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## **A review on: Holy basil and mediterranean basil (Genus Ocimum): The unique medicinal plant**

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### **Abstract**

In the present review on Tulsi, an effort has been done to Medicinal properties of Tulsi. The therapeutic uses of plant are considered as safe, inexpensive & efficient as their ease of availability. The basil plant consumed herbs, *Ocimum* genus in plant family Lamiaceae. Tulsi to be effective for diabetes, The Rama Tulsi is the effective remedy for the severe acute Respiratory Syndrome. Juice of its leaves gives relief in cold, fever, bronchitis and cough. Tulsi oil is also used as the ear drop. Tulsi helps in curing malaria. It is very effective against indigestion, headache, hysteria, insomnia and cholera. The fresh leaves of Tulsi are taken by the millions of people every day. Tulsi reduces stress, enhances stamina, relieves inflammation, lowers cholesterol, eliminates toxins, protects against radiation, prevents gastric ulcers, lowers fevers, improves digestion and provides a rich supply of antioxidants and other nutrients. Tulsi is especially effective in supporting the heart, blood vessels, liver and lungs and also regulates blood pressure and blood sugar. Recent studies suggest that Tulsi may be a COX-2 inhibitor, like many modern painkillers. Tulsi improves the body's overall defence mechanism including its ability to fight viral diseases. It is good source of vitamin A and C, Calcium, Zinc, Iron, Chlorophyll and it possess antibacterial, insecticidal properties. In different parts of the world, several types of basil are cultivated, some of the widely used varieties can be categorized in two groups – holy basil and Mediterranean basil.

**Keywords:** holy basil, mediterranean basil, pharmacological properties

### **Introduction**

The genus *Ocimum* comprises more than 150 species and is considered as one of the largest genera of the Lamiaceae family [1], Tulsi is described as sacred [2], and medicinal plant in ancient literature [3]. The name Tulsi is derived from 'Sanskrit', which means "matchless one" [4]. Among the plants known for medicinal value, the plants of genus *Ocimum* are very important for their therapeutic potentials. *Ocimum sanctum* L. (Tulsi), *Ocimum gratissimum* (Ram Tulsi), *Ocimum canum* (Dulal Tulsi), *Ocimum basilicum* (Ban Tulsi), *Ocimum kilimandscharicum*, *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 properties [5, 6, 7].

**A Holy Basil:** It is known as Tulsi and is the most revered houseplant in India it is associated with Ayurveda and Hindu religion as goddess of wealth, health and prosperity. The plants have strong medicinal properties compared to second group species. This small herb is found throughout India and is cultivated, worshiped in temples and houses of Hindus. This is commonly known as Vishnu-Priya, Tulsi in Sanskrit, and Kala Tulsi in Hindi and Marathi as Tulshi, Tulasi in Tamil, Thulsi in Telugu and India's Holy Basil in English Not to be confused with *Ocimum Tenuiflorum*, it is a synonym for *Ocimum Sanctum*. There 4 species popular of Holy basil:

Rama tulsi, Krishna tulsi, Amrita tulsi and Vana tulsi.

**Mediterranean Basil:** It is known as Sweet basil and is the most popular variety of basil which is found all over the world including Asia, Europe, America and Africa. It is most consumed herb worldwide and known by several common names such as king of herbs, royal herb, great basil and Saint-Joseph's-wort etc., it is used in culinary preparations and used in several Mediterranean basil types of popular cuisines like Italian, Thai etc. Sweet basil, Thai basil, Purple basil, Lemon basil, Vietnamese basil, American basil, African blue basil, Italian genovese basil, Lettuce basil, Green ruffles basil, Cardinal basil, Greek basil, Spicy globe basil, Summer long basil.

### **Introduction of Species**

#### **Rama Tulsi (*Ocimum Sanctum*)**

The plant has pure green leaves and better tolerance to winters, sun light, plant requires more watering and fertilization than the other varieties. The Queen of herbs is one of the most worshiped aromatic herbs that is found at almost every house in India.

Location – Outdoors

Light – Full Sun

Watering – Daily, except winters

Temperature – Loves range 15 to 40 degree Celsius

Common names – Ram Tulsi

Botanical name – *Ocimum Sanctum*



Fig 1

**Krishna tulsi (*Ocimum Tenuiflorum*)**

The plant has purple fringed leaves and purple stems with pungent and strong test of leaves, it has more medicinal properties than the other species. Below are its growing habits:

Location – Outdoors

Light – Full Sun

Watering – Daily, except winters

Temperature – Loves range 20 to 45 degree Celsius

Common names – Krishna Tulsi

Botanical name – *Ocimum tenuiflorum*



Fig 2

**Amrita tulsi (*Ocimum Tenuiflorum*)**

The plant is less commonly grown perennial, aromatic and sacred species of holy basil in India. Below are its growing habits:

Location – Outdoors

Light – Full Sun

Watering – Daily, except winters

Temperature – Loves range 15 to 40 degree Celsius

Common names – Amrita Tulsi

Botanical name – *Ocimum tenuiflorum*



Fig 3

**Vana tulsi (*Ocimum Gratifissum*)**

It is woody type perennial, aromatic and sacred species of holy basil in India. Below are its growing habits:

Location – Outdoors

Light – Full Sun

Watering – Daily, except winters

Temperature – Loves range 15 to 40 degree Celsius

Common names – Vana Tulsi

Botanical name – *Ocimum gratissum*



Fig 4

**Sweet basil (*Ocimum Basilicum*)**

It is most commonly grown perennial, aromatic and culinary type species of basil, the plant has bigger green color leaves and stems. Below are its growing habits:

Location – Outdoors

Light – Full Sun

Watering – Daily, except winters

Temperature – Loves range 10 to 35 degree Celsius

Common names – Basil

Botanical name – *Ocimum basilicum*



Fig 5

**Thai basil (*Ocimum Thyriflora*)**

It is perennial, aromatic and culinary type species of basil, the plant has green color pointed leaves, reddish purple color stem and dark purple color flowers. Below are its growing habits:

Location – Outdoors

Light – Full Sun

Watering – Daily, except winters

Temperature – Loves range 10 to 35 degree Celsius

Common names – Thai Basil

Botanical name – *Ocimum thyriflora*



Fig 6

**Purple basil (Ocimum Basilicum)**

It is commonly grown perennial, aromatic and culinary type species of basil, the plant has bigger purple color leaves and stems. Below are its growing habits:

Location – Outdoors

Light – Full Sun

Watering – Daily, except winters

Temperature – Loves range 10 to 35 degree Celsius

Common names – Purple Basil

Botanical name – Ocimum basilicum



Fig 7

**Lemon basil (Ocimum citriodorum)**

The plant is perennial, aromatic and culinary type species of basil, the plant has green color leaves and white color flowers. It has strong lemon scent and all parts of the flower, leaves and stems are edible. It is known by several common names such as Lemon basil, hoary basil, Thai lemon basil, or Lao basil etc. it is a hybrid between sweet basil and American basil. Below are its growing habits:

Location – Outdoors

Light – Full Sun

Watering – Daily, except winters

Temperature – Loves range 10 to 35 degree Celsius

Common names – Lemon Basil

Botanical name – Ocimum citriodorum



Fig 8

**Vietnamese basil (Ocimum Cinnamom)**

It is perennial, aromatic and culinary type species of basil, the plant has green color leaves, reddish purple color stem and pink color flowers. Below are its growing habits:

Location – Outdoors

Light – Full Sun

Watering – Daily, except winters

Temperature – Loves range 10 to 35 degree Celsius

Common names – Vietnamese Basil

Botanical name – Ocimum cinnamom



Fig 9

**American basil (Ocimum Americanum)**

It is perennial, aromatic and culinary type species of basil, the plant is known for its rich color, sweet flavor, cleanliness and uniformity of particle size, it is considered to be of very high quality which has green color pointed leaves, purple color stem and purple color flowers. Below are its growing habits:

Location – Outdoors

Light – Full Sun

Watering – Daily, except winters

Temperature – Loves range 10 to 35 degree Celsius

Common names – Americal Basil

Botanical name – Ocimum americanum



Fig 10

**African blue basil (Ocimum Kilimandscharicum)**

It is perennial, aromatic and culinary type species of basil, the plant has green color leaves and purple color flowers. It has strong camphor scent and all parts of the flower, leaves and stems are edible. Below are its growing habits:

Location – Outdoors

Light – Full Sun

Watering – Daily, except winters

Temperature – Loves range 10 to 35 degree Celsius

Common names – Blue Basil, Kapur Tulsi

Botanical name – Ocimum kilimands charicum



Fig 11

**Italian Genovese basil (*ocimum basilicum*)** [8].

It is classic Italian species with large dark green leaves, it is most common grown perennial, aromatic and culinary type species of basil, the plant has bigger green color leaves and stems. Below are its growing habits:

Location – Outdoors

Light – Full Sun

Watering – Daily, except winters

Temperature – Loves range 10 to 35 degree Celsius

Common names – Italian Basil

Botanical name – *Ocimum basilicum*



Fig 12

***Ocimum sanctum***

General uses of importance- *Ocimum sanctum* Linn. Popularly known as the holy basil or Tulsi in India is a home remedy for various illnesses. Traditionally, the fresh fruit and leaf juice were commonly used in the treatment of cough as demulcent, mild upper respiratory tract infection, general stress syndrome, worm infestations, superficial fungal infections, and also as a diuretic [9]. This plant has been evaluated pharmacologically for immunomodulatory, antistress, antimicrobial, anti-inflammatory antiasthmatic, hypoglycaemic, hypotensive and analgesic activities and found to be effective in varying degrees in the animal models. The plant has also shown significant anti-oxidant activity [10]. *O. sanctum* is reported to be well tolerated up to a dose of 5–7 g/day for 3 months except for constipation in few cases [4]. The crude forms of the plant and the extracts are used singularly or in combination with other herbs as a cough remedy and expectorant based on the traditional experience. An infusion of leaf had been used as anti-spasmodic in gastric disorders of children. A concoction of root of Tulsi is still being used as a diaphoretic in malarial fevers in remote areas. The seeds are mucilaginous and demulcent and are given in different ailments of genito-urinary system [11]. Tulsi is good for heart, stimulates digestion, and reduces breathing

difficulties and cough [12]. It has also been used in the treatment of snake-bite and scorpion-stings described in ancient texts by Charaka and Sushruta. Thus, every part of the plant has useful application. Even today people use different parts of this plant for treatment of various ailments based on traditional knowledge [13].

***Ocimum americanum*:**

General uses of importance- It represents an important source for essential oils and is used in food, perfumery and cosmetic industries. *O. americanum* L. is also grown in parts of India for flavour and fragrance industry and as a source of natural camphor, since the plant was introduced there from Kenya in the Second World War [14]. *Ocimum americanum* L. (syn. *O. canum* Sims) is a resilient shrub unattached by most plant pests and animal predators. *O. americanum* L. is used in the traditional system of medicine to treat conjunctivitis, malaria and headache. It has been reported in Somalia for its essential oils, flavones and triterpenic acids and is used for flavouring foods and in traditional medicine. In South Africa, it is often referred to as camphor basil [15, 16, 17]. In Zimbabwe, its traditional uses range from flavour and fragrance, to insect repellence and as a preservative for corpses [17-18].

***Ocimum basilicum***

General uses of importance *Ocimum basilicum* L. (sweet basil) is an annual herb which grows in several regions all over the world. The plant is widely used in food and oral care products. The essential oil of the plant is also used as perfumery [19]. The leaves and flowering tops of sweet basil are used as carminative, galactagogue, stomachic and antispasmodic medicinal plant in folk medicine [20, 21]. Antiviral and antimicrobial activities of this plant have also been reported [22, 23]. There are many cultivars of basil which vary in their leaf colour (green or purple), flower colour (white, red, purple) and aroma [24]. Basil is one of the most important medicinal and aromatic plants because of the continuous and increase demand of its products from the local and international markets. Basil essential oil is extensively used for flavouring food stuffs such as sources, vinegars, pickles, ketchups, beverages, condiments and confectionery goods. Basil essential oil is also important part of toiletry products such as mouth washes and dental creams. In perfumery basil essential oil is used for compounding certain popular perfumes and jasmine blends. Basil is also recognized as a febrifuge and antimalarial plant, infusion of the plant is used for gouty joints, cephalalgia and gargle for foul breath. Relief in irrigation for throat, earache and ring worm is also well known properties of basil extract [25]. The leaves of basil are used in folk medicines a tonic and vermifuge, and basil tea taken hot is good for treating nausea, flatulence, and dysentery. The oil of the plant has been found to be beneficial for the alleviation of mental fatigue, colds, spasm, rhinitis, and as a first aid treatment for wasp stings and snakebites [26]. *O. basilicum* extracts have been shown to display important effects at cellular level, including the platelet antiaggregant property and inhibitory activity against HIV-1 reverse transcriptase. Infusions of OB are used in traditional medicine to decrease plasma lipid content some Mediterranean areas

such as the Eastern Morocco [27].



Fig 13

## Phytoconstituents

Table 1

1.	Fixed oil 28	Linoleic acid, Linolenic acid, Oleic acid, Palmitric acid, Stearic acid.	Seeds
2	Essential oil 29,30,31	Aromadendrene oxide, Benzaldehyde, Borneol, Bornyl acetate, Camphor, Caryophyllene oxide, cis- $\alpha$ - Terpineol, Cubenol, Cardinene, D-Limonene, Eicosane, Eucalyptol, Eugenol, Farnesene, Farnesol, Furaldehyde, Germacrene, Heptanol, Humulene, Limonene, n-butylbenzoate, Ocimene, Oleic acid, Sabinene, Selinene, Phytol, Veridifloro, $\alpha$ -Camphene, $\alpha$ Myrcene, $\alpha$ -Pinene, $\beta$ -Pinene, $\alpha$ -Thujene, $\beta$ Guaiene, $\beta$ Gurjunene, methyl chavicol and linalool.	Leaves
3	Mineral Contents 32	Vitamin C, Vitamin A, Calcium, Phosphours, Chromium, Copper, Zink, Iron.	Whole Plant
4	Alcoholic Extract 33	Aesculectin, Aesculin, Apgenin, Caffeic acid, Chlorogenic Acid, Circineol, Gallic Acid, Galuteolin, Isorientin, Isovitexin, Luteolin, Molludistin, Orientin, Procatechuic acid, Stigmsterol, Ursolic acid, Vallinin, Viceni, Vitexin, Vllinin acid.	Leaves / Areal Parts

The leaves of OS contain 0.7% volatile oil comprising about 71% eugenol and 20% methyl eugenol. The oil also contains carvacrol and sesquiterpine hydrocarbon caryophyllene [34]. Fresh leaves and stem of OS extract yielded some phenolic compounds (antioxidants) such as cirsilinole, circimaritin, isothymusin, apigenin and rosameric acid, and appreciable quantities of eugenol [35]. Two flavonoids, viz., orientin and vicenin from aqueous leaf extract of OS have been isolated [36]. Ursolic acid, apigenin, luteolin, apigenin-7-O-glucuronide, luteolin-7-O glucuronide, orientin and molludistin have also been isolated from the leaf extract [37]. OS also contains a number of sesquiterpenes and monoterpenes viz., bornyl acetate, -elemene, neral, - and -pinenes, camphene, campesterol, cholesterol, stigmsterol and -sitosterol [38].

### Pharmacological activities

All over the world scientific research is getting momentum to evaluate the pharmacological activities, side effects and medicinal uses of genus ocimum against different diseases. On the basis of various experimental and clinical researches, the following pharmacological activities or medicinal properties of genus ocimum have been reported.

**Anticancer Activity:** Anti-melanoma activity of 50% alcoholic aqueous leaf extract of different species of Ocimum

was studied by Monga *et al.* in 2011. Leaf extract administered orally (200mg/kg, p.o.) resulted in significant reduction in tumour volume, increase in average body weight, and survival rate of mice [39].

**Antiemetic Activity:** Tulsi leaves also check vomiting and used for antiemetic action [40].

**Anticoagulant Activity:** Ocimum sanctum fixed oil (3 ml/kg, ip) was studied for anticoagulant activity. It was observed that blood clotting time was prolonged and the response was comparable to that obtained with aspirin (100 mg/kg). The effect appears to be due to the anti-aggregatory action of oil on platelets [41].

**Hepatoprotective Activity:** Lahon *et al.* in 2011 studied hepatoprotective activity of Ocimum sanctum alcoholic leaf extract against paracetamol-induced liver damage in Albino rats synergism with silymarin and concluded that Ocimum sanctum alcoholic leaf extract showed significant hepatoprotective activity and synergism with silymarin [42].

**Immunomodulatory Activity:** Jeba *et al.* in 2011 studied that aqueous extract of Ocimum sanctum at the oral doses of 100, 200 mg/kg/day in rats enhances the production of RBC, WBC, haemoglobin and also enhanced the production of antibodies without affecting the biochemical parameters [43].

**Anti-plasmodial Activity:** Leaf extract, root extracts, the

stem and flower extracts of *Ocimum sanctum* showed excellent anti-plasmodial activity in a study carried out by Inbaneson *et al.* in 2012 on three different species of *Ocimum*. The *in vitro* anti-plasmodial activity might be due to the presence of alkaloids, glycosides, flavonoids, phenols, saponins, triterpenoids, proteins, resins, steroids and tannins in the ethanolic extracts of tested plants [44].

**Antipyretic Activity:** The antipyretic activity of *Ocimum sanctum* fixed oil was evaluated by testing it against typhoid paratyphoid A/B vaccine-induced pyrexia in rats. The oil on ip administration considerably reduced the febrile response indicating its antipyretic activity. At a dose of 3 ml/kg, the antipyretic activity of the oil was comparable to aspirin. Further, the fixed oil possessed prostaglandin inhibitory activity and the same could explain its antipyretic activity [45].

**Anti-Fertility activity:** Albino rats treated with benzene extract of *Ocimum sanctum* leaves (250mg/kg body weight) decreased the total sperm count and sperm motility. The effects were the results of androgen deprivation due to the anti-androgenic property of *O. sanctum* leaves. There was an increasing in sperm testosterone level whereas the level of FSH and LH, sperm count were reduced in rabbits [46].

**Antibacterial Activity:** Antibacterial activity of the aqueous, alcoholic, chloroform extract and oil obtained from leaves of *Ocimum sanctum* were studied against *E.coli*, *P.aeruginosa*, *S. typhimurium* and *S.aureus*. Extract obtained from *Ocimum sanctum* were observed equally effective against pathogenic gram positive and gram negative bacteria [47].

**Anti-inflammatory activity:** *Ocimum sanctum*'s methanolic extract (500mg) proved the inflammatory activity in rats. Fixed oil and linolenic acid present in tulsi have the ability to block cyclooxygenase and lipoxygenase pathways of arachidonic acid metabolism. Therefore they show anti-inflammatory activities against PGE2, leukotrienes induce edema in rats [48]. *O. sanctum*'s aqueous extract (200mg/ kg or 400mg/ kg) showed significant activity ( $P < 0.05$ ) in rats induced with carrageenan paw edema. This showed that effect of *O. sanctum* was better than indomethacine (STD drug) [49]

**Anti-fungal activity:** Methanolic fraction and aqueous fraction of *Ocimum sanctum* showed anti-fungal activity against dermatophytic fungus i.e. *T. rubrum* etc. Aqueous fraction showed better anti dermatophytic activity as compared to methanolic fraction [50].

**Chemopreventive activity:** The chemopreventive effect of OS leaf extract is probably through the induction of hepatic/extrahepatic GST in mice. Elevated levels of reduced GSH in liver, lung and stomach tissues in OS extract supplemented mice were also found [51]. Significant ant proliferative and chemopreventive activities were observed in mice with high concentration of OS seed oil [52]. The potential chemopreventive activity of seed oil has been partly attributed to its antioxidant activity [53].

**Radioprotective activity:** The radioprotective effect of OS was firstly reported in the year 1995 [54]. Two isolated flavonoids, *viz.*, orientin and vicenin from OS leaves showed better radioprotective effect as compared with synthetic radioprotectors. They have shown significant protection to the human lymphocytes against the clastogenic effect of radiation at low, nontoxic concentrations [55]. The combination of OS

leaf extract with WR-2721 (a synthetic radioprotector) resulting in higher bone marrow cell protection and reduction in the toxicity of WR-2721 at higher doses, suggested that the combination would have promising radioprotection in humans [56].

**Antioxidant activity:** The antioxidant properties of flavonoids and their relation to membrane protection have been observed [57]. The phenolic compounds, *viz.*, cirsilineol, cirsimaritin, isothymusin, apigenin and rosmarinic acid, and appreciable quantities of eugenol (a major component of the volatile oil) from OS extract of fresh leaves and stems possessed good antioxidant activity [58].

**Antihypertensive and cardioprotective activities:** The transient cerebral ischemia and long term cerebral hypo perfusion (causing cellular oedema, gliosis and perivascular inflammatory infiltrate) have been prevented by OS [59]. The OS fixed oil administered intravenously produced hypotensive effect in anaesthetized dog, which seems to be due to its peripheral vasodilatory action. Essential fatty acids like linoleic and linolenic acids, contained in the OS oil produce series 1 and 3 (PGE1 and PGE3) prostaglandins and inhibit the formation of series 2 prostaglandins (PGE2) [60].

**Antimicrobial activity:** The AIE of OS was also found to be active against multidrug-resistant strains of *S. aureus* that are also resistant to common beta lactam antibiotics [61]. Similarly, OS was found to be active against resistant *Neisseria gonorrhoea* strains [62]. OS fixed oil showed good antibacterial activity against *Bacillus pumilus*, *Pseudomonas aeruginosa* and *S. aureus*. Higher content of linolenic acid in OS fixed oil could contribute towards its antibacterial activity [63].

**Central Nervous System (CNS) depressant activity:** The AIE of OS prolonged the time of lost reflex in mice due to pentobarbital (40 mg/kg, ip), decreased the recovery time and severity of electroshock and pentylenetetrazole induced convulsions. It also decreased apomorphine induced fighting time and ambulation in "open field" trials. At high doses, OS extract increased swimming time suggesting a CNS stimulant and/or antistress activity. The effect was comparable to that of desipramine, an antidepressant drug [64]. OS fixed oil (2-3 ml/kg, ip) has been reported [65].

**Analgesic activity:** The OS oil was found to be devoid of analgesic activity in experimental pain models (tail flick, tail clip and tail immersion methods). However, it was effective against acetic acid induced writhing method in mice in a dose dependent manner. The writhing inhibiting activity of the oil is suggested to be peripherally mediated due to combined inhibitory effects of prostaglandins, histamine and acetylcholine [66].

**Antiarthritic activity:** The Antiarthritic activity of OS fixed oil was evaluated against formaldehyde-induced arthritis in rats. The fixed oil significantly reduced the diameter of inflamed paw. On intraperitoneal administration of the fixed oil daily for 10 days, there was marked improvement in the arthritic conditions in rats. The antiarthritic effect at 3 ml/kg dose was comparable to aspirin @ 100 mg/kg, ip [67].

**Adaptogenic activity/antistress activity:** The immunostimulant capacity of OS may be responsible for the adaptogenic action of plant [68]. The AIE of OS whole plant increased the physical endurance (survival time) of swimming

mice, prevented stress induced ulcers and milk induced leucocytosis, respectively in rats and mice, indicating induction of non-specifically increased resistance against a variety of stress induced biological changes by OS in animals [69].

**Anticataract activity:** The AqE of fresh leaves of OS delayed the process of cataractogenesis in experimental models of cataract (galactosemic cataract in rats by 30% galactose and naphthalene cataract in rabbits by 1 g/kg naphthalene). OS 1 and 2 g/kg delayed the onset as well as subsequent maturation of cataract significantly in both the models [70].

**Antiulcer activity:** The fixed oil of OS administered intraperitoneally elicited significant antiulcer activity against aspirin, indomethacin, alcohol (ethanol 50%), histamine, reserpine, serotonin or stress-induced ulcers in rats [71]. The fixed oil significantly possessed antiulcer activity due to its lipooxygenase inhibitory, histamine antagonistic and antisecretory effects [72].

### Conclusion

In conclusion it is to be found that the various *Ocimum* species found are very much distinguished from each other. All the species are possessing different pharmacological activities science the huge variation in the chemical composition is there. The holy basil is the most revered houseplant in India and the plant is found throughout India and is cultivated. The Mediterranean basil *ocimum* species is the most popular variety of basil which is found all over the world. Tulsi is a popular home remedy for many ailments such as wound, bronchitis, liver diseases, catarrhal fever, otalgia, lumbago, hiccough, ophthalmia, gastric disorders, genitourinary disorders, skin diseases, various forms of poisoning and psychosomatic stress disorders. It has also aromatic, stomachic, carminative, demulcent, diaphoretic, diuretic, expectorant, alexiteric, vermifuge and febrifuge properties. Tulsi is also known as "the elixir of life" since it promotes longevity. Different parts of plant are used in Ayurveda and Siddha Systems of Medicine for prevention and cure of many illnesses and everyday ailments like common cold, headache, cough, flu, earache, fever, colic pain, sore throat, bronchitis, asthma, hepatic diseases, malaria fever, as an antidote for snake bite and scorpion sting, flatulence, migraine headaches, fatigue, skin diseases, wound, insomnia, arthritis, digestive disorders, night blindness, diarrhoea and influenza. This review will definitely help for the researchers as well as clinicians dealing with genus *ocimum* in future work related to the complex phytochemistry and its proper usage as this herb is seemed to be highly valuable, possessing many pharmacological/ medicinal properties.

### References

- Evans WC. Trease and Evans Pharmacognosy. W.B. Saunders Company London, 1996, 48.
- Anonymous. Wealth of India. Vol.7. Publication and Information Directorate, CSIR, New Delhi, 1991, 79-89.
- Kirtikar KR, Basu BD. Indian Medicinal Plant. 2nd Ed. Bishen Singh Mahendra Pal Singh, New Connaught Place, Dehradun. 1975; 3:1965-1968.
- Ghosh GR Tulasi (N.O. Labiatae, Genus-Ocimum). New Approaches to Medicine and Health (NAMA), 1995, (3):23-29.
- Atal CK, Kapoor BM. Cultivation and utilization of medicinal plants (Eds. PID CSIR), 1989
- Sen P. Therapeutic potentials of Tulsi: from experience to facts. *Drugs News & Views*. 1993; 1(2):15-21.
- Nagarajun S, Jain HC, Aulakh GS. Indigenous plants used in the control of Diabetes. In: Cultivation and utilization of medicinal plants. Editors: Atal C.K and Kapoor B.M (Published by PID CSIR), 1989, 584.
- <https://www.mashrita.com/tulsi-holy-basil-types-herb-found-world>.
- Nadkarni AK. Indian material Medica, Popular Prakashan Bombay, 1993; 1:865-866.
- Yanpallewar SU, Rai S, Kumar M, Acharya SB. Evaluation of antioxidant and neuroprotective effect of *Ocimum sanctum* on transient cerebral ischemia and long term cerebral hypo perfusion. *Pharmacol. Biochem. Behav.* 2004; 79(1):155-164.
- Gupta S, Mediratta PK, Singh S, Sharma KK, Shukla R. Antidiabetic, antihypercholesterolaemic and antioxidant effect of *Ocimum sanctum* (Linn) seed oil. *Indian J Exp.Biol.*2006; (44) 300– 304.
- Chandra A, Mahdi AA, Singh RK, Mahdi F, Chander R. Effect of Indian herbal hypoglycaemic agents on antioxidant capacity and trace elements content in diabetic rats. *J. Med Food.* 2008, (11):506–512.
- Bhattacharya SK, Bhattacharya A, Chakrabarti A. Adaptogenic activity of Siotone, a polyherbal formulation of Ayurvedic rasayanas. *Indian J Exp Biol*, 2000, (38):119-128.
- Baslas RK, Gupta R, Baals KK. Chemical examination of essential oils from plants of genus *Anethum* (Umbelliferae) oils of seeds of *Anethum graveolens*, Part I. *Flavour, Ind.* 1971; 2:241-245.
- Xaasan CC, Cabdulraxmaan AD, Passannanti S, Piozzi F, Schmid JP. Plants indicated by Brazilian Indians to Central Nervous System disturbances: A bibliographical approach *J.Nat. Prod.* 1981; 44:752.
- Xaasan CC, Ciilmi CD, Faarax MX, Passamanti S, Piozzi F, Paternostro M, *et al.* *Phytochemistry*, 1980, (19):2229.
- Xaasan CC, Roberts M. *Indigenous Healing Plants*, Southern Book Publishers: Cape Town, South Africa 1990.
- Watt JM, Breyer-Brandwijk MG. *The Medical and Poisonous Plants of Southern and Eastern Africa*. Second ed. E. and S. Livingstone, 1962.
- Bauer K, Garbe D, Surburg H. *Common fragrance and flavour materials*. 3 rd. edition, Weinheim: Wiley-VCH, 1997, 171.
36. Chiej R. *The Macdonald encyclopedia of medicinal plants*. London: Macdonald and Co (Publishers) Ltd, 1988, 207.
- Duke JA. *CRC handbook of medicinal herbs*. Boca Raton: CRC Press, 1989, 333.
- Chiang LC, Cheng PW, Chiang W, Lin CC. Antiviral activity of extracts and selected pure constituents of *Ocimum basilicum*. *Cli. Exp. Pharmacol Physiol.* 2005; (32) 811816.

23. Baratta MT, Dorman HJD, Deans SG, Figueiredo AC, Barroso JG, Ruberto G, *et al.* Antimicrobial and antioxidant properties of some commercial essential oil. *Flav. Fragr J.* 1998; (13):235-234.
24. Morales M.R, Simon J.E. New basil selections with compact inflorescences for the ornamental market, in: Janick J (ed.), *Progress in new crops.* Arlington: ASHS Press, 1996, 543546.
25. Hussain AI, Anwar F, Sherazi STH, Przybylski R. Chemical composition, an antioxidant and antimicrobial activity of basil (*Ocimum basilicum*) essential oils depends on seasonal variations. *Food Chem.* 2008; (108):986-995.
26. Baytop T: *Treatment with Plants in Turkey, Istanbul, Turkey, Istanbul Univ,* 1984, 3255.
27. Okazaki K, Nakayama S, Kawazoe K, Takaishi, Y, Antiaggregant Effects on Human Platelets of Culinary Herbs. *Phytother. Res,* 1998, (12)603.
28. Singh S, Taneja M, Majumdar KD. Biological Activity of *Ocimum Sanctum L.* fixed oil-An Overview. *Ind J of Exp Biology.* 2007; 45:403-412.
29. Naquvi JK, Dohare LS, Shuaib M, Ahmad IM. Chemical Composition of Volatile Oil of *Ocimum Sanctum Linn.* *Int J of Biomed and Adv Res.* 2012; 3:129-131.
30. Vani RS, Cheng SF, Chuah CH. Comparative Study of Volatile Compounds from Genus *Ocimum.* *Am J of Appl. Sci.* 2009; 6:523-528.
31. Khan A, Ahmad A, Akhtar F, Yousuf S, Xess I, Khan LA, *et al.* *Ocimum sanctum* essential oil and its active principles exert their antifungal activity by disrupting ergosterol biosynthesis and membrane integrity. *Res Microbiol.* 2010; 161:816-823.
32. Anbarasu K, Vijayalakshmi G. Improved shelf life of protein-rich tofu using *Ocimum sanctum* (tulsi) extracts to benefit Indian rural population. *J Food Sci.* 2007; 72:300-05.
33. Mondal S, Bijay R, Miranda RB, Sushil CM. The Science behind Sacredness of Tulsi (*Ocimum sanctum LINN.*). *Ind J of Physiol Pharmacol.* 2009; 53:291-306.
34. Shah CS, Qadry JS. *A Text Book of Pharmacognosy,* 1998, 216.
35. Yanpallewar SU, Rai S, Kumar M, Acharya SB. Evaluation of antioxidant and neuroprotective effect of *Ocimum sanctum* on transient cerebral ischemia and long term cerebral hypo perfusion. *Pharmacol Biochem Behav.* 2004; 79(1):155-164.
36. Gupta SK, Prakash J, Srivastava S. Validation of traditional claim of Tulsi, *Ocimum sanctum Linn.* as a medicinal plant. *Indian J Exp Biol.* 2002; 40:765-773.
37. Nair AGR, Gunasegaran R, Joshi BS. Chemical investigation of certain south Indian plants. *Indian J Chem.* 1982; 21B:979.
38. IDMA. *Indian Herbal Pharmacopoeia.* Mumbai, India, 2002, 272.
39. Monga J, Sharma M, Tailor N, Ganesh N. Antimelanoma and radio protective activity of alcoholic aqueous extract of different species of *Ocimum* in C (57) BL mice. *Pharm Biol.* 2011; 49:428-436.
40. Kumar V, Andola CH, Lohani H, Chauchan N. Pharmacological Review on *Ocimum sanctum Linnaeus:* A Queen of herbs. *J of Pharmacy Res.* 2011; 4:336-338.
41. Singh S, Rehan HMS, Majumdar DK. Effect of *Ocimum sanctum* fixed oil on blood pressure, blood clotting time and pentobarbitone-induced sleeping time. *J Ethnopharmacol.* 2001; 78:13943.
42. Lahon K, Das S. Hepatoprotective activity of *Ocimum sanctum* alcoholic leaf extract against paracetamol induced liver damage in Albino rats. *Pharmacognosy Res.* 2011; 3:13-18.
43. Jeba CR, Vaidyanathan R, Rameshkumar G. Immunomodulatory activity of aqueous extract of *Ocimum sanctum* in rat. *International Journal on Pharmaceutical and Biomedical Research.* 2011; 2:33-38.
44. Inbaneson SJ, Sundaram R, Suganthi P. *In vitro* antiplasmodial effect of ethanolic extracts of traditional medicinal plant *Ocimum* species against *Plasmodium falciparum.* *Asian Pac J Trop Med.* 2012; 5:103-106.
45. Pandey G, Madhuri S. Pharmacological Activities of *Ocimum sanctum* (Tulsi): A Review. *Int J of Pharmaceutical Sic Rev and Res.* 2010; 5:61-66.
46. Kadian R. Therapeutic potential and phytopharmacology of tulsi. *Int. J Pharm. & Life Sci.* 2012; 3(7):1858-1867.
47. Mishra P, Mishra S. (Study of Antibacterial Activity of *Ocimum sanctum* Extract against Gram Positive and Gram Negative Bacteria. *American J of Food Tech.* 2011; 6:336-341.
48. Pandey G. Pharmacological activities of *Ocimum sanctum* (Tulsi): A review. *Int J. pharma Sci Rev. Res.* 2010; 5(1):61-66.
49. Mrutyunjay MM. Evaluation of the anti-inflammatory activity of *Ocimum sanctum Linn* (Tulsi) in albino rats. *Int. J Gurr. Microbial App. Sci.* 2014; 3(1):198-205.
50. Balakumar S. Anti-fungal activity of *Ocimum sanctum Linn.* (Lamiaceae) on clinically isolated dermatophytic fungi. *Asian. Paci J. Trop. Med,* 2011, 654-657.
51. Prashar R, Kumar A. Chemopreventive action of *Ocimum sanctum* on 2, 12-dimethylbenz (a) anthracene (DMBA) induced papillomagenesis in the skin of mice. *Int J Pharmacog.* 1995; 33:181.
52. Prakash J, Gupta SK, Singh N, Kochupillai V, Gupta YK. Antiproliferative and chemopreventive activity of *Ocimum sanctum Linn.* *Int J Med Biol Environ.* 1999; 27:165.
53. Prakash J, Gupta SK. Chemopreventive activity of *Ocimum sanctum* seed oil. *J Ethnopharmacol.* 2000; 72(12):29-34.
54. Uma Devi P, Gonasoundari A. Radioprotective effect of leaf extract of Indian Medicinal Plant *Ocimum sanctum.* *Indian J Exp Biol.* 1995; 33:205.
55. Uma Devi P, Gonasoundari A, Vrinda B, Srinivasan KK, Unnikrishanan MK. Radiation protection by the *Ocimum sanctum* flavonoids orientin and vicenin: Mechanism of action. *Radiat Res.* 2000; 154(4):455460.
56. Gonasoundari A, Uma Devi P, Rao BSS. Enhancement of bone marrow radioprotection and reduction of WR-2721 toxicity by *Ocimum sanctum.* *Mutat Res.* 1998; 397:303.
57. Saija A, Scalese M, Lanza M, Marzillo D, Bonina F, Castelli F, *et al.* Flavonoids as antioxidant agents:



- Importance of their interaction with biomembrane. Free Rad Biol Med. 1995; 19:481.
58. Nair AGR, Gunasegaran R, Joshi BS. Chemical investigation of certain south Indian plants. Indian J Chem. 1982; 21B:979.
  59. Kelm MA, Nair MG, Strasburg GM, DeWitt DL. Antioxidant and cyclooxygenase inhibitory phenolic compounds from *Ocimum sanctum* Linn. Phytomedicine. 2000; 7(1):7-13.
  60. Singh S, Rehan HMS, Majumdar DK. Effect of *Ocimum sanctum* fixed oil on blood pressure, blood clotting time and pentobarbitone-induced sleeping time. J Ethnopharmacol. 2001; 78:139.
  61. Auil F, Khan MS, Owais M, Ahmad I. Effect of certain bioactive plant extracts on clinical isolates of betalactamase producing methicillin resistant *Staphylococcus aureus*. J Basic Microbiol. 2005; 45(2):106-114.
  62. Shoken P, Ray K, Bala M, Tandon V. Preliminary studies on *Ocimum sanctum*, *Drynaria quericifolia* and *Annona squamosa* against *Neisseria gonorrhoea*. Sex Transm Dis. 2005; 32(2):106-111.
  63. Singh S, Malhotra M, Majumdar DK. Antibacterial activity of *Ocimum sanctum* L. fixed oil. Indian J Exp Biol. 2005; 43:835.
  64. Sakina MR, Dandiya PC, Hamdard HE, Hameed A. Preliminary psychopharmacological evaluation of *Ocimum sanctum* leaf extract. J Ethnopharmacol. 1990; 28:143.
  65. Singh S, Rehan HMS, Majumdar DK. Effect of *Ocimum sanctum* fixed oil on blood pressure, blood clotting time and pentobarbitone-induced sleeping time. J Ethnopharmacol. 2001; 78:139.
  66. Singh S, Majumdar DK. Analgesic activity of *Ocimum sanctum* and its possible mechanism of action. Int J Pharmacog. 1995; 33:188.
  67. Singh S, Taneja M, Majumdar DK. Biological activities of *Ocimum sanctum* L. fixed oil- An overview. Indian J Exp Biol. 2007; 45:403-412.
  68. Godhwani S, Godhwani JL, Vyas DS. *Ocimum sanctum*: A preliminary study evaluating its immunoregulatory profile in albino rats. J Ethno pharmacol. 1988; 24:193-198.
  69. Bhargava KP, Singh N. Antistress activity of *Ocimum sanctum* Linn. Indian J Med Res. 1981; 73:443.
  70. Gupta SK, Prakash J, Srivastava S. Validation of traditional claim of Tulsi, *Ocimum sanctum* Linn. As a medicinal plant. Indian J Exp Biol. 2002; 40:765-773.
  71. Singh S, Majumdar DK. Evaluation of the gastric antiulcer activity of fixed oil- *Ocimum sanctum* (Holy basil). J Ethnopharmacol. 1999; 65:13-19.