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A review on: Indian traditional shrub Tulsi (Ocimum sanctum): 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. As plants known for medical value, the plants of genus Ocimum. Tulsi is a medicinal plant present in India recognized and prized for its medicinal and therapeutic use. Several medicinal properties of Tulsi are present in the roots, leaves and seeds. It has a wide range of action on the human body. It heals many diseases chronically due to its chemical constituent and believes that it has Anti- ageing, Immunomodulatory property along with antimicrobial and anticancer property. Tulsi named as Queen of Herbs of India and one of the holiest and most healthiness giving herbs. Tulsi is famous for its vital role in the conventional ayurvedic and unani systems of body fitness health and herbal medicine of the East. This plant belongs to Labiates family and characterized by square stem and specific aroma. Tulsi use in ayurvedic medicine and its extracts are used in ayurvedic remedies for common colds, headaches, stomach disorders, soreness, heart sickness, a range of poisoning, and malaria.

Keywords: Ocimum sanctum, Tulsi, chemical constituents, Ayurveda, pharmacological properties, scientific reports

Introduction

Tulsi is a sacred plant of Hindu religion worshipped all over the India. Tulsi means 'incomparable one' or 'matchless one' and is derived from Sanskrit ^[1]. Ocimum sanctum (Family Labiatae) is a many branched, erect, stout and aromatic herb about 75 cm high. 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 India's Holy Basil in English ^[2]. The leaves, seeds and root of this plant have been used in indigenous ayurvedic medicine. This plant is traditionally known for its medicinal properties ^[2]. Tulsi has two varieties – Black (Krishna Tulsi) and Green (Ram Tulsi). They have similar chemical and medicinal properties. Genus Ocimum has varies species like Ocimum sanctum L (Tulsi), O. gratissimum (Ram Tulsi), O. canum (Dulal Tulsi), O. baselicum (Ban Tulsi), O. kilimandschricum, O. americanum, O. camphora and O. micranthum. They are cultivated in different parts of the world and are widely known for their medicinal properties ^[3]. Tulsi is also described as: Vanya (wild) and Gramya (Grown in homes) ^[4]. Plant is useful in the treatment of cold, cough, malaria, dengue, bronchitis, asthma, sore throat, influenza, heart disorders, eye diseases, mouth infections, insect bites, stress, and kidney stones etc ^[5].

Morphology

It is erect, branched fragmented shrub with the height of about 30- 60cm when mature. Its leaves are simple, aromatic, branched, opposite, obtuse, elliptical and have dentate margins. They are up to 5cm long. Flowers are elongate raceme in close whorls and purple in colour. Seeds are radish yellow and fruits are small⁴. It is planted after rainy season and harvested after few months ^[5].

Taxonomy

Kingdom	:	Plantae
Division	:	Magnoliophyta
Class	:	Magnoliopsida
Order	:	Lamiales
Family	:	Labiatae

Genus : Ocimum
Species : sanctum

Cultivation

Tulsi grows in tropical and warm regions. Plant is originated in India and is distributed and cultivated throughout the country. It is cultivated up to 1800 m above the sea level [4].

In India plant is grown from Himalayas to Andaman and Nicobar islands. It is widely grown in some areas of Asia and Africa [1]. It grows naturally in moist soil. Size form and medicinal properties of the plant depend upon the type of the soil and variations in the rainfall. There are almost 150 species of Ocimum genus in the tropical regions of Asia [6]

Table 1: Phytochemicals Present in Ocimum Sanctum

1.	Fixed oil ⁷	Linoleic acid, Linolenic acid, Oleic acid, Palmitric acid, Stearic acid.	Seeds
2	Essential oil ^{8,9,10}	Aromadendrene oxide, Benzaldehyde, Borneol, Bornyl acetate, Camphor, Caryophyllene oxide, cis- α -Terpineol, Cubenol, Cardinene, D-Limonene, Eicosane, Eucalyptol, Eugenol, Farnesene, Farnesol, Furaldehyde, Germacrene, Heptanol, Humulene, Limonene, n-butylbenzoate, Ocimene, Oleic acid, Sabinene, Selinene, Phytol, Veridifloro, α -Camphene, α Myrcene, α -Pinene, β -Pinene, α -Thujene, β -Guaiene, β -Gurjunene, methyl chavicol and linalool.	Leaves
3	Mineral Contents ¹¹	Vitamin C, Vitamin A, Calcium, Phosphours, Chromium, Copper, Zink, Iron.	Whole Plant
4	Alcoholic Extract ¹²	Aesculectin, Aesculin, Apgenin, Caffeic acid, Chlorogenic Acid, Circineol, Gallic Acid, Galuteolin, Isorientin, Isoviteixin, Luteolin, Molludistin, Orientin, Procatechuic acid, Stigmsterol, Urosolic acid, Vallinin, Viceni, Vitexin, Vllinin acid.	Leaves / Areal Parts

Tulsi plant as per ayurveda [13-15]

Ayurveda doctors recommend using all plant parts of Tulsi (Ocimum Sanctum). To arrange its juice we have to collect leaves, tender branches, tender roots, seeds and flowers of Tulsi almost all aerial part of Tulsi plant. Clean them fine with flowing pure water. Sever them into small pieces and crush them in a mortar and pastel to get ready a soft paste. Put the prepared arrange on a thin cotton cloth and press it to get pure Tulsi fluid. Tulsi as an ayurvedic drug, Tulsi plant extracts are used in ayurvedic remedies for common colds, headaches, stomach disorders, inflammation, heart disease, various forms of poisoning, and malaria. Traditionally, Tulsi is taken in many forms: as an herbal tea, dried powder, fresh leaf, or mixed with Honey or Ghee. This traditional shrub belongs to Labiatae, it is recognized by square stem and definite aroma. Two type of Osmium sanctum or common Tulsi plant are present.

1. Tulsi plants with green leaves known as Ram Tulsi
2. Tulsi plants with purple leaves known as Krishna Tulsi.

Tulsi medicinal property as per ayurveda

- Tulsi has anti-inflammatory properties as it undermined vata. So its external application on swollen area helps to reduce swelling and pain.
- Tulsi cures in many skin disorders. It is efficient in skin rashes, insect bites and itching. Trees of this plant are effectively used in ring worm infection also lucoderma.
- Fresh juice of Tulsi leaves is employ in nasya karma. This technique helps to ease headache and diseases of head and neck. Tulsi leaves act as nerving tonic.
- Extract of Tulsi leaves use to reduce acne, pimples and scars.
- As per Ayurvedic, arrangements of Tulsi are valuable in indigestion, intestinal parasites and constipation [7].
- Trampled leaves of Tulsi are extremely efficient in fever, cough, bronchitis and other medicinal problem of lungs.
- Tulsi employ as a cardiac tonic and purifies blood.
- Seeds of Tulsi are efficient in impulsive ejaculation. Mild aphrodisiac



Fig 1: Tulsi Ocimum sanctum plant

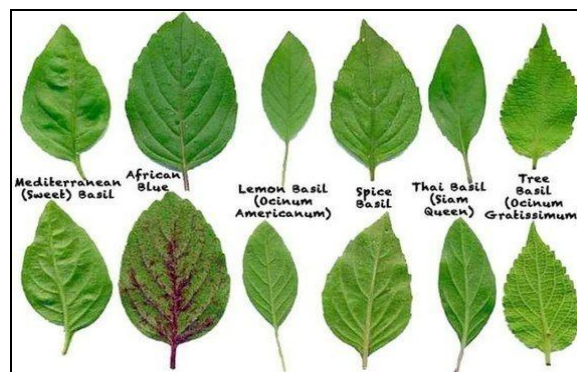


Fig 2: Different type Tulsi leaf of Ocimum Sanctum plant



Fig 3: Ocimum sanctum farming Sanctum plant



Fig 4: Krishna Tulsi



Fig 5: Ram Tulsi

Table 2: Extract and the Part of Tulsi Plant Used For Pharmacological Activities

	Therapeutic activity	Extract used	Part used
1	Anti-stress	Ethanollic	Whole plant (dried)
2	Anti-inflammatory	Methanolic/aqueous	Leaves
3	Anti-fungal	Methanolic/Ethanollic	Leaves
4	Anti-fertility	Benzene	Leaves
5	Hepatoprotective	Ethanollic/aqueous	Whole plant (aerial)
6	Anti-diabetic	Ethanollic/aqueous	Leaves
7	Anti-ulcer	Ethanollic/aqueous	Leaves
8	Anti-microbial	Ethanollic	Leaves
9	Anti-psychotic	Methanolic/ leaves paste	Leaves
10	Anti-cancer	Ethanollic	Root

Pharmacological Activities

The leaves are demulcent, diaphoretic & expectorant in bronchitis, cough, cold & cough & fever. It is an insecticide anti-helminthes & deodorizer & also has been used as laxative, stimulant & anti-inflammatory, cardio tonic & blood purifier in hepatic disorders. It can be used for indigestion, diminished appetite & all types of malaise. The oil may applied externally for chronic ulcers, inflammation and skin disorders [16-18] The therapeutic calibers of essential oils extracted from the fresh leaves of *Ocimum sanctum* has been claimed due to the presence of eugenol which is the major constituent of essential oils a phenolic compounds (1-hydroxy-2-methoxy-4-allyl benzene). It is well reported that significant activity of eugenol, essential oil components extracted from Tulsi leaves on immune system, gastric system, Central nervous system, blood chemistry etc. In experimental animals eugenol shows anti-diabetic,

triglyceride cholesterol decreasing action & other diagnostic clinical enzymes in blood serum LDH, GPT, GOT & alkaline phosphatase describing the therapeutic potentials of *Ocimum sanctum* as anti-diabetic, hypolipidemic, hepatoprotective agent. Eugenol also shows vasodilator effect on rabbit arterial tissues [18]. *Ocimum* as a whole plant is used in ulcers, maggots in wounds, pneumonia, anthrax, indigestion, myringitis (inflammation of inner ear), pain in abdomen, stoppage of urination, liver, constipation, fluke, stomach pain, cannabis poisoning, opacity of cornea, tachycardia, sore eyes, sprains. The leaves are used in bleeding, eye disease and udder infections & wound healing in ruminant's [19]. The ethanolic extract of Tulsi leaves lead to marked lowering of blood sugar in normal glucose fed hyperglycemic & streptozocin induced diabetic rats [20].

Scientific reports on tulsi plants and its health benefits

anti-stress: Stress leads to the production of more free radicals which produces an adverse effect on vital organs and human tissues. The agents increase the physical endurance and the states of non-specific resistance are called adaptogens or anti-stress agents [21]. Recent studies have shown that *O. sanctum* has a powerful adaptogenic property. Leaves of Tulsi help to prevent and reduce physical and mental stress [22]. Tulsi plays a role of a rejuvenator, which reduces stress, relaxes body and improves the memory. In an animal study it is found that the oral administration of ethanolic extract of tulsi (dose 20mg/kg) for 7 days has increased the level of adrenaline, non- adrenaline and decreased dopamine and serotonin levels in mice. This has resulted in overcoming the gravitational induced stresses [21]. In another animal study, it is found that the ethanolic extract of *O. sanctum* helps in preventing the change in plasma level of corticosterone which is induced due to the exposure to noise stress. This also indicates the anti-stress activity of Tulsi [23]. Adaptogenic activity of plant may be due to its immune- stimulant capacity [2, 4].

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 [2]. *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) [24].

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 [34].

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 [25].

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 [26].

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 tumor volume, increase in average body weight, and survival rate of mice [27].

Antiemetic Activity: Tulsi leaves also check vomiting and used for antiemetic action [28].

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 [29].

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 [30].

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, hemoglobin and also enhanced the production of antibodies without affecting the biochemical parameters [31].

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 [32].

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 activity³³.

Conclusion

Tulsi is a common herb grown in many households with a wide range of therapeutic properties. Tulsi is one of the most sacred herbs of India, and is an integral part of ancient Hindu traditions. According to Hindu mythology, Tulsi has been originated as one of the 14 "Ratnas (gems or treasures)" from the ocean as the ultimate sacred plant to enhance health and remove diseases. Tulsi is known as Queen of herbs due to its matchless properties. In Ayurveda, it is used as home remedy for treating various diseases. It is investigated that various parts of this plant is used for its anti-inflammatory, anti-fertility, anti-bacterial, hepatoprotective and other therapeutic

properties. "Tulsi" can be measured as a powerful herb which is used by the humans from very old times. Several medicinal properties have been attributed to the plant not only in Ayurveda and Siddha but also in Greek, Roman and Unani. The vast survey of literature showed that *Ocimum sanctum* has a huge spectrum of pharmacological activities. It has an esteemed status in herbs with diverse biological potentials and has a great scope for further new area of investigations. Traditionally crude extracts of various parts of plants have been used for their anti-diabetic, antioxidant, anti-stress, anti-hypolipidemic and antibacterial properties.

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