



---

## Ocimum Sanctum (tulsi): Bio-pharmacological Activities

**Corresponding Author:**

Dr. Vinod Singh,  
Associate Professor and Head, Microbiology, Barlatullah University, Barkatullah University, 462026 - India

**Submitting Author:**

Dr. Vinod N Singh,  
Associate Professor and Head, Microbiology, Barlatullah University, Barkatullah University, 462026 - India

**Article ID:** WMC001046

**Article Type:** Review articles

**Submitted on:** 22-Oct-2010, 03:13:17 AM GMT **Published on:** 22-Oct-2010, 06:13:13 PM GMT

**Article URL:** [http://www.webmedcentral.com/article\\_view/1046](http://www.webmedcentral.com/article_view/1046)

**Subject Categories:** PHARMACOLOGY

**Keywords:** Ocimum sp, Eugenol, Medicinal plant, Immunomodulatory, Anti-cancer, Antimicrobial agent

**How to cite the article:** Singh V , amdekar s , Verma O . Ocimum Sanctum (tulsi): Bio-pharmacological Activities . WebmedCentral PHARMACOLOGY 2010;1(10):WMC001046

**Source(s) of Funding:**

no funding

**Competing Interests:**

no competing interest

# Ocimum Sanctum (tulsi): Bio-pharmacological Activities

**Author(s):** Singh V , amdekar s , Verma O

## Abstract

### Abstract

Medicinal plants are used by the practitioners and pharmacologists to prevent and cure many diseases for the last several thousand years. Tulsi is known as "Queen of plants" "The mother medicine of nature". Tulsi i.e. *Ocimum sanctum* is a plant with enormous properties for curing and preventing diseases. It is regarded as deity in Indian subcontinent. The genus *Ocimum sanctum* Linn. (Labiatae or Lamiaceae) comprises 30 species which are found in tropical and subtropical regions. Leaves and flowering tops are used for extracting essential oil. Oil of *O. sanctum* has revealed the presence of five fatty acids (stearic, palmitic, oleic, linoleic and linolenic acids). It is a good source of beta carotene, calcium, vitamin C and it also contains volatile substances (including estragol, linalool, eugenol, methyl chavicol and small quantities of methyl cinnamate, cineole, and other terpenes), tannins, camphor, flavonoids, triterpene: urolic acid. Leaves are diaphoretic, anti-periodic; they are also used in bronchitis, gastric and hepatic disorders. Decoction of leaves is recommended for cough, malaise and in colds. It is a good mosquito repellent as well. Oil extracted from flowers is used in skin diseases and ring worm infection. Various studies have been performed with *Ocimum sanctum* for its antibacterial, antioxidant, antiulceric, antimalarial, antidiabetic, anti-inflammatory, antilipidemic, anticancer and immunomodulatory properties. Present review incorporates the description of chemical and bio-pharmacological properties of *Ocimum* species

## Introduction

### Introduction

Plants are the primary source of medicines. Medicinal plants are considered to be very rich sources of secondary metabolites and oils which are of therapeutic importance. The important advantages of medicinal plants in various treatments are: their safety besides being less expensive, efficacy and availability through out the world [1]. Use of plants as a source of

medicinal value is a very old concept. Chinese were the first to use plants as therapeutics before 4000-5000 B.C. In India use of plants as a medicine appeared in Rigveda which has been written 3500 - 1600 B.C. Properties of plants as a source of medicine were studied in detail in Ayurveda which is considered the foundation of all the medical sciences [2].

In India Tulsi is taken as the most sacred plant. The use of *Ocimum sanctum* (Tulsi) as an aromatic plant has been well documented in Ayurveda. It belongs to the family Labiateae. It is grown in tropical and subtropical including India [3]. It is omnipresent in all Indian fields. It is an erect, sweet scented herb. Name "Tulsi" in Sanskrit means "the incomparable one". Whole plant is used as a source of remedy [4]. In India two forms of Tulsi are more common - dark or Shyama (Krishna) Tulsi and light or Rama Tulsi. The former possesses greater medicinal value and is commonly used for worship. Various other species are also commonly found in India like *O. canum*, *O. basilicum*, *O. kilimandscharicum*, *O. americanum*, *O. camphora* and *O. micranthum* [5], [6].

This plant has been evaluated pharmacologically for antimicrobial, immunomodulatory, anti-stress, anti-inflammatory, antipyretic, anti-asthmatic, hypoglycemic, hypotensive and analgesic activities. Tulsi has been found to be utmost effective in various types of animal models [7].

The leaves contain an essential oil, which contains eugenol, eugenal, carvacrol, methylchavicol, limatrol and caryophylline. The seeds contain oil composed of fatty acids and sitosterol. The roots contain sitosterol and three triterpenes A, B, and C. The leaves also contain ursolic acid and n-triacontanol. Eugenol, its methyl ether, nerol, caryophyllene, terpinen 4-decylaldehyde, selinene, pinenes, camphene and  $\alpha$ -pinene have been identified in essential oil. Additionally, it also contains rosmarinic acid, thymol, linalool and methyl chavicol and citral etc.[8].

### Therapeutic uses of *Ocimum sanctum*

Various medicinal properties have been attributed to *O. sanctum*. Whole tulsi plant has been found to possess several therapeutic properties and it is used by the medical practitioners. Flower, fruit, leaf, stem, root and for that matter almost every part of the plant is used as an expectorant, analgesic, anticancer, anti-asthmatic, anti-emetic, diaphoretic, anti-diabetic,

anti-fertility, hepatoprotective, hypotensive, hypolipidemic etc.

#### **Tulsi as a prophylactic agent**

Decoction of leaves is used against the gastritis and hepatic disorders [9]. The juice of fresh leaves is also given to patients to treat dysentery. In a study, it has been found that methanolic extract of *Ocimum suave* showed healing effect against chronic gastric ulcers induced in experimental rats. *Ocimum sp.* along with pepper, turmeric and onion is prophylactic against malaria. Oil is insecticidal and larvicidal. It contains:  $\beta$ -bisabolene (13-20%), methyl chavicol (3-19%), 1,8-cineole (9-33%), eugenol (4-9%), (E)- $\alpha$ -bisabolene (4-7%) and  $\alpha$ -terpineol (1.7-7%) are the main constituents of tulsi oil [1]. Often, Tulsi is planted in Indian gardens as a mosquito repellent. Essential oils of Tulsi possess 100% larvicidal property. It has been found that Tulsi has excellent anti-malarial properties as well. Eugenol is the main constituent and it is responsible for its repellent property. Paste prepared from Tulsi leaves is used against the ringworm infection. Tulsi removes worms and parasites. Tulsi extract with honey is recommended so that the parasites may be excited, thus drawing them out of their hiding places. Paste of its leaves is applied on face to clear marks [6]. Urosolic acid present in leaves returns elasticity and removes wrinkles. Tulsi helps skin stay healthy and supple. Use of Tulsi in the treatment of all kinds of cuts, wounds and ulcers is highly beneficial. The leaf juice of tulsi along with triphala is used as an eye tonic and is recommended for glaucoma, cataract, chronic conjunctivitis and other diseases associated with eyes. Chewing 3-4 of leaves before a meal helps stimulating the appetite, and a tea taken after a meal promotes digestion by increasing the flow of gastric juices, while reducing gas and bloating. *Ocimum sanctum* also reduces the chances of ulcers. It is an active diaphoretic common cold. It removes excess cough from lungs and nasal passages. A decoction of Tulsi leaves is a popular remedy for common cold in India. It is also given for fever along with the clove. It also lowers the uric acid levels and hence is considered as a potential anti-inflammatory agent. The leaves of basil are specific for many fevers. During the rainy season, when malaria and dengue fever are widely prevalent, tender leaves, boiled with tea, act as preventive against these diseases. In case of acute fevers, a decoction of the leaves boiled with powdered cardamom brings down the temperature, thereby it has been considered as a potential antipyretic cocktail as a home remedy. Tulsi is an important constituent of many cough syrups and expectorants. It helps to mobilize mucus in bronchitis and asthma. Chewing

tulsi leaves relieves cold and flu. The leaves are nerve tonic and also sharpen memory. They promote the removal of the catarrhal matter and phlegm from the bronchial tube. It is useful in teeth disorders and is also recommended as a remedy against pyorrhea. Also, it is used as a remedy for night blindness and conjunctivitis. Being nerve tonic the leaves are used to sharpen memory. It is a good source of antioxidants and offer substantial protection against free radical induced damage. Oxygen free radicals are natural physiological products, containing one or more unpaired electrons [1]. Reactive oxygen species (ROS) may damage life important membrane lipids, proteins, DNA and carbohydrates [2]. This damage has been implicated in the causation of several diseases such as liver cirrhosis, atherosclerosis, cancer, and diabetes etc. [3], [4], [6], [7]. It has been well accepted that dietary antioxidants have great potential in ameliorating these disease processes [8]. Antioxidants thus play important role in protecting the human body against damage by reacting oxygen species [9]. It also decreases the lipid peroxidation and increases the activity of super-oxide dismutase [10]. Presence of eugenol attributes to its anti-oxidative property and is also thought to be responsible for inhibition of lipid peroxidation [11]. This property helps in maintaining good health and in preventing the chances occurrence of heart diseases as well as most of the other biochemical diseases because oxidative stress is the hallmark of such diseases [12].

#### **Antibacterial, antiviral and antifungal activities**

Essential oil present in most of the *Ocimum* species is responsible for its antifungal, antibacterial and antiviral properties. Microorganisms develop resistance against various antibiotics and due to this an immense clinical problem develops in treatment of infectious diseases. Medicinal plants can be used to overcome this problem. Tulsi leaves have been reported to show strong antifungal activities against the *Aspergillus* species [13]. In vitro antifungal activity was also observed against *Candida* species also when oil from *O. gratissimum* L. was used [14]. *Ocimum* shows strong antibacterial activity against *Klebsiella* (causes pneumonia and urinary tract infections), *E. coli*, *Proteus* & *Staphylococcus aureus* and *Vibrio cholerae*. Studies have shown *O. basilicum* act as a strong antiviral agent against DNA viruses (herpes viruses (HSV), adenoviruses (ADV) and hepatitis B virus) and RNA viruses (coxsackievirus B1 (CVB1) and enterovirus71 (EV71) [7]. *O. tenuiflorum* also has been reported to be having antiviral activity against Bovine herpes virus -1. Essential oil from *Ocimum sp* which contain eugenol, carvacrol, methyl eugenol, caryophyllene are considered mainly to be responsible

for various antimicrobial properties.

#### **Antidiabetic properties**

Leaves of *O. sanctum* have been shown to possess hypoglycaemic effects in experimental animals [15], [16], [17], [18]. Decoction prepared with various parts of plant lowers the blood sugar level [19]. A study conducted [20] on rats has suggested that constituent of *O. sanctum* leaf extracts have stimulatory effects on physiological pathways of insulin secretion. Various studies have been performed on the antiglycemic properties of *Ocimum* but its mechanism of action has not been elucidated as yet [20], [21]. Study [22] conducted with tulsi plus neem has suggested that this combination is better for the diabetic patients in lowering the sugar level.

#### **As an anticancer agent**

Cancer has been a leading cause of death in the developing countries. With changing standard of living and food habits and also due to availability of curative treatment for many infectious diseases, cancer is surpassing other ailments as a principle cause of morbidity and mortality even in developing countries. Surgery, radiotherapy and chemotherapy- the established treatment modalities for various cancers are costly, mutilating, having serious side effects and associated with residual morbidity as well as frequent relapses. In ayurveda, various plants are used as a potential source of anticancer and antitumor properties. It has been found that ethanolic extract of *O. sanctum* mediated a significant reduction in tumor cell size and an increase in lifespan of mice having Sarcoma-180 solid tumors [23]. Similar results were also obtained by others where anticancer activity of *O. sanctum* in Lewis lung carcinoma animal model has been reported [24]. Ursolic acid and oleanic acid possess anticancer property. *Ocimum* has the ability to protect the DNA of the body from dangerous radiations [25].

#### **Antilipidemic efficacy**

Hyperlipidaemia, atherosclerosis and related diseases are becoming a major health problem now days. Aqueous extract of *O. basilicum* reduces the level of total cholesterol, triglycerides and LDL-cholesterol levels in acute hyperlipidaemia induced by triton WR-1339 in rats [26]. In a study conducted on rabbits a diet supplemented with 1-2 % fresh leaves of Tulsi for 28 days lowered the total lipid [27].

#### **As an antifertility agent**

One of the major constituents of the Tulsi leaves is ursolic acid and it has been reported that it possess anti-fertility effect. This effect has been attributed to its anti-estrogenic activity which may be responsible for arrest of spermatogenesis in males and due to inhibitory effect on implantation of ovum in females. This constituent may prove to be a promising

anti-fertility agent devoid of side effects. In males, Tulsi leaves reduce spermatogenesis by retarding sertoli cells activity [28]. The leaves of *O. canum* have been shown to possess anti-implantation activity in experimental albino rats. Ursolic acid is responsible for its anti-sterility property [1]. Tulsi leaves have antiandrogenic property [29] as well. Benzene extract of *O. sanctum* in albino rats decreases the total sperm count and sperm motility [29].

#### **Stress relieving agents**

Stress is a common phenomenon that is experienced by every individual. Stress is defined as "non specific result of any demand upon the body". Stress can be either physical or psychological. When stress becomes extreme, it is harmful for the body and, hence, needs to be treated. Stress is involved in the pathogenesis of a variety of diseases that includes psychiatric disorders such as depression and anxiety, immunosuppression, endocrine disorders including diabetes mellitus, male impotence, cognitive dysfunction, peptic ulcer, hypertension and ulcerative colitis. Tulsi is an excellent rejuvenator, which has been known to help reduce stress, relax the mind and assist the body in improving memory. Tulsi has antihypoxic effect and it increases the survival time during anoxic stress [30]. A study conducted with rabbits has suggested that Tulsi decreased oxidative stress [31].

Tulsi leaves are regarded as an 'adaptogen' or anti-stress agent. Recent studies have shown that the leaves afford significant protection against stress [32]. If taken twice a day, Tulsi is a powerful calming herb. It also counteracts many troublesome effects of chronic stress, including nervousness, sleeplessness, and digestive disorders. Animal research has verified that extracts of Tulsi leaves prevented changes in plasma levels of the stress hormone corticosterone induced by both acute and chronic noise stress.

#### **As an immunomodulatory agent**

Tulsi strengthens the immune response by enhancing both cellular and humoral immunity. It shows anti-inflammatory action akin to aspirin but doesn't show any side effects. It reduces the pain and dangerous inflammation that leads to arthritis. Studies conducted on Freund's adjuvant induced arthritis, formaldehyde-induced arthritis and also turpentine oil-induced joint edema in rats have shown that oil of Tulsi decreased significantly the symptoms of arthritis and edema [33]. Fixed oil of *Ocimum sanctum* (Labiatae) was found to possess significant anti-inflammatory activity against carrageenan- and different other mediator-induced paw edema in rats. *Ocimum sanctum* may be a useful anti-inflammatory agent which blocks both

the pathways, i.e. cyclooxygenase and lipoxygenase of arachidonic acid metabolism.

## Conclusion

### Conclusions

There are many herbal plants in the world but the *Ocimum sanctum* (Tulsi) is considered to be the queen of herbs due to its greater medicinal values. It is well documented in the Hindu mythology about the Tulsi. Considering the health beneficial effects of Tulsi our ancestors in India insisted to plant a Tulsi sapling in everyone's house. Keeping the various medical benefits in view, investigations are called for to be attempted towards purifications of Tulsi components and their characterization in terms of chemical natures and bio-pharmacological activities. Probably, such natural components might prove to be potentially beneficial but comparatively less toxic. Eventually, plants belonging to *Ocimum* genus could contribute a lot towards economy and healthy problem.

## References

- Ahmed M, Ahamed RN, Aladakatti RH, Ghosesawar MG. Reversible anti-fertility effect of benzene extract of *Ocimum sanctum* leaves on sperm parameters and fructose content in rats. *J Basic Clin Physiol Pharmacol.* 2002; 13(1):51-9.
- Amrani S, Harnafi H, Bouanani Nel H, Aziz M, Caid HS, Manfredini S, Besco E, Napolitano M, Bravo E. Hypolipidaemic activity of aqueous *Ocimum basilicum* extract in acute hyperlipidaemia induced by triton WR-1339 in rats and its antioxidant property. *Phytother Res.* 2006 ;20(12):1040-5.
- Banerjee, S, Parashar R, Kumar A, Rao A R. Modulatory influence of alcoholic extract of *Ocimum* leaves on carcinogen-metabolizing enzyme activities and reduced glutathione levels in mouse. *Nutr Cancer* 1996, 25(2): 205-217
- Bansod S and Rai M. Antifungal Activity of Essential Oils from Indian Medicinal Plants against Human Pathogenic *Aspergillus fumigatus* and *A. niger*. *World Journal of Medical Sciences* 2008, 3(2): 81-88
- Bhargava K P, Singh N. Antistress activity of *Ocimum sanctum* Linn. *Ind J Med Res* 1981,73:443-451
- Chattopadhyay RR. Hypoglycemic effect of *O. sanctum* leaf extract in normal and streptozotocin diabetic rats. *Indian Journal of Experimental Biology* 1993,31 891–893
- Chiang L C, Ng L T, Cheng P W, Chiang W & Lin C. Antiviral activities of extracts and selected pure constituents of *Ocimum basilicum*. *Clinical and Experimental Pharmacology and Physiology* 2005, 32(10): 811-816.
- Dhar M L, Dhar M M, Dhawan BN, Mehrotra BN & Roy C. Screening of Indian plants for biological activity, Part I. *Indian Journal of Experimental Biology* 1968,6 232–247
- Eshrat Halim, Hussain M A, Kaiser Jamil, Mala Rao. Hypoglycemic, Hypolipidaemic and Antioxidant properties of tulsi (*Ocimum sanctum* linn) on streptozotocin induced diabetes in rats. *Indian J of Clin Biochemistry* 2001,16(2); 190-194.
- Farid et al. Effect of *Ocimum basilicum* on glucose and lipids metabolism. 2009 187-199.
- Gupta S K, Prakash J, Srivastava S V. Validation of claim of Tulsi, *Ocimum sanctum* Linn as a medicinal plant. *Indian J Experimental Biology* 2002, 40(7): 765–773.
- Hannan J M A, , Marenah L, Ali L, Rokeya B, Flatt P R and Abdel-Wahab YHA *Ocimum sanctum* leaf extracts stimulate insulin secretion from perfused pancreas, isolated islets and clonal pancreatic  $\beta$  cells. *Journal of Endocrinology* 2006,189: 127–136
- Joglekar GV, Chaudhary NY & Aiman R. Effect of indigenous plant extracts on glucose-absorption in mice. *Indian Journal of Physiology and Pharmacology* 1959, 3: 76
- Jyoti S, Satendra S, Sushma S, Anjana T, Shashi S. Antistressor activity of *Ocimum sanctum* (Tulsi) against experimentally induced oxidative stress in rabbits. *Methods Find Exp Clin Pharmacol.* 2007, 29(6):411-6.
- Karthikeyan, P. Gunasekaran, N. Ramamurthy and S. Govindasamy Anticancer Activity of *Ocimum Sanctum*. *Summary Pharmaceutical Biology* 1999, Vol. 37, No. 4, Pages 285-290 .
- Kath R K & Gupta R K. Antioxidant activity of hydroalcoholic leaf extract of *Ocimum sanctum* in animal models of peptic ulcer. *Indian J Physiol Pharmacol* 2006, 50 (4): 391–396.
- Kochhar A, Sharma N and Sachdeva R. Effect of Supplementation of Tulsi (*Ocimum sanctum*) and Neem (*Azadirachta indica*) Leaf Powder on Diabetic Symptoms, Anthropometric Parameters and Blood Pressure of Non Insulin Dependent Male Diabetics. *Ethno-Med* 2009, 3(1): 5-9
- Madhuri Sharma and Pandey Govind. Ethnomedicinal plants for prevention and treatment of tumours 2009, 3 (1):2-5.
- Misra P ?, Pal NL, Guru P K, Katiyar J C and Tandon J S. Antimalarial Activity of Traditional Plants against Erythrocytic Stages of *Plasmodium berghei*.

- Pharmaceutical Biol. Vol. 29(1): 19-23, 1991.
20. Mandal S, Das D N, Kamala D, Ray K, Roy G, Chaudhari SB, Sahana. *Ocimum sanctum* Linn - A study on gastric ulceration and gastric secretion in rats. *Indian J Physiol Pharmacol* 1993, 37: 91-92
21. Nagarajun S, Jain HC, Aulakh GS. Indigenous plants used in the control of Diabetes. In: *Cultivation and utilization of medicinal plants*. Editors: Atal CK and Kapoor BM (Published PID CSJR).p. 584, 1989.
22. Nair V D, Jaleel CA, Gopi R, Gomathinayagam M, Panneerselvam R. Antioxidant potential of *Ocimum sanctum* under growth regulator treatments. *EurAsia J BioSci* 2009; 3: 1- 9.
23. Nakamura C V, Ishida K, Faccin L C, Filho B P D, Cortez D A G, Rozental S, de Souza W and Ueda-Nakamura T. In vitro activity of essential oil from *Ocimum gratissimum* L. against four *Candida* species. *Research in Microbiology* 2004, 155(7): 579-586.
24. *Ocimum sanctum*. The Indian home remedy. In: *Current Medical Scene* (Edited and published by S. Rajeshwari, Cipla Ltd., Bombay Central, Bombay), 1992
25. Panda S and Kar A. *Ocimum sanctum* leaf extract in the regulation of thyroid function in the male mouse. *Pharmacol Res* 1998, 38(2): 107-110.
26. Pandey BP and Anita. In: *Economic Botany* (Published by Chand and Company Ltd., Ramnagar, New Delhi), p. 294. 1990.
27. Paul V T, Mezui C, Enow-Orock G E, Dimo T, Nyasse B Healing effect on chronic gastric ulcers and short term toxicity profile of the leaf methanol extract of *Ocimum suave* wild (Lamiaceae) in rats. *Afr. J. Trad. CAM* 2005, 2 (3): 312 - 325.
28. Prakash P & Gupta N. Therapeutic use of *Ocimum sanctum* Linn (Tulsi) with a note on eugenol and its pharmacological actions: A short review. *Indian J. Physiol. Pharmacol* 2005,49 (2): 125-131.
29. Pratibha D. Nadig and Laxmi S. Study of anti-tussive activity of *Ocimum sanctum* Linn in guinea pigs. *Indian J Physiol Pharmacol* 2005, 49 (2): 243-245.
30. Rai V, Iyer U and Mani U V. Effect of Tulasi (*Ocimum sanctum*) leaf powder supplementation on blood sugar levels, serum lipids and tissue lipids in diabetic rats. *Plant Food for human Nutrition* 1997, 50(1): 9-16.
31. Rastogi S. Ayurveda for comprehensive healthcare. *Indian J. Med. Ethics* 2009, 6(2):101-102.
32. Reghunandana R et al. (1995). Effect of *Ocimum sanctum* Linn (Tulsi) extract on testicular function. *Indian J Medical Research* 1995,49(4):83-87.
33. Santum induces apoptosis in A549 lung cancer cells and suppresses the in vivo growth of lewis carcinoma cells. *Physiotherapy Research*,2009,23(10),1385-1391

## Authors

---

**Sarika amdekar**  
P.h.D. Scholar,  
Barkatullah University  
Bhopal(M.P)  
Inda  
462026.  
Omparakash Verma  
National JALMA Institute for Leprosy and other  
Mycobacterial Diseases  
Tajganj  
Agra(U.P.)  
India  
2610002.

## Disclaimer

This article has been downloaded from WebmedCentral. With our unique author driven post publication peer review, contents posted on this web portal do not undergo any prepublication peer or editorial review. It is completely the responsibility of the authors to ensure not only scientific and ethical standards of the manuscript but also its grammatical accuracy. Authors must ensure that they obtain all the necessary permissions before submitting any information that requires obtaining a consent or approval from a third party. Authors should also ensure not to submit any information which they do not have the copyright of or of which they have transferred the copyrights to a third party.

Contents on WebmedCentral are purely for biomedical researchers and scientists. They are not meant to cater to the needs of an individual patient. The web portal or any content(s) therein is neither designed to support, nor replace, the relationship that exists between a patient/site visitor and his/her physician. Your use of the WebmedCentral site and its contents is entirely at your own risk. We do not take any responsibility for any harm that you may suffer or inflict on a third person by following the contents of this website.