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## Phytoconstituents, traditional, medicinal and bioactive uses of Tulsi (*Ocimum sanctum* Linn.): A review

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### Abstract

*Ocimum sanctum* is found throughout India and is cultivated near Hindu houses and temples. The leaves, seeds and root of this plant have been used in Ayurvedic medicine. The chemical composition of Tulsi is highly complex, containing many nutrients and other biological active compounds. Due to its inherent botanical and biochemical complexity, Tulsi standardization has, so far, eluded modern science. Perhaps best known of many active compounds that have been identified and extracted are eugenol (an essential oil) and ursolic acid. Many scientific studies have indicated that *Ocimum sanctum* has anti-stress, antioxidant, hepatoprotective, immunomodulating, antiinflammatory, antibacterial, antiviral, antifungal, antipyretic, antidiuretic, antidiabetic, antimalarial and hypolipidemic properties with a wide margin of safety. In Ayurvedic medicine, Tulsi is being used either alone or in combination with others in various clinical conditions like anxiety, chronic cough, bronchitis, fever, snake and scorpion bites.

**Keywords:** *Ocimum sanctum*, essential oil, antioxidant activity

### 1. Introduction

The Indian Himalaya is home to more than 8000 species of vascular plants [1] of which 1748 are known for their medicinal properties [2]. Higher plants have played key roles in the lives of tribal peoples living in the Himalaya by providing forest products for both food and medicine. Numerous wild and cultivated plants have been utilized as curative agents since ancient times, and medicinal plants have gained importance recently not only as herbal medicines, but also as natural ingredients for the cosmetic industry. Plants have been used by men from prehistoric times to get rid of suffering & curing ailments. The folk medicines of almost around the world rely chiefly on herbal medicine even today. The therapeutic uses of plant are safe & economical & effective as their ease of availability [3, 4]. *Ocimum Sanctum* has been extensively used in Ayurvedic system of medicine for various ailments including capability lowering plasma glucose [5]. There are about 160 species in this genus broadly dispersed over the warm region of the globe. *Ocimum sanctum*, *Ocimum gratissimum* (Ram tulsi), *Ocimum canum* (dulal tulsi), *Ocimum basilicum* (Ban tulsi), *Ocimum killimandscharicum*, *Ocimum americanum*, *Ocimum camphora* & *Ocimum miranthum* are examples of known important species of genus *Ocimum* which grow in different parts of world and are known to have medicinal properties [6-8]. Tulsi is a Sanskrit word which means "the incomparable one" and has a very special place in the Hindu culture. Several medicinal properties have been attributed to the Tulsi plant not only in Ayurveda and Siddha but also in Greek, Romannand Unani systems of medicine [9]. In traditional systems of medicine the Indian medicinal plants have been used in successful management of various disease conditions like bronchial asthma, chronic fever, cold cough, malaria, dysentery, convulsions, diarrhea, arthritis, emetic syndrome, skin diseases, insect bite etc and in the treatment of gastric, hepatic, cardiovascular and immunological disorders [10-15]. *Ocimum sanctum* Linn. (Tulsi) commonly known as holy basil in English or sacred basil in Hindi, in Sanskrit it is known as Vishnu priya, Divya and belongs to family (labiatae). As its Latin name implies it considered a very sacred plant. It is high in sattva imparting the quality of lightness and spiritual clarity. An excellent herb for lifting the heaviness of fevers, cough & cold etc. Tulsi is a prophylactic shrub growing to about 75 cm. It is commonly found near temples & home & is worshiped daily by Hindus [16].

### 2. Chemical constituents

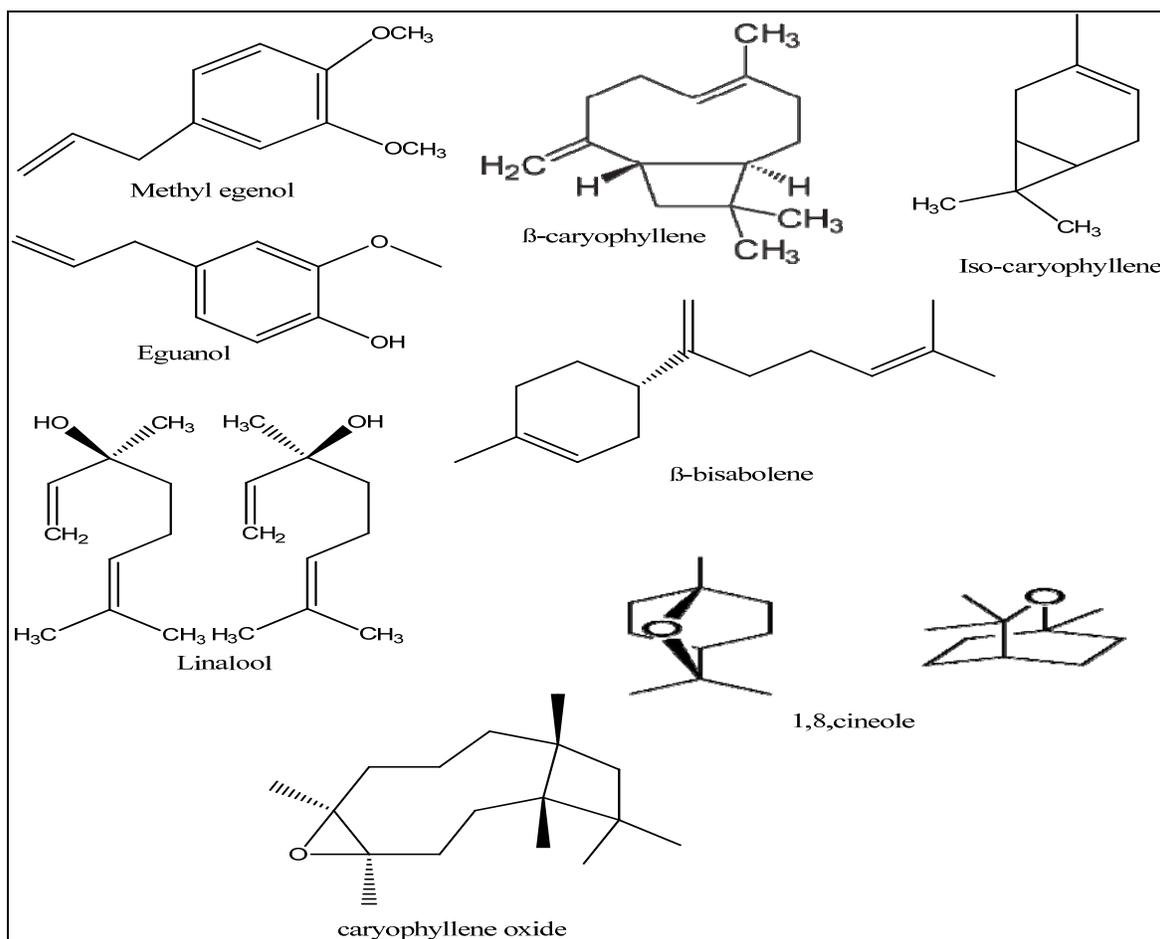
Literature survey revealed in *O. Sanctum*, the presence of methyl eugenol,  $\beta$ -caryophyllene [17-18], methyl eugenol, (E)-caryophyllene, eugenol and,  $\beta$ -elemene [19], methyl chavicol, and linalool [20] from India;  $\beta$ -bisabolene, 1,8-cineole and methyl chavicol [21] from Poland; methyl eugenol and Isocaryophyllene [22] from Nigeria; eugenol,  $\beta$ -caryophyllene and caryophyllene oxide [23] from Northeastern Brazil; eugenol,  $\beta$ -elemene and  $\beta$ -caryophyllene [24] from Cuba;

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methyl chavicol, camphor and  $\beta$ -caryophyllene [25] from Australia. In other species, *O. gratissimum* is a well-known plant used in the Indian herbal medicine. The flowers and the leaves of this plant are rich in essential oils, so it is used in the preparation of teas and infusions. The volatile oil of *O. gratissimum* contains mostly thymol and eugenol, those are probably responsible for its reported antimicrobial activity [26]. *O. kilimandscharicum* is known as Kapur tulsii. Aqueous extract of leaves contain camphor, 1,8-cineole, limonene, trans-caryophyllene, camphene, 4-terpeneol, myrtenol,

aterpineol, endo-borneol and linalool. It also contains flavonoids, tannins, saponins, sterols, carbohydrates, proteins and triterpenoids. Its essential oil contains oxygenated monoterpenes (95.8%), like camphor (64.9%), limonene (8.7%), camphene (6.4%) and (E)-ocimene (3.0%) [27]. *O. kilimandscharicum* attracted attention as a source of camphor [28].

## 2.1 Major compounds present in *Ocimum* species



## 3. Traditional, medicinal and bioactive uses:

### 3.1. Traditional uses:

Literature survey revealed that Tulsi has been used traditionally in Ayurveda and Siddha systems of medicine for prevention and cure of common cold, headache, cough, influenza, earache, fever, colic pain, sore throat, bronchitis, asthma, hepatic diseases, malarial fever, as an antidote for snake bite and scorpion sting, flatulence, migraine headaches, fatigue, skin diseases, wound, insomnia, arthritis, digestive disorders, night blindness and diarrhoea. The leaves are good for nerves and to sharpen memory [29]. Holy Basil is so good for boosting up the immune system. It protects from nearly all sorts of infections from viruses, bacteria, fungi and protozoa. Recent studies show that it is also helpful in inhibiting the growth of HIV and carcinogenic cells [30]. In India plants have been traditionally used for human and veterinary health care and also in the food and textile industry. Maximum of the local food resources known in indigenous people were undocumented to nutritional literature, trade, cosmetics and perfumes: but India has a special position in area of herbal medicines *Ocimum sanctum* used in various purposes such

as leaves, flowers, stem, root, seeds etc. are known to have potential pharmacological activity such as expectorant, analgesic, anticancer, hepatoprotective, hypotensive, hypolipidemic and antistress agent. It also plays a significant role in treatment of fevers, arthritis, convulsions, bronchitis etc, in traditional medical practices [31-34].

### 3.2. Medicinal Uses:

**3.2.1. Eye care:** The leaf juice of *Ocimum sanctum* along with triphala is used in ayurvedic eye drop preparations recommended for glaucoma, cataract, chronic conjunctivitis & other painful eye disease. In daily routine one may use about three drops of tulsii oil along with honey and it is supposed to improve eye sight [35].

**3.2.2. Malaria Fever:** Decoction of the root of tulsi plant is given as a diaphoretic in malarial fevers. Ayurvedic preparations containing *Ocimum sanctum* L., *Allium sativum*, *Piper nigrum* & *Curcuma longa* have been shown to possess antimalarial activity against *Plasmodium vivax* & *Plasmodium falciparum* [35].

**3.2.3. Used as a heart tonic.** Affinity of *Ocimum sanctum* for rasa dathu helps to increase circulation through the heart where there is congestion from high vatta and kapha eugenol from *Ocimum sanctum* has been reported to possess the vasorelaxing action on rabbit arterial tissue indicating its therapeutic importance as a vasodilator. Methyl eugenol was identified as the major constituent of *Ocimum sanctum* oil & is probably accounted for the observed larvacidal action of the oil [36-38].

**3.2.4. Skin care:** In case of ring worm or other skin related diseases such as leucoderma paste of tulsi leaves is applied on the affected area to cure these ailments. In case of *chicken pox* tulsi leaves are taken with saffron to explore the disease. The ethanolic extract of tulsi leaves lead to marked lowering of blood sugar in normal glucose fed hyperglycaemic & streptozocin induced diabetic rats [39, 40].

### 3.3. Bioactive uses of *Ocimum* :

**3.3.31. Insecticidal activity:** Tulsi extract & essential oil have also been found to possess insecticidal & larvicidal activity against mosquitoes [35].

**3.3.2. Anti-diabetic potential:** Aqueous decoction of whole plant lowers the blood sugar level & is said to control diabetic mellitus [33].

**3.2.2. Anti-tubercular activity:** Tulsi also has anti-tubercular activity & inhibits in vitro growth of *Mycobacterium tuberculosis* [35].

**3.2.3. Anti-stress activity:** Literature survey revealed that the plant extracts exhibit anti-stress activity by improving SDH level in albino rats. Benzene extract of leaves in case of the male rat has been suggested to reduce spermatogenesis retarding strolia cells activity without affecting the germ cells [41]. Ursolic acid a major constituent of the tulsi leaves possess ant fertility effect in rat of both sexes & due to anti-estrogenic effect reduce spermatogenesis & causes a decrease in sperm counts [35]. There are several other pharmacological effects such as hepatoprotective, anti-inflammatory (oral & topical), antiulcer, anti-hyperlipidemic, antiviral, antimicrobial activities have also been considered to ursolic acid [42].

**3.2.4. Anti fertility effect:** The leaves of *Ocimum sanctum* L. are said to have abortifacient in women & *sanctum* has also ant fertility effect. The local women of Kerala & the ayurvedic physician have been reported to use tulsi leaves for ant fertility effect [32].

**3.2.5. As a antidote:** Tulsi have been recommended for use as antidote for dog bite, scorpion bite & insect bite in traditional system of medicine [35, 44, 45].

**3.2.6. Anti fertility effect:** The leaves of *Ocimum sanctum* L. are said to have abortifacient in women & *sanctum* has also ant fertility effect. The local women of Kerala & the ayurvedic physician have been reported to use tulsi leaves for ant fertility effect [32].

### 4. Conclusions

Tulsi is a tradition herb used in India, it has diverse healing properties and considered as adaptogenic. Many varieties of tulsi species are available, among them three species were selected for evaluation of antimicrobial activity. Survey of

literature showed that *Ocimum sanctum* has an esteemed status in herbs with diverse pharmacological activity spectrum. Yet crude extracts of various parts of plants have medicinal applications from time immemorial, modern approaches to drug development may explore regarding bioactivity, pharmaco-therapeutics clinical trials, mechanism of action, safety evaluation after proper standardization & clinical trials. The multidimensional uses of Tulsi, in Uttarakhand the farming of this plant will be very effective to check migration and provide employment for local people.

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