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A BRIEF OVERVIEW ON PHYTOCHEMICAL AND BIOPOTENSIAL OF OCIMUM SANCTUM

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ABSTRACT

In the present review on Tulsi, an effort has been done to Medicinal properties of Tulsi. The therapeutic uses of plant are considered as safe, inexpensive as their ease of availability. As plants known for medical uses, the plants of genus Ocimum**.** Tulsi is a medicinal plant present in India recognized for its medicinal and therapeutic uses. Various medicinal properties of Tulsi are present in the roots, leaves and seeds. It has a wide range of action on the human body. It cures many diseases chronically due to its chemical constituent and believes that it has Anti- ageing, Immunomodulatory property along with antimicrobial and anticancer property. Tulsi known as Queen of Herbs of India and one of the holiest and most healthiness giving herbs. Tulsi is famous for its vital role in the conventional ayurvedic and unani systems of body fitness health and herbal medicine of the East. This plant belongs to family Labiatea and characterized by square stem and specific aroma. Tulsi use in ayurvedic medicine and its extracts are used in ayurvedic remedies for common colds, headaches, stomach disorders, soreness, heart sickness, a range of poisoning, and malaria.

KEYWORDS: Ocimum sanctum, Tulsi, pharmacological properties, scientific reports.

1) INTRODUCTION

Tulsi is a sanctified plant of Hindu religion worshipped all over the India. Tulsi means ‘incomparable one’ or ‘matchless one’ and is derived from Sanskrit.[1] Ocimum sanctum (Family Labiatae) is a plant with branched, erect, stout and aromatic herb about 75 cm high. This little herb is found throughout India and is cultivated, worshiped in temples and houses of Hindus. This is commonly known as Vishnu-Priya, Tulsi in Sanskrit, and Kala Tulsi in

Hindi and India's Holy Basil in English.[2] The leaves, seeds and root of this plant have been used in original ayurvedic medicine. This plant is traditionally known for its medicinal properties.[2] Tulsi has two types of verities – Black (Krishna Tulsi) and Green (Ram Tulsi). They have similar chemical and medicinal properties. Genus Ocimum has no of species like Ocimum sanctum L (Tulsi), O. gratissimum (Ram Tulsi), O. canum (Dulal Tulsi), O. bascilicum (Ban Tulsi), O. americanum, O. camphora and O. micranthum. They are cultivated in different parts of the world and are widely known for their medicinal properties.[3] Tulsi is also described as: Vanya (wild) and Gramya (Grown in hones).[4] Plant is useful in the treatment of cold, cough, malaria, dengue, bronchitis, asthma, sore throat, influenza, heart disorders, eye diseases, mouth infections, insect bites, stress, and kidney stones etc.[5]

Table 1: Synonyms of Tulsi in Indian Lanuages.

SR. NO.	NAME	LANGUAGE	STATE
1	Tulsi, kalotulsi, Kural	Bengali	Bengali
2	Sabje, talasi	Gujarat	Gujarat
3	Pachcha, Kunnakam	Malayalam	Kerala
4	Mayangton, Naoshek lei	Manipuri	North eastern India
5	Sabja, Tulasa	Marathi	Maharashtra
6	Tulsi	Punjabi	Punjab
7	Tiruttizhai, Tiviragandam	Tamil	Tamil nadu
8	Oddhi, Rudrajada	Teligu	Andhra Pradesh
9	Karitulasai, Tulasiya	Kannada	Karnataka

Table 2: Chemical Constituent of Tulsi.

Sr no	Type of chemical constituent	Chemical constituent	Part of the plant
1	Fixed oil[7]	Linoleic acid, Linolenic acid, Oleic acid, Palmitric acid, Stearic acid.	Seeds
2	Essential oil[16,17,18]	Aromadendrene oxide, Benzaldehyde, Borneol, Bornyl acetate, Camphor, Caryophyllene oxide, cis-α-Terpineol, Cubenol, Cardinene, D-Limonene, Eicosane, Eucalyptol, Eugenol, Farnesene, Farnesol, Furaldehyde, Germacrene, Heptanol, Humulene, Limonene, n-butylbenzoate, Ocimene, Oleic acid, Sabinene, Selinene, Phytol, Veridifloro, α-Camphene, αMyrcene, α-Pinene, β-Pinene, α-Thujene, β-Guaiene, β-Gurjunene, methyl chavicol and linalool.	Leaves
3	Mineral Contents[19]	Vitamin C (ascorbic acid), Vitamin A(retinol), Calcium, Phosphours, Chromium, Copper, Zink, Iron.	Whole Plant
4	Alcoholic Extract[20]	Aesculectin, Aesculin, Apgenin, Caffeic acid, Chlorgenic Acid, Circineol, Gallic Acid, Galuteolin, Isorientin, Isovitexin, Luteolin, Molludistin, Orientin, Procatechuic acid, Stigmsterol, Urosolic acid, Vallinin, Viceni, Vitexin, Vllinin acid.	Leaves / Areal Parts

2) MORPHOLOGY

It is erect, branched fragmented shrub with the height of about 30- 60cm when mature. Its leaves are simple, aromatic, branched, opposite, obtuse, elliptical and have dentate margins. They are up to 5cm long. Flowers are elongate raceme in close whorls and purple in colour. Seeds are radish yellow and fruits are small4. It is planted after rainy season and harvested after few months.[5]

Taxonomy

Kingdom : Plantae

Division : Magnoliophyta

Class : Magnoliopsida

Order : Lamiales

Family : Labiatae

Genus:Ocimum

Species: Sanctum

Figure 1: Tulsi Herb.

3) CULTIVATION

Tulsi grows in tropical and warm regions. Plant is originated in India and is distributed and cultivated throughout the country. It is cultivated up to 1800 m above the sea level.[4] In India plant is grown from Himalayas to Andaman and Nicobar islands. It is widely grown in some areas of Asia and Africa.[1] It grows naturally in moist soil. Size form and medicinal features of the plant depend upon the type of the soil and variations in the rainfall. There are almost 150 species of Ocimum genus in the tropical regions of Asia.[6]

Holy basil grows to between 30-130 cm tall, with opposite, light green, silky leaves 3-11 cm long and 1-6 cm broad. The flowers are very small, white in color and are arranged in a terminal spike. Uncommon among Laminacaea, the four stamens and the pistil are not pushed under the upper lip of corolla, but lie over the inferior lip. After entomophilous pollinatioin, the corolla falls down and 4round achenes develop inside the bilabiate calyx. Holy basil asil is very sensitive to cold, with best growth in hot, dry conditions. Holy basil will grow best outdoors, it can be grown indoor in a pot and, like most herbs, will do best on an equator-facing windowsill. It should be place away from extremely cold drafts, and grows best in strong sunlight; therefore a greenhouse or row cover is ideal if available. They can, however, be grown even in a basement, under fluorescent lights.[7,8]

3.1. CULTIVATION METHODS

Soil condition

Sacred basil thrives on a wide range of soils. Rich loam, poor laterite, saline and alkaline to moderately acidic soils are also well suited for its cultivation process. Well drained soil helps in better vegetative growth. H_2O logged conditions can cause root-rot and results in stunted growth.

1) Climate: It flourishes well under fairly high rainfall and humid conditions. Long days and high humidity tempreture have been found favorable for plant growth and oil production. It can grow up to an altitude of 900 m. The plant is moderately tolerant to drought and frost. The plant can be grown under partially shaded conditions but with low oil contents.[8]
2) Propagation: Tulsi is propagated through seeds. Seeds will undergoes over generations, due to its high cross-pollination. Hence, for fresh plantings, the growers have to take fresh seeds from the pedigree stock.[9]
3) Planting time: The nursery can be raised in the third week of February and transplanting is generally done in the middle of April.[8]
4) Harvesting: The crop is to be harvested at full bloom stage to obtain maximum essential oil yield and better quality oil. The initial harvest is obtained at 90-95 days of planting. Thereafter, it may be harvested at every 65-75 days interval. Harvesting should be done on bright sunny days for high and good quality oil. There is no need to harvest the crop if there was a rain in the previous day. The crop should be cut at 15-20 cm above the ground level.[10]

5) Processing: The harvested produce may be allowed to wilt in the field itself for 4-5 hours so as to reduce the moisture and also the bulkiness. However, oil quality and its yield will not diminish or minimize up to 6-8 hours after harvest, but further delay may cause considerable loss in yield and quality of oil. Steam distillation is found to be superior to hydro distillation and hydro cum steam distillation.[11]
6) Distillation unit should be clean, rust free and free of any other odour. The oil obtained is then decanted and filtered. The distilled oil is treated with anhydrous sodium sulphate at the rate of 20 g per litre to remove the moisture. The oil should be stored in sealed amber coloured glass or container, containers made of stainless steel, galvanised tanks, aluminium containers and stored in a cool and dry place. All processing activities should be recorded.[12]
7) Expected yield: About 8 to 10 tons of fresh herbage per acre can be obtained by two to three harvests in a year.[13] The yield of oil present in basil varies with type, season and place of origin. Oil recovery ranging from 0.3 – 0.4%. Expenses is around Rs.6,000/acre. Present market rate ranging from Rs.600 to Rs.800.[14]

4) BIO-POTENTIAL OF TULSI

4.1. Analgesic Activity

Analgesic activity of fixed oil from the seeds of *OS* in mice using the tail flick, tail clip, tail immersion and acetic acid-induced writhing methods. It was found to be effective against acetic acid induced writhing in dose dependent manner suggesting that writhing inhibiting activity of the oil is peripherally mediated due to combined inhibitory effects of prostaglandins, histamine and acetylcholine.

4.2. Antiasthmatic Activity

50% aqueous ethanol extract of dried and fresh leaves and the volatile and fixed oils of OS was evaluated against histamine and acetylcholine induced pre-convulsive dysponea (PCD) in guinea pigs.[21]

4.3. Antibacterial Activity

Antibacterial activity of the aqueous, alcoholic, chloroform extract and oil obtained from leaves of *Holy basil* were studied against *E.coli, P.aeruginosa, S. typhimurium* and *S.aureus*. Extract obtained from OS were observed equally effective against pathogenic gram-positive and gram- negative bacteria.[22]

4.4. Anticancer Activity

Antimelanoma activity of different species of Ocimum was studied by Monga et al. in 2011. Leaf extract administered orally (200mg/kg, p.o.) resulted in significant reduction in tumor volume, increase in average body weight and survival rate of mice.[23]

4.5. Anticataleptic Activity

Aswar et al in 2010 studied the anticataleptic activity of the aqueous extract (300 mg/kg, i.p) and the alcoholic extract (300 mg/kg, i.p) of the leaves of *Ocimum sanctum* and observed a significant ($P < 0.001$) reduction in cataleptic scores.[24]

4.6. Anticonvulsant Activity

Different extracts of stem, leaf and stem callus of holy *basil* were tested for antiepileptic or anticonvulsive activity against standard drug phenytoin using maximal electroshock (MES) model. Ethanol and chloroform extracts of stem, leaf and stem calli were useful in preventing tonic convulsions induced by transcorneal electroshock.[25]

4.7. Antiemetic Activity

Tulsi leaves also check vomiting and used for antiemetic action.[26]

4.8. Anti-helminthic Activity

The essential oil of *Ocimum sanctum* and eugenol, tested in-vitro, showed potent anthelmintic activity in the Caenorhabditis elegans model.[27]

4.9. Antihyperlipidemic and Cardioprotective Activity

Antihyperlipidemic and cardioprotective activity of *Ocimum sanctum* fixed oil in rats fed with a high fat (HF) diet and concluded that treatment with *Ocimum sanctum* fixed oil decreased the high serum lipid profile and cardioprotective actions against hyperlipidemia. The essential fatty acids like Linolenic acid and linoleic acid contained in *Ocimum sanctum* fixed oil were possibly responsible for both lipid-lowering and cardiac protective action against hyperlipidemia.[28]

4.10 Antihypertensive Activity

The holy basil fixed oil administered intravenously produced hypotensive effect in anaesthetized dog which seems to be due to its peripheral vasodilatory action. Essential fatty acids like linoleic and linolenic acid contained in the OS oil produce series 1 and 3 (PGE1 and PGE3) prostaglandins and prostaglandins (PGE2).[29]

4.11. Antistress Activity

Fresh leaves of *Ocimum sanctum* were evaluated for antistress activity.[30]

4.12. Antianxiety and Antidepressant Activity

Chatterjee et al in 2011 studied the effect of ethanolic extract of leaves of *Ocimum sanctum* in Swiss albino mice against both anxiety and depressive disorder. Depression was studied by using tail suspension test and forced swim test. Anxiety studies included light dark test, elevated plus maze test and hole board test.[31]

4.13. Demulcent/Stimulant/Expectorant

Traditionally, juice of the leaves of OS plant was used as demulcent, stimulant and expectorant. An infusion of leaf had been used as anti-spasmodic in gastric disorders of children2.

4.14. Eye Disease

The leaf juice of *holy basil* along with triphala is used in ayurvedic eye drop preparations recommended for glaucoma, chronic conjunctivitis and other eye related disease. In daily routine one may use about three drops of tulsi oil along with honey and it is supposed to improve eye sight.[32]

4.15. Hepatoprotective Activity

Hepatoprotective activity of *Ocimum sanctum* alcoholic extract of leaf against paracetamol-induced liver damage in albino rats synergism with silymarin and concluded that *Ocimum sanctum* alcoholic leaf extract showed significant hepatoprotective activity and synergism with silymarin.[33]

4.16. Immunomodulatory Activity

The aqueous extract of *Ocimum sanctum* at the oral doses of 100, 200 mg/kg/day in rats enhances the production of RBC, WBC, haemoglobin and also enhanced the production of antibodies without affecting the biochemical parameters.[34]

4.17. Neuroprotective Activity

Ocimum sanctum shows ameliorative potential in attenuating vincristine induced peripheral neuropathic pain in rats which may be attributed to decrease in oxidative stress and calcium levels.[35]

4.18. Radio-protective Activity

The study indicated possible radioprotective effect of OS and amifostine against high-dose (131) I exposure24. Flavonoids extracted from the leaves of OS were studied as a radio-protector on the erythrocyte antioxidants in oral cancer. Results of the study suggest that erythrocytes from cancer patients responded to oxidative stress by elevating glutathione level while a decrease in glutathione levels observed in OS flavonoids treated patients could be due to the free radical scavenging effect of OS flavonoids, sparing the glutathione. However, OS flavonoids did not seem to exert its effect on other antioxidants of erythrocytes.[36]

Table 3: Medicinal Properties of Tulsi.

SR.NO.	PHARMACOLOGICAL ACTIVITY	PLANT PARTS	EXTRACTS
1	Analgesic Activity	Leaves/Seeds Aqueous	Suspension/Fixed
2	Antiasthmatic Activity	Leaves	Hydrochloric Extract
3	Antibacterial Activity	Leaves	Alcoholic Extract
4	Anticataleptic Activity	Leaves	Alcoholic Extract
5	Anticonvulsant Activity	Stem/Leaves	Alcoholic/Chloroform extract
6	Anti-helminthic Activity	Leaves	Essential oil
7	Antihyperlipidemic Activity	Seeds/leaves	Fixed oil, Essential oil
8	Antihypertensive Activity	Seeds	Fixed oil
9	Anticancer Activity	Leaves	Alcoholic extract
10	Neuroprotective Activity	Leaves	Alcoholic Extract

5) CONCLUSION

Plants have been used for the treatment of diseases throughout the world since the beginning of civilization. Tulsi is cultivated for religious and medicinal purposes. It is widely known across South Asia as a medicinal plant and an herbal tea. Several medicinal properties have been attributed to the plant not only in Ayurveda and Siddha but also in Greek, Roman and Unani. The vast survey of literature showed that *Ocimum sanctum* has a broad spectrum of pharmacological activities. It has an esteemed status in herbs with diverse biological potentials and has a great scope for further newarea of investigations. Traditionally crude extracts of various parts of plant have been used for their analgesic, antiasthmatic, antistress, antihyperlipidemic and antibacterial properties. Future research on sacred basil should be emphasized for control of various diseases especially it should be explore as a significant remedy regarding neuropsychological disorders for the welfare and service of mankind. Tulsi

is known as Queen of herbs due to its matchless properties. In Ayurveda, it is used as home remedy for treating various diseases. It is investigated that various parts of this plant is used for its anti-inflammatory, ant-fertility, anti-bacterial, hepatoprotective and other therapeutic properties. "Tulsi" can be measured as a powerful herb which is used by the humans from very old times. Several medicinal properties have been attributed to the plant not only in Ayurveda and Siddha but also in Greek, Roman and Unani. The vast survey of literature showed that Ocimum sanctum has a huge spectrum of pharmacological activities. It has an esteemed status in herbs with diverse biological potentials and has a great scope for further new area of investigations. Traditionally crude extracts of various parts of plants have been used for their anti-diabetic, antioxidant, anti-stress, anti-hypolipidimic and antibacterial properties.

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