



Review of Biological Studies of *Ocimum Sanctum*

*Pratik Chandrakant Waghmare**¹, *Vaibhav Jadhav**², *Vikas Wamane**²

*¹ Student, *² Assistant Professor

^{1,2}Pratibhatai Pawar College of Pharmacy

DOI: <https://doi.org/10.55248/gengpi.2022.31201>

Abstract: -

In this current review of Tulsi, we sought to review the medicinal properties of Tulsi. Therapeutic use of plants is believed to be as safe, inexpensive, and efficient as they are readily available. Plants known for their medicinal properties include the *Ocimum* genus. Tulsi is a medicinal plant native to India, highly valued for its medicinal and therapeutic effects. Some of the medicinal properties of tulsi are found in its roots, leaves and seeds. The effects on the human body are wide-ranging. It chronically cures many ailments because of its chemical constituents and is thought to have anti-aging and immunomodulatory properties, as well as anti-bacterial and anti-cancer properties. Tulsi is called the Queen of Indian Herbs and is the most sacred. In Healthy Herbs she is one. Tulsi is renowned for its important role in traditional Ayurvedic and Unani systems of physical fitness, health and oriental herbal medicine. This plant belongs to the Labiatae family and is characterized by square stems and a unique aroma. Tulsi is used in Ayurvedic medicine and its extracts are used in Ayurvedic therapy for colds, headaches, upset stomach, pain, heart disease, many poisonings and malaria. All studies show good clinical results. Results were reported, but no study reported serious adverse events. The research reviewed supports traditional use and suggests that tulsi is an effective treatment for lifestyle-related chronic conditions such as diabetes, metabolic syndrome, and psychological stress. Further research is needed to investigate the dosage, clarify dosages and forms of delivery, and determine which populations are most likely to benefit from the therapeutic effects of Tulsi. OS was revered in nearly all ancient Ayurvedic texts for its extraordinary medicinal properties. It has a hot and bitter taste, hot, light and dry. Its seeds are considered cold-acting. Tulsi roots, leaves and seeds have several medicinal properties. Ayurvedic textbooks classify OS as stimulant, aromatic and antipyretic. It aggravates pitta while soothing Kapha and Vata. It has a wide range of effects on the human body, primarily as an antitussive, antiperspirant, and a palliative for indigestion and anorexia.

Key Words: - Tulsi, Health, Pain Relief, Respiratory Diseases

Introduction:-

Ocimum sanctum (Lamiaceae) is a many-branched, upright, vigorous and aromatic plant about 75 cm high. It's an herb. This small herb is found throughout India and is cultivated and worshiped by Hindus in temples and homes. Is known. The leaves, seeds and roots of this plant have been used in indigenous Ayurvedic medicine. The plant is traditionally known for its medicinal properties. Tulsi has his two truths, Black (Krishna Tulsi) and Green (Ram Tulsi). They have similar chemical and pharmacological properties. [1]



Fig:-1 Krishna Tulsi



Fig:-2 Ram Tulsi

It is a typical fragrant perennial herb, 30-60 cm tall, with many branches. The stems and twigs are usually purple, sub square, sometimes woody below, and covered with soft, spreading hairs.

Tulsi Morphology: -

Stem:

Erect, branched, square, slightly woody, stiff, branches covered with soft hairs.

Leaf:

2.5 x 1.6 – 3.2 cm, elliptic – elliptic, obtuse or acute, entire or serrate, hairy on both sides, small glandular – punctate, base obtuse or acute, petiole long 1.3 – 2.5 cm long, slender, hairy

Inflorescence: Verticillaster.

Flowers:

Dense spiral racemes 15–20 cm long, bracts about 3 mm long, width almost equal to length, broadly ovate acuminate, long narrow tips, cilia, pedicel calyx. They have longer, finer, shorter hair.

Fruit:

Fruitlets 1.25 mm long, broadly oval, nearly smooth, yellow with black spots.^{3, [3]}

Preclinical studies have shown that tulsi increases swim survival time in mice and stress-induced stress in rats. It has been shown to prevent ulcers and have comparable anti-stress effects. Similarly, a recent study reported that ethanolic and aqueous extracts of Tulsi leaves protected rats from stress-induced cardiovascular changes. Studies in animal models have also shown that Tulsi leaf extract has anticonvulsant and anxiolytic properties.

Several animal studies conducted over the past 50 years have reported that consuming Tulsi leaves improved both glucose and lipid profiles in normal and diabetogenic animal models. Intramammary injection of aqueous tulsi leaf extract has also shown promising effects in enhancing the immune response in a bovine model. [4]

Tulsi is used to treat wounds, bronchitis, liver disease, catarrhal fever, ear pain, lumbago, hiccups, eye irritation, stomach problems, genitourinary problems, and skin diseases, various forms of poisoning, mental and physical health. It is a common home remedy for many ailments, including stress. Hindrance. It also has aromatic, stomachic, digestive, lubricating, diaphoretic, diuretic, expectorant, alexiteric, anthelmintic and antipyretic properties. Considering these facts, an attempt was made to examine the different pharmacological activities of OS based on experimental and clinical studies reported in various literatures. [5]

Taxonomy: -

Kingdom: Plants

Taxonomy: Magnoliophyta

Class: Magnoliopsida

Order: Lamiales

Family: Labiatae

Genus: Ocimum

Species: sanctum

Synonyms:-

- Sanskrit : Surasa, Krishna tulasi, Bana Tulasi
- Assamese : Tulasii
- Bengali : Tulasai
- English : Holy Basil
- Gujrati : Tulasei, Tulsi
- Hindi : Tulasii
- Kannada : Tulaseii, Shri Tulsi, Vishanu Tulsi
- Malayalam : Tulsii, Tulasae
- Marathi : Tulase
- Punjabi : Tulsi
- Tamil : Tulaesi, Thulasii, Theiru Theezaei
- Telugu : Tulasii
- Urdu : Raihana, Tulss [6]

Table 2: Extract and the Part of Tulsi Plant Used For Pharmacological Activities [6]

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

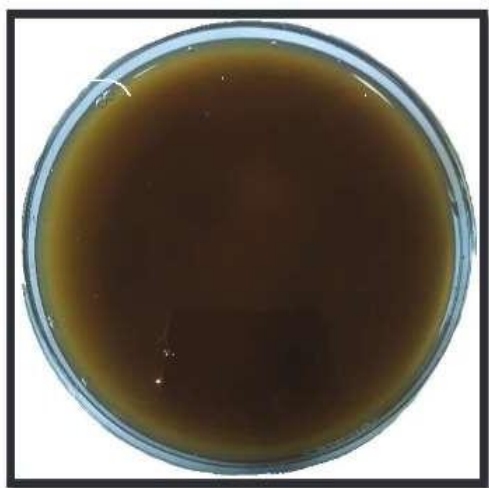


Fig. Aqueous extract *Ocimum sanctum* leaves

Phytochemical constituents of *Ocimum sanctum*:-

Contains eugenol (20%). Volatile oils also consist of carvacrol and the sesquiterpene hydrocarbon caryophyllene. Other chemical constituents present are phenols, flavonoids, terpenoids and fatty acids. Plant seeds are rich in fatty oils (18-22%), polysaccharide mucus, and β -sitosterol. Linoleic acid is considered the main component of seed oil. Other chemical constituents present are:

1. Phenol:

The phenolic component found in OS plants consists of chlorogenic acid, vanillic acid, osimnaphthonic acid, caffeic acid, and menthylsalicylic acid glucoside. Plant. Other chemical components present were confirmed by HPLC to consist of ethyl gallate, protocatechuic acid, 4-hydroxybenzoic acid, methyl gallate, vanillin, and 4-hydroxybenzaldehyde.

2. Flavonoids:

The main component is flavonoid, which is composed of OS plant methoxyflavonoids and their glycosides (silsimartin, isothymusin, luteolin), C-glycosides and flavonoids (vicenin, isovitexin, isoorientin, orientin). Other flavones detected by atmospheric pressure chemical ionization mass spectrometry (APCI-MS) are Cirsumaritin, Crisilineol, Isothymusin, Gardenin, Apigenin, Eupatorin, and Salvigenin.

3. Phenyl propanoids Eugenol:

OS leaves. Other phenylpropanoid derivatives are osiglycoside or eugenyl β -D-glucoside, and ferraldehyde, citrusine C and dehydrodigenol were extracted from leaf parts of OS plants

4. Neolignans:

Methanolic extracts of OS plants have neolignan components and are composed of turcinol A to turcinol G formed by the polymerization of eugenol

5. Terpenoids:

Terpenoids reported in OS plants include sesquiterpenoids (β -caryophyllene and 4,5-epoxy-caryophyllene), abietan diterpenoids (carnosic acid), ursane triterpenoids (ursolic acid, urs-12-en -3 β , 6 β). , 20 β -triol-28-acid and Olean triterpenoids (oleic acid, β -amyrin-glucopyranoside) the most common component detected by HPTLC and UPLC-ESI-MS/MS is ursolic acid. The terpenoid component was β -caryophyllene. Elements, α -humulene, α -caryophyllene, germacrene, trans- α -bergamotene, 5 β -hydroxycaryophyllene

6. Coumarins:

There are three coumarins constituents extracted from tulsi plant named aeculetin, aesculin and ocimarin

7. Steroids:

The steroidal components present are β -sitosterol, β -sitosterol-3-O β -D-glucopyranoside, stigmasterol, and campesterol extracted from stems and leaves of OS

8. Essential Oils:

Essential oils extracted from the leaves of OS plants are mainly composed of terpenoids including phenolic acids, esters, aliphatic aldehydes, bicyclic terpenoids, acyclic monoterpenoids and sesquiterpenoids. Chemical composition varies from region to region depending on growing, harvesting and

climatic conditions. The main phytochemicals in essential oils are eugenol or methyl eugenol and methyl chavicol, which are involved in antibacterial and anthelmintic properties. Other components of essential oils are beta-caryophyllene, beta-caryophyllene oxide, and germacrene D.

9. Fixed oil (non-volatile oil):

The fixed oil isolated from OS seeds accounts for 18.22%, mainly composed of linoleic acid (66.1%), anti-inflammatory, antihypertensive, chemopreventive, It has an anticoagulant effect. property ownership Other ingredients included are stearic acid (2.1%), oleic acid (9.0%), palmitic acid (6.94%) and α -linolenic acid (15.7%) extracted from OS leaves.

10. Fatty Acid Derivatives:

OS Fatty acid derivatives extracted from roots and leaves of plants are cerebrosides. Also, palmityl glucoside and sanctumic acid found in OS leaves are responsible for the mosquito-killing properties of heat. During the rainy season when dengue and malaria are prevalent, the leaves are boiled in tea and used as a primary method for administering to patients. It is the main component of the dosage form. Because it helps loosen phlegm in respiratory ailments.

Health benefits of Tulsi in our daily life

1. Fever and Common Cold:

The leafs are used in many types of fevers. In the duration of rainy season, when dengue and malaria fever is speeded all over the areas then its leafs are used as a prevalent method, as leafs are boiled with tea and given to patients.

2. Coughs:

It is a main ingredient in many Ayurvedic cough syrups and other kind of dosage forms because they help in release mucus in respiratory disorders.

3. Sore Throat:

Leafs of this plant are boiled with water and given to a patient with sore throat illness. This extract also used as a gargle.

4. Respiratory Disorder:

The herb is useful in the Respiratory Disease. Tulsi is very good herb to cure the asthma and other swasa diseases. Kwath of leafs with ginger and honey is very good and effective home remedy used for all kind of respiratory disorders and cold. This extract with the mixture of lavang and lavana shows instant aid in influenza [6].

Health Benefits Of Tulsi:-

Traditional uses:-

Due to its ability to prolong life, tulsi is frequently referred to as "the elixir of life." As an antidote for snake bite and scorpion sting, flatulence, migraine headaches, fatigue, skin conditions, wounds, insomnia, arthritis, digestive disorders, night blindness, diarrhoea, and influenza, various plant parts are utilised in the Ayurvedic and Siddha Systems of Medicine for the prevention and treatment of numerous diseases and common ailments. These include the common cold, headache, cough, flu, earache, fever, colic pain, sore throat, and bronchitis, asthma the leaves help to calm the nerves and improve memory. Tulsi leaves can be chewed to treat mouth infections and ulcers [12].

Protection and detoxification

Many of the physiological advantages of tulsi can be ascribed to its capacity to support the body's internal hygienic processes and safeguard against injury brought on by toxins. These activities are frequently credited to tulsi's high phenolic component concentration and anti-oxidant qualities; Krishna tulsi (the black/purple kind) has a higher phenolic content and anti-oxidant capacity than white Vana (wild) tulsi. [15]

By raising the body's levels of anti-oxidant molecules like glutathione and boosting the activity of anti-oxidant enzymes like superoxide dismutase and catalase, which protect cellular organelles and membranes by scavenging harmful free radicals caused by a lack of oxygen and other toxic agents, laboratory studies have demonstrated that tulsi protects against toxic chemical-induced injury.[9]

Antimicrobial activity:-

By means of its phytoconstituents separated from various regions, tulsi is known to have antibacterial activity against a variety of bacteria, the most prevalent being *Candida albicans*, *Staphylococcus aureus*, and *Escherichia coli*. According to Singh et al., a higher amount of linoleic acid in *O. sanctum* L. fixed oil may contribute to its antibacterial action in light of the many research that have been undertaken. *S. aureus* was the most susceptible bacterium, and the oil has antibacterial efficacy against *S. aureus*, *Bacillus pumilus*, and *Pseudomonas aeruginosa*. [10, 13]

Analgescic:

It has been claimed that the oil obtained from the *Ocimum sanctum* plant has analgesic properties. Acetic acid-induced writhing techniques, tail flick, tail clip, and tail immersion were used in this investigation on mice. According to the findings, acetylcholine, histamine, and prostaglandin have a combined inhibitory impact that accounts for the oil's inhibitory effects [8, 16].

Anticancer activity of *Ocimum sanctum*

It has been demonstrated that tulsi has excellent anticancer properties. The alcoholic extract (AIE) of leaves of *O. sanctum* modulates the detoxification of carcinogens and mutagens, which is carried out by enzymes including glutathione-S-transferase, cytochrome b5 and cytochrome P450, and aryl hydrocarbon hydroxylase. Tulsi has been shown to have anticancer effect against human fibrosarcoma cell cultures, where AIE of the medication caused cytotoxicity at concentrations of 50 mg/ml and higher. Cells in these investigations had condensed nuclei and reduced cytoplasm under a microscope. When the DNA was examined using agarose gel electrophoresis, it was discovered to be fragmented. [14]

Memory enhancer activity:

Mice's aging-induced memory impairments and the amnesic impact of scopolamine (0.4 mg/kg) were both lessened by the AIE of the dried entire plant of OS. The exteroceptive behavioural model used was called the passive avoidance paradigm. Step-down latency (SDL) and acetylcholinesterase inhibition were dramatically increased by OS extract. In order to treat cognitive diseases like dementia and Alzheimer's disease, OS can be used. [5]

Antidiabetic activity:

In normal, glucose-fed hyperglycemic, and streptozotocin-induced diabetic rats, oral administration of OS extract significantly lowered blood sugar levels. A considerable reduction in fasting and postprandial blood glucose levels of 17.6% and 7.3%, respectively, was seen in a randomised, placebo-controlled, cross over single blind human experiment. The trend in urine glucose levels was similar. [48] Additionally, OS has aldose reductase activity, which could aid in lowering diabetes complications including cataract and retinopathy. [5]

Neurocognitive Effect:-

Regardless of age, gender, formulation, dose, or research quality, the four trials that reported on neurocognitive effects all shown significant improvements in mood and/or cognitive function. A randomised, placebo-controlled clinical experiment that measured cognitive performance found that treatment with 300 mg of tulsi daily for four weeks improved cognitive flexibility, short-term memory, and attention in 40 healthy young adults (17 to 30 years old). [17, 18] Although there was no significant difference in stress levels, the cognitive effects of tulsi were only comparable to the placebo after the first two weeks. This is in contrast to three clinical investigations that found larger tulsi doses administered over longer periods of time significantly reduced anxiety and stress levels. [4]

Central Nervous System (CNS) depressant activity:

The AIE of OS lowered the recovery time and severity of electroshock and pentylenetetrazole-induced convulsions, and delayed the length of lost reflex in mice caused by pentobarbital (40 mg/kg, ip). In "open field" trials, it also reduced apomorphine-induced fighting time and ambulation. OS extract lengthened swimming time at high doses, indicating a CNS stimulant and/or antistress action. The results were comparable to those of the antidepressant desipramine. According to one study, OS fixed oil (2–3ml/kg, ip) lengthens rats' pentobarbitone-induced slumber. The potentiation of pentobarbitone-induced sleep time may be caused by fixed oil, which inhibits the hepatic metabolism of pentobarbitone and renal clearance.

Table 8: Showing list of formulations containing Tulsi as a major ingredient.

Sl.NO	Yogas	Dosage form	Indications
1	Anu taila	Taila	Urdhwajatru roga
2	Marichyaadi taila	Taila	Apatantraka
3	Nili nishadi taila	Taila	Kapala vyadhi
4	Nirgundi taila	Taila	Karna roga

5	Tulasiswarasadi taila	Taila	Pinasa, nasa daurgandhya
6	Vrana ropana taila	Taila	Swasa, kasa,jwara
7	Vyagree taila	Taila	Putinasa, sita jwara
8	Agurvadya taila	Taila	Sitajwara
9	Manasamitra vati	Vati	Manasika vyadhi's
10	Bilvadi gutika	Vati	Sarpa, luta visha
11	Surasaadigana kwatha	Kwatha	Bala graha, krimi
12	Ksudraadi kwatha	Kwatha	Jihvaka
13	Swasahara kashaya churna	Churna	Swasa
14	Kustadi lepa	Lepa	Kusta, visarpa
15	Dadhika grita	Grita	Apasmara,unmade
16	Dasamoola grita	Grita	Grahini, kasa
17	Hingusauvarcaladya ghrita	Ghrita	Vatagulma
18	Kandvadou lepa	Lepa	Charma roga
19	Nimbaadi lepa	Lepa	Kusta, visarpa
20	Jwarankusha rasa	Rasa	Ekadoshaja jwara
21	Cintamani rasa	Rasa	Sannipata jwara.swasa, kasa
22	Jwarankusha rasa	Rasa	Sarva jwara
23	Vishma jwara rasa	Rasa	Vishama jwara
24	Muktaadi mahanjana	Anjana	Netra roga
25	Amavata rasayoga	Rasa	Amavata
26	Sitakesari rasa	Rasa	Seeta jwara
27	Sannipata bhairava rasa	Rasa	Sannipata jwara
28	Vasanta kusumakara rasa	Rasa	Amashaya gata roga
29	Sannipata bhairava rasa	Rasa	Sannipata jwara, kandu

30	Tribhuvanakeerti rasa	Rasa	Vatakaphajjwara
31	Tulasi arka	Arka	Shawsa,Kasa

Conclusion:-

The long history of regular tulsi use in traditional medicine suggests that serious long-term side effects are unlikely and that daily tulsi consumption is safe. Additionally, the findings of this research are in line with earlier proof of tulsi's therapeutic effectiveness and safety, which includes numerous in vitro and in vivo investigations as well as numerous human clinical trials in addition to traditional use. Because of their high value, medicinal plants are utilised in India to treat and cure a variety of diseases. The tulsi plant (*Ocimum sanctum*) is revered. It is mostly employed as medicine and a herbal tea. It is employed in the medical systems of Ayurveda, Siddha, Greek, Roman, and Unani. The *Ocimum sanctum* plant is said to have medicinal qualities including antiulcer, antistress, antifertility, antiasthmatic, analgesic, antidiabetic, anti-inflammatory, antioxidant, antibacterial, and neuroprotective action, according to numerous research investigations.

A pharmacological screening of a wide range of plant parts has confirmed its long-standing value in treating a variety of illnesses. Because there are still insufficient clinical trials and clinical data to support its value, the traditional usage cannot be justified. Additionally, it contains numerous secreted therapeutic qualities that might be examined once more in the future.

REFERENCES:-

1. Kulkarni, K.V. and Adavirao, B.V., 2018. A review on: Indian traditional shrub Tulsi (*Ocimum sanctum*): the unique medicinal plant. *Journal of Medicinal Plants Studies*, 6(2), pp.106-110.
2. Eshwari S. Paratkar*, Suryaprakash K. Jaisal, M.S. Jaiswal The role of Tulsi plant in management of Alasaka kushtha – A literature review *International Journal of Research in Indian Medicine* Vol. 05th Issue: 2nd
3. Kavyashree, M.R., Harini, A. and Hegde, P.L., 2019. A review on Tulasi (*Ocimum sanctum* Linn.). *Journal of Drug Delivery and Therapeutics*, 9(2-s), pp.562-569.
4. Jamshidi, N. and Cohen, M.M., 2017. The clinical efficacy and safety of Tulsi in humans: a systematic review of the literature. *Evidence-Based Complementary and Alternative Medicine*, 2017.
5. Bindu Ahlawat and Dr. Om Prakash Sharma Pharmacological Activities Of *Ocimum Sanctum* (Tulsi): A Review *World Journal Of Pharmaceutical And Medical Research Wjpmr*, 2019, 5(1), 104-109
6. Kaur, S., Sabharwal, S., Anand, N., Singh, S., Baghel, D.S. And Mittal, A., 2020. An Overview of Tulsi (Holy basil). *European Journal of Molecular & Clinical Medicine*, 7(07), p.2020.
7. Panchal, P. and Parvez, N., 2019. Phytochemical analysis of medicinal herb (*Ocimum sanctum*). *International Journal of Nanomaterials, Nanotechnology and Nanomedicine*, 5(2), pp.008-011.
8. Thakur, S., Choudhary, S., Walia, B. and Chaudhary, G., Tulsi-A Review Based Upon Its Ayurvedic and Modern Therapeutic Uses.
9. Cohen, M.M., 2014. Tulsi-*Ocimum sanctum*: A herb for all reasons. *Journal of Ayurveda and integrative medicine*, 5(4), p.251.
10. Srinivas, N., Sali, K. and Bajoria, A.A., 2016. Therapeutic aspects of Tulsi unraveled: A review. *Journal of Indian Academy of Oral Medicine and (1)*, p. *Radiology*, 2817.
11. Riddhi R Patel Tulsi: The Queen of Medicinal Herbs *Journal of Bioequivalence & Bioavailability*
12. Govind P, Madhuri S. Pharmacological activities of *Ocimum sanctum* (tulsi): A review. *Int J Pharm Sci Rev Res*. 2010; 5(1):61-66.
13. Singh S, Malhotra M, Majumdar DK. Antibacterial activity of *Ocimum sanctum* L. fixed oil. *Ind J Exp Biol* 2005; 43:835-7
14. Karthikeyan K, Ravichadran P, Govindasamy S. Chemopreventive effect of *Ocimum sanctum* on DMBA-induced hamster buccal pouch carcinogenesis. *Oral Oncol* 1999; 35:112-9.
15. Wangcharoen W, Morasuk W. Antioxidant capacity and phenolic content of holy basil. *Songklanakarin J Sci Technol* 2007; 29:1407-15
16. Singh S, Majumdar DK. Analgesic activity of *Ocimum sanctum* and its possible mechanism of action. *International journal of Pharmacognosy*. 1995...
17. R. C. Saxena, R. Singh, P. Kumar et al., "Efficacy of an extract of *ocimum tenuiflorum* (OciBest) in the management of general stress: A Double-blind, Placebo-controlled Study," *Evidence-based Complementary and Alternative Medicine*, vol.2012, Article ID 894509, 7 pages, 2012.
18. D. Bhattacharyya, T. K. Sur, U. Jana, and P. K. Debnath, "Controlled programmed trial of *Ocimum sanctum* leaf on generalized anxiety disorders," *Nepal Medical College Journal*, vol. 10, no. 3, pp. 176–179, 2008