HOLY BASIL: A NATURAL HEALER FOR HUMAN SUFFERING

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ABSTRACT
Therapies involving plants have existed for thousands of years and some may be as old as human civilization itself. One such medicinal plant is “Tulsi” which is regarded as the “Queen of Herbs” because of its varied medicinal properties and mythological value too. Several pharmacological studies have established a scientific basis for therapeutic uses of this plant. This article helps us in improving our knowledge on the pharmacological profile and therapeutic potential of ‘Tulsi’ and thus pave the path for future studies in its application in the fields of general medicine and dentistry.

KEYWORDS: Tulsi, Holy Basil, Phyto-constituents, Antioxidant, Medicinal plant.

INTRODUCTION
Plants are the primary and one of the most important sources of medicines. Today the large numbers of drugs in use are derived from plants. The medicinal plants are rich in secondary metabolites and essential oils of therapeutic importance. The important advantages claimed for therapeutic uses of medicinal plants in various ailments are their safety besides being economical, effective and their easy availability. Because of these advantages the medicinal plants have been widely used by the traditional medical practitioners in their day to day practice.[1]
The use of plants as a source of medicinal value is a very old concept. Chinese were the first to use plants as therapeutics before 4000-5000 B.C. In India use of plants as a medicine appeared in Rigveda which was written around 3500 - 1600 B.C. Later the properties and therapeutic uses of medicinal plants were studied in detail and recorded empirically by the ancient physicians in Ayurveda (an indigenous system of medicine) which is a basic foundation of ancient medical science in India.[2]

According to a survey of World Health Organization, the practitioners of traditional system of medicine treat about 80% of patients in India, 85% in Burma and 90% in Bangladesh.[3,4]

Tulsi has been used for thousands of years in Ayurveda for its diverse healing properties. It is mentioned in the Charaka Samhita an ancient Ayurvedic medicinal herb. In the indian subcontinent Tulsi is considered as the most sacred plant and is often referred as the “Holy Basil”. [5]

"Tulsi" in Sanskrit means "one that is incomparable“[6] and hence is considered the queen of herbs. Tulsi the mother plant of medicine is recognized thousands years ago by ancient Rishis to be India’s greatest healing herb. The Rishis of India saw tulsi is so good for health and healing that it is declared as a god in itself. Tulsi is most respectable and honored herb due to its importance in healing, religion, spirituality and culture. The other popular name of it is “Sulbha” as it is easily obtainable.[7] OS has been revered in India over five thousand years, as a healing balm for body, mind and spirit and is known to bestow an amazing number of health benefits. Three varieties of Tulsi are the Rama or Light Tulsi (Ocimum Sanctum), Shyama or Dark Tulsi (Ocimum Sanctum), Vana Tulsi (Ocimum Gratissimum).[8]

This article enlightens us with the knowledge on the therapeutic uses of Tulsi in the field of medicine and dentistry.

DISCUSSION

Phyto-constituents

The leaf of tulsi contains 0.7% volatile oil comprising about 71% eugenol and 20% methyl eugenol. The oil also contains carvacrol and sesquiterpine hydrocarbon caryophyllene.[9] Fresh leaves and stem of tulsi extract yielded some phenolic compounds (antioxidants) such as cirsilineol, circimaritin, isothymusin, apigenin and rosameric acid and appreciable quantities of eugenol.[10] Two flavonoids, viz., orientin and vicenin from aqueous leaf extract
of OS have been isolated. Ursolic acid, apigenin, luteolin, apigenin-7-O-glucuronide, luteolin-7-O glucuronide, orientin and molludistin have also been isolated from the leaf extract.[11] Tulsi also contains a number of sesquiterpenes and monoterpenes viz., bornyl acetate, α-elemene, neral, α-and β-pinenes, camphene, campesterol, cholesterol, stigmasterol and β-sitosterol.[12]

**Medicinal properties**

**Antioxidant activity**-O.Sanctum extract has significant ability to scavenge highly reactive free radicals. The phenolic compounds, viz., cirsilineol, cirsimaritin, isothymusin, apigenin and rosmarinic acid, and appreciable quantities of eugenol (a major component of the volatile oil) from OS extract of fresh leaves and stems possessed good antioxidant activity.[11]

**Chemopreventive and Radioprotective activity**

Oral treatment with the leaf extract significantly elevated the activities of cytochrome p-450, cytochrome b5, aryl hydrocarbon hydroxylase and glutathione S-transferase in the liver, all of which are important in the detoxification of carcinogens as well as mutagens.[13] Karthikeyan et al suggested that the orally administered extract of O. sanctum may have the ability to prevent the early events of 7,12-dimethylbenz (a) anthracene (DMBA) induced carcinogenesis.[14]

Prashar et al suggested that its leaf extract blocks or suppresses the events associated with chemical carcinogenesis by inhibiting metabolic activation of the carcinogen.[15] Prakash and Gupta concluded that the potential chemopreventive activity of seed oil is partly attributable to its antioxidant properties.[16]

Orientin (Ot) and Vicenin (Vc), two water-soluble flavonoids isolated from the leaves of O. sanctum have shown significant protection against radiation lethality and chromosomal aberrations in vivo. Both the compounds showed significant protection to the human lymphocytes against the clastogenic effect of radiation at low, non-toxic concentrations. The radioprotection seems to be associated with their antioxidant activity.[17,18]

**Antidiabetic activity**

The leaves of tulsi plant contain various essential oils within them. it is therefore very useful in improving pancreatic beta cells function and thus enhancing the insulin secretion to keep a check over the blood sugar within the patients suffering by diabetes.[19]
Oral administration of OS extract led to marked lowering of blood sugar in normal, glucose-fed hyperglycemic and streptozotocin-induced diabetic rats. A randomized, placebo-controlled, cross-over single blind human trial indicated a significant decrease in fasting and postprandial blood glucose levels by 17.6% and 7.3%, respectively. Urine glucose levels showed a similar trend. Further, OS has aldose reductase activity, which may help in reducing the complications of diabetes such as cataract, retinopathy, etc.

Sarkar et al demonstrated that administration of fresh leaves of Tulsi mixed in diet resulted in significant lowering in serum total cholesterol, triglyceride, phospholipid and LDL-cholesterol levels, and significant increase in the HDL-cholesterol and total faecal sterol contents.

**Antiulcer activity**

Holy basil is reported to possess potent anti-ulcerogenic as well as ulcer-healing properties and it is due to its ability to reduce acid secretion and increase mucous secretion. The fixed oil of Tulsi was found to possess significant anti-ulcer activity against Aspirin-, Indomethacin-, alcohol-, histamine-, reserpine-, erotonin- and stress-induced ulceration in experimental animal models. Significant inhibition was also observed in gastric secretion and Aspirin-induced gastric ulceration in pylorus ligated rats. The lipoxygenase inhibitory, histamine antagonistic and antisecretory effects of the oil could probably have contributed towards anti-ulcer activity.

**Antitumor effect**

The seed oil of Ocimum sanctum was evaluated for chemo-preventive activity against subcutaneously injected 20–methylcholanthrene induced fibrosarcoma tumors in the thigh region of Swiss albino mice. Supplementation of maximal tolerated dose (100 ml/kg body weight) of the oil significantly reduced 20-methylcholanthrene induced tumor incidence and tumor volume. The results of this study suggest that the potential chemopreventive activity of the oil is partly attributable to its antioxidant properties. The chemo-preventive efficacy of 100 ml/kg seed oil was comparable to that of 80 mg/kg of vitamin E.

**Gastrointestinal disorders**

Aqueous decoction of Tulsi leaves is given to patients suffering from gastric and hepatic disorders. Herbal preparations containing Ocimum sanctum L. have been suggested to shorten the course of illness, clinical symptoms and biochemical parameters in patients suffering from viral hepatitis. Effective in increasing the peristaltic movements of GI tract.
is helpful in improving appetite. Also have some mild laxative properties therefore helps in evacuation of the bowel and maintenance of a healthy bowel. The juice of fresh leaves is also given to patients to treat chronic fever, dysentery, hemorrhage and dyspepsia.\[27,28\] Tulsi leaves also check vomiting and has been as anthelmintic Gastric ulceration and secretion are reported to be inhibited by Tulsi in albino rats.\[29,30\]

**Antiarthritic activity**
The antiarthritic activity of OS fixed oil was evaluated against formaldehyde-induced arthritis in rats. The fixed oil significantly reduced the diameter of inflamed paw. On intraperitoneal administration of the fixed oil daily for 10 days, there was marked improvement in the arthritic conditions in rats. The anti-arthritis effect at 3 ml/kg dose was comparable to aspirin @ 100 mg/kg, ip.\[41\] The fixed oil inhibited carrageenan and inflammatory mediators e.g. serotonin, histamine, bradykinin and PGE2) induced inflammation. It is natural that the oil could inhibit any inflammatory response involving these mediators. The result suggests potentially useful antiarthritic activity of the inflammation models, including adjuvant as well as turpentine oil-induced joint oedema in rats.\[31\]

**Eye (Ocular) Disorders**
The leaf juice of Ocimum sanctum L. along with Triphala is used in Ayurvedic eye drop preparations recommended for glaucoma, cataract, chronic conjunctivitis and other painful eye diseases.\[27,28\]

The AqE of fresh leaves of OS delayed the process of cataractogenesis in experimental models of cataract (galactosemic cataract in rats by 30% galactose and naphthalene cataract in rabbits by 1 g/kg naphthalene). OS 1 and 2 g/kg delayed the onset as well as subsequent maturation of cataract significantly in both the models.\[32\]

**Anticoagulant activity**
The OS fixed oil (3 ml/kg, ip) prolonged blood clotting time and the response was comparable to that obtained with aspirin (100 mg/kg). The effect appears to be due to the anti-aggregatory action of oil on platelets.\[33\]

**Anti-thyroid activity**
The effects of Ocimum sanctum leaf extract on the changes in the concentrations of serum T3, T4 were investigated in the male mouse. Ocimum sanctum leaf exhibited anti-thyroidic and anti-oxidative properties.\[34\]
Antifertility effect
The leaves of Ocimum sanctum L. are said to have abortifacient effect in women. Ocimum sanctum L. has also got antifertility effect. Ursolic acid, one of the major constituents of the Tulsi leaves has been suggested to possess antifertility effect in rats of both sexes and in male mice. Ursolic acid because of its anti-estrogenic effect reduces spermatogenesis and causes a decrease in sperm counts.\textsuperscript{[35,36]}

Cardiovascular Disorders
It has beneficial effect in cardiac diseases and the weakness resulting from the various cardiac disorders. It even reduces the level of blood cholesterol. Eugenol (extracted from Tulsi leaves) has been well shown to possess the vaso-relaxing action on rabbit arterial tissue indicating its therapeutic importance as a vasodilator.\textsuperscript{[37,38]}

Respiratory Disorders
Tulsi is very effective in treating the common cold. A decoction of the leaves, with honey and ginger is an effective remedy for bronchitis, bronchial asthma, influenza, cough and cold. For the immediate relief in cases of Influenza the decoction of the leaves, cloves and common salt also gives immediate relief within the case of influenza. Tulsi is important constituent of many Ayurvedic cough syrups and expectorants. It helps to mobilize mucus in bronchitis and asthma thus is very beneficial for maintenance of a very healthy respiratory passage. Chewing Tulsi leaves relieves cold and flu. Water boiled with Tulsi leaves is taken as to drink in case of sore throat. This water can also be used for the purpose of gargles.\textsuperscript{[29,39]}

Renal Disorders
Tulsi has strengthening effects on the kidney. In cases of renal stone the juice of Tulsi leaves and honey, if taken regularly for 6 months it will expel them through the urinary tract. Leaves and seeds of Tulsi plants have been reported to reduce blood and urinary uric acid level in albino rabbits and possess diuretic property. The fresh leaves and flower tops of Ocimum sanctum L. have been used as antispasmodic agent (as smooth muscle relaxant). The seeds are mucilaginous and demulcent and are given in disorders of the genitourinary system.\textsuperscript{[27,29]}

Dermatological Disorders
Applied locally, Tulsi juice is beneficial in treatment of ringworm and other skin diseases. It is also very beneficial in skin disorders such as leucoderma.\textsuperscript{[29]}
Psychological Disorders

Tulsi leaves are regarded as an “adaptogen” or antistress. Recent studies have shown that leaves provide its user with significant protection against stress. Even healthy persons can chew 12 leaves of Tulsi, twice a day to prevent stress. It even purifies the blood and helps prevent several common psychological disorders.\[^{40}\]

Inflammatory Disorders

Tulsi inhibits inflammation causing enzymes in our bodies which contribute to pain and other signs of inflammation. The anti-inflammatory effects of Tulsi are comparable to ibuprofen, naproxen and aspirin. Tulsi even enhances the adrenal function by lowering cortisol levels. This results in reducing the negative effects of stress. Tulsi is very effective in suppressing any kind of edema that happening in the body. It improves blood circulation in the body therefore helpful in dealing with any kind of swellings in the body.\[^{32}\]

Linolenic acid present in O. sanctum fixed oil has the capacity to block both the cyclooxygenase and lipoxygenase pathways of arachidonate metabolism and could be responsible for the anti-inflammatory activity of the oil.\[^{41}\]

Antimicrobial activity

The narrowest spectrum of antibacterial activity was observed in O. sanctum. The crude aqueous extract of leaf possesses some antibacterial and immunomodulatory active principles. Neisseria gonorrhoeae clinical isolates and WHO strains were found to be sensitive to extracts .Aqueous extract of the plant showed growth inhibition for Klebsiella, Escherichia coli, Proteus and Staphylococcus aureus. Alcoholic extract showed growth inhibition for Vibrio cholerae. The elanolic extracts from the leaves showed better activity against the β-lactamase producing methicillin-resistant Staphylococcus aureus strains. The essential oil also showed potent anthelmintic activity in the Caenorhabditis elegans Model.\[^{42}\]

Oro-dental uses

Anticariogenic properties

Strep. mutans is a micro organism which has been well documented in literature as the main causative agent for dental caries. In an in – vitro study the various concentration of the tulsi extract have been assessed against the Strep. mutans and concluded that the composition of tusli extract 4% has a maximum antimicrobial potential.\[^{43}\]
Toothache

Tulsi leaves contain 0.7% volatile oil comprising about 71% eugenol and 20% methyl eugenol. This eugenol helps Tulsi in acting as a COX-2 inhibitor and thus helps in relieving toothache.[44]

Sesquiterpene b-caryophyllene (an FDA approved food additive) also serves the same purpose, which is naturally present in Tulsi.[41]

Oral infection

Tulsi leaves are quite effective in treating common oral infection. Few leaves chewed daily help in maintaining oral hygiene. The anti bacterial agents present in the plant is Carracrol and Tetrpene.[43]

Aphthous ulcerations

Tulsi at a dose of 100mg/kg was found to be anti ulcer agent in a study. It possess anti ulcerogentic as well as ulcer healing properties. The anti-ulcer effect of Tulsi is said to be due to its cyto-protective effect rather than its anti-secretory property.[24]

Nutrients

Tulsi contains Vit. A and C, calcium, zinc and iron. It also has small amount chlorophyll and many other phytonutrients. Deficiency of these nutrients has been associated with variety of oral diseases. Thus Tulsi can be of benefit in treatment of oral manifestations of nutritional deficiencies.[45]

Periodontal disease

The progression of the disease Periodontitis results in the destruction of the periodontium, i.e., the alveolar bone and periodontal ligaments is brought about by the influence of cytokines. Cytokines generally act as intra-cellular messenger molecules that evoke particular biological activities after binding to a receptor (e.g. IL1, IL6, IL8, IFNalfa, IFNbeta) on a responsive target cell.[46] The main biological activities include cellular and humoural responses, induction of inflammatory response, regulation of haematopoiesis and induction of wound healing.

Occimum sanctum extract reduces inflammation by inhibiting the release of pro inflammatory cytokines (like TNF & IL1) and mediators (Nitric oxide). Specific cytokines help initiate and regulate various inflammatory processes. Nitric oxide, a chemical involved
in various cell signaling reactions helps in inflammatory cascade. Thus blocking the action of these two substances means blocking communication of inflammatory processes.\cite{47}

Powder of dried tulsi leaves can be used for brushing the teeth. It can be mixed with mustard oil to make a paste and used as tooth paste. This can also be useful in treatment of halitosis and can also be massaged over the gingival to treat various gingival and periodontal diseases.\cite{43,44}

**Antifungal agent (Candidiasis)**
The antifungal activity of essential oil of tulsi and its two main components i.e. eugenol and linalool have been investigated against two species of Candida (C.albicans and C.tropicalis) which are the causative agents for oral candidiasis, and it was concluded that linalool is having more effective against Candida.\cite{48}

**Lichen planus**
Tulsi due to its immunomodulation property can be considered as for treating lichen planus.\cite{49}

**Precancerous lesions and conditions**
Polyphenol rosmarinic acid present in tulsi acts as powerful antioxidant. So this property can therapeutically utilized in treating common oral precancerous lesion and conditions like leukoplakia and oral submucous fibrosis.\cite{50,51}

**Pemphigus**
Tulsi is said to have immunomodulation property which helps in promoting the healing of blisters and sores, therefore this immunomodulating properties of Tulsi can be used in healing of mucosal condition like pemphigus.\cite{52}

**Oral cancer**
Oral treatment of fresh leaves paste of Tulsi may have the ability to prevent the early events of DMBA induced buccal pouch carcinogenesis.\cite{42}

**CONCLUSION**
In the developing countries, increased cost of medication and their side effects are of great concern to the doctors and general public. This has lead to opening new channels of pharmacological investigations focusing on medication derived from natural herbs and
thereby diverting human trends toward natural cure. One of such herb which serves as a
vitalizer for human beings is ‘Tusli’ or ‘Holy Basil’. Tulsi has been widely used for curing
various ailments due to its great therapeutic potentials.

It has prove beneficial in treating oral diseases/general medicine because of its antibacterial,
anti-inflammatory, ulcer healing, antioxidant, immune-modulatory properties. Therefore
future studies should be directed to explore and evaluate the therapeutic potential of this holy
plant in field of general and oral medicine.

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