-oxidant, allergenic, anti tumor and spasmogenic²⁸.

PHARMACOLOGICAL ACTIVITY:

c) Anti-malarial :

- The use of plant extracts as repellents against malaria vectors have been avocated in different studies. The feeding inhibition of four years old *Ocimum kilimandscharicum* Guerke (OK) in liquid paraffin or glycerin was compared with N,N-diethyl-3-methylbenzamide (DEET) using cage evaluation method. The four years old extracts of *Ocimum kilimandscharicum* Guerke performed similarly when mixed either in glycerine or liquid paraffin. Blood feeding

succession was highest in negative control (glycerine / liquid paraffin alone) while low in OK and DEET. Therefore, promotion of plant extracts for commercialization is of priority in rural Tanzania where whole plants are currently used as repellents against malaria vector³⁰.

- Leaves and seeds of *Ocimum kilimandscharicum* Guerke were tested by thermal expulsion from modified traditional stoves showed significant repellency against *Anopheles gambiae* lato Giles (Diptera: Culicidae) 81.5% *Anopheles arabiensis* Patton and 18.5%. A latin square design was applied for randomly assigning the treatment and control plants to experimental houses over different nights³¹.
- Evaluations under field conditions confirmed high protective efficacy, enhanced feeding inhibition and house entry inhibition (Deterrence). Protection efficiency for *Culex quinquefasciatus* was 90.50%. This study shows the potential of crude extracts and whole plants of *Ocimum kilimandscharicum* Guerke for use in protecting against human biting while the burning of plants reduces significantly the indoor resting mosquitoes³².

d) Insecticidal :

The bioactivity of materials from the leaves of *Ocimum kilimandscharicum* Guerke was tested against *Rhyzopertha dominica* (Fabricius) (Coleoptera: Bostrichidae), *Sitophilus zeamais* Motschulsky (Coleoptera: Curculionidae), *Sitotroga cerealella* (Olivier) (Lepidoptera: Gelechiidae) in maize and sorghum grains in the laboratory. Exposure of adults of the three insect species to dried ground leaves and essential oil extract of *Ocimum kilimandscharicum* Guerke induced 100% mortality after 48h. All the plant materials were repellent to *Sitophilus zeamais* with the essential oil extract applied at 0.3g/250g of grain evoking the highest repellent action³³.

e) Antioxidant Property :

Methanol extract of leaves of *Ocimum kilimandscharicum* Guerke exhibited activity in all the in vitro antioxidant assays but it was not as potent as butylated hydroxyl anisole (BHA). The phytochemicals found in extract are rich antioxidants and these extracts can be used as an effective preservative in food industry³⁴.

✦ Antimicrobial Activity :

Essential oil from aerial parts of *Ocimum kilimandscharicum* Guerke shows antimicrobial activity against Gram +ve bacteria (*Staphylococcus aureus*, *Enterococcus faecalis*), Gram –ve bacteria (*Escherichia coli*, *Pseudomonas aeruginosa*) and also against yeast *Candida albicans*³⁵.

✦ Wound Healing activity :

Aqueous extract of leaves shows wound healing activity at two different doses (200 and 400mg/kg) in three types of wound models on rats: the excision, incision and dead space wound model. Significant increase in skin breaking strength, granuloma breaking strength, wound contraction, dry granuloma weight and decreased in epithelization period was observed. Biochemical

parameters obtained from histological examination of granuloma tissue determination using Van Geison And Masson Trichome strains shows, viz; L-Hydroxyproline, Hexose amine, Asorbic acid and Malondialdehyde which confirmed its potential wound healing activity. Thus, it was found that enhanced wound healing may be due to free radical scavenging action and the antibacterial property of the phytoconstituents present in it, either due to their individual or additive effect³⁶.

✦ Antifungal Activity:

Ocimum kilimandscharicum Guerke is active against *Aspergillus niger*, *Aspergillus fumigates*, *Candida albicans*, *Cryptococcus neoformans*, *Microsporum cassis*, *Sporotrichum schenki*³⁷.

OTHER STUDIES:

(a) Infection potential and management of root knot nematode on camphor basil (*Ocimum kilimandscharicum* Guerke) was also studied in detail³⁸.

(b) Karyomorphological studies were done in the population of *Ocimum kilimandscharicum* Guerke³⁹.

(c) Clonal propagation of *Ocimum kilimandscharicum* Guerke by tissue culture was done⁴⁰.

(d) An efficient plant regeneration protocol from nodal explants of *Ocimum kilimandscharicum* Guerke has been developed⁴¹.

MARKETED FORMULATION:

Using modern science and technology, a new brand of medicines called Naturub was developed from purified

extracts of *Ocimum kilimandscharicum* Guerke based on the traditional knowledge & practices. Naturub is registered as a medicine. Naturub is certified and registered as the first natural product by the Pharmacy and Poisons Board of Kenya – it is sold widely in corporate retail chains in Kenya. Its balm is used for alleviating flu, cold, chest congestion, aches and pain, insect bites and muscular pain. While the ointment is used for the fast relief of muscular strain, rheumatism, arthritic joint, fibrositis, lumbago, neuralgia and sciatica⁴².

CONCLUSION:

An attempt was made to address chemistry, pharmacology and tissue culture study of the *Ocimum kilimandscharicum*. Therefore, the review of plant *Ocimum kilimandscharicum* revealed that it has got a variety of medicinally significant constituents, which are being utilized in the field of different system of medicine. This comprehensive review article will be very useful in future to those researchers interested in validating the hidden truth which has not been scientifically validated. Eventually plant belonging to *Ocimum* genus could contribute a lot towards economy and healthy problem.

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