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A TREATISE ON *OCIMUM SANCTUM*

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Abstract:
Ocimum sanctum is generally known as tulsi. It is widely branched and erect, stout and aromatic herb, which grows about a height of 75 cm. This herb is found mostly throughout India and is cultivated in Hindu houses and temples. The various parts of the plant like leaves, seeds and root of this plant have been used in Ayurvedic medicine. The plant has been used in ailment of different disorders and it is having the various activities like antidiabetic, antimalarial, anti- stress, antioxidant, hepatoprotective, antibacterial, antiviral, antifungal, immunomodulating, antiinflammatory, antipyretic, antidiuretic, and hypolipidemic properties with a wide range of safety. In Ayurvedic medicine this plant is being used either alone or in combination with different drugs in various clinical conditions like anxiety, bronchitis, fever, chronic cough, snake and scorpion bites. The plant has many nutrients and other biological active compounds. The main active compounds that have been identified and extracted are ursolic acid and eugenol (an essential oil). The present objective of the work is to highlight the various chemical constituents and different pharmacological activities of the plant against various disorders.

Keywords: *Ocimum sanctum, Tulsi, Ayurveda, Rama tulsi, Krishna tulsi.*

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INTRODUCTION:

Ocimum sanctum is a many branched, erect, stout and aromatic herb that grows about 75 cm height. It belongs to family Lamiaceae. It has two varieties i.e. black (Krishna tulsi) and green (rama tulsi), having same chemical constituents [1]. Ocimum sanctum(OS) is also known as Queen of herbs, the legendary and "Incomparable One" [2]. Other names of OS are Holybasil or sacred basil in English, Tulsi in Hindi and Gujarathi, Tulasi in Sanskrit, Krishna tulsi in Marathi. The natural habitat of tulsi is different from sea level to an altitude of 200 m and is grown in moist soil throughout the globe [3]. Tulsi is a home remedy for various ailments like wound, lumbago, bronchitis, liver diseases, skin diseases opthalmia, gastric disorders, different forms of poisoning and psychosomatic stress disorders [4]. It also has aromatic, stomachic, demulscent, diuretic, expectorant, carminative, alexiteric, vermifuge and febrifuge properties [5].

PLANT PROFILE:

Tulsi is cultivated all over India. This is an erect, branched and grows up to height of 30-60 cm. The leaves are simple, aromatic, opposite arrangement with entire or sub serrate or dentate margins.

Inflorescence is raceme type there are more than 3 numbers of flowers and these flowers are small. The colours of the flowers are purple. The seeds are having reddish yellow in colour. The entire plant is bitter and acrid in taste [6].

Scientific classification:

Kingdom	: plantae
Order	: Lamiales
Family	: Lamiaceae
Genus	: *Ocimum*
Species	: *O.tenuiflorum*
Binomial name	: *Ocimum tenuiflorum* or *ocimum sanctum*(7)

Nutritional composition:

Protein	: 4.2 g,
Fat	: 0.5 g,
Carbohydrates	: 2.3 g,
Calcium	: 25 mg,
Phosphorus	: 287 mg,
Iron	: 15.1mg,
Edible portion	: 25 mg,

It also contains vitamins like A and C and minerals like calcium, zinc and iron and other phytonutrients [7].

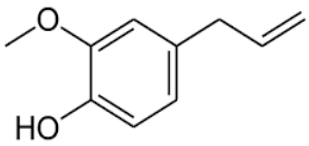
Krishna tulsi

Rama **tulsi**

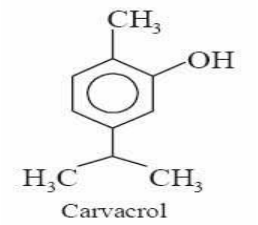
CHEMICAL CONSTITUENTS:

The leaves of *Ocimum sanctum* L. contain 0.7% volatile oil which consists of 71% eugenol and 20% methyl eugenol . The extraction of stem and leaves of *Ocimum sanctum* L. contains some phenolic compounds (which act as anti oxidants) such as circimaritin, isothymusin, apigenin , cirsilineol, and rosameric acid, and high quantities of eugenol [8]. OS also contains a number of sesquiterpenes and monoterpenes viz., bornyl acetate,-elemene, campesterol, cholesterol, neral, - and-pinenes, camphene, stigmasterol and -sitosterol [9].

Structure of some important chemical constituents of Ocimum sanctum Linn [10].



Eugenol



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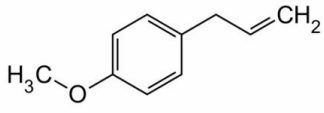
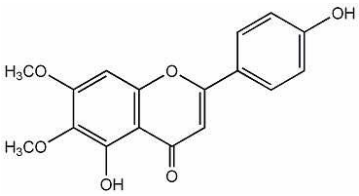
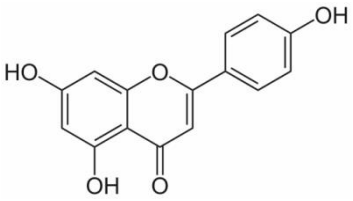


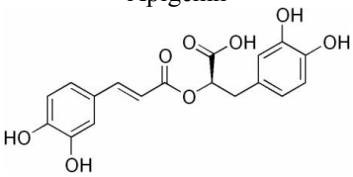
Estragol



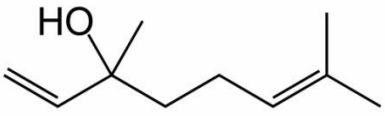
Cirsimaritin



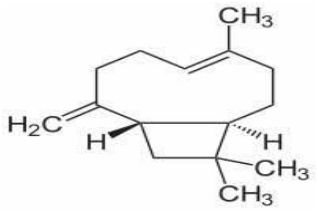
Apigenin



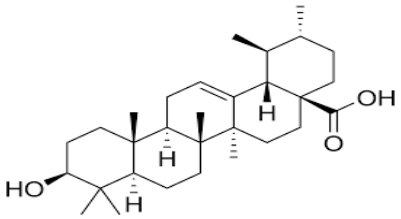
Rosmarinic acid



Linalool



Caryophylline



Ursolic acid

PHARMACOLOGICAL ACTIVITIES:

Antimicrobial activity: The Aqueous extract of *Ocimum sanctum* are resistant towards beta lactam antibiotics [11]. Aqueous extract of the plant showed growth inhibition of *Klesbiella, E. Coli and Staphylococcus aureus* [12]. Similarly, the plant was active against resistant *Neisseria gonorrhea* strains [13]. The fixed oil of the plant has good antibacterial activity against *Bacillus pumilus, Pseudomonas aeruginosa* and *S. aureus*. Higher content of linolenic acid in fixed oil also has antibacterial activity [14].

Analgesic Activity: The analgesic activity of fixed oil of *Ocimum sanctum* in mice and rats using the tail clip, tail immersion, tail flick, and acetic acid-induced writhing methods was performed. It was showed that the plant is 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 histamine, prostaglandins and acetylcholine [15].

Antiulcer Activity: The Aqueous extract of *Ocimum sanctum* (100mg /kg an 200 mg/kg orally) was exhibited protection against ethanol induced gastric ulceration in wistar rats. It also exhibits antiulcer activity by increasing antioxidant potential of gastric mucosa and reduce the damage of mucosa [16]. Administration of the fixed oil of the plant by i.p. shows significant antiulcer activity against aspirin, indomethacin, alcohol (ethanol 50%), histamine, reserpine, serotonin / stress-induced ulcers in rats. The fixed oil has antiulcer activity due to its lipoxygenase inhibitory, histamine antagonistic and antisecretory effects [17].

Neuroprotective Activity: *Ocimum sanctum* shows activity in attenuating vincristine induced peripheral neuropathic pain in rats. Administration of OS (100 and 200 mg/kg p.o.) and its saponin rich fraction (100 and 200 mg/kg p.o.) for 14 days for the animal, attenuated vincristine-induced neuropathic pain along with decrease in oxidative stress and calcium levels [18].

Anticancer activity: The anticancer activity of *Ocimum sanctum* has been proved by several investigators [19,20,21,22].The alcoholic extract of leaves of plant has a modulatory influence on carcinogen metabolizing enzymes such as cytochrome b5, aryl hydrocarbon hydroxylase, cytochrome P 450 and glutathione S-transferase (GST), which are important in detoxification of carcinogens and mutagens [23]. The anticancer activity of the plant has been reported against human fibro sarcoma cells culture, wherein alcoholic extract of this drug induced cytotoxicity at a dose of 50 g/ml and above. Morphologically, the cells showed shrunken cytoplasm and condensed nuclei. The DNA was found to be fragmented in agarose gel electrophoresis [24]. Leaf extract blocks or suppresses the events associated carcinogenesis by inhibiting metabolic activation of the carcinogen [25]. The anticancer activity was observed in Swiss albino mice bearing Ehrlich ascites carcinoma (EAC) and S 180 tumours [26].

Antiarthritic Activity: The fixed oil of *Ocimum sanctum* seeds was screened for antiarthritic activity using formaldehyde-induced arthritis, Freund's adjuvant arthritis and turpentine oil induced joint edema in rats. The fixed oil has anti-arthritic activity in both models and anti-edema activity against turpentine oil-induced joint Edema [27].

Radioprotective activity: The radioprotective effect was firstly reported in the year 1999 [28]. Two isolated flavonoids, viz., orientin and vicenin from the leaves showed better radioprotective effect as compared with synthetic radio protectors. They have shown protection to the human lymphocytes against the clastogenic effect of radiation at low, non toxic concentrations [29]. The combination of leaf extract with WR-2721 (a synthetic radioprotector) resulting in higher bone

marrow cell protection and reduction in the toxicity of WR-2721 at higher doses, suggested that the combination would have radioprotection in humans [30].

Anticoagulant activity: The fixed oil (3 ml/kg, ip) prolongs the blood clotting time and the response was comparable with aspirin (100 mg/kg). The effect appears to be due to the antiaggregation action of oil on platelets [31].

Antifertility activity: Benzene extract of fresh leaves in male rats showed decreased sperm motility, total sperm count and weight of testis [32]. The long term feeding (up to 3 months) of leaves (200 and 400 mg/kg) to adult male and female albino rats along with normal diet decreased sperm count, sperm motility and weight of male reproductive organs [33].

Hepatoprotective activity: Oral administration of hydroethanolic extract of leaves at a dose of 200 mg/kg in male wistar albino rats shows protection against liver injury induced by paracetamol [34]. The cold water extract (3g/100 g, orally for 6 days) was found to be effective against carbon tetrachloride (0.2 ml/100 g, subcutaneously) induced liver damage in albino rats [35].

Antidiabetic activity: Oral administration of extract led to marked lowering of blood sugar levels in glucose fed hyperglycemic and streptozotocin-induced diabetic rats [36]. A randomized, cross over single blind human trial and placebo-controlled indicated a significant decrease in fasting and postprandial blood glucose levels by 17.6% and 7.3%, respectively. Urine glucose levels showed a similar decrease levels. Further, plant has aldose reductase activity, which may help in reducing the complications of diabetes such as cataract and retinopathy etc [37].

Antioxidant activity: The antioxidant properties of flavonoids and their relation to membrane protection have also been observed [37]. Antioxidant activity of the flavonoids (orientin and vicenin) was observed in the radiation induced lipid peroxidation in mouse liver [38]. The plant extract has significant ability to scavenge highly reactive free radicals [38]. The phenolic compounds namely isothymusin, apigenin, cirsilineol, cirsimaritin and rosmarinic acid, and appreciable quantities of eugenol (a major component of the volatile oil) from plant extract of fresh leaves and stems possessed good antioxidant activity.

Antihypertensive and cardioprotective activities: The transient cerebral ischemia and long term cerebral hypoperfusion have been prevented by the tulsi [38]. The fixed oil administered intravenously produced hypotensive effect in dog, which seems to be due to its peripheral vasodilatory action. Essential fatty acids like linoleic and linolenic acids produce series 1 and 3 (PGE1 and PGE3) prostglandins and inhibit the formation of series 2 prostglandins (PGE2) [39]. The long term feeding of plant offers significant protection against isoproterenol-induced myocardial necrosis in wistar rats through enhancement of endogenous antioxidant [40].

TOXICITY: The median lethal dose (LD50) of fixed oil was determined after i.p. administration in mice. There was found no untoward effect on subacute toxicity study of the plant fixed oil [41].

DISCUSSION AND CONCLUSION:

Aromatic plants and different fragrant flowers are some of nature's most beautiful creations. For global benefit, medicinal plants, especially the aromatic species are the key in solving different interrelated global issues. Phytochemicals are being used from ancient time. There are many plants which are used as herbal medicine in Ayurveda. Considering medicinal value of *Ocimum sanctum Linn* present studies have been taken. Tulsi is cultivated for religious and medicinal purposes in India. It is widely known across south Asia as a medicinal plant and as a herbal tea. The vast survey of literature showed that *Ocimum sanctum* has a large spectrum of pharmacological activities. Traditionally extracts of various parts of plants have been used for their antidiabetic, antioxidant, antistress, antihyperlipidemic and antibacterial properties. Future research on sacred basil should be emphasized for ailment and control of various diseases especially it should be explore as a significant remedy in neuropsychological disorders for the welfare & service of mankind.

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