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Research Paper

A mini Review on Phyto-chemical and Pharmacological Activities on Ocimum kilimandscharicum gurke

K. Keerthika*, A. Srivani
Centre for Pharmaceutical sciences, University college of Engineering, Science and Technology, Jawaharlal Nehru Technological University, Hyderabad-500085, Telangana, India
***Corresponding author:** K. Keerthika; e-mail: keerthikak245@gmail.com*

ABSTRACT:
This review paper involves Ethanomedicinal uses and pharmacological survey of Ocimum kilimandscharicum gurke and belonging to family Lamiaceae. The plant has been used traditionally in African countries as a mosquito repellent and Git disorders. In Indian system of medicine (Ayurveda) O. kilimandscharicum (also known as Kapur Tulsi) been used as an Anti-inflammatory, Indigestion, Mosquito repellent and Aromatic purpose. One of the well-known representatives of this Genus O. kilimandscharicum is a native of Kenya and distributed in East Africa. It is widely distributed in different parts of the world and long history traditional medicinal uses. The primary phytoconstituents of O. kilimandscharicum's essential oil includes camphor. Various oxygenated Monoterpenes have been reported in hydro-distilled essential oil of this plant aerial parts. Other important compounds found to be Terpenoids or phenyl propane derivatives including alpha-pinene, linolool, limonene, camphene, beta pinene,1,8-cineole, caryophylene,4-terpineol which have been responsible for various Pharmacological activities (insecticidal, antimicrobial, antioxidant, wound healing, anti-melanoma, radio protective, anti-inflammatory activity) etc. The plant is a rich source of phytochemical compounds, bioactive phenolic compounds, flavonoids, terpenoids, glycosides etc.

***Key Words**: Ocimum kilimandscharicum gurke, mosquito repellent, essential oil, chemical constituents.*

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I. Introduction

Ocimum kilimandscharicum is a plant belonging to family Lamiaceae. It is widely distributed in different parts of the world and has a long history of traditional medicinal uses. The plant has been used traditionally in African countries as mosquito repellant and for GIT disorders. The volatile oil from plant is found to be rich in camphor. 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[1].

1.1. Taxonomical Classification

Kingdom	:	Plantae
Subkingdom	:	Tracheobionta
Superdivision	:	Spermatophyta
Division	:	Magnoliophyta
Class	:	Magnoliopsida
Subclass	:	Asteridae
Order	:	Lamiales
Family	:	Lamiaceae
Genus	:	*Ocimum*
Species	:	*kilimandscharicum*
Biological name	:	***O. kilimandscharicum***

1.2. Vernacular Names

Language Name		Known by
English	:	African Basil, Camphor Basil, Camphor-Scented Basil, Hoary Basil, Kilimanjaro Basil, Perennial Basil, Fever plant
Hindi	:	Kapur Tulsi, Kapuri Tulsi
Sanskrit	:	Kapura Tulasi
French	:	Basilic Camphré, Basilic Camphre, Basilic Du Mont Kilimanjaro
Portuguese	:	Basilicão-Canforado, Basilicão-Canforado (Brazil)
Russian	:	Bazilik Kamforrnyi.
Thai	:	Ka Phrao India (Prachin Buri), Ka Phrao Khaek (Bangkok)
German	:	Kampferbasilikum
Telugu	:	Kapura Tulasi

1.3. Habitat

O. kilimandscharicum Guerke is a native of Kenya (East Africa)[2]. Its occurrence has been reported in Rwanda[3], Athens[4], Nigeria, Sudan [5] Ghana & India. In India it is being cultivated in U.P, West Bengal, Dehradun, Maharashtra, Mysore, Kerala, Jammu and Darjeeling [6].

1.4. Morphology

O. kilimandscharicum Guerke- Perennial herbs up to 1m tall [7]

- ***Leaves***: Green colour, odor aromatic, taste slightly bitter, Simple, elliptic-ovate (25-40 & 10-20 mm) decussate, 3- 4 cm long, 8-1.2 cm broad, apex obtuse of 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- 20 mm long, hirsute with white long spreading hairs.
- ***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.
- ***Calyx****:* 2-3.5mm long at anthesis, 3-4.5 mm long in fruit: posterior lip rounded pubescent inside, glaborous 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.
- ***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, s mooth or minutely tuberculate, producing mucilage when wet.

1.5. Ethno-Botanical Uses

- *O. kilimandscharicum* is employed as an indigenous medicine for a variety of ailments like cough, bronchitis, viral infections, foul ulcers, anorexia and wounds [8].
- The leaves of O. kilimandscharicum are acrid, thermogenic, aromatic, insecticidal, antiviral, appetizing and deodorant and are useful in cough, bronchitis, foul ulcers and wounds, opthalmopathy and vitiated conditions of 'vata'
- The plant has reported to have various central nervous system (CNS) activities. The plant has shown neurotoxic, antineuralgic, CNS stimulant, tranquilizer, anti-alzhemerian and sedative effects. [9].

II. Phyto-chemicals from *O. kilimandscharicum*

The plant *O. kilimandscharicum* is a rich source of essential oil and phytochemical compounds, bioactive phenolic compounds, flavonoids, terpenoids, glycosides etc.

2.1. R.K. Joshi et al., 2013 [10] extracted the essential oils from leaves of *O. kilimandscharicum* by hydro-distillation and analyzed by gas chromatography equipped with a flame ionization detector (GC-FID) and gas chromatography coupled with mass spectrometry (GC/MS). Forty-one constituents were identified, which comprised 97.1% of the total constituents. The most abundant compound was camphor (45.9%), followed 1,8-cineol (14.6%) and limonene (8.1%) (Fig 1).

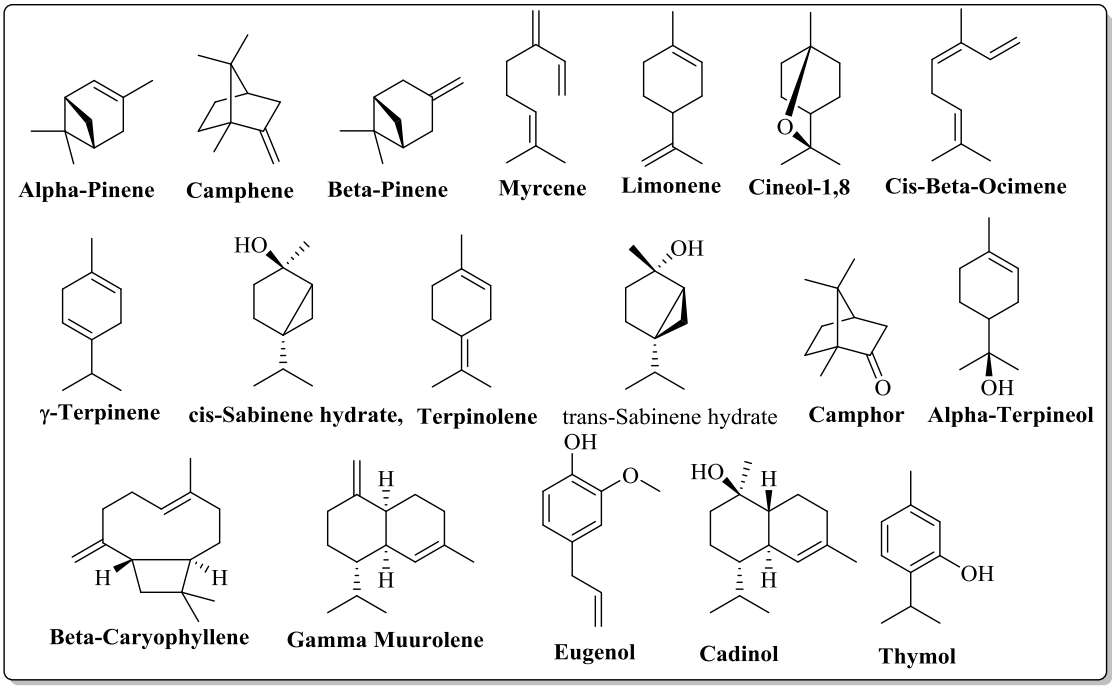

Figure 1. Essential oil components from *O. Kilimandscharicum*

2.2. Shinde et al., 2010 [11] extracted the plant material with chloroform, methanol and acetone successively by cold maceration. Further sub-fractionation by SPE and purification by P-TLC led to the isolated of six compounds eugenol, quercitin, cadinol, thymol, β-sitosterol and stigmasterol (Fig. 2). The isolated constituents were evaluated for their antibacterial activity by the broth microtitre MIC assay against a panel of multidrug-resistant (MDR) and methicillin-resistant *Staphylococcus aureus* (MRSA) strains (ATCC-25923, SA-1199B, XU-212, RN-4220, EMRSA-15 and EMRSA-16) and minimum inhibitory concentrations (MICs) of eugenol and cadinol were found to be in the range of 2–128 µg/ml. This study corroborates the traditional claims of *O. kilimandscharicum* as a topical antibacterial.

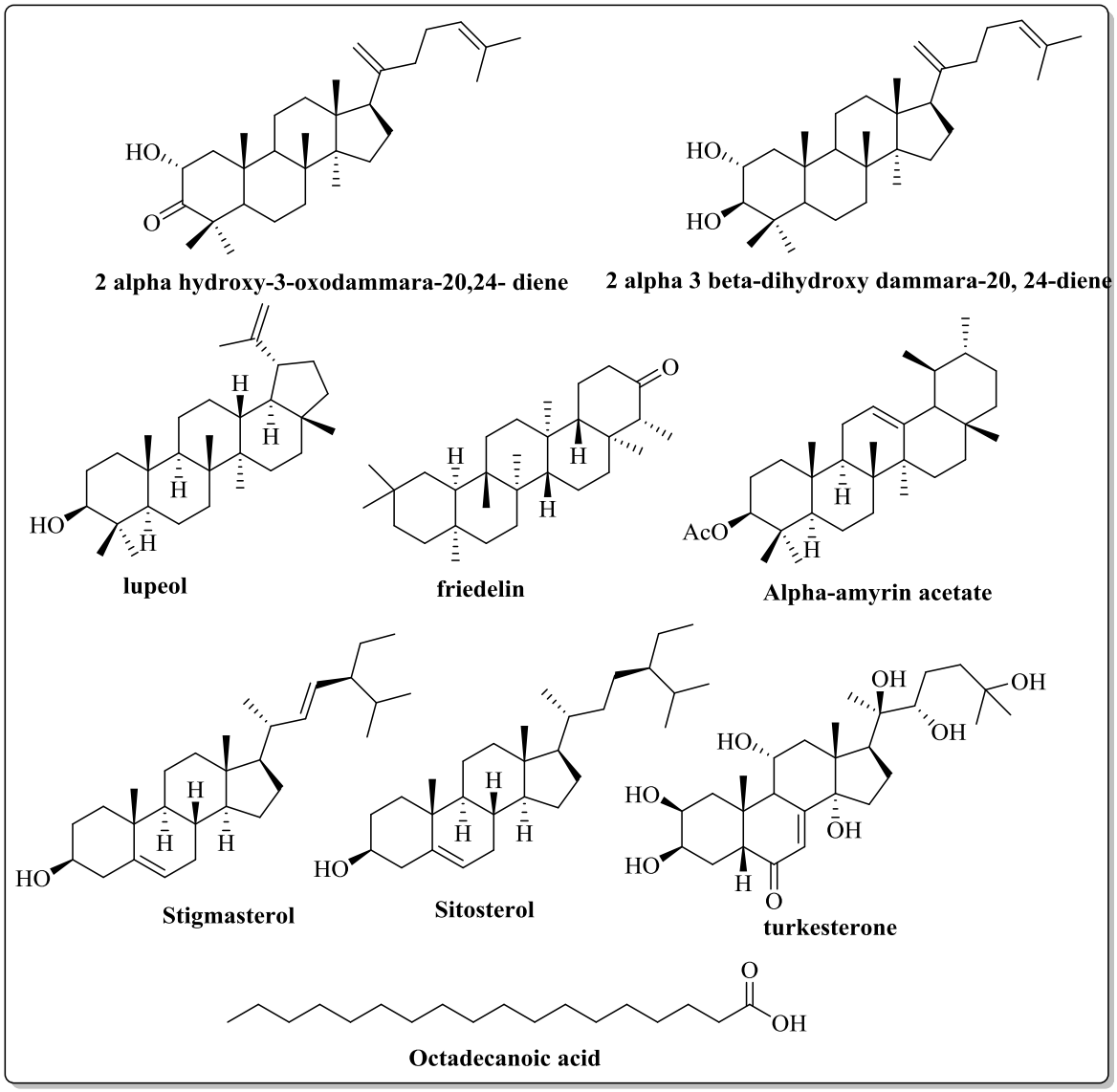

Figure 2. Steroids, Triterpenoids and fatty acid from *O. Kilimandscharicum*

2.3. Albert Mulianga Makenzi et al., 2019 [12] isolated the 12 phytomolecules form the leaves of *O. kilimandscharicum* they are 2α-hydroxy-3-oxodammara-20,24- diene, 2α,3β-dihydroxy dammara-20, 24-diene, apeginin7-O-neohespeiridoside, quercetin, turkesterone, fesitin, apeginin, chrysin, lupeol, stigmasterol, friedelin, αamyrin acetate and n-octacosonoic acid. Crude extracts and isolated compounds were investigated for contact toxicity and anti-feedant activity against *Sitophilus zeamais* and *Prostephanus truncates.* (Fig. 2 & 3).

2.4. Rene´e J. Grayer et al., 2002 [13] reported the flavonoids from the aerial parts of the *O. kilimandscharicum.* The isolated compounds are Luteolin 5- O-glucoside, Quercetin 3-rutinoside (Fig. 3).

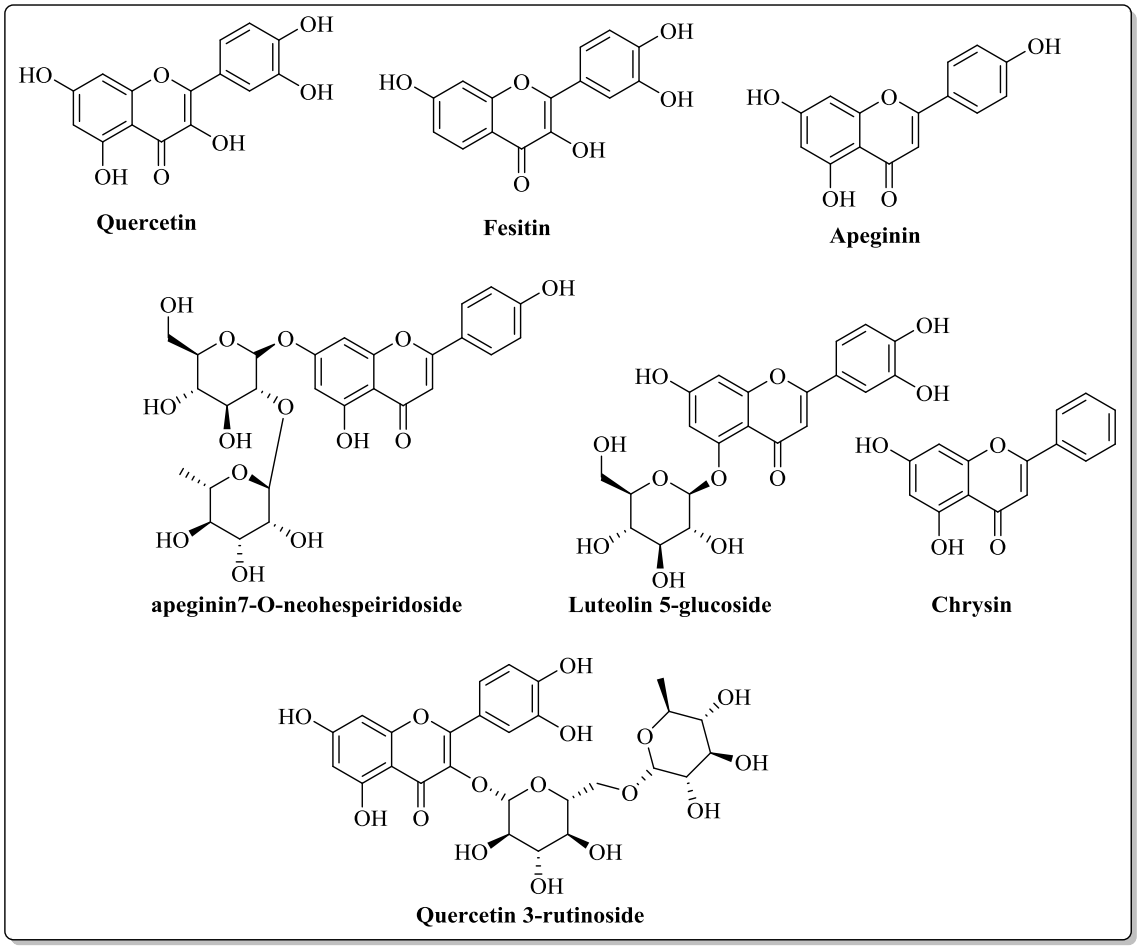

Figure 3. Flavanoids from *O. Kilimandscharicum*

III. Pharmacological Activities of O. kilimandscharicum

O. Kilimandscharicum has large range of bioactivity profile like Antimicrobial, Anti-diarrhoeal, Antimelanoma and radioprotective, Antinociceptive, Antioxidant, Antiplasmodial, Mosquito repellant, Pesticidal activity etc.

3.1. Ouandaogo H.S et al 2024[14] evaluated potential antibacterial activity of *O. Kilimandscharicum*. The best inhibition zone for the methanol and aqueous-mediated AgNPs, ranging from 12 ± 1 to 16 ± 1mm. Additionally, the methanol and aqueous extract silver nanoparticles had the same Minimum Inhibitory Concentration (6.25 ± 0.00 mg/ml), whereas the Minimum Bactericidal Concentrations were 12.5 ± 0.00 and 25 ± 0.00 mg/ml, respectively. The highest inhibition zone of 16 ± 1 mm was observed against *Salmonella choleraesuius* with 50 ± 0.00 mg/ml aqueous silver nanoparticles. The results show that the silver nanoparticles made with *Ocimum kilimandscharicum* have antibacterial action against those microorganisms.

3.2. Sarin RV et al 2013 [15] studied the anti-diarrhoeal activity of aqueous extract of leaves of *O. kilimandscharicum* in animal models. The results showed that a significant delay in the onset of defecation (po-0.05), reduction in the cumulative faecal weight (po-0.001), along with a change in the faecal consistency from watery to solid form was observed at the dose of 200 mg/kg in the castor oil-induced diarrhoea model. Similarly, the extract at the doses of 100 mg/kg (po-0.01) and 200 mg/kg (po-0.001) significantly decreased the weight of intestinal content in castor oil induced enteropooling assay. The aqueous extract of leaves of *O. kilimandscharicum* showed anti-diarrhoeal activity, which may be due to its anti-motility and anti-secretory effects, which thus proved the traditional claims.

3.3. Monga J et al., 2011 [16] reported the Antimelanoma and radioprotective activity of alcoholic aqueous extract of *O. kilimandscharicum*. The 50% alcoholic aqueous extract administered orally (200 mg/kg, p.o.) resulted in significant reduction in tumor volume, increase in average body weight, and survival rate of mice. The various extracts showed modulatory influence against lethal irradiation doses of gamma radiation in terms of radiation-induced chromosomal damage, while at the same time induced an increase in reduced glutathione level and GST activity.

3.4. Mwangi PW et al., 2012 [17] carried out the antinociceptive activity of *O. kilimandscharicum* using the radiant tail-flick test in mice. At 100, 200, 400 and 800 (mg/kg Bwt) dosages, the ethanolic leaf extracts exhibited statistically significant antinociceptive activities ($p < 0.01$), in a dose dependent manner. The experimental results obtained in this study therefore validate the traditional uses of these plant species as analgesics. Further, this study provides a springboard into future phytochemical and pharmacological studies of this plant.

3.5. Hakkim FL et al., 2008 [18] reported the anti-oxidant activity of *O. kilimandscharicum* methanol extract. The extract exhibited activity in all the in vitro antioxidant assays but it was not as potent as butylated hydroxyl anisole (BHA). The phytochemicals found in each extract are rich antioxidants and these extracts can be used as an effective preservative in food industry.

3.6. Owuor BO et al., 2012 [19] studied the *in vitro* antiplasmodial activity of *O. kilimandscharicum.* The IC_{50}'s for drugs and total plant extracts ranged from 0.01217 to 10.679 mg/ml. Extracts were more active on chloroquine sensitive than resistant *Plasmodium falciparum* strains. *O. kilimandscharicum* exhibited promising results.

3.7. Kweka EJ et al., 2008 [20] reported the Mosquito repellant potential of *O. kilimandscharicum.* Protection efficiency was 89.75% for An. arabiensis while for *Cx. quinquefaciatus* it was 90.50%. In the experimental hut, deterrence induced by burning of *Ocimum* and other plants ranged from 73.1.0% to 81.9% for *An. arabiensis* and 56.5% to 67.8% for *Cx. quinquefaciatus*, while feeding inhibition was 61.1% to 100% for *An. arabiensis* and 50% to 100% for *Cx. quinquefaciatus*. Evaluations under field conditions confirmed high protective efficacy, enhanced feeding inhibition and house entry inhibition.

3.8. Obeng-Ofori D et al, 1998 [21] reported the pesticidal potential of camphor, a major component of essential oil of the basil shrub, *O. kilimandscharicum*, against the beetles, *Sitophilus granarius, S. zeamais, Tribolium castaneum* and *Prostephanus truncates.* Camphor impregnated on the grain surface was more effective than on filter paper. There was, however, highly significant reduction in toxicity in grain after only 24 h following treatment. Development of eggs and immature stages within grain kernels, as well as progeny emergence, was completely inhibited in camphor-treated grain. The potential use of suitable products derived from *O. kilimandscharicum* as supplementary or alternative grain protectants against insect damage in traditional grain storage in developing countries is discussed.

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References.

[1]. Pandey AK, Singh P, Tripathi NN. Chemistry and bioactivities of essential oils of some Ocimum species: an overview. J Coast Life Med. 2013; 1(3): 192-205.
[2]. Ejobi F, Latigo AAR. Local knowledge repels mosquitoes in Kenya, Appropriate Technology, 1997, 23, 32-33.
[3]. Ntezurubanza L, Scheffer JJC, Looman A Svendson AB, Component of essential oil of Ocimum kilimandscharicum Guerke grown in Rwanda, Planta Medica, 1984, 50, 385-88.
[4]. Charles DJ, Simon JE, Essential oil constituents of Ocimum kilimandshcaricum Guerke, Journal of Essential Oil Research, 1992, 4, 125-128.
[5]. Barker C, Dunn HC, Hilditch TP, African drying volatile oils: Some Nigerian and Sudanese drying oils, Journal of Indian Chemical Society, 1950, 69, 71-75.
[6]. Singh H, Handa KL, Kapoor LD, Camphor basil raised in Jammu and Kashmir, Indian Journal of Pharmacy, 1955, 17, 97-98.
[7]. Bhutani KK. Ocimum kilimandscharicum Guerke In: Agro techniques and cultivation practices of some important medicinal plants. Published by NIPER, Punjab, India, 2003. P. 37-41.
[8]. Paschapur MS, Patil MB, Kumar R, Patil SR. Evaluation of aqueous extract of leaves of Ocimum kilimandscharicum on wound healing activity in albino wistar rats. IJPRIF. 2009; 1(3): 544-50.
[9]. Dolly G, Nidhi S, Bps S, Shweta R, Shikha A. Ocimum kilimandscharicum: A systematic review. JDDT. 2012; 2(3): 45-52.
[10]. Joshi RK. Chemical composition of the essential oil of camphor basil (Ocimum kilimandscharicum Guerke). Glob J Med Plant Res. 2013; 1(2): 207-9.
[11]. Shinde K, Shinde V, Mahadik K, Gibbons S. Phytochemical and antibacterial studies on Ocimum kilimandscharicum. Planta Med. 2010; 76: 412.
[12]. Albert Mulianga Makenzi, Lawrence Onyango Arot Manguro, Philip Okinda Owuor and Sylvia Awino Opiyo. Chemical Constituents of Ocimum Kilimandscharicum Guerke Acclimatized in Kakamega Forest, Kenya. Bull. Chem. Soc. Ethiop. 2019, 33(3), 527-539.
[13]. Rene´e J. Grayer, Geoffrey C. Kite, Nigel C. Veitch, Maria R. Eckert, Petar D. Marin, Priyanganie Senanayake, Alan J. Paton. Leaf flavonoid glycosides as chemosystematic characters in Ocimum. Biochemical Systematics and Ecology 30 (2002) 327–342.
[14]. Ouandaogo HS, Diallo S, Odari E, Kinyu J (2024) Silver nanoparticle biosynthesis utilizing Ocimum kilimandscharicum leaf extract and assessment of its antibacterial activity against certain chosen bacteria. PLOS ONE 19(5): e0295463. https://doi.org/10.1371/journal.pone.0295463.
[15]. Sarin RV, Narwal S, Bafna PA. Anti-diarrhoeal activity of aqueous extract of Ocimum kilimandscharicum. J Ethnopharmacol. 2013; 148: 223-8.

[16]. Monga J, Sharma M, Tailor N, Ganesh N. Antimelanoma and radioprotective activity of alcoholic aqueous extract of different species of Ocimum in C57BL mice. Pharm Biol. 2011; 49(4): 428-36.
[17]. Mwangi PW, Wambugu S, Kariuki DK, Mbugua PM, Kanui TI. Antinociceptive activities of the ethanolic extracts of Ocimum kilimandscharicum baker ex Gürke and Ocimum kenyense ayob. Ex a.j. Paton leaves. IJP. 2012; 3(1): 1-4.
[18]. Hakkim FL, Arivazhagan G, Boopathy R. Antioxidant property of selected Ocimum species and their secondary metabolite content. J Med Plants res. 2008; 2(9): 250-7.
[19]. Owuor BO, Ochanda JO, Kokwaro JO, Cheruiyot AC, Yeda RA, Okudo CA, et al. In vitro antiplasmodial activity of selected Luo and Kuria medicinal plants. J Ethnopharmacol. 2012; 144: 779-81.
[20]. Kweka EJ, Mosha FW, Lowassa A, Mahande AM, Mahande MJ, Massenga CP, et al. Longitudinal evaluation of Ocimum and other plants effects on the feeding behavioral response of mosquitoes (Diptera: Culicidae) in the field in Tanzania. Parasit Vectors. 2008; 1: 42.
[21]. Obeng-Ofori D, Reichmuth CH, Bekele AJ, Hassanali A. Toxicity and protectant potential of camphor, a major component of essential oil of Ocimum kilimandscharicum, against four stored product beetles. Int J Pest Manage. 1998; 44(4): 203-9