



# THERAPEUTIC ACTION OF QUEEN OF HERB(TULSI)

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**ABSTRACT:** Ayurveda is the traditional Indian system of medicine that is meant for curing diseases and also in preventing the occurrence of diseases. It focuses on healthy lifestyle practices and regular consumption of herbs especially mediational plants for curing various diseases. In the traditional system of medicine, different parts of the Tulasi plant (*Ocimum sanctum* Linn.) possess various therapeutic effects. Eugenol (1-hydroxy-2-methoxy-4-allylbenzene), the active constituents present in *O. sanctum* L. is largely responsible for the therapeutic potentials. *Caenorhabditis elegans* is a free-living, transparent nematode, about 1 mm in length, that lives in the temperate soil environment. This has been widely used as a model organism for various studies. The effect of crude extract of *Ocimum sanctum* on *C. elegans* has been studied here. Firstly, it includes extraction process from Tulsi leaves, then the maintenance of *C. elegans* which involves Preparation of NGM agar plates, M9 buffer solution, MEM for *E. coli*; seeding and chunking of plates; age synchronization.

**KEYWORDS:** *Ocimum sanctum*, Tulsi, Chemical constituents, Ayurveda, Pharmacological properties.

## INTRODUCTION

Tulsi (*Ocimum sanctum* L.) in Hindi or Tulasi in Sanskrit (holy basil in English) is an exceptionally adored culinary and restorative fragrant herb from the family Lamiaceae that is indigenous to the Indian subcontinent and been utilized inside Ayurvedic medication over 3000 years. In the Ayurveda framework tulsi is frequently alluded to as a "Solution of Life" for its mending powers and has been known to treat a wide range of basic wellbeing conditions. In the Indian Materia Medica tulsi leaf separates are portrayed for treatment of bronchitis, ailment and pyrexia. It is viewed as a pervasive plant in India. It is a fragrant plant in the family lamiaceae. It is an erect, much stretched sub bush 30-60cm tall with furry stems and basic inverse green leaves that are unequivocally scented. Tulsi is an erect pleasant-smelling bush which develops up to a stature of 3-5 feet.

Indeed, for sore throat, the leaves of therapeutic plant Tulsi are of extraordinary worth. Simply heat up the leaves of Tulsi in water and request that the patient swish with this decoction. Tulsi can reinforce the kidneys. For those experiencing the issue of renal kidney stones, the decoction arranged by blending the juice of Tulsi leaves with nectar, whenever taken truly for six successive months can remove these stones through the urinary tract. For keeping up solid heart, Tulsi is of most extreme worth. It helps in bringing down the degree of cholesterol in blood.[1]

## SYNONYMS

Sacred basil, Holy basil.

## BIOLOGICAL SOURCE

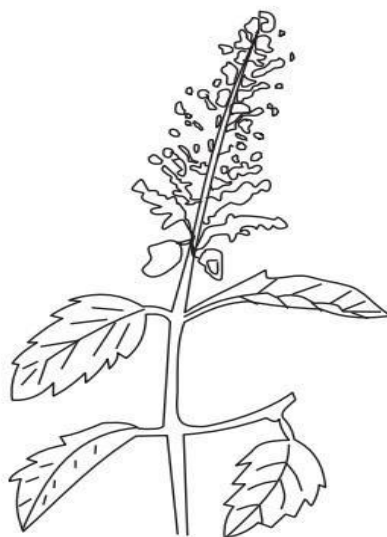
Tulsi consists of fresh and dried leaves of *Ocimum sanctum* Linn., belonging to family Labiatae.

## GEOGRAPHICAL SOURCE

It is a herbaceous, much branched annual plant found throughout India, it is considered as sacred by Hindus. The plant is commonly cultivated in garden and also grown near temples. It is propagated by seeds. Tulsi, nowadays, is cultivated commercially for its volatile oil.

## CHARACTERISTICS

It is much branched small herb and 30 to 75 cm in height. All parts of tulsi are used in medicine, especially fresh and dried leaves. Leaves are oblong, acute with entire or serrate margin, pubescent on both sides and minutely gland-dotted, the leaves are green in colour with aromatic flavour and slightly pungent taste. Flowers are purplish in colour in the form of racemes. Nutlets are sub globose, slightly compressed, pale brown or red in colour. Seeds are reddish-black and sub globose.



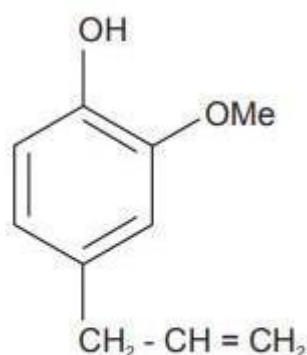
**Ocimum Sanctum**

## MICROSCOPY

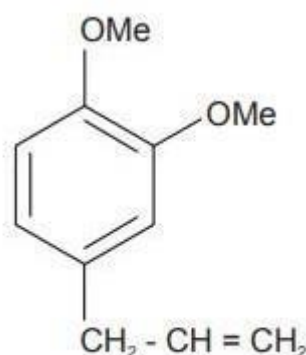
Tulsi leaf is dorsiventral. Stomata are of diacytic type, particularly abundant on lower surface. Epidermal cells are wavy walled with thin cuticle. A single layer of elongated palisade cells is present below upper epidermis. Mesophyll consists of four to six layers of spongy parenchymatous cells with intercellular spaces and oil glands. Leaf bears both covering and glandular trichomes; covering trichomes, uniseriate, multicellular and often very long (100–400  $\mu$ ). Glandular trichomes are sessile with radiate head composed of eight cells with common cuticle forming a bladder, typical labiate type trichomes. A few glandular trichomes with unicellular stalk and a spherical unicellular head also occur. The midrib region shows collenchymatous cells below both upper and lower epidermis. Xylem bundles are arranged in an arc. The phloem is arranged on the dorsal side of xylem.

## CHEMICAL CONSTITUENTS

Tulsi leaves contain bright, yellow coloured and pleasant volatile oil (0.1 to 0.9%). The oil content of the drug varies depending upon the type, the place of cultivation and season of its collection. The oil is collected by steam distillation method from the leaves and flowering tops. It contains approximately 70% eugenol, carvacrol (3%), and eugenol-methyl- ether (20%). It also contains caryophyllin. Seeds contain fixed oil with good drying properties. The plant is also reported to contain alkaloids, glycosides, saponin, tannins, an appreciable amount of vitamin C and traces of maleic, citric, and tartaric acid. [2-6]



**Eugenol**



**Methyleugenol**

**SCIENTIFIC CLASSIFICATION****Kingdom:** Plantae**Division:** Magnoliopyt**Class:** Lagnoliopsida**Order:** Lamiales**Family:** Lamiaceae**Genus:** Ocimum**Species:** Ocimum tenuiflorum**Binomial name:** Ocimum tenuiflorum (or) ocimum sanctum L.**PHYTOCHEMICALS PRESENT IN OCIMUM SANCTUM**

Extracts Phyto Chemicals Plant Parts

**1.** Fixed oil Linoleic acid, Linolenic acid, Oleic acid, Palmitric acid, Stearic acid.**Seeds****2.** Essential oil, 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-butyl benzoate, 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 Vitamin C, Vitamin A, Calcium, Phosphours, Chromium, Copper, Zink, Iron.**4. Wholeplant****5.** Alcoholic Extract Aesculetin, Aesculin, Apgenin, Caffeic acid, Chlorogenic Acid, Circannual, Gallic Acid, Galuteolin, Isorientin, Isovitexin, Luteolin, Molludistin, Orientin, Procatechuic acid, Stigmsterol, Urosolic acid, Vallinin, Viceni, Vitexin, Vllinin acid.[7]

Tulsi is also known as "the elixir of life" since it promotes longevity.

**CLASSICAL THERAPEUTIC USES:**

- **Kasa:** The juice of black Tulasi mixed with honey is useful in cough caused by Kapha.
- **Kushta:** Mula swarasa should be taken daily in the early morning.
- **Sheetapitta:** Applications of Tulasi juice is the best remedy.
- **Vishamajwara:** Leaves juice mixed with Maricha powder should be taken.
- **Karnashula, Vranaprakshalana, Krmidamsa and carmaroga:** Leaves juice is useful.
- **Mutrakrcchra:** Seeds are useful.
- **Krimi:** The drugs of surasadi gana separately should be taken with honey.
- **Visha:** In case of poison located in head, one should take as snuff, the roots of Bandhuka, Bhargi and black tulasi
- **Karnashula:** Oil cooked with surasadi drugs should be filled in the ear. It removes pain.
- **Pakshmathata:** Pushpakasisa is powdered and impregnated with Tulasi juice in a copper vessel for ten days used as collyrium.
- **Conjunctivites:** Juice of tulasi mixed with honey should be used as collyrium.
- **Vrana:** Sprinkling with the juice of surasadi drugs or paste of garlic destroys the maggots in wound.

- **Indigestion:** Water boiled with the root of Shweta tulasi and sunthi removes indigestion immediately.
- **Makkalla (Post-partum pain):** Intake of the juice of tulasi mixed with old jaggery and wine -scum removes pain.
- **Pediatric disorders:** Lavanga, tulasi leaves and tankana all pounded together should be given to the child, it alleviates jwara, kasa, shwasa and abdominal disorders.[8]

## TYPES OF TULSI:

There are three different types of tulsi or holy basil namely.

### **Rama Tulsi:**

Rama Tulsi is also called green leaf tulsi and this is a different type of tulsi breed that has light purple flowers and has a clove-like scent to it. It consists of eugenol which is usually found in cloves and has a mellow flavour.

### **Krishna Tulsi:**

This type of Tulsi is also called purple leaf tulsi and has a clove-like aroma. It tastes like pepper in your mouth. This type of tulsi helps cure infections such as throat infections, respiratory problems, earaches and skin diseases. The oil from Krishna Tulsi is used as ear drops. It is also used to cure malaria, indigestion, insomnia and cholera.

### **Vana Tulsi:**

Vana Tulsi is a native to India, Sri Lanka, and Northeastern parts of Africa. This type of tulsi is usually grown for medicinal purposes and it is imbibed into Indian religious beliefs. This type must be protected from freezing and will grow in conditions that have full sun and dry areas. It has light green leaves that are accompanied by a lemony aroma and flavour. Vana Tulsi leaves increases immunity and this is usually used for preparing tea. When consumed in the form of tea, it provides health benefits such as increased physical and mental endurance and adds more oxygen and nutrients to your bloodstream.

## PROPERTIES OF TULSI:

- It might be an antipyretic (relieves fever) agent
- It might have anti-inflammatory activity
- It might be an antiemetic (prevents vomiting)
- It might help lower the blood sugar (antidiabetic)
- It might act as an hypotensive (lowers blood pressure)
- It might have hypolipidemic (lowers cholesterol) activity
- It might act as an analgesic (relieves pain)
- It might have anti-asthmatic activity
- It might be an hepatoprotective (liver-protective) agent
- It might help reduce stress (antistress)
- It might be a potent expectorant (expels mucous)
- It might have anticancer potential
- It might be a diaphoretic (induces sweating)

## BENEFITS OF USING TULSI:

Western medicine gives you instant relief but comes with a lot of side effects. Holy basil or Tulsi offers slow relief but you can be sure that there are no side effects and that is the reason why it is called the wonder herb. A single Tulsi plant can help you get rid of many health issues such as.

### **Tulsi for Skin:**

Tulsi is proven to be the safest skin cream that can be used and the benefits are massive. Tulsi reflects on your skin when you consume it as well as applied. This wonder herb is used to treat acne, skin infections, lighten dark spots and improve skin texture. Here is a list of benefits that tulsi does to your skin.

- Tulsi helps in skin brightening.
- Tulsi helps in curing acne face marks.

- Tulsi mixed with eggs and mixed can help in tightening skin pores.
- Tulsi helps in curing skin infections and any sort of skin allergies.

### ***Tulsi for Hair:***

Holy Basil can be applied to your hair for multiple reasons and all that it does is it makes your hair look better in all ways. Here are some of the ways in which tulsi can benefit your hair.

- Tulsi can help prevent hair fall.
- Tulsi can reduce greying of the hair and keep it thick and black.
- Tulsi can reduce dandruff.
- Tulsi can help prevent dry scalp.

### ***Tulsi for Weight Loss:***

Tulsi is a natural ingredient that aids weight loss. If you're wondering how to burn fat in a quick way without any side effects, then you need to opt for drinking tulsi tea. Two cups a day will make a difference. Also, you need to keep in mind that drinking tulsi tea will act more efficiently only if you work out. of course, without exercising tulsi tea can slim you down, but exercising will make the process faster. Here are some ways in which tulsi can help you lose weight.

- Tulsi tea controls your metabolism and helps your body absorb essential nutrients.
- Tulsi tea helps boost your digestive system which is important for losing weight quickly.
- Tulsi tea has zero calories that boost your stamina.

### ***Tulsi for Eyes:***

Your eyes are prone to a lot of dust and pollution every day. Thus, most people develop eye-related problems and Tulsi acts as an immediate cure for eye-related problems such as:

- Tulsi soothes the eyes.
- Tulsi leaves left in boiled water overnight can be used to wash your eyes.
- Tulsi eyewash can also reduce strain on your eyes.

Most importantly, it reduces the strain on your eyes and makes them feel relaxed. Tulsi eyewash can also help you prevent many other eye-related problems such as conjunctivitis and boils.

### ***Tulsi Prevents Premature Ageing:***

Vitamin C & A and phytonutrients are essential oils that are found in Tulsi, which are used as excellent antioxidants that protect the body from premature ageing. If herbal tea is said to make you feel and look young, imagine what Tulsi can do. Consuming 2 cups of Tulsi tea can help you look younger and prevent premature ageing.

### ***Tulsi To Quit Smoking:***

Tulsi leaves help fight cancer and prevents it from attacking you. The best aid to stop smoking is by munching tulsi leaves and this help get the nicotine content off your body. It helps in the purification of blood. Here are some ways in which tulsi can help you stop smoking.

- Every time you get the urge to smoke, chew Tulsi leaves.
- Make it a point to drink tulsi tea.

Tulsi can definitely help you stop smoking, provided you learn ways to deviate and curtail yourself from going against the urge. It's all in your mind and the power of becoming a deviant from the habit is the 1st step to change the habit. [9-11]

### **Antioxidant Activity**

Antioxidant activity of the flavonoids (orientin and vicenin) in vivo was expressed in a significant reduction in the radiation induced lipid peroxidation in mouse liver. OS extract has significant ability to scavenge highly reactive free radicals<sup>28</sup>. 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.

### **Immunomodulatory Activity**

Steam distilled extract from the fresh leaves of OS showed modification in the humoral immune response in albino rats which could be attributed to such mechanisms as antibody production, release of mediators of hypersensitivity reactions and tissues responses

to these mediators in the target organs. OS seed oil appears to modulate both humoral and cell-mediated immune responsiveness and GABergic pathways may mediate these immunomodulatory effects.

### **Antipyretic Activity**

The antipyretic activity of OS 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.

### **Anticancer Activity**

The alcoholic extract (AIE) of leaves of OS has a modulatory influence on carcinogen metabolizing enzymes such as cytochrome P 450, cytochrome b5, aryl hydrocarbon hydroxylase and glutathione S-transferase (GST), which are important in detoxification of carcinogens and mutagens.<sup>34</sup> The anticancer activity of OS has been reported against human fibrosarcoma cells culture, wherein AIE of this drug induced cytotoxicity @5 the cells showed shrunken cytoplasm and condensed nuclei. The DNA was found to be fragmented on observation in agarose gel electrophoresis.

### **Chemopreventive Activity**

The chemopreventive effect of OS leaf extract is probably through the induction of hepatic/extra hepatic GST in mice. Elevated levels of reduced GSH in liver, lung and Stomach tissues in OS extract supplemented mice were also found. Significant antiproliferative and chemo preventive activities were observed in mice with high concentration of OS seed oil. The potential chemopreventive activity of seed oil has been partly attributed to its antioxidant activity.

### **Radioprotective Activity**

The radio protective effect of OS was firstly reported in the year 1995.<sup>39</sup> Two isolated flavonoids, viz., orientin and vicenin from OS leaves showed better radio protective effect as compared with synthetic radio protectors. They have shown significant protection to the human lymphocytes against the clastogenic effect of radiation at low, nontoxic concentrations. The combination of OS leaf extract with WR-2721 (asynthetic radio protector) 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.

### **Antihypertensive And Cardio Protective Activities**

The transient cerebral ischemia and long term cerebral hypoperfusion (causing cellular oedema, gliosis and perivascular inflammatory infiltrate) have been prevented by OS. 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). The long term feeding of OS offers significant protection against isoproterenol-induced myocardial necrosis in Wistar rats through enhancement of endogenous antioxidant.

### **Antimicrobial Activity**

AQE of OS showed growth inhibition for *Klesbiella*, *E. coli*, *Proteus* and *Staphylococcus aureus*; while AIE of OS showed growth inhibition for *Vibrio cholerae*. 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. Similarly, OS was found to be active against resistant *Neisseria gonorrhoea* strains. 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.

### **Anti-Inflammatory Activity**

Methanolic extract (500 mg/kg) and aqueous suspension of OS showed analgesic, antipyretic and anti-inflammatory effects in acute (carrageenan-induced pedal oedema) and chronic (croton oil induced granuloma and exudate formation) inflammations in rats. The fixed oil and linolenic acid possess significant anti-inflammatory activity against PGE2, leukotriene and arachidonic acid induced paw oedema in rats by virtue of their capacity to block both the cyclooxygenase and lipoxygenase pathways of arachidonic acid metabolism.

### **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.

### **Memory Enhancer Activity**

The AIE of dried whole plant of OS ameliorated the amnesic effect of scopolamine (0.4 mg/kg) and aging-induced memory deficits in mice. Passive avoidance paradigm served as the exteroceptive behavioural model. OS extract increased step-down latency (SDL) and acetylcholinesterase inhibition significantly. Hence, OS can be employed in the treatment of cognitive disorders such as dementia and Alzheimer's disease.

### **Hepatoprotective Activity**

Oral administration of hydro-ethanolic extract of OS leaves @ 200 mg/kg in male Wistar albino rats gave protection against liver injury induced by paracetamol. The cold-water extract (3g/100 g, orally for 6 days) of OS was found to be effective against carbon tetrachloride (0.2 ml/100 g, subcutaneously) induced liver damage in albino rats.

### Antifertility Activity

Benzene extract of fresh OS leaves in male rats showed decreased total sperm count, sperm motility and weight of testis. The long-term feeding (up to 3 months) of OS leaves (200 and 400 mg/kg) to adult male and female albino rats along with normal diet decreased sperm count, sperm motility and weight of male reproductive organs.

### Antidiabetic Activity

Oral administration of OS extract led to marked lowering of blood sugar in normal glucose fed hyperglycemic and streptozotocin-induced diabetic rats. A randomized, placebo-controlled, cross over single blind human trial indicated a significant decrease in fasting and postprandial blood glucose levels by 17.6% and 7.3%, respectively. Urine glucose levels showed a similar trend. Further, OS has aldose reductase activity, which may help in reducing the complications of diabetes such as cataract, retinopathy.

### 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. The fixed oil significantly possessed antiulcer activity due to its lipoxygenase inhibitory, histamine antagonistic and antisecretory effects.

### Antiarthritic Activity

The anti-arthritic 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, ip41. The fixed oil inhibited carrageenan and inflammatory mediators (e.g., serotonin, histamine, bradykinin and PGE2) induced inflammation. It is natural that the oil could inhibit any inflammatory response involving these mediators. The result suggests potentially useful anti-arthritic activity of the inflammation models; including adjuvant as well as turpentine oil induced joint oedema in rats.

### Adaptogenic Activity/Antistress Activity

The immune-stimulant capacity of OS may be responsible for the adaptogenic action of plant. 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. [12-15]

## CONCLUSION

In Hinduism, it is regarded as an earthly manifestation of the Goddess Lakshmi. She is the great worshipper of Lord Vishnu. The offering of its leaves is mandatory in ritualistic worship of Lord Vishnu and his forms like Lord Krishna and Lord Vithoba. While worshipping trees is not uncommon in Hinduism, the Tulsi plant is considered the holiest of all plants. The Tulsi plant is regarded as a threshold point between heaven and earth.

According to the Devi Bhagavata Purana, Tulsi is a manifestation of Lakshmi, the goddess of wealth and principal consort of Vishnu. A feud between her and Goddess Saraswati arose because Saraswati was angry at her. Goddess Saraswati cursed Goddess Lakshmi to be born on earth. As Goddess Ganga tried solving the feud, Goddess Lakshmi, and Goddess Ganga cursed each other become rivers on earth. However, Lord Vishnu assured Goddess Lakshmi that she would be born as Tulsi.

A person who waters and cares for the Tulsi daily is believed to gain moksha (salvation) and the divine grace of Vishnu, even if he does not worship it. Traditionally, the daily worship and care of the plant are the responsibility of the women of the household. The plant is regarded as a "women's deity" and a "symbol of ideal wifehood and motherhood". Though daily worship is prescribed, Tuesdays and Fridays are considered especially sacred for Tulsi worship.

Every part of the Tulsi plant is revered and considered sacred. Even the soil around the plant is holy. The Padma Purana declares a person who is cremated with Tulsi twigs in his funeral pyre gains moksha and a place in Vishnu's abode Vaikuntha. If a Tulsi stick is used to burn a lamp for Vishnu, it is like offering the gods lakhs of lamps.

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