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Review on Chemical Constituents & Pharmacological Action of *Ocimum kilimandscharicum*

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ABSTRACT: According to the ayurveda, plants have been used for the treatment of so many diseases. Herbal drugs are easily available and have fewer side effects. So, many people are attracted towards the herbal drugs. *Ocimum kilimandscharicum* is one of a few types of basil that is perennial. It is a well known plant in Indian traditional system of medicine. *Ocimum kilimandscharicum* plant is widely used in the management of various ailments including colds, coughs, abdominal pains, measles, anti-ulcer, bronchitis, anorexia, memory disorders and diarrhoea. This review delineates with all the phytochemical and pharmacological aspects of *Ocimum kilimandscharicum that* will help the various practitioners and clinicians to get aware of the modern and traditional use of this plant.

KEYWORDS: *Ocimum kilimandscharicum;* Anorexia; Diarrhoea; Measles; Bronchitis.

INTRODUCTION

Herbal medicine also called botanical medicine or phytomedicine refers to using a plant's seeds, berries, roots, leaves, bark, or flowers for medicinal purposes. Verbalism has a long tradition of use outside of conventional medicine. As improvements in analysis and quality control along with advances in clinical research show the value of herbal medicine in the treating and preventing disease [1]. According to the ayurveda, plants have so many constituents which may be used for the treatment of so diverse ailments. Herbs had been used by all cultures throughout history but India has one of the oldest, richest and most diverse cultural living traditions associated with the use of medicinal plants [2].

Ocimum is a genus of about 35 species of aromatic annual and perennial herbs and shrubs in the family Lamiaceae, mostly native to the tropical and warm temperate regions of the Old World. Some medicinally important species includes [3].

- ***Ocimum americanum*** (syn. O. canum) is a native of tropical Africa. It is known as lime, hairy or hoary basil, is an annual herb with white or lavender flowers. It is used for medicinal purposes. Plant shows antimicrobial and antioxidant activity [4]. *Ocimum americanum* contains volatile oil, flavanoids, carbohydrates, phytosterols, tannins and fixed oils [4].

- ***Ocimum basilicum*** or sweet basil, a culinary herb. Most culinary and ornamental basils and there are many hybrids between species. *O. basilicum* var. thyrsiflora, or Thai basil, O. basilicum is a common ingredient in Thai cuisine, with a strong flavour similar to aniseed, used to flavour curries and stir-fries [5]. It has been used as a folk remedy for an enormous number of ailments, including boredom, cancer, convulsion, deafness, diarrhoea, epilepsy, gout, hiccup, impotency, insanity, nausea, sore throat, toothaches, and whooping cough. Basil has been reported in herbal publications as an insect repellent. [6].

- ***Ocimum gratissimum***, also known as African basil, or African Basil Wild basil in Hawaii, where it has naturalized. *Ocimum gratissimum*, also known as Clove Basil, Ocimum gratissimum contains antibacterial [7], antidiabetic [8], Antitumor, anti-cancer [9], diarrhoea [10], anti-fertility [11], hepatoprotective [12] and analgesic activity [13] and gastrointestinal disorders [14].

- ***Ocimum micranthum***, or Amazonian basil, is a South American variety often utilized in ayahuasca rituals for its smell which is said to help avoid bad visions [3]. It possess antibacterial, antiprotozoal and antioxidant activity [15].

- ***Ocimum tenuiflorum*** (also known as tulsi, tulasī, or Holy Basil) is an aromatic plant in the family Lamiaceae which is native throughout the Old World tropics and widespread as a cultivated plant and an escaped weed [16]. It is an erect, much branched sub shrub 30–60 cm tall with hairy stems and simple opposite green leaves that are strongly scented. Leaves have petioles, and are ovate, up to 5 cm long, usually slightly toothed. Flowers are purplish in elongate racemes in close whorls [17]. There are two main morphotypes cultivated in India—green-leaved (Sri or Lakshmi tulsi) and purple-leaved (Krishna tulsi) [18]. It possess antioxidant [19] and also used in memory improvement [20].

- ***Ocimum sanctum***, known as tulsi in Hindi and holy basil in English, is an erect softy hairy aromatic herb or undershurb found throughout India. Tulsi is commonly cultivated in gardens. Two type of *Ocimum sanctum* are met within cultivation i.e. tulsi plant with green leaves known as sri tulsi & tulsi plant with purple leaves known as Krishna tulsi. *Ocimum sanctum* is held sacred by Hindus and is used as medicinal plants in day to day practice in Indian homes for various ailments. It shows a number of medicinal activities. it used in anticancer, antifertility, antidiabetic and various other disease [21].

- ***Ocimum kilimandscharicum*** is an economically important medicinal perennial herb that is widely distributed in East Africa, India and Thailand. It is extensively grown in the Tropics [22].

OCIMUM KILIMANSCHARICUM

Ocimum kilimandscharicum can be propagated by seeds and cuttings. It bears flowers with long flower stems, up to 18 inches long [23]. *Ocimum kilimandscharicum* seeds are black and very small, oval shaped and about 1mm in the middle and 2mm long. Seedlings are raised in nurseries and transplanted on the farms. Once the shrub is established, it can be harvested 3 times per annum for more than three years. It requires well-drained soils, though does well in clayey and sandy soils, with an average annual rainfall of 1250 mm, fairly high temperatures and at altitudes of up to 900 mm [24].

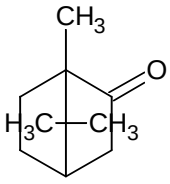
Figure 1. Leaves of Ocimum kilimandscharicum(source:-Botanical garden sarangpur (chd)**)**

CHEMICAL CONSTITUENTS

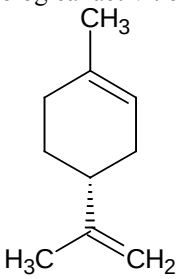
Seed oil of *Ocimum kilimandscharicum* contains α – pinene (1.23%), camphene (7.32%), β – myrcene (1.58%), ethylamyl carbinol (0.88%), 1 – phellandrene(0.26%), α – terpinene (0.33%), p – cymene (0.62%), dl – limonene(13.56%), 1,8 –cineole (0.85%), β – ocimene (2.00%), γ – terpinene (0.88%), trans- sabinene hydrate (0.49%), α – 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%), germarcrene-d(0.43%) [25].

The essential oil of aerial parts of Ocimum kilimandscharicum contains α-pinene(1.23%), camphene(7.32%), β-myrcene(1.58%), α-phellandrene (0.26%), α-terpinene(0.33%), *p*-cymene(0.62%), DL-limonene (13.56%), 1,8-cineole (0.85%), β-ocimene (2.00%)γ-terpinene (0.88%), *cis*-sabinene hydrate (0.47%), α-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 there constituents [25].

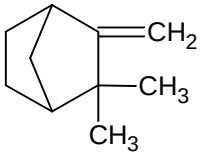
Aqueous extract of leaves of *Ocimum kilimandscharicum* Aqueous extract of leaves of *Ocimum kilimandscharicum* contains camphor, 1,8-cineole, limonene, trans caryophyllene, camphene, 4-terpeneol, myrtenol, α-terpineol, endo-borneol ,linalool [26]. Leaves also contain flavonoids, tannins, saponins, sterols, carbohydrates, proteins and triterpenoids [27]. These chemical constituents are mainly responsible for various biological activities.



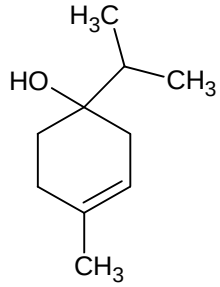
Camphor



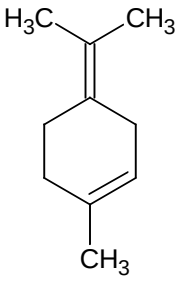
Limonene



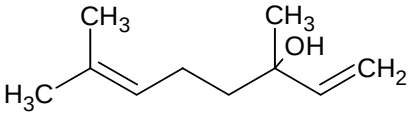
4-terpineol



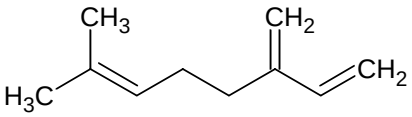
Camphene



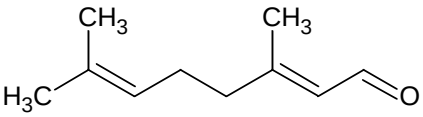
Linalool



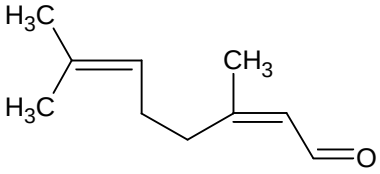
Alpha-terpinolene



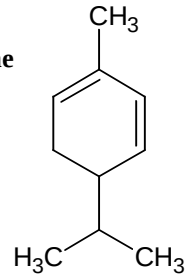
Beta myrcene



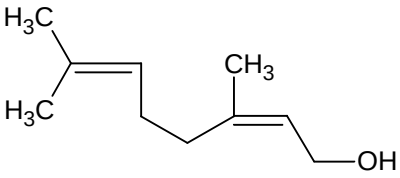
Geranial



Neral



Alpha-phellandrene



Nerol

TRADITIONAL USES

In traditional medicine, this plant is widely used for the treatment of various ailments including colds, coughs, abdominal pains, measles and diarrhoea [28]. The leaves treat congested chest, cough and cold, by sniffing crushed leaves or inhaling vapour of boiling leaves. Infusion of leaves is a cure for measles Essential oils posses biologically active constituents that act as insect repellents, particularly against mosquitoes and storage pests [29,26,28]. Some local farmers also mix stored foodstuffs with dry leaves of *Ocimum kilimandscharicum* for protection against insect pest damage in storage [30]. It show antibacterial and antioxidant activity. It also used in viral infections, foul ulcers, anorexia and for healing wounds. *Ocimum kilimandscharicum* in boiled water in a pot or saucepan to generate an aroma. It is also used in the Mediterranean area in interesting forms for decorative purposes.

PHARMACOLOGICAL ACTIVITY

ANTIOXIDANT ACTIVITY

The modulations in enzymatic and non-enzymatic antioxidants were observed in *Ocimum kilimandscharicum* exposed to UV-B stress. Recovery on lipid peroxidation and alterations in the contents of free radicals in leaves was studied. Lipid peroxidation measured in terms of MDA level increased with UV-B doses and the ratio was higher with high dose of radiations. Recovered leaves showed lower

MDA content and hydroxide radicals. Ascorbate, flavanoids and proline contents increased highly in leaves recovered from UV-B stress. *Ocimum kilimandscharicum* shows, higher free radical scavenging capacity and more efficient antioxidant potential using thiobarbituric acid assay in liver and muscle assay systems of ovarian models. This shows that *Ocimum kilimandscharicum;* due to abundant presence of flavanoids have great potential to be exploited as antioxidant [31].

ANTIMICROBIAL ACTIVITY

Essential oil from aerial parts of *Ocimum kilimandscharicum* shows antimicrobial activity against Gram +ve bacteria (*Staphylococcus aureus*, *Enterococcus faecalis*), Gram-ve bacteria (*Escherichia coli*, *Pseudomonas aeruginosa*) and also against yeast *Candida albicans* [25].

WOUND HEALING ACTIVITY

Aqueous extract of leaves shows wound healing activity at two different doses (200 and 400 mg/kg) in three types of wound models on rats: the excision, the 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 Gieson and Masson Trichome strains shows, viz; L-Hydroxyproline, Hexose amine, Ascorbic 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 effect [27].

ANTIBACTERIAL ACTIVITY

Ocimum kilimandscharicum is active against a number of bacteria i.e. *bacillus saccharolyticus, bacillus stearothermophilus, bacillus thurengiensis, bacillus subtilis, lactobacillus casei, lactobacillus plantarum, micrococcus luteus, sarcina lutea, staphylococcus aureus* etc. [28].

ANTIFUNGAL ACTIVITY

Ocimum kilimandscharicum is active against *aspergillus fumigates, aspergillus niger, candida albicans, Cryptococcus neoformans, microsporum cassis, sporotrichum schenkii* [32].

The dried ground leaves and essential oil of *O.kilimandscharicum* in doses of 25.0 g leaves and 0.3 g essential oil per 250 g grain (maize or sorghum) killed 100% of *Sitophilus zeamais, Rhyzppertha dominica* and *Sitotroga cereaklla* in 48 h. The best repellent activity was seen by 0.3 g essential oil/250 g grains against *Sitophilus %eamais* [33].

Using modern science and technology, a new brand of medicines called Naturub® was developed from purified extracts of *Ocimum kilimandscharicum* based on the traditional knowledge and 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, bruises, lumbargo, neuralgia and sciatica [34].

REFERENCES

[1] Ehrlich SD, NMD, Solutions Acupuncture, a private practice specializing in complementary and alternative medicine, Phoenix. Review provided by Healthcare Network;2009
[2] Tandon V, Kapoor B, Gupta B M. Herbal drug research in India: A trend analysis using IJP as a marker. *Indian journal of Pharmacology*2004; 36 (2): 99-100.
[3] Steele, John j, perfumers and the sacred use of fragrance in amazonian shamanism." the smell culture reader, edited by jim drobnick. berg publishers 2006: 230.
[4] D. Sai Koteswar Sarma, A. Venkata Suresh Babu. Pharmacognostic and phytochemical studies of Ocimum americanum. journal of pharmaceutical and chemical research2011;3(3):337-347.
[5] http://en.wikipedia.org/wiki/Ocimum
[6] Christopher Sullivan ‟09 in College Seminar 235 - Food For Thought: The Science, Culture, & Politics of Food in Spring 2009
[7] Lamiaceae Silva L.L., Heldwein C.G., Reetz L.G.B., Hörner R., Mallmann C.A., Heinzmann B.M. Chemical composition, antibacterial activity in vitro and brine-shrimp toxicity of the essential oil from inflorescences of Ocimum gratissimum L., [In Process] Brazilian Journal of Pharmacognosy 2010 20:5:700-05.
[8] A., Tanko Y., Okasha M.A., Magaji R.A., Yaro A.H Mohammed. Effects of aqueous leaves extract of Ocimum gratissimum on blood glucose levels of streptozocin-induced diabetic wistar rats. African Journal of Biotechnology 2007 6:18 (2087-2090)
[9] Ekunwe S.I., Thomas M.S., Luo X., Wang H., Chen Y., Zhang X., Begonia G.B. Potential cancer-fighting Ocimum gratissimum (OG) leaf extracts: increased anti-proliferation activity of partially purified fractions and their spectral fingerprints.. Ethnicity & disease 2010 20:1 Suppl 1 (S1-12-6)
[10] Veronica N. Offiah, Unoma A. Chikwendu, "Antidiarrhoeal effects of Ocimum gratissimum leaf extract in experimental animals", Journal of Ethnopharmacology1999; 68:327-30.
[11] Obianime A.W., Aprioku J.S., Esomonu C.T.O Antifertility effects of aqueous crude extract of Ocimum gratissimum L. leaves in male mice. Journal of Medicinal Plant Research 2010 4:9809-16.
[12] Arhoghro E.M., Ekpo K.E., Ibeh G.O. Effect of aqueous extract of scent leaf (Ocimum gratissimum) on carbon tetrachloride (CCl4) induced liver damage in albino Wister rats. African Journal of Pharmacy and Pharmacology 2009 3:11 (562-567).
[13] Iroanya O.O., Okpuzor J.E., Mbagwu H., Ojobo P.D. Analgesic properties of an indigenous polyherbal preparation. The FASEB Journal 2009 23:S1
[14] Socorro V. F. Madeira, Francisco José A. Matos, José H. Leal-Cardoso, and David N. Criddle, "Relaxant effects of the essential oil of Ocimum gratissimum on isolated ileum of the guinea pig", Journal of Ethno pharmacology2002;81:1-4.
[15] M. C. Navarro, M. P. Montilla, M. M. Cabo, M. Galisteo, A. Cáceres, C. Morales, I. Berger. Antibacterial, antiprotozoal and antioxidant activity of five plants used in izabal for infectious disease. phytotherapy research2003;17:325-29.
[16] Staples, George; Michael S. Kristiansen (1999). Ethnic Culinary Herbs. University of Hawaii Press. p. 73.
[17] Warrier, P K (1995). Indian Medicinal Plants. Orient Longman. p. 168.
[18] Kothari, S K; Bhattacharya, A K,). " Volatile Constituents in Oil from Different Plant Parts of Methyl Eugenol-Rich Ocimum tenuiflorum L.f. (syn. O. sanctum L.) Grown in South India". Journal of Essential Oil Researc2008:9:05.
[19] Balaji r, Prakash g, Suganya devi p, Antioxidant activity of methanol extract of Ocimum tenuiflorum (dried leaf and stem). international journal of pharma research and development2002;3:20-27.
[20] H. Joshi, M. Parle. Cholinergic basic of memory improving effect of Ocimum tenuiflorum, indin journal of pharmaceutical science2006;68:364-65.
[21] P. Prakash,Neelu gupta** therapeutic uses of Ocimum sanctum with a note on eugenol and its pharmacological uses. indian j physiol pharmacol, prakash et al.,2005;49(2):125-131.
[22]Saha Soumen,tulsi dey, and parthadeb ghosh. micro propagation of Ocimum kilimandscharicum guerke (labiatae). acta biologica cracoviensia series botanica2010 ;52: 50–58.
[23] Seyoum Aklilu, Ephantus w. Rabiru, Wilber lwande, Gerry f. killeen, Ahmed hassanali, Bart g. j. knols Repellency of live potted plants against anopheles gambiae from human baits in semi-field experimental huts. am. j. trop. med. Hyg2002; 67: 191–195.
[24] Wealth of India, 1966
[25] Anand Ankur Kumar,Manindra Mohan,S. Zafar Haider, Akash Sharma.Essential oil composition and antimicrobial activity of three Ocimum species from uttarakhand (india).International journal of pharmacy and pharmaceutical sciences2011;3:223-225.
[26] Eliningaya J. Kweka1, Hassan M. Nkya, Lucile Lyaruu, Epiphania E. Kimaro, Beda J. Mwang'onde,Aneth M. Mahande.Efficacy of Ocimum kilimandscharicum plant extracts after four years of storage against Anopheles gambiaess.Journal of Cell and Animal Biology2009;3:171-174
[27] Paschapur Mahesh S, M B Patil, Ravi Kumar, Sachin R Patil.Evaluation of aqueous extract of leaves of Ocimum kilimandscharicum on wound healing activity in albino wistar rats International journal of pharmtech research coden(usa)2009;1:544-550
[28] Raja R. and Ratnam Prasad. Chemotypes of Ocimum: Exploring the Potential of Pathway Engineering
[29] Soumen saha,Tulsi dey, Parthadeb ghosh. micropropagation of *Ocimum kilimandscharicum* guerke (labiatae). *acta biologica cracoviensia series botanica2010;* 52/2: 50–58.
[30] D. obeng-ofori1,C reichmuth, A. J. Bekele,A Hassanal. Bioactivity of camphor, a major component of essential oil of Ocimum kilimandscharicum against sitophilus zeamais an prostepha nus truncates.Second international conference on urban pests1996:626
[31] Singh santosh kumar, Ankur Anand, Satish Kumar Verma, Md Aslam Siddiqui, Abhishek Mathur and Sonia Saklani**. A**nalysis of phytochemical and antioxidant potential of Ocimum kilimandscharicum linn.international journal of current pharmaceutical research2011:3:40-46
[32] Prasad, G., Kumar, A., Singh, A.K., Bhattacharya, A.K., Singh, K. and Sharma, V.D. Antimicrobial activity of essential oils of some Ocimum species and clove oil. Fitoterapia1986;429–32

[33] Jembere Bekele1, Ahmed Hassanali. Blend effects in the toxicity of the essential oil constituents of Ocimum kilimandscharicum and Ocimum kenyense (Labiateae) on two post-harvest insect pests. Phytochemistry2001; 57: 385–391/
[34] james ligare. Domestication and commercialisation of Ocimum kilimandscharicum, a traditional medicinal and insecticidal plant Equator initiative partners award this certificate to achievement to Muliru farmers conservation group (MFGC) – Kenya presented at nations general assembly in new York, USA on 20 sept. 2010.