A Review of Tulsi and its potential health benefits

Srikala kamireddy**\***1,Dr.CH K V L S N Anjana Male**1** , K. Lurdhu mary1 , Pichika. Swarna2

Bhimavarapu. sri durga2, Gundapaneni. Naga Jaya krishna Prasad2

Nirmala College of pharmacy, Atmakuru, Mangalagiri, AP, India-522503.

2 B.Pharm students, Nirmala College of Pharmacy, Atmakuru, Mangalagiri, AP, India-522503.

1Associate professor, Department of Pharmaceutics, pharmaceutical chemistry, pharmaceutical analysis, Nirmala College of Pharmacy, Atmakuru, Mangalagiri.

\*Corresponding Author:

Srikala kamireddy

Gmail:sriklamadhu@gmail.com

Mobile:9177035010



**Abstract:**

Holy basil sometimes referred to as *Tulsi* is a native of the Indian subcontinent and is highly regarded for its therapeutic applications in the Siddha and Ayurvedic medicinal systems. Several human, animal, and in vitro research have shown that *tulsi* possesses a variety of medicinal qualities, including immune modulatory, adaptogenic, antibacterial, and anti-inflammatory actions. Nevertheless, there are no thorough analyses of human research examining the safety and efficacy of *Tulsi* as a medicine. (*Tulsi*), a medication utilized in conventional medicine. Almost all ancient Ayurveda literature extolsthe *Osmium sanctum* for its amazing therapeutic qualities. It tastes strong and bitter and Seems dry, scorching and fluffy. Its seeds are said to have a cooling effect. The seeds, roots, and leaves of *tulsi* are all medicinally beneficial. According to Ayurvedic texts, OS is categorized as a stimulant, fragrant, and antipyretic. It decreases *Vata* and *Kapha* but increases *Pitta*. It affects the human body in a number of ways, the most prominent being that it suppresses coughing, induces sweating, relieves dyspepsia, and mitigates anorexia. Numerous biological and pharmacological effects are associated with OS, such as antimicrobial, Anti-viral, antifungal, antiprotozoal, antimalarial, anthelmintic, antidiarrheal, analgesic, antipyretic, anti-inflammatory, anti-allergic, antihypertensive, cardio protective, depressant of the central nervous system (CNS), memory enhancer, anti-hyper cholesterolemic, hepatoprotective, asthmatic, anti-thyroid, anti-oxidant, anti-cancer, chemo preventive, radio-protective, immunomodulatory, anti-fertility, anti-ulcer, anti-leukoderma, anti-arthritic, adaptogenic/anti-stress, anti-cataract and anti-coagulant activities.

**Keywords:** ocimum sanctum, holy basil, ayurveda, memory enhancer, lifestyle

**Introduction:**

Since ancient times, different medicinal characteristics of plants have been discovered. Essential oils obtained from medicinal plants are secure, affordable, efficient, and widely accessible [1, 2, 3,4,5] and more Over 8000 species of vascular plants, 1748 of which are recognized to have therapeutic uses, are found in India. [5]. Tulsa (Ocimum sanctum L), often known as "Holy Basil" and "Queen of Herbs," is one of the most extensively used herbs in Indian traditional medicine [6, 7]. The Sanskrit origin of the name *Tulsi* is "the incomparable one" [8]. It is revered with great fervor and is referred to as "Vishnu Priya" in Indian culture The Greek word zoo, which means to smell or have a strong *aroma*, is where the term Ocimum comes from [9]. Ocimum sanctum[OS], Ocimum gratissimum, Ocimum canum, Ocimum basilicum, Ocimum killimandscharicum, Ocimum Americanum, Ocimum camphor, and Ocimum mirant rum are a few of the 160 species of this plant that are used for therapeutic purposes [10, 11]. Ocimum tenuiflorum (also known as Krishna *tulsi*), Ocimum sanctum (also known as Rama *tulsi*), and Ocimum gratis sim are the three most popular varieties of *Tulsi* [12]. This plant's medicinal benefit has been attributed to a variety of phytochemical components, which have been shown to be present in both conventional and contemporary medical systems, such as Ayurveda, Unani, Siddha, Greek, and Roman [13]. Depending on how it is cultivated and harvested, this plant may have a different phytochemical composition. It is well renowned is known as "the elixir of life" in Ayurveda and is thought to prolong life.

**Synonym:** Holy basil, Kali-*tulsi*, Tulasi, Veranda.

**Biological source:** Ocimum sanctum and Ocimum basilicum leaves, among others, are the biological source of *tulsi* [16].

**Family:** *Labiatae*

**Geographical source:** All of Asia's tropical and subtropical regions are home to O. sanctum. The plant is indigenous to the Indian subcontinent, which also includes a portion of the Himalayas, Malaysia, the Caribbean, and the Pacific [18]. Practically every state in India grows it. Due to some sacred beliefs, it is a portion of the region around temples and other places of worship. The particular habitats where the species has historically existed are not currently known.

**Characteristics:**

Its height ranges from 30 to 75 cm and it has numerous branches. Tulsi leaves, particularly the fresh and dried varieties, are used in medicine. The morphology of the leaves might be whole or serrated; they are oblong, sharp, hairy on both sides, and have a thin gland-dotted border.Green in appearance, the leaves have a fragrant smell and a gentle bite. Racemes of purple flowers have a purplish tint [17]. Nutlets are pale brown or crimson in hue, subglobose, and somewhat compressed. Reddish-black, subglobose seeds are produced.

**Collection and cultivation:**

* **Soil condition:** Sacred basil thrives in a range of soil conditions. It can flourish in loam-rich, laterite-deficient, saline, and alkaline to moderately acidic soils. The soil must be well-drained in order to promote better vegetative development. Standing water may result in root rot and reduced growth.
* **Climate**: It thrives in settings with humidity and rainfall that are relatively high. Long days and mild temperatures have been found to be beneficial for plant growth and oil production. Up to 900 meters above sea level, it can grow. The plant can tolerate frost and drought to a certain extent. Despite producing little oil, the plant can be grown in partially shaded environments.
* **Propagation:** Seeds are used to propagate *Tulsi*. Due to the significant cross-pollination, seeds will degrade over generations. Therefore, the growers must use fresh seeds from the pedigree stock for new crops [19].
* **When to plant**: Typically, transplants take place towards the middle of April. As early as the third week of February, the nursery can be elevated.
* **Harvesting**: To generate the most essential oils and oil of the finest quality, the crop must be harvested when it has finished blooming. After sowing, the first crop is harvested 90 to 95 days later. It can then be harvested every 65 to 75 days after that. It is best to harvest on sunny days with superior oil quality. It is not advised to harvest the crop if it rained the day before. Cut the crop 15 to 20 cm above the ground.
* **Processing**: The harvested produce may be allowed to wilt for 4-5 hours on the field itself to reduce moisture content and bulkiness. However, oil quality and quantity don't start to deteriorate until 6 to 8 hours after harvest. If you wait any longer, however, the production and quality of your oil could significantly decline. It has been established that steam distillation is superior to hydro distillation and hydro cum steam distillation. Equipment used in distillation must be immaculate, rust-free, and odor-free. The oil is then decanted and purified after that. The distilled oil is mixed with 20 g of anhydrous sodium sulfate or normal salt per liter in order to remove the moisture. Airtight amber glass bottles, stainless steel containers, galvanized tanks, or aluminum containers should be used to store the oil.kept in a cool, dry location. Recordings of all processing operations should be made [20].
* **Expected yield**: Two to three harvests each year can yield about 8 to 10 tons of fresh herbage per acre. The type, season, and location of origin all affect the oil yield. Oil recovery rates are between 0.3% and 0.4%. The cost per acre is roughly Rs. 6,000. The going fee is between Rs. 600 and Rs. 800.

**Microscopy:**

Dorsiventral is the *Tulsi* leaf. Diacritic stomata are particularly prevalent on the bottom surface. Epidermal cells have a thin, wave-like cuticle. There is a single layer of elongated palisade cells underneath the top epidermis.The mesophyll comprises four to six layers of spongy parenchymatous cells with intracellular gaps and oil glands. The covering trichomes of a leaf are both uniseriate, multicellular, and frequently very long (100–400). The usual labiate type trichomes are sessile glandular trichomes with radiating heads made up of eight cells each and a shared cuticle forming a bladder.

A few glandular trichomes with a spherical, one-celled head and a stalk are also present. In the midrib area, collenchyma Tous cells are visible beneath the top and bottom epidermis. The xylem bundles are arranged in a curved pattern. The phloem is arranged on the dorsal side of the xylem**.**

**Chemical constituents:**

Methyl chavicol (15–27%), eugenol (8–30%), and (-)-linalool (30–40%) are all found in Ocimum basilicum L. Basil oil contains negligible amounts of (+)-delta-cadinene, 3-care, alpha-humulene, citral, and (-)-trans-caryophyllene [21]. The primary compounds detected in Thai basil oil are methyl chavicol (93.0%), eugenol (41.5%), gamma-caryophyllene (23.7%), and methyl eugenol (11.8%). Neral (32.2%) and geraniol (32.0%) were present in significant amounts in hoary basil oil, but methyl chavicol (0.8%) was present in low concentrations [22]. Linum usitatissimum oil has high concentrations of polyunsaturated fatty acids (PUFA), notably those that are eicosanoid precursors and have strong anti-inflammatory activities [23]. Ocimum basilicum L. EO contains eugenol (67.4% and 72.8%) as well as additional substances as caryophyllene (7.3% and 8.4%), element (11.0 and 10.9%), and germacrene D (2.4 and 2.2%). Ocimum basilicum cvs. "Vikarsudha" and "CIM-Soumya" included methyl chavicol (68.0% and 64.9%), linalool (21.9% and 25.6%), bicyclogermacrene (2.0% and 0.7%), and -terpineol (1.2% and 0.1%) as its primary components. Basilicum cvs., O. It was discovered that eugenol (77.2%), 1,8-cineole (76.6%), germacrene D (2.7%), and -caryophyllene (1.7%) were the major components of Ocimum gratissimum (OG). The monoterpenoids that make up the majority of the essential oil (95.8%) from Ocimum kilimandscharicum include camphor (64.9%), limonene (8.7%), camphene (6.4%), and (E) -beta -ocimene (3%) [24]. O. basilicum contains methyl chavicol (87.0%) as well as (Z)- and (E)- methyl cinnamate (69.1%) [25]. Sacred/holy basil (OT L.f.; Lamiaceae), which contains a lot of methyl eugenol, is high in EO production and purity. The oil's components include eugenol, beta-element, and (E)-cinnamyl acetate. Gas chromatography was used to find the presence of well-known insect repellents such camphor, caryophyllene oxide, cineol, methyl eugenol, limonene, myrcene, and thymol.

**Pharmacological actions:**

* Globally, scientific research on the pharmacological properties, adverse effects, and therapeutic uses of OS against different diseases is gaining momentum. Following are some of OS's medicinal properties or pharmacological activities that have been identified as a consequence of numerous experimental and clinical research.
* **Anti-cancer activity:**

Numerous researchers 8–11 have established and cited OS's anticancer efficacy [27, 28, 29, 30]. Aryl hydrocarbon hydroxylase, cytochrome P450, The detoxification of carcinogens and mutagens depends on the enzymes cytochrome b5, glutathione S-transferase (GST), and aryl hydrocarbon hydroxylase, and the alcoholic extract (Ale) of OS leaves modulates these enzymes [31]. When OS's anticancer action was used to human fibrosarcoma cells, the medicine's greatest concentration of ale, 50g/ml, induced cytotoxicity. From a morphological standpoint, the cells have decreased cytoplasm and constricted nuclei. The DNA was found to be fragmented when it was analyzed using agarose gel electrophoresis [32]. OS considerably decreased the frequency of hepatomas in rats and mice that were brought on by the chemicals 3'-methyl-4-dimethylaminoazo-benzene and benzo(a) pyrene, respectively [33]. The Ale in the leaves of OS was shown to inhibit mice with chemically induced cutaneous papillomata [34]. When *Tulsi* leaf extract was administered topically in 7,12-dimethylbenz(a)anthracene (DMBA)-induced papilloma genesis, the incidence of tumors, the average number of papillomata per animal, and the overall number of papillomata in mice were all noticeably reduced. The extract significantly boosted GST activities when applied topically and decreased GSH concentration [35]. A flavonoid called eugenol, which is present in many plants, including *tulsi*, was discovered to have a similar effect [36]. Oral administration of fresh leaf *tulsi* paste may be able to halt the initial phases of DMBA-induced buccal pouch carcinogenesis [37]. OS leaf extract inhibits or suppresses the events associated with chemical carcinogenesis by inhibiting the metabolic activation of the carcinogen [38]. The antitumor effectiveness of OS in Ehrlich ascites carcinoma (EAC) and S 180 tumor-bearing Swiss albino mice

**Memory-boosting exercise**:

* The amnesic effects of scopolamine (0.4 mg/kg) and the memory deficiencies produced on by aging in mice were both reduced by drinking of the dried whole plant of OS. The exteroceptive behavior model was the passive avoidance paradigm. Acetylcholinesterase inhibition and step-down latency (SDL) were dramatically enhanced by OS extract. OS can be utilized to treat cognitive disorders including dementia and Alzheimer's disease [40].
* **Depressant action in the central nervous system (CNS):**

The Ale of OS lowered the recovery time and intensity of electroshock and pentylenetetrazol-induced convulsions and delayed the time of lost reflex in mice caused by pentobarbital (40mg/kg,IP). In "open field" trials, it also reduced apomorphine-induced fihting time and ambulation. OS extract lengthened swimming time at high doses, indicating a CNS stimulant and/or antistress action. The outcome was comparable to that of the antidepressant desipramine [42]. According to a report 29, OS fixed oil (2-3ml/kg, IP) lengthens rats' pentobarbitone-induced slumber [43]. The potentiation ofpentobarbitone-induced sleepiness may be caused by fixed oil's suppression of the hepatic metabolism of pentobarbitone and renal clearance.

* **Radioprotective activity:**

The radioprotective properties of OS were originally documented in 1995 [44]. Orientin and vicenin, two extracted flavonoids from OS leaves, outperformed synthetic radioprotectors in terms of radioprotective efficacy. At low, non-toxic concentrations, they have demonstrated considerable protection of human lymphocytes against the clastogenic effect of radiation [45]. The combination of OS leaf extract with WR-2721, a synthetic radioprotector, increased the protection of bone marrow cells and decreased WR-2721 toxicity at higher dosages, suggesting that the combination would have promising radioprotection in people [46].

* **Anti-oxidant activtiy:**

Numerous scientists have reported OS's antioxidant activity [27, 28, 29, 30]. Flavonoids' anti-oxidant abilities and their connection to membrane protection have been discovered [47]. Radiation-induced lipid peroxidation in the mouse liver was significantly reduced as a result of the flavonoids (orientin and vicenin)'s in vivo antioxidant activity [45]. The capacity of OS extract to scavenge highly reactive free radicals is significant [48]. The phenolic components from the OS extract of fresh leaves and stems, including curvilineal, cirsimaritin, thymosin, apigenin, and rosmarinic acid, as well as significant amounts of eugenol (a key component of the volatile oil), had strong antioxidant activity [49].

* **Anti-hypertensive and cardio protective activtiy:**

OS has avoided both short-term and long-term cerebral hypoperfusion, which can lead to cellular edema, gliosis, and perivascular inflammatory infiltration [48]. Injecting OS fixed oil into a dog under anesthesia caused hypotension, which is thought to be caused by its peripheral vasodilatory impact. The OS oil contains essential fatty acids including linoleic and linolenic acids, which produce series 1 and 3 prostaglandins (PGE1 and PGE3) and suppress the production of series 2 prostaglandins (PGE2) [43]. Through the increase of endogenous antioxidants, long-term feeding of OS provides considerable protection against isoproterenol-induced cardiac necrosis in Wistar rats [50].

* **Anti-inflammatory activity:**

Rats with both acute (carrageenan-induced pedal edema) and chronic (croton oil-induced granuloma and exudate development) inflammations responded well to methanolic extract (500 mg/kg) and an aqueous suspension of OS [51]. Because they can inhibit both the cyclooxygenase and lipoxygenase pathways of arachidonic acid metabolism, In rats, paw edema caused by PGE2, leukotriene, and arachidonic acid is significantly reduced by fixed oil and linolenic acid. [52].

* **Analgesic activity:**

Experimental pain models (tail flick, tail clip, and tail immersion procedures) revealed that the OS oil lacked any analgesic efficacy. It did, however, work in a dose-dependent manner to stop mice from writhing when exposed to acetic acid. The combined inhibitory actions of prostaglandins, histamine, and acetylcholine are thought to constitute the mechanism by which the oil's writhing-inhibiting activity is peripherally mediated [53].

* **Anti-pyretic activity:**

OS fixed oil's antipyretic efficacy was assessed by subjecting rats to a pyrexia-inducing dose of the typhoid-paratyphoid A/B vaccine. After receiving oil intravenously, the febrile response was significantly reduced, showing the oil's antipyretic effectiveness. The oil's antipyretic efficacy was comparable to aspirin at a dose of 3 ml/kg. Additionally, the fixed oil has prostaglandin inhibitory action, which could account for its antipyretic effects [54].

* **Anti-microbial activity**:

For Klebsiella, E. coli, Proteus, and Staphylococcus aureus, AqE of OS demonstrated growth inhibition, whereas Ale of OS indicated growth inhibition for Vibrio cholera [55]. Additionally, it was discovered that the AlE of OS is effective against S. aureus strains that are resistant to both typical beta-lactam antibiotics and multidrug-resistant S. aureus [56]. OS was also discovered to be effective against strains of Neisseria gonorrhea that are resistant [57]. The antibacterial activity of OS fixed oil was effective against S. aureus, Pseudomonas aeruginosa, and Bacillus pumilus. The bactericidal action of OS fixed oil may be influenced by its higher linolenic acid content [58].

* **Immunomodulatory activity:**

Fresh leaves of OS were used to make the steam-distilled extract, which considerably changed. To treat cognitive disease like dementia and Alzheimer’s disease, OS can be used [59].

* **Anti-diabetic activity:**

In normal, glucose-fed hyperglycemic, and streptozotocin-induced diabetic rats, oral administration of OS extract resulted in a notable decrease in blood sugar [60]. In a randomized, placebo-controlled, cross-over, single-blind human experiment, blood glucose levels during fasting and after meals were significantly reduced by 17.6% and 7.3%, respectively. The pattern in urine glucose levels was similar [61]. Additionally, OS has aldose reductase activity, which could aid in lowering diabetes complications including cataracts and retinopathy [62].

* **Hepatoprotective activity:**

In male Wistar albino rats, oral treatment of a hydroethanolic extract of OS leaves at 200 mg/kg protected against liver damage brought on by paracetamol [63]. The cold-water extract of OS (0.3 g/100 g, taken orally for 6 days) was found to be beneficial in protecting albino rats' livers from damage brought on by carbon tetrachloride (0.2 ml/100 g, applied subcutaneously) [64].

* **Anti-fertility activity:**

Fresh OS leaf benzene extract in male rats with decreased total sperm count, sperm motility, and testis weight [65]. Long-term (up to 3 months) feeding of OS leaves (200 and 400 mg/kg) together with a normal diet lowered sperm count, sperm motility, and weight of male reproductive organs in adult male and female albino rats [66].

* **Anti-ulcer activity:**

Rats with ulcers caused by aspirin, indomethacin, alcohol (ethanol 50%), histamine, reserpine, serotonin, or stress responded significantly to the fixed oil of OS when delivered intraperitoneally [54]. Because of the fixed oil's lipoxygenase inhibitory, histamine antagonistic, and antisecretory properties, it considerably had antiulcer activity [67].

* **Anti-arthritic activity:**

Rats with arthritis brought on by formaldehyde were used to test OS Fixed Oil's anti-arthritic properties. The diameter of the inflamed paw was greatly reduced by the fixed oil. The arthritic symptoms in rats significantly improved after intraperitoneal treatment of the fixed oil daily for 10 days. According to IP, the antiarthritic efficacy was comparable to aspirin at 100 mg/kg at a dose of 3 ml/kg [54]. The fixed oil suppressed Carrageenan and inflammation caused by inflammatory mediators (such as serotonin, histamine, bradykinin, and PGE2). Naturally, the oil would inhibit any inflammatory reaction involving these mediators. The outcome shows that inflammation models, including adjuvant as well as turpentine oil-induced joint edema in rats, may have effective antiarthritic properties [68].

* **Anti-stress and adaptogenic activities:**

The ability of OS to stimulate the immune system may be what gives the plant its adaptogenic properties [69]. Ale of the entire OS plant increased the physical endurance (survival time) of swimming mice, prevented milk-induced leukocytosis in mice, and prevented stress-induced ulcers in rats, indicating that OS induces non-specifically increased resistance against a variety of stress-induced biological changes [70].

* **Chemo preventive activity:**

The chemo-preventive action of OS leaf extract is most likely due to the mice's induced hepatic/extrahepatic GST. Additionally, elevated amounts of decreased GSH were discovered in the liver, lungs, and stomach tissues of mice receiving OS extract supplements [71]. Humoral immune responses in albino rats had significant antiproliferative and chemo-preventive effects, which could be explained by mechanisms like antibody production, the release of mediators of hypersensitivity reactions, and tissues’ responses to these mediators in the target organs [72]. Both humoral and cell-mediated immunological responses appear to be modulated by OS seed oil, and GABAergic pathways may underlie these immunomodulatory effects [73].

* **Anti-coagulant activity:**

Blood clotting time was prolonged by the OS fixed oil (3ml/kg, IP), and the effect was comparable to that from aspirin (100mg/kg). The antiaggregatory effect of oil on platelets is thought to be the cause of the effect [43].

* **Cataract prevention:**
* In experimental models of cataract (galactosemic cataract in rats by 30% galactose and naphthalene cataract in rabbits by 1g/kg naphthalene), the AqE of fresh leaves of OS slowed the development of cataract genesis. Both the early start and later development of cataracts were greatly postponed in both animals by OS 1 and 2g/kg.
* **Toxicity:**

After giving mice an Ip injection, the OS fixed oil's median lethal dosage (LD50) was calculated. Up to 30 ml/kg of fixed oil was well tolerated, but at 55 ml/kg, 100% death was observed. Oil has an LD50 of 42.5ml/kg. The subacute toxicity investigation of OS fixed oil in rats at a dose of 3ml/kg/day, Ip for 14 days revealed no adverse effects..

 [54].

**Medicinal properities:**

* *Tulsi* lowers blood pressure and blood glucose levels and contains antioxidant properties [74].
* It brings down the lipid level. It is therefore advantageous for heart problems [75].
* It improves endurance and is essential to herbal tea [74].
* In addition, it is used to treat gastrointestinal problems, coughs, colds, and malaria [75]. The water that is collected from it is used as a mouthwash to relieve tooth pain [74].
* Due to its anti-bacterial properties, it is used to make a variety of skin ointments and cosmetics. [75].
* Its oil exhibits "malarial larva" stomach poisoning [75].
* It possesses abilities to modulate the immune system [76].
* It serves as an insect repellent. It is therefore frequently used to store grains [74].

 Beta-Ursolic acid, a component of *tulsi*, may be useful as a fertility-reducing drug.

**Types of tulsi:**

Basil is cultivated in many different kinds all over the world. Holy basil (Ocimum sanctum) and Mediterranean basil (Ocimum basilicum) are two of the most often used varieties**.**

**A.Holy basil:**

The most revered houseplant in India is *tulsi*, which is also known as the goddess of riches, health, and prosperity in Hinduism and ayurveda. Less potent therapeutic effects are displayed by plants from the first group of species than by those from the second group. According to regional religious customs, several popular varieties go by a variety of common and regional names, such as Rama and Krishna *Tulsi* in Sanskrit, Trittavu in Malayalam, Tulshi in Marathi, Tulasi in Tamil, Thulsi in Telugu, and Holy Basil in English. It is a synonym for Ocimum Sanctum as opposed to Ocimum Tenuiflorum.

The following There are 4 types of holy basil.often grown:

1. Rama *Tulsi* (Ocimum sanctum)
2. Krishna *Tulsi* (Ocimum tenuiflorum)
3. Amrita *Tulsi* (Ocimum tenuiflorum)

4.Ocimum gratissum, or *tulsi* vana

**B.** **Middle Eastern basil:**

The most popular kind of basil is what is known as sweet basil. It may be found throughout Africa, Asia, Europe, and America. It is the most extensively used herb in the world and is also known as "king of herbs," "royal herb," "great basil," and "Saint-Joseph's-wort," among other names. In addition to being utilized in culinary preparations, it is employed in many well-known cuisines, including as Italian, Thai, and others.

There are 4 widely used species of holy basil:

###  1. ocimum basilicum, sometimes known as sweet basil 2. Thai basil (Ocimum thyrsiflora) is a kind of basil native to Thailand. 3. (Ocimum basilicum) Purple basil

###  4. Ocimum citriodorum, sometimes known as lemon basil,

###  5. Cinnamon basil (Ocimum basilicum)

###  6. Ocimum americanum, or American basil

###  7. Ocimum kilimandscharicum, sometimes known as African blue basil

###  8. Genovese basil from Italy (ocimum basilicum)

###  9. Basil lettuce.

###  10. Basil with green frills

###  11. Cardinal basil

###  12. Greek basil

###  13. savory globe basil

###  14. Seasonal basil

**Uses in tradition:**

* "The elixir of life" is another name for tulisi. given that it prolongs life [2].
* In the Vedic and Siddha traditions of medicine, where various plant components are used to cure and prevent a number of illnesses [2].
* The leaves are employed to improve memory [2].
* Chewing on leaves can help treat oral infections and ulcers [2].

**Health benefits of *tulsi*:**

* **Fever and cold:** A number of fevers can be treated using the leaves. Its leaves are used as a typical remedy during the rainy season, when dengue and malaria fever spread across the territories, as the leaves are boiled with tea and given to sufferers.
* **Cough**: Due to its propensity to help with mucus discharge in respiratory illnesses, it is a popular ingredient in many Ayurvedic cough syrups and other dosage forms [77].
* **SORE THROAT**: This plant's leaves are cooked in water and administered to those with sore throats. [78] uses this extract to gargle as well.**.**
* **Respiratory disorder:** The plant is helpful in respiratory diseases. *Tulsi* is a fantastic plant for treating waste disorders like asthma. A very good and efficient home cure for colds and respiratory problems is that leaves with ginger and honey. This extract, which contains a blend of living and Havana, provides immediate relief from influenza.
* **Kidney stone:** *Tulsi* has a very positive and productive effect on kidney stones. If a patient has a kidney stone, giving them leaf juice and honey for six months will help them pass the stone through their urinary system [78].
* **Heart diseases:** All forms of heart disorders and the "weakness" of the heart are cured by *Tulsi*. It assists in lowering blood cholesterol levels [77].
* **For children:** Leaf juice can be used to serve quotidian childhood ailments such as the usual cold, high body temperatures, loose stools, and vomiting. *Tulsi* leaves combined with kesar hasten the appearance of chicken pox blisters [78].
* **Stress:** *Tulsi* leaves are a stress reliever.
* **Insect bites:** *Tulsi* is both preventative or precautinatory and therapeutic for bites or stings from insects. Take leaf juice and repeat after a few hours. In the case of bug bites, clean root calk is utilized [77].
* **Skin disorders**: Applying *Tulsi* juice to the skin can help treat fungal infections and other sorts of skin disorders. It is also useful in the treatment of leukoderma [78].
* **Dental problem**: Sun-dried and powdered leaves can be used to clean teeth and cure tooth problems. Some potency when combined with mustered oil to make calk and administered as dental cream. This is also used to treat pyorrhoea and other dental problems.

**Health benefits of krishna *tulsi*:**

Ayurveda claims that Krishna *Tulsi* has a spicy, bitter flavor. In order to balance Kapha and Vata, it is necessary to have access to deep tissues or dry tissue secretions. *Tulsi* can help you stay healthy overall and stave off sickness if you regularly consume it.

Coughs, anxiety, diarrhoea, dysentery, fever, eye conditions, arthritis, otalgia, vomiting, hiccups, cardiac and gastric problems, back pain, genitourinary, ringworm, malaria, skin conditions, and bug, snake, and scorpion stings are among the conditions that *Tulsi* is used to cure. Here are some of Krishna *Tulsi*’s advantages.

1. **It helps with parasites and worms:**

The antibacterial properties of *Tulsi* prevent the multipliction of E. coli. So, the best remedy for worms and other parasites would be *Tulsi*. It can be used to make tea with honey or fresh juice. The parasites become excited by the sweetness and emerge from their hiding places.

1. **It helps with digestion:**

*Tulsi* is an excellent antioxidant.it is beneficial for the oesophagus, intestines, and stomach. *Tulsi* is an herb that naturally aids digestion. Ginger is a nice addition to it. Like Vana, Krishna, and Rama, all three sacred varieties of *Tulsi* can be used as ginger, cinnamon, liquorice, or peppermint.

1. **It can help stop fevers:**

The ability of *Tulsi* to relieve pain makes it effective as a painkiller. In certain circumstances, it can even eliminate the discomfort or emotion. Therefore, even in viral encephalitis, typhoid, and malaria cases, it may be the greatest medication for avoiding and decreasing fevers. The *Tulsi* herb is a proven method for treating malaria fevers, according to the Imperial Malarial Conference.

1. **it improves heart and blood circulation:**

*Tulsi* is also the best medicine for the heart’s health and blood flow in general. It is known to be cardiotonic, which means it can stop a heart attack and lower high blood pressure caused by stress.

1. **Keeps heart healthy:**

*Tulsi* has properties that help keep blood pressure at a healthy level and protect the heart and blood vessels. It helps the blood flow by slightly thinning the blood, lowering the stroke risk.

**Health benefits of rama *tulsi*:**

1. **Lowers hyper tension:**

A natural herb with stress-relieving qualities is *Tulsi*. So, drinking a cup of *Tulsi* tea might invigorate someone anxious or worried.

1. **Treating wounds and battling infection:**

The antiviral, antibacterial, antifungal, and anti-inflammatory properties of *tulsi* have long been recognized. It also has analgesic properties.

1. **Improves the gastrointestinal system:**

The *Tulsi* herb improves the digestive system by enhancing liver health.

1. **Aids with weight loss:**

*Tulsi* aids in weight loss by assisting your body in releasing toxins by improving the condition of your intestines. The body's metabolism is accelerated, which further accelerates the process of burning fat.

1. **The removal of kidney stones:**

*Tulsi* is an effective detoxifier and helps kidney stone sufferers feel less pain. It aids in lowering the body's uric acid levels, which are a major contributor to kidney stones**.**

1. **Supports the fight against diabetes:**

People with type 2 diabetes might manage their disease with the use of *tulsi* tea. One of the most popular herbal teas for controlling diabetes is this one.

1. **Oral and dental hygiene:**

The most frequent dental issue that people have during their lifetime is a tooth cavity. The good news is that *Tulsi* contains antibacterial qualities that aid in the battle against germs and oral bacteria.

1. **Benefits for skin and hair:**

*Tulsi* is full of antioxidants, vitamins, and minerals that can combat the signs of aging. It can aid in decreasing scalp irritation as well as hair loss.

1. **Skin benefits:**

*Tulsi* drops help to cleanse the skin of acne and pimples. It has a lot of antioxidants, which slows down the aging process.

1. **Increases resistance:**

*Tulsi* has zinc and vitamin C, two anti-infective substances. To boost immunity, *tulsi* tea or leaves should be drunk every day.

**Health benefits of vana *tulsi*:**

* Excellent for treating skin conditions including psoriasis and eczema.
* Reduces acidity and burning
* Suitable for diabetes
* Alleviates constipation by facilitating simple bowel movements
* Removes impurities from the stomach and is effective for treating arthritis

**References:**

1. Medicinal plants have been used for different ailments of human beings all over the world just from the beginning of civilization.
2. Kumar V., Andola H. C., Lohani H. and Chauhan N. (2011). Pharmacological Review on Ocimum sanctum Linnaeus: A Queen of Herbs. J of Pharm Res, 4:366-368.
3. Atal CK, Kapoor BM. Cultivation and utilization of medicinal plants Eds. PID (SIR). 1989.
4. Govind P, Madhuri S. Medicinal plants: better remedy for neoplasm. Indian drugs. 2006;43(11):869-74.
5. Singh DK, Hajra PK. Floristic diversity. In Changing Perspective of Biodiversity Status in the Himalaya, GS Gujral, V Sharma, Eds. British Council Division, British High Commission Publication. Wildlife Youth Services: New Delhi, India. 1996, 23-38.
6. Rahal A, Kumar A. *Tulsi*: A miracle herb in the hands of a traditional house lady.7.
7. Kayastha BL. Queen of herbs *Tulsi* (Ocimum sanctum) removes impurities from water and plays a disinfectant role J MedPlants Stud. 2014;2(2).
8. Kadian R, Parle M. Therapeutic potential and phytopharmacology of *Tulsi* international journal of Pharmacy and Life Sciences. 2012 Jul 1;3(7).
9. McIntosh C. The Book of the Garden. Roy.1855.
10. KR K, Basu BD. Ocimum sanctum inIndian Medicinal Plants. Published by LBBasu, Allahabad. 1965
11. Gupta SK, Prakash J, Srivastava S. Validation of traditional claim of *Tulsi*, Ocimum sanctum Linn. As a medicinal plant. 2002.
12. Bhamra S, Heinrich M, Howard C, JohnsonM, Slater A. DNA authentication of *Tulsi* (Ocimum tenuiflorum) using the nuclear ribosomal internal transcribed spacer (ITS)and the chloroplast intergenic spacer trnH- psbA. Planta Medica. 2015 Nov;81(16):PW\_20.
13. Garodida P, Ichikawa H, Malani N, Sethi G, Aggarwal BB. From ancient medicine to modern medicine: ayurvedic concepts of health and their role in inflammation and cancer. J Soc Integr Oncol. 2007 Mar 21;5(1):25-37.
14. Pattanayak P, Behera P, Das D, Panda SK. Ocimum sanctum Linn. A reservoir plant for therapeutic applications: An overview. Pharmacognosy reviews. 2010 Jan;4(7):95.
15. Kadian R, Parle M. Therapeutic potential and phytopharmacology of *Tulsi*. International Journal of Pharmacy and Life Sciences. 2012 Jul 1;3(7).
16. Ocimum sanctum. *[Germplasm Resources Information Network](https://en.wikipedia.org/wiki/Germplasm_Resources_Information_Network%22%20%5Co%20%22Germplasm%20Resources%20Information%20Network) (GRIN)*. [Agricultural Research Service](https://en.wikipedia.org/wiki/Agricultural_Research_Service) (ARS), [United States Department of Agriculture](https://en.wikipedia.org/wiki/United_States_Department_of_Agriculture) (USDA). Retrieved 7 July 2021.
17. *Warrier, P K (1995). Indian Medicinal Plants. Orient Longman. p. 168.*[*ISBN*](https://en.wikipedia.org/wiki/ISBN_%28identifier%29)[*978-0-86311-5516*](https://en.wikipedia.org/wiki/Special%3ABookSources/978-0-86311-551-6)*.*
18. Bast, Felix; Pooja Rani; Devendra Meena (2014). ["Chloroplast DNA Phylogeography of Holy Basil (*Ocimum tenuiflorum*) in Indian Subcontinent"](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3910118). *The Scientific World Journal*. **70** (3): 277-85. [doi](https://en.wikipedia.org/wiki/Doi_%28identifier%29):[10.1155/2014/847482](https://doi.org/10.1155/2014/847482). [PMC](https://en.wikipedia.org/wiki/PMC_%28identifier%29) [3910118](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3910118). [PMID](https://en.wikipedia.org/wiki/PMID_%28identifier%29) [847482](https://pubmed.ncbi.nlm.nih.gov/847482).
19. Rehman HU. In vitro Propagation of Kainth (Pyruspashia) Using Explants from Forced Cutting. J Horticulture. 2015; 2:127.
20. Smitha, G. R., Thania, S. V. and Manivel, P. (2014). Cultivation of Ocimum, DMAPR, Boriavi, Technical Report. Extension bulletin.
21. Zhelijazkov VD, Cantrell CL, Tekwani B, Khan SI. Content, composition, and bioactivity of the essential oils of three basil genotypes as a function of harvesting. J Agric Food Chem 2008;56: 390-5.
22. Viyoch J, Posuthanan N, Faikreua A, Nupangta K, Wangtorpol K, Ngokkuen J. Evaluation of in vitro antimicrobial activity of Thai basil oils and their micro-emulsion formulas against Propionibacterium acnes. Int J Cosmet Sci 2006;28: 125-33.
23. Singh S, Taneja M, Majumdar DK. Biological activities of Ocimum sanctum L. Fixed oil- an overview. Indian J Exp Biol 2007;45: 403-12.
24. Padalia RC, Verma RS. The comparative volatile oil composition of four Ocimum species from Northern India. Nat Prod Res 2011;25: 569-75.
25. Rao BR, Kotharia SK, Rajput DK, Patel RP, Darokar MP. Chemical and biological diversity in fourteen selections of four Ocimum species. Nat Prod Commun 2011;6: 1705-10.
26. Kothari SK, Bhattacharya AK, Ramesh S. Essential oil yield and quality of methyl eugenol rich Ocimum tenuiflorum L. (syn. O. sanctum L.) Grown in south India as influenced by the method of harvest. J Chromatography A 2004;1054: 67-72.
27. Madhuri S. Studies on estrogen-induced uterine and ovarian carcinogenesis and effect of ProImmu in rats. Ph.D. thesis, Rani Durgavati Vishwa Vidyalaya, Jabalpur, MP, India: 2008.
28. Madhuri S., Pandey Govind. Effect of ProImmu, a herbal drug on estrogen caused uterine and ovarian cytotoxicity. Biomed 5(1):2010,57-62.
29. Pandey Govind. An overview of certain anticancer natural products. J Pharm Res 2(12):2009,1799-1803.
30. Pandey Govind, Madhuri S. Autochthonous herbal products in the treatment of cancer. Phytomedicine 7:2006,99-104.
31. Pandey Govind, Madhuri S. Medicinal plants: Better remedy for neoplasm. Indian Drug 43(11):2006,869-874.
32. Kathiresan K, Guanasekan P, Rammurthy N, Govidswami S. Anticancer activity of Ocimum sanctum. Pharmaceutical Biology 37(4):1999,285-290.
33. Aruna K, Sivaramakrishnan VM. Anticarcinogenic effects of some Indian plant products. Food Chem Toxicol 30:1992,953.
34. Uma Devi P. Radioprotective, anticarcinogenic and antioxidant properties of the Indian holy basil, Ocimum sanctum (Tulasi). Indian J Exp Biol 39:2001,185-190.
35. Prashar R, Kumar A, Banerjee S, Rao AR. Chemopreventive action by an extract from Ocimum sanctum on mouse skin papilloma genesis and its enhancement of skin glutathione-S-transferase activity and acid soluble sulfhydryl level. Anticancer Drugs 5:1994,567-572.
36. Sukumaran K, Unnikrishnan MC, Kuttan R. Inhibition of tumor promotion in mice by eugenol. Indian J Physiol Pharmacol 38:1994,306.
37. Karthikeyan K, Ravichandran P, Govindasamy S. Chemopreventive effect of Ocimum sanctum on DMBA-induced hamster buccal pouch carcinogenesis. Oral Oncol 35(1):1999, 112-119.
38. Prashar R, Kumar A, Hewer A, Cole KJ, Davis W, Phillips DH. Inhibition by an extract of Ocimum sanctum of 7, 12-dimethylbenz (a) anthracene in rat hepatocytes in vitro. Cancer Lett 128(2):1998,155-160.
39. Somkuwar AP. Studies on anticancer effects of Ocimum sanctum and Withania somnifera on experimentally induced cancer in mice. PhD thesis, JNKVV, Jabalpur, MP, India: 2003.
40. Kathiresan K, Guanasekan P, Rammurthy N, Govidswami S. Anticancer activity of Ocimum sanctum. Pharmaceutical Biology 37(4):1999,285-290.
41. Bhargava KP, Singh N. Antistress activity of Ocimum sanctum Linn. Indian J Med Res 73: 1981,443.
42. Sakina MR, Dandiya PC, Hamdard HE, Hameed A. Preliminary psychopharmacological evaluation of Ocimum sanctum leaf extract. J Ethnopharmacol 28:1990,143
43. 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 78:2001,139
44. Uma Devi P, Gonasoundari A. Radioprotective effect of leaf extract of Indian Medicinal Plant Ocimum sanctum. Indian J Exp Biol 33:1995,205.
45. Uma Devi P, Gonasoundari A, Vrinda B, Srinivasan KK,vUnnikrishanan MK. Radiation protection by the Ocimum sanctum flavonoids orientin and vicenin: Mechanism of action. Radiat Res 154(4): 2000,455-460.
46. Gonasoundari A, Uma Devi P, Rao BSS. Enhancement of bone marrow radioprotection and reduction of WR-2721 toxicity by Ocimum sanctum. Mutat Res 397:1998,303.
47. Saija A, Scalese M, Lanza M, Marzillo D, Bonina F, Castelli F. Flavonoids as antioxidant agents: Importance of their interaction with biomembrane. Free Rad Biol Med 19:1995,481.
48. Kelm MA, Nair MG, Strasburg GM, DeWitt DL. Antioxidant and cyclooxygenase inhibitory phenolic compounds from Ocimum sanctum Linn. Phytomedicine. 7(1):2000,713.
49. Nair AGR, Gunasegaran R, Joshi BS. Chemical investigation of certain South Indian plants. Indian J Chem 21B:1982,979.
50. Sood S, Narang D, Dinda DK, Maulik SK. Oral administration of Ocimum sanctum Linn. augments cardiac endogenous antioxidants and prevents isoproterenol-induced myocardial necrosis in rats. J Pharm Pharmacol 57(1):2005,127-133.
51. Gupta SK, Prakash J, Srivastava S. Validation of traditional claim of *Tulsi*, Ocimum sanctum Linn. as a medicinal plant. Indian J Exp Biol 40:2002,765-773
52. Singh S, Majumdar DK. Evaluation of the anti-inflammatory activity of fatty acids of Ocimum sanctum fixed oil. Indian J Exp Biol 35:1997,380-383.
53. Singh S, Majumdar DK. Analgesic activity of Ocimum sanctum and its possible mechanism of action. Int J Pharmacog 33:1995,188.
54. Singh S, Taneja M, Majumdar DK. Biological activities of Ocimum sanctum L. fixed oil- An overview. Indian J Exp Biol 45:2007,403-412.
55. Geeta Vasudevan DM, Kedlaya R, Deepa S, Ballal M. Activity of Ocimum sanctum (the traditional medicinal plant) against the enteric pathogens. Indian J Med Sci 55(8):2001,434-438.
56. Auil F, Khan MS, Owais M, Ahmad I. Effect of certain bioactive plant extracts on clinical isolates of beta-lactamase producing methicillin-resistant Staphylococcus aureus. J Basic Microbiol 45(2):2005,106-114.
57. Shoken P, Ray K, Bala M, Tandon V. Preliminary studies on Ocimum sanctum, Drynaria quercifolia and Annona squamosa against Neisseria gonorrhoeae. Sex Transm Dis 32(2):2005,106-111.
58. Singh S, Malhotra M, Majumdar DK. Antibacterial activity of Ocimum sanctum L. fixed oil. Indian J Exp Biol 43:2005,835.
59. Joshi H, Parle M. Cholinergic basis of memory improving effect of Ocimum tenuiflorum Linn. Indian J Pharm Sci 68(3):2006,364-365.
60. Chattopadhyay RR. Hypoglycemic effect of Ocimum sanctum leaf extract in normal and streptozotocin-induced diabetic rats. Indian J Exp Biol 31:1993,891-893.
61. Agrawal P, Rai V, Singh RB. Randomized placebo-controlled, single-blind trial of holy basil leaves in patients with noninsulin-dependent diabetes mellitus. Int J Clin Pharmacol Ther 34:1996,406.
62. Halder N, Joshi N, Gupta SK. Lens aldose reductase inhibiting potential of some indigenous plants. J Ethnopharmacol 86(1):2003,113-116.
63. Chattopadhyay RR, Sarkar SK, Ganguly S, Medda C, Basu TK. Hepatoprotective activity of O. sanctum leaf extract against paracetamol-induced hepatic damage in rats. Indian J Pharmacol. 24:1992,163.
64. Seethalakshmi B, Narasappa AP, Kenchaveerappa S. Protective effect of Ocimum sanctum in experimental liver injury in albino rats. Indian J Pharmacol, 14:1982,63.
65. Seth SD, Johri N, Sundaram KR. Antispermatogenic effect of Ocimum sanctum. Indian J Exp Biol 19:1981,975.
66. Khanna S, Gupta SR, Grover JK. Effect of long-term feeding of *Tulsi* (Ocimum sanctum) on reproductive performance of adult albino rats. Indian J Exp Biol 24:1986,302.
67. Singh S, Majumdar DK. Evaluation of the gastric antiulcer activity of fixed oil- Ocimum sanctum (Holy basil). J Ethnopharmacol 65:1999,13-19.
68. Singh S, Majumdar DK. Effect of the fixed oil of Ocimum sanctum against experimentally induced arthritis and joint edema in laboratory animals. Int J Pharmacog 34:1996,218.
69. Godhwani S, Godhwani JL, Vyas DS. Ocimum sanctum: A preliminary study evaluating its immunoregulatory profile in albino rats. J Ethnopharmacol 24:1988,193-198.
70. Prashar R, Kumar A. Chemopreventive action f Ocimum sanctum o 2, 12-dimethylbenz(a) anthracene (DMBA) induced papilloma genesis in the skin of mice. Int J Pharmacog 33:1995, 181.
71. Mediratta PK, Dewan V, Bhattacharya SK, Gupta VS, Maiti S, Sen P. Effect of Ocimum sanctum Linn. on humoral immune responses. Indian J Med Res 87:1998,384.
72. Mukherjee R, Das PK, Ram GC. Immunotherapeutic potential of Ocimum sanctum Linn. bovine subclinical mastitis. Rev Vet Sci 79(1):2005,37-43.
73. Gupta SK, Prakash J, Srivastava S. Validation of traditional claim of *Tulsi*, Ocimum sanctum Linn. as a medicinal plant. Indian J Exp Biol 40:2002,765-773.
74. Warrier, P K (1995). Indian Medicinal Plants. Orient Longman. p. 168
75. Staples, George; Michael S. Kristiansen (1999). Ethnic Culinary Herbs. The University of Hawaii Press. P.73. ISBN9780824820947.
76. Culinary Herbs. The University of Hawaii Press. p. 73. ISBN 9780824820947.
77. NIIR Board, National Institute of Industrial Research (India) (2004). Compendium of Medicinal Plants. 2004. National Institute of Industrial Research. p. 320. ISBN 9788186623800.
78. Puri, Harbans Singh (2002). Rasayana: Ayurvedic Herbs for Longevity and Rejuvenation. CRC Press. Pp. 272-280. ISBN 9780415284899.
79. Biswas, N. P.; Biswas, A. K.. "Evaluation of some leaf dust as grain protectant against rice weevil Sitophilus oryza (Linn.).". Environment and Ecology (Vol. 23) ((No. 3) 2005): pp. 485–488.
80. adalia RC, Verma RS. Comparative volatile oil

composition of four Ocimum species from Northern India. Nat Prod Res 2011;25:569-75