JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

An Overview on Diverse Pharmacological Property of Tulsi

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Tulsi is a wonder herb plant with diverse medicinal property. In Hindu religion it is plant of great importance. In extract of *Tulsi* leaves and seed oil contains many biologically active compounds such as eugenol, terpenes, alkaloids, glycosides, saponines, tannins, ascorbic acid and carotene etc are responsible for its therapeutic value. Researches show that it has number of pharmacological properties such as antimicrobial, antioxidant, anti-inflammatory, antipyretic, antitumor etc. In India it is traditionally used as medicine for treatment of various health related problems such as fever, common cold, headaches, stomach problems etc.

Key words: Plant extract, Pharmacology, Treatment, *Ocimum sanctum*, Medicine

1. Introduction:

The botanical name of Tulsi,is *Ocimum sanctum* (Rama tulsi) *and Ocimum tenuiflorum* (Krishna tulsi), commonly known as holy basil. It is an aromatic perennial plant in the family Lamiaceae. Its other name, Vishnupriya means the one that pleases Lord Vishnu. Tulsi grows wild in the tropics and warm regions. The plant is distributed and cultivated throughout India. Tulsi is cultivated for its religious importance and traditional medicine purposes, and for its essential oil. It is widely used as a herbal tea. Different parts of plant are used as medicine for prevention and cure of many illnesses and everyday ailments like common cold, headache, cough, flu, earache, fever, colic pain, sore throat, bronchitis, asthma, hepatic diseases, malaria fever, as an antidote for snake bite and scorpion sting, flatulence, migraine headaches, fatigue, skin diseases, wound, insomnia, arthritis, digestive disorders, night blindness, diarrhoea and influenza etc [1-2].

2. Physiology of the plant:

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Table 1: Taxonomical classification:

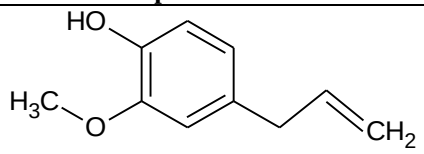
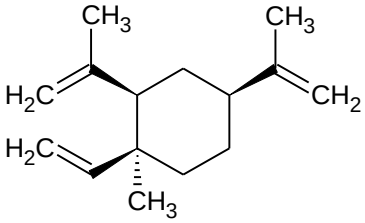
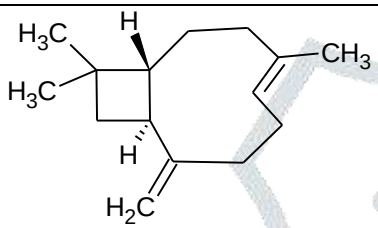
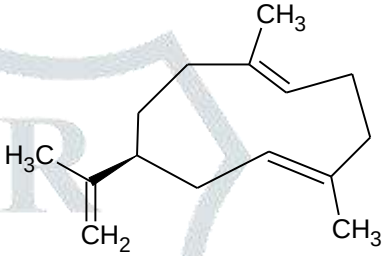
Kingdom:	**Plantae**
Subkingdom:	Tracheobionta
Superdivision:	Spermatophyta
Division:	Magnoliophyta
Class:	Magnoliopsida
Subclass:	Asteridae
Order:	Lamiales
Family:	Lamiaceae
Genus:	*Ocimum*
Species:	*sanctum, tenuiflorum*

Tulsi is an erect, much-branched shrub, 30–60 cm (12–24 in) tall with hairy stems. Leaves are green or purple; they are simple, petioled, with an ovate, up to 5 cm (2.0 in)-long blade which usually has a slightly toothed margin; they are strongly scented and have adecussate phyllotaxy. The purplish flowers are placed in close whorls on elongate racemes . *Ocimum sanctum* has two varieties i.e. green-leaved (Rama *tulsi*) and purple-leaved (Krishna *tulsi*), their chemical constituents are similar. While Krishna tulsi possessing greater medicinal value

3. Chemical components:

Tulsi has specific aromatic odour because of the presence of 0.7 % essential or volatile oil, mainly concentrated in the leaf. Tulsi essential oil consists mostly of eugenol (~70%) β-elemene (~11.0%), β-caryophyllene (~8%) and germacrene (~2%), with the balance being made up of various trace compounds, mostly terpenes. The oil extracted from seeds is called fixed oil and mainly composed of fatty acids. Besides oil, the plant also contains alkaloids, glycosides, saponines and tannins. The leaves contain ascorbic acid and carotene as well [3].

Table 2: **Chemical Components**

 Eugenol A member of the allylbenzene class of chemical compound	 β-elemene a class of sesquiterpenes
 β-caryophyllene is a natural bicyclic sesquiterpene	 germacrene are a class of volatile organic hydrocarbons, specifically, sesquiterpenes

4. Pharmacological Properties:

4.1. Antimicrobial activity:

Tulsi is excellent source of active components which act as a natural antimicrobial agent and used for treatment of various diseases in whole world from ancient time. Tulsi extract shows inhibitory effects against pathogens such as *Staphylococcus aureus, Pseudomonas aeruginosa, E. coli, Klebsiella pneumonia, Proteus mirabilis, Salmonella typhimurium, Salmonella typhae, Shigella dysentriae, Bacillus pumilus, Aspergillus spp., Candida albican* and *Penicellium spp*. Dixit et al. in 2021 reported antibacterial potential of *Ocimum tenuiflorum* against *Bacillus subtilis* and find good activity [4]. Yamani et al. in 2016 studied the antimicrobial activity test of essential oil extracted from *Ocimum tenuiflorum* which showed significant antimicrobial activity against *Staphylococcus aureus* and *E. coli*, but was less active against *Pseudomonas aeruginosa* [5]. Essential oil and extract of Tulsi leaves have antiviral properties that's why it is used extensively in medical practices. It is an excellent antimicrobial agent so it is used in food products as an ingredient as well as medicine. Jayati et al. in 2013 evaluated antiviral properties of leaves of *O. sanctum* against New Castle Disease Virus and concluded that the extract of *O. sanctum* leaves prevented the virus to multiply and can be used to get protection against NCD virus [6].

4.2. Antioxidant property:

Oxidative stress arising out of excessive production of reactive oxygen species (ROS) is implicated in many diseases such as cancer, atherosclerosis, ageing, diabetes, *etc*. External supplementation of antioxidants is recommended to protect cells from the deleterious effects of oxidative stress [7]. Saravanan et al. in 2021 evaluated antioxidant activity of aqueous extract of O*cimum sanctum* by DPPH free radical scavenging, Nitric oxide radical scavenging and Superoxide anion radical scavenging and observed significant antioxidant activity result [8]. Xia et al. in 2018 investigated Antioxidant activity of *Ocimum sanctum* extract by performing total phenolic content test and DPPH to identify the percentage of scavenging by the chemical constituents and proved that this extract has the antioxidant potential [9].

4.3. Anti-inflammatory property:

Mirje et al. in 2014 studied anti-inflammatory activity of *Ocimum sanctum* Linn (Tulsi) in albino rats and find significant result. *O. sanctum* possesses significant anti-inflammatory activity probably due to inhibition of both cyclooxygenase and lipooxygenase pathways of arachidonic acid metabolism [10]. Singh et al. in 1995 evaluated anti-inflammatory activity of the fixed oil of *Ocimum sanctum* by carrageenin-induced paw edema in rats. He found that oil significantly reduced carrageenin-induced paw edema [11]. Manaharan et al. in 2014 evaluated anti-metastatic and anti-inflammatory activities of *Ocimum sanctum* essential oil and observed strong anti-inflammatory activity which cause the significant decrease in the number of migrated cancer cells [12].

4.4. Antipyretic

Singh et al. in 1995 reported that *Ocimum* oil also reduces typhoid-paratyphoid A/B vaccine-induced pyrexia and, at a dose level of 3.0 ml/kg, and find the antipyretic activity was similar to that of aspirin (100 mg/ kg) [11]. Balakrishna et al. in 2017 evaluated the effect of extract of *Ocimum Sanctum* in Brewer's Yeast induced pyrexia in albino rats and observed significant reduction in pyrexia [13].

4.5. Antitumor Property:

Kartikeyan et al. in 1999 reported anticancer activity of *Ocimum sanctum* on mice bearing Sarcoma-180 solid tumors and observed significant reduction in tumor volume and an increase in lifespan [14]. Harsha et al in 2020 evaluated the cytotoxic effect of *O. sanctum* on leukemic cell lines K562 [15]. Luke et al. in 2021 study the effect of aqueous and dry leaves extract of *Ocimum sanctum* was observed on Ca9-22 cell line (Oral squamous cell carcinoma cell line). And concluded that concluded that, *Ocimum sanctum* have anti-cancerous activity [16].

5. Role of Tulsi in Traditional medicine:

Respiratory disorders: A decoction of the leaves along with honey and ginger is an effective remedy for bronchitis, asthma, influenza, cough and cold. A decoction of the leaves, cloves and common salt should be boiled in half a litre of water until only half the water is left. Drinking this can give immediate relief in case of influenza.

Common cold: The Tulsi leaves, boiled with tea, prevent cold during the rainy season

Sore throat: Water boiled with Tulsi leaves can be consumed to help cure a sore throat. This water can also be used to gargle.

Fever: Leaves boiled with powdered cardamom in half a litre of water and mixed with sugar and milk help to bring down the temperature during a fever. Take 2 cup water10 leaves of Tulsi, 21 black pepper, 5 clove, 3 gram dry ginger and sugar, boil it till half water is remaining, filter and take it to get relief from fever.

Ear Problems: Put 4 drops of warm Tulsi leave juice in ear to get relief from ear pain.

Stomach: The extract of Tulsi roots sweetened with sugar will relieve constipation and distension of the stomach, ensuring satisfactory bowel movement. Daily chewing 5 leaves of Tulsi make digestive system strong.

Heart disorders: Chewing 10- 12 leaves of Tulsi daily reduces the level of blood cholesterol.

Stress: Chewing 12 leaves of basil twice a day prevents stress.

Mouth infections: The leaves are quite effective in treating ulcers and infections in the mouth. A few leaves chewed regularly will cure these conditions.

Tooth problems: Leaves dried in the sun and powdered can be used for brushing the teeth. Leaves dried and mixed with mustard oil are used as toothpaste. This paste is very good for maintaining the overall dental health, countering bad breath and massaging the gums. The paste is also useful in treating pyorrhea and other tooth disorders.

Insect bites: A teaspoonful of the juice of the leaves can be taken every few hours in case of an insect bite. Fresh Tulsi leaf juice must also be applied to the affected parts.

Headaches: Dried and powdered leaves are mixed with sandalwood paste and applied on the forehead to get relief from the heat and headaches. Or take juice of the leaves with equal amount of lemon juice to get relief from headaches.

Eye disorders: The leaf juice of Tulsi 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. Two drops of black basil juice can be put into the eyes daily at bedtime cure eye disorder.

Women's diseases: Two grams of the gum of a neem tree, ajwain seeds, tamal patra, and five equal parts of the Tulsi plant are ground into powder, boiled in 100 gm of water until only one-fourth of the water remains. The extract is cooled and strained to treat excessive menstrual bleeding. Applying the paste of Tulsi over the abdomen and the breasts of a pregnant woman relieves itching of the skin. Drinking Tulsi juice will lessen the severity of labour pains. Tulsi seeds soaked overnight for twelve hours in water, and then crushed well and administered with sugar relieve post-delivery pains. Consuming a mixture of 20 gm of tulsi juice, 20 gm of the juice of maize leaves, 10 gm of the juice or extract of ashwagandha, and 10 gm of honey, for seven days following delivery, improves lactation. Regular period cycles can be restored by taking 125 gm of ground Tulsi seeds, black sesame seeds, tender shoots of the cotton plant, tender shoots of bamboo plants and 220 gm of aged jaggery, mixed with the powder.

Problems in men's urinary system: Tulsi juice is added to double the quantity of grape juice, sugarcane juice or coconut milk and consumed. Powdered Shyama Tulsi mixed with lemon juice, if taken regularly, cures all abnormalities of the urinary system. Tulsi seeds ground with cumin seeds and sugar, taken with milk, help relieve pains caused by stones in the bladder and the burning sensation while passing urine. The juice of Tulsi leaves and honey, if taken regularly for six months, will break down, dislodge and expel the stones via the urinary tract.

Nocturnal emissions: soak 10 gm of Tulsi seeds overnight in water in an earthen pot. Grind them well in the morning together with 15 almond kernels and 16 small cardamoms. Add sugar as required and drink the mixture. Chewing small pieces of Tulsi roots with betel leaves also solves this problem.

Children's diseases: Two grams of Tulsi juice taken three to four times a day or warm Tulsi juice with ginger and cool it add honey in it prevents all types of sickness in children. In case of fever caused by a cold, Tulsi juice should be smeared on the chest and forehead. The child should be made to inhale the vapours emanating from the juice, and should also be given a teaspoonful of the juice with half a teaspoonful of honey.

6. Conclusions:

Tulsi is an ancient Indian herb, has long history as a medicinal plant with diverse therapeutic uses. Several research offers evidence that Tulsi is useful against stress; it enhances stamina and increases efficient use of oxygen by body; strengthens immune

system; reduces inflammation; protects from radiation; reduces aging; supports the lungs, liver and heart; it exhibits antibiotic, antiviral and antifungal, antioxidant properties. All the parts of plant leaves, root and seeds have medicinal importance. It can be used directly of by making extract of that for treatment of various diseases. The daily consumption of Tulsi leaves make body free from diseases.

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