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GENERAL INTRODUCTION, CLASSIFICATION, MORPHOLOGY, PHYTOCONSTIUENTS, TRADITIONAL & MEDICINAL USES, PHARMACOLOGICAL ACTIVITIES OF TULSI (*OCIMUM SANCTUM)*

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ABSTRACT

Plants have served humankind as a source of medicinal agents since its earliest beginnings. Tulsi is one of the drugs belonging to such a kind. It is an aromatic plant. It is found throughout India. As it has medicinal as well as spiritual importance in India, especially in Hinduism, it mostly found and cultivated near Hindu houses and temples. The leaves, seeds, and roots of this plant have been used as ayurvedic medicines. The chemical composition of Tulsi is highly complex, containing many nutrients and other biological active compounds the main chemical composition of tulsi are: Oleanolic acid, Ursolic acid, Rosmalinic acid, Eugenol, Carvacrol, Linalool and β-caryophyllyne. Tulsi standardization has so far, included in modern sciences. Perhaps best known of many active that have been identified and extracted are Eugenol (an essential oil) and Ursolic acid. Many specific studies have indicated that Tulsi (*ocimum Sanctum)* has anti- stress, antioxidant, hepatoprotective, immumnomodulating, anti-inflamatory, antibacterial, antiviral, antifungal, antipyretic, antidiuretic, antidiabetic, antimalerial and hypolipidemic with a wide margin of safety. In Ayurvedic Medicine, Tulsi is being used alone or in combination with other drugs in various clinical conditions like anxiety, chronic cough, bronchitis, various respiratory syndromes, fever, snake and scorpion bites.

KEYWORDS: *Ocimum sanctum,* essential oil, antimicrobial activity, use in chronic cough and various respiratory syndromes.

INTRODUCTION

The Indian Himalaya is home to more than 8000 species of vascular plants of which 1748 are known for their medicinal properties. 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. Tulsi is one of those wonderful and amazing plants. Tulsi has been extensively used in Ayurvedic system of medicine for various ailments including capability of lowering plasma glucose. There are 160 species of in the genus (*Ocimum*) broadly dispersed over the warm region of the globe. *Ocimum sanctum* (Krishna tulsi), *Ocimum gratissimum*(Ram tulsi), *Ocimum canum*(dulal tulsi), *Ocimum basilicum*(Ban tulsi), *Ocimum killimandscharicum, Ocimum americanum, ocimum camphora &Ocimum mirantham* are examples of known important species of genus *Ocimum* which grows in different parts of world and are known to have medicinal properties. The Tulsi plant 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 and Unani system of medicine. *Ocimum sanctum* (Tulsi) is also known as Holy basil & sacred basil in English, Divya & Vishnupriya in Sanskrit, Raihan in Urdu and Tulsi in Hindi and Mostly all Regional Languages of India. Tulsi belongs to family (Lamiaceae) as its Latin name (*Ocimum sanctum*) implies it is considered as 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.

Sources

A. Biological source

Tulsi consist of the fresh and dried leaves of the plant of Ocimum species like Ocimum sanctum L. & Ocimum basilicum belonging to family Lamiaceae.

B. Geographical source

In India, the plant is grown throughout the country from Andaman and Nicobar islands to the Himalayas up to 1800 meters above the sea level.[3] It is also abundantly found in Malaysia, Australia, West Africa and some of the Arab countries. It is a herbaceous, much branched annual plant found throughout India, it is considered as sacred by Hindus. The plant is

commonly cultivated in garden and also grown near temples. It is propagated by seeds. Tulsi, nowadays, is cultivated commercially for its volatile oil.

Classification

The taxonomical classification of plants consists of kingdom, sub-kingdom, superdivision, division, phylum, class, sub-class, order, family, genus and species of that particular plant. As Tulsi is also known as 'Queen of Herbs' there is a special classification of it. As binomial nomenclature of Tulsi i.e. *Ocimum sanctum* shows genus and species of it. The Tulsi belongs to class: Magnoliopsida, order: Lamiales, and family: Lamiaceae. The brief classification is as follows.

Taxonomical Classification of Tulsi

Kingdom: **Plantae**
Subkingdom: **Tracheobionta**
Superdivision: **Spermatophyta**
Division: **Magnoliophyta**
Class: **Magnoliopsida**
Subclass: **Asteridae**
Order: **Lamiales**
Family: **Lamiaceae**
Genus: **Ocimum**
Species: **O. sanctum**

- **Morphology**

The morphology of a particular plant is the study of external appearance of that plant that means how the root, stem, leaves, branches, flower, fruit and seeds appear. Here in Tulsi plant the morphology is shown as follows.

Fig.1:- Ocimum Sanctum(Tulsi) Plant

The Roots of the *Ocimum sanctum* plant are Thin, wiry, branched in appearance; hairy, and soft in nature, while externally blackish-brown and internally pale violet in colour. The stem is erect, herbaceous, woody, branched by appearance; hairy, sub-Quadrangular in nature, externally purplish-brown to black, internally cream coloured; fracture, fibrous in bark and short in xylem; the odour of stem is faintly aromatic. Leaves are 2.5-5 cm long, 1.6-3.2 cm wide, elliptic, oblong, obtuse or acute, entire or serrate, pubescent on both sides; petiole is thin, about 1.5-3cm long and hairy, having aromatic odour and characteristic taste. The *Ocimum sanctum* flower is purplish or crimson coloured, small in close whorls; bracts about 3mm long and broad, pedicels are longer than calyx, slender, pubescent; calyx ovoid or campanulate 3-4 mm bilipped, upper lip is broadly obovate or suborbicular, shortly apiculate, while lower lip is 170 longer than upper having four mucronate teeth, lateral two short and central two largest; corolla is about 4 mm long, pubescent; having aromatic odour; pungent taste. The fruit consist of a group of 4 nutlets, each with one seed, enclosed in an enlarged, membranous, veined calyx, nutlets are sub-globose or broadly elliptic, slightly compressed, nearly smooth; pale brown or reddish with small black marking at the place of attachment to the thalamus; with aromatic odour and pungent taste. Seeds of Tulsi are rounded to oval; brown, mucilaginous when soaked in water, 0.1 cm long, slightly notched at the base having no odour and pungent taste which is slightly mucilaginous.

Fig.2:- Leaves and Flowers of Ocimum sanctum (Tulsi)

- **Chemical Constituents**

Literature survey revealed in *O.sanctu*m the presence of methyl eugenol, β-caryophyllene, eugenol, β-elemene, methyl chavicol, and linalool from India; β-bisabolene, 1,8-cineole and methyl chavicol from Poland; Methyl eugenol and Isocaryophyllene from Nigeria; eugenol, β-caryophyllene and caryophyllene oxide from Northeastern Brazil; eugenol, β-elemene and β-caryophyllene from Cuba; methyl chavicol, camphor and β-caryophyllene from Australia. In other species, *O.gratissisum* 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.gratissisum* contains mostly thymol and eugenol those are probably responsible for antimicrobial activity. *O.kilimandscharicum* is known as kapur tulsi. Aqueous extract of leaves contains camphor, 1,8-cineole, limonene, Trans-caryophyllene, camphene, 4-terpeneol, myrtenol, aterpineol, endo-borneol and linalool. Aterpineol, endo-borneol and linalool. It also contains flavanoids, tannins, saponins, sterols, carbohydrates, proteins triterpenoids. It's essential oil contains oxygenated monoterpenes (95.8%), like camphor (64.9%), limonene (8.7%), camphene (6.4%) and (E)-Ociemene (3.0%). *O.kilimandscharicum* attracted attention as a source of camphor.

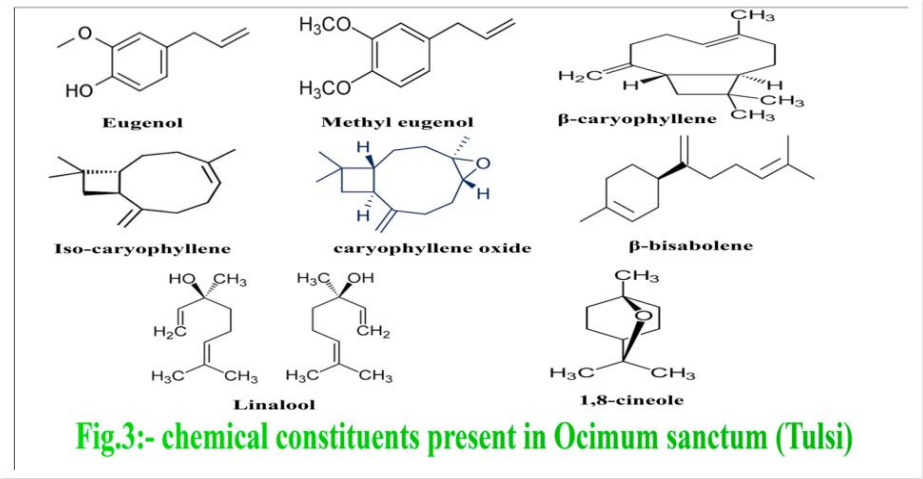

Fig.3:- chemical constituents present in Ocimum sanctum (Tulsi)

- **Traditional And Medicinal Uses**

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. 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. 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.

2. Medicinal Uses

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 tulsi oil along with honey and it is supposed to improve eye sight.

2.2.Malaria Fever: - Decoction of the root of tulsi plant is given is given as a diaphoretic in malarial fevers. Ayurvedic preparations containing Ocimum sanctum L., Allium sativum, Piper nirgum & Curcuma longa have been shown to possess antimalarial activity against Plasmodium vivax & Plasmodium falcifarum.

2.3.Used as a heart tonic:- Affinity of Ocimum sanctum for rasa dhatu helps to increase circulation through the heart where there is congestion from high vata and kapha eugenol from Ocimum sanctum has been reported to possess the vasodilating 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.

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.

- **Pharmacological Activities of Tulsi**

1. **Anticancer activity: -** In ayurveda, various plants are used as a potential source of anticancer and antitumor properties. It has been found that ethanolic extract of Ocimum sanctum mediated a significant reduction in tumor cell size and an increase in lifespan of mice having Sarcoma-180 solid tumors. Similar results were also obtained by others where leaf extract administered orally (200 mg/kg, p.o.) resulted in significant reduction in tumor volume, increase in average body weight, and survival rate of mice. Ocimum has the ability to protect the DNA of the body from dangerous radiations.
2. **Antidiabetic activity: -** O. sanctum has been reported to possess very good anti diabetic properties. The anti-diabetic activity of hydroalcoholic extract of O. tenuiflorum against streptozotocin and nicotimanide induced diabetes in rats was found to be significant at the dose levels of 250 and 500 mg/kg body weight and this effect was comparable with glibenclamide. Hyperglycaemia was shown to be reduced in alloxan diabetic rats when administered ethanol extract of O. sanctum in both acute and long-term feeding studies. In another study by J M A Hannan et al. prominent insulin-secretory effects were noted in the rat pancreas perfused with the ethanol extract and three partition (ethylacetate, butanol and aqueous) fractions of O. sanctum. Similar effects were found in acute insulin-release studies using isolated rat islets.

3. **Antilipidemic activity: -** 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 WR1339 in rats. In a study conducted on rabbits a diet supplemented with 1- 2 % fresh leaves of Tulsi for 28 days lowered the total lipid.
4. **Antibacterial activity: -** Antibacterial activity of the aqueous, alcoholic, chloroform extract and oil obtained from leaves of Ocimum sanctum were studied against E.coli, P. aeruginosa, S. typhimurium and S. aureus. Extract obtained from O. sanctum were observed equally effective against pathogenic gram-positive and gram- negative bacteria. Fresh leaves essential oil had shown more antibacterial properties compared to dried leaves essential oil of Tulsi and in case of fungus the property is just the reverse.
5. **Eye Disease: -** The leaf juice of Ocimum sanctum along with triphala is used in ayurvedic eye drop preparations recommended for glaucoma, chronic conjunctivitis and other painful eye disease. In daily routine one may use about three drops of tulsi oil along with honey and it is supposed to improve eye sight.
6. **Anti fertility activity: -** The benzene and petroleum ether extracts of leaves of Tulsi have been reported to produce 80% and 60% antifertility activity respectively in female rats. In Kerala the local women as well as the Ayurvedic physicians have been reported to use the leaves of Tulsi for antifertility effect. One of the major constituents of the Tulsi leaves is ursolic acid and it has been reported that it possess antifertility 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.
7. **Mosquitocidal activity: -** Mosquitocidal activity of Tulsi was investigated using its eugenol and triglyceride (isolated from Tulsi's hexane extract) on fourth instars Aedes aegypti larvae. When seeds of Tulsi was placed in water, it exude within one hour, a mucilaginous substance (polysaccharides) and larvae which came in contact with seeds became firmly attached to it and died due to drowning of larvae.

CONCLUSION

It is observed from various studies that the Ocimum sanctum have a number of pharmaceutical and medicinal property and according to this it is effective in the treatment of

a number of diseases. Future research on sacred basil should be emphasized for control of various diseases.

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