ijlpr 2023; doi 10.22376/ijlpr.2023.13.5.P1-P5

International Journal of Life science and Pharma Research

ISSN 2250-0480

Review Article

Tulsi – Therapeutic Efficacy

Therapeutic Uses of Tulsi

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Abstract: The medicinal plant, generally referred to as "tulsi," belongs to the genus "*Ocimum sanctum*," It has been employed in Ayurveda and other traditional indigenous medical systems for ages. It has wide applications, not just restricted to medicine but also dental applications. The use of such plants has seen a boom in recent years, especially in India, although it has been overlooked for a long time. Its application is primarily in the field of oral medicine and is used to treat disorders like potentially malignant disorders. Many studies have shown that the qualities of tulsi, such as expectorant, analgesic, anticancer, antiasthmatic, antiemetic, diaphoretic, antidiabetic, antifertility, hepatoprotective, hypotensive, hypolipidemic, and antistress agent, can be used to treat a wide range of medical diseases. Tulsi and other such plants have fewer side effects and are a potent alternative to modern therapeutic modalities for treating such disorders. Although its potential has yet to be fully realized as more research is needed, there is no question about its effects as a therapeutic agent. This paper reviews the therapeutic potential of tulsi to treat oral diseases. According to the current research, Tulsi has various therapeutic uses that several studies have validated. However, its use in allopathic medicine is still constrained because there must be human clinical trials.

Keywords- Herbal, Tulsi, Therapeutic, Medicine, Dentistry, *Ocimum Sanctum*, Health

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Received On 13 January, 2023

Revised On 29 March, 2023

Accepted On 17 April, 2023

Published On 1 September, 2023

Funding This research did not receive any specific grant from any funding agencies in the public, commercial or not for profit sectors.

Citation Ashutosh Burungale and Dr. Ravikant Sune , Therapeutic Uses of Tulsi.(2023).Int. J. Life Sci. Pharma Res.13(5), P1-P5 http://dx.doi.org/10.22376/ijlpr.2023.13.5.P1-P5

1. INTRODUCTION

A growing number of oral disorders, including lichen planus, oral submucous fibrosis, leukoplakia, pemphigus vulgaris, aphthous ulcer, candidiasis, herpes virus, and oral infections, are being treated in dentistry using herbal medicines. Additionally, it helps to lessen oral discomfort and prevent dental cavities. Even in periodontics, it has a wide range of uses. Different periodontal bacteria cause periodontal tissues to be destroyed, resulting in an inflammatory illness known as periodontitis. Periodontitis can be actively treated with herbal therapy. Tulsi has been marketed as a mouth cleansing, topical, and mouth freshening agent for accelerating wound healing in the oral cavity and dental implants. Tulsi belongs to the kingdom Plantae. Tracheophytes and angiosperm are the clades for tulsi. The botanical order for tulsi is Myrtales, and it belongs to the family of Myrtaceae. A genus to which it belongs, Syzygium, S. aromaticum is the species for tulsi, the binomial name for tulsi is Syzygium aromaticum, and the other names for tulsi are caryophyllus aromaticus L., eugenia aromatic, baill. Eugenia.[1] "Holy Basil" is the term used in India. Evidence shows that *Ocimum sanctum* (tulsi) was used in Ayurveda as an aromatic herb. It is a member of the Labiatae family and is a familiar sight in Indian fields. It thrives in tropical and subtropical regions, including India[2]. Tulsi is known as the "queen of herbs" and means "the peerless one" in Sanskrit.[3] Pharmacological research has been done on the plant's antibacterial, immunomodulatory, anti-inflammatory, hypoglycemic, chemoprotective, and analgesic effects.[4]

2. PHYTOCHEMICAL CONSTITUENT OF TULSI

70% of the chemical components of *Ocimum sanctum* are eugenol, methyl eugenol, caryophyllene, phenolic compounds, camphene, stigmasterol, cardine, cubenol, borneol, linoleic acid, linolenic acid, oleic acid, palmitic acid, steric acid, vallinin, gallic acid, circineol, caryophyllene oxide, isorientin, minerals, and vitamins.

2.1 Pharmacology of parts of the plant

2.2 Leaves

The FDA has authorized tulsi leaves as a food additive because they act well against germs.[5] These can be useful in the management of widespread oral infections. Some of these include caryophyllene, tetpene, sesquiterpene, and carvacrol. Regularly chewing these leaves might help maintain good oral hygiene. 0.7% of the volatile oil in the *Ocimum sanctum* leaf comprises around 71% eugenol and 20% methyl eugenol. Tulsi is a potent COX-2 inhibitor since it contains a large amount of Eugenol (1-hydroxyl-2 methoxy-4 allyl benzene). Tulasi's anti-analgesic activity is used to manage mucosal and dental pain. The inhibition of the cyclooxygenase and lipoxygenase pathways of arachidonic acid metabolism causes this.[6] A toothpaste made from powdered Tulsi leaves, mustard oil can be used to clean teeth. The powdered Tulsi leaves were once used to treat halitosis and keep teeth healthy. Tulsi powder massages have been reported to be quite beneficial in treating numerous periodontal and gingival disorders.[5-6]

2.3 Seeds

Antibacterial activities of seeds were also studied and it was revealed that the crude, supernatant, residue, and dialyzed samples obtained from the seeds inhibited the growth of P. multocida, E. coli, B. subtilis, and S. aureus.[7]

2.4 Roots

Sitosterol and triterpenes A, B, and C are found in roots.

2.5 Oral Benefits of Tulsi

Toothache Since tulsi has a high concentration of eugenol (1-hydroxy-2-methoxy-4 allyl benzene), it inhibits COX-2 in a manner akin 3to that of contemporary analgesics. *Ocimum sanctum* leaves contain 0.7% volatile oil, which comprises around 71% eugenol and 20% methyl eugenol.[8] Oral diseases Common mouth infections can be effectively treated with tulsi leaves. Tulsi leaves aid in maintaining good dental hygiene when chewed. Carvacrol and terpene, two antibacterial substances, are found in this plant. The sesquiterpene b-caryophyllene also has a comparable effect. This naturally occurring component of Tulsi is an FDA-approved food ingredient.[9]

2.6 Anti-cariogenic

The causal bacteria that largely contributes to tooth decay is Streptococcus mutans. The antibacterial property of Tulsi extract at 4% was shown to be the highest in an in-vitro investigation that compared the various concentrations of Tulsi extract against streptococcus mutans.[9]

2.7 Candidiasis

Linalool was found to be more effective and promising than eugenol in a study that examined the antifungal activity of *Ocimum sanctum* essential oil and its two constituents, eugenol, and linalool, against two species of Candida (C. albicans and C. tropicalis), both of which are known to cause oral candidiasis.[10]

2.8 Lichen planus

Ocimum sanctum has the unique ability to affect skin and blood tissue while bringing about the required immunomodulation. It is regarded as one of the Ayurvedic therapy options for lichen planus.[10]

2.9 Leukoplakia and oral submucous fibrosis

Tulsi contains polyphenol rosmarinic acid, which is a potent antioxidant. Frequent oral precancerous lesions and diseases can be treated with the help of this antioxidant property.[11-12]

2.10 Pemphigus

Ayurvedic treatment aims to strengthen the immune system and hasten the healing of wounds and sores. Due to its immunomodulating qualities, *Ocimum sanctum* may help treat the immune-mediated mucosal disease pemphigus.[13]

2.11 Aphthous lesions

In research, *Ocimum sanctum* was discovered to be an efficient anti-ulcer agent *at a dosage of 100 mg/kg. Ocimum sanctum's* anti-ulcer effects could result from its cytoprotective effects rather than its antisecretory effects.[14]

2.12 Nutrient

Vitamins A and C, calcium, zinc, and iron are the nutrients found in tulsi. Chlorophyll and other phytonutrients are also present. A range of oral illnesses have been linked to nutritional deficiencies.[15]

2.13 Role of Tulsi in periodontal diseases

You may use tulsi leaves that have been sun-dried and ground up to wash your teeth.[16] It may also be made into a paste and used as toothpaste by combining it with mustard oil. Halitosis can also be successfully avoided with tulsi. In addition, it can be used to massage the gingiva in conditions like gingivitis and periodontitis because of its anti-inflammatory effects.

3. THERAPEUTIC USES OF TULSI IN DENTISTRY

The herb tulsi is called an "Elixir of Life." Tulsi has historically been used in thousands of formulations to treat conditions affecting the digestive, metabolic, reproductive, and neurological systems, as well as the mouth and throat, lungs, heart, blood, liver, and kidney. The many components of tulsi, such as its leaves, roots, blooms, and stems, all possess alluring therapeutic potential. As a hepatoprotective, analgesic, anticancer, antiasthmatic, antiemetic, diaphoretic, antidiabetic, antifertility, hypotensive, hypolipidemic, and antistress agent[17], tulsi has been utilized in traditional medicine. Tulsi is a highly promising plant in managing oral illnesses and dentistry since it is so helpful in treating various medical conditions. Common mouth infections can be effectively treated with tulsi leaves. Strong antibacterials such as carracrol, terpene, and sesquiterpene b caryophyllene are present in tulsi leaves. Tulasi leaves can be chewed to maintain good dental hygiene. The FDA has authorized the antibacterials found in tulsi leaves as a food additive.[18] The *Ocimum sanctum* can be utilized to treat pemphigus because of its immunomodulating properties. Blisters and sores are healed with tulsi. Further study is needed to evaluate the potential use of tulsi's immunomodulatory effect in immunologically mediated mucosal diseases like pemphigus.[19] *Ocimum sanctum* has ulcer-healing and powerful antiulcerogenic effects. A 100mg/kg dosage of *Ocimum sanctum* was discovered to be beneficial against ulcers. *Ocimum sanctum* is said to have cytoprotective effects rather than anti-secretory action that contribute to its antiulcer effects. Both peptic and oral ulcers can be treated with tulsi. An excellent source of iron, zinc, vitamin C, and vitamin A is tulsi. In addition, it is a great source of poly nutrients like chlorophyll. Therefore it might be utilized as a dietary supplement for conditions like oral diseases that arise from a deficiency in these nutrients. Streptococcus mutans are very susceptible to the tulsi extract's significant antibacterial activity. According to reports, the main bacteria causing tooth caries is Streptococcus mutans. According to an in vitro investigation, the maximum antibacterial activity of tulsi extract is seen at a 4 percent concentration10. The tulsi has excellent antifungal properties as well. Two strains of candida are resistant to linalool and eugenol, which are present in tulsi essential oil (C. albicans and Candida tropicalis), according to research by Khan A et al.12. However, linalool is more efficient than eugenol against candidiasis. The tulsi has immunomodulatory properties. Additionally, it affects hematopoietic tissues and skin. Tulsi can therefore be used to treat oral lichen planus. However, further research is required to determine if tulsi effectively treats oral lichen planus.[19]

Tulsi's chemical makeup and active ingredients: Tulsi has a highly complex chemical makeup. There are several phytochemicals in it. Antioxidant, adaptogenic, anti-inflammatory, antibacterial, and immune-enhancing qualities are among the many chemicals in the plant.

3.1. Antioxidant

The powerful antioxidant polyphenol rosmarinic acid is found in tulsi. It shields the body's cells from free radical damage. The body's excessive oxidation also damages cells, but this acid stops it from happening.[20]

3.2. Antibacterial

This plant contains the antibacterial substances carvacrol and terpene. The sesquiterpene b-caryophyllene likewise produces a similar result. This naturally occurring ingredient in tulsi is a food additive that has received FDA approval. Tulsi essential oil also possesses antiviral, antibacterial, and antifungal effects. It prevents the growth of M. tuberculosis, B. anthracis, and E. coli. It is one-tenth as potent as streptomycin and one-fourth as potent as isoniazid in its antitubercular action. The ether extract of OS leaves has antibacterial action against Staphylococcus aureus and Escherichia coli.[21] *Ocimum sanctum* fixed oil had effective antibacterial action against Pseudomonas aeruginosa, Bacillus pumilus, and Staphylococcus aureus. Alcoholic extracts of OS exhibited a broader zone for Vibrio cholerae and a wider series of inhibition of E. coli, Klebsiella, Proteus, and Staphylococcus aureus.

3.3. Analgesic

Tulsi's Eugenol content allows it to function as a COX-2 inhibitor, similar to current analgesics (1- hydroxyl-2methoxy-4-allylbenzene). OS leaves have a volatile oil content of 0.7 percent, with around 71 percent eugenol and 20 percent methyl eugenol.[22] Anti-inflammatory - Besides being an antioxidant, rosmarinic acid is a rich source of anti-inflammatory. Another substance in the mixture providing the same purpose is called apigenin. As evidenced by its effectiveness in inflammation models resistant to specific cyclooxygenase inhibitors, *Ocimum sanctum*'s anti-inflammatory properties support the dual suppression of arachidonate metabolism. The results suggest that *Ocimum sanctum* may be a potent anti-inflammatory drug due to its capacity to inhibit both the cyclooxygenase and lipoxygenase routes of arachidonic acid metabolism. Fatty acids from fixed oil made from *Ocimum sanctum* were tested for anti-inflammatory effects. The results suggested that linolenic acid, present in O. sanctum fixed oil and can block both the cyclooxygenase and lipoxygenase pathways of arachidonic metabolism, may be responsible for the oil's anti-inflammatory effects.[23]

3.4. Anticarcinogenic

Swiss albino mice's thighs were used to test the *Ocimum sanctum* seed oil's ability to suppress the growth of fibrosarcoma tumors generated by subcutaneous injection of 20-methylcholanthrene. The occurrence and volume of tumors caused by 20-methylcholanthrene were greatly decreased by adding the oil at the maximum permissible dose (100 ml/kg body weight). According to the study's findings, the oil's ability to prevent cancer may be partly due to its antioxidant capabilities. 100 ml/kg of seed oil had

chemopreventive effectiveness similar to 80 mg/kg of vitamin E.[24] It has been demonstrated that tulsi had anticancer effects on human fibrosarcoma cell cultures, where AIE of the drug produced cytotoxicity at concentrations of 50 mg/ml and higher.[25] N-methyl-N′ -nitro-N-nitrosoguanidine has been shown to lessen the risk of cancer when Tulsi leaf extract in 70% ethanol is administered.[26] Tulsi extract has been demonstrated to affect key molecules involved in cell proliferation, invasion, angiogenesis, and apoptosis. Tulsi administration has been proven to reduce these activities.[26] According to research, the leaf extract may also block or impede the biochemical procedures involved in chemical carcinogenesis by avoiding the transformation of procarcinogens into carcinogens through metabolic activation.[27]

3.5. Anti-Ulcerogenic

Evaluation of *Ocimum sanctum*'s anti-ulcerogenic and ulcer-healing abilities Researchers studying Sprague-Dawley rats, histamine-induced duodenal (HST) ulcer in guinea pigs, and ulcer-healing activity in acetic acid-induced (AC) chronic ulcer model concluded that OS both reduced the incidence of ulcers and improved their healing. OS was shown to be effective at 100 mg/kg of dose. The cytoprotective impact of OS, not its antisecretory activity, may cause its anti-ulcer effects. To sum up, it was shown that OS has strong anti-ulcerogenic and ulcer-healing capabilities and might function as a strong therapeutic agent for peptic ulcer disease.[28] Oral ulcers benefit from this quality as well.

3.6. Uses of Tulsi in oral infections

Sore throat: Water heated while basil leaves are still within can be consumed to soothe a sore throat. Gargle with this water as well.

3.7. Toothpaste

When used as toothpaste, the plant benefits dental issues. Its leaves can be used to wash teeth after being sun-dried and powdered. It may also be made into a paste and used as toothpaste by combining it with mustered oil. It does wonders for fighting bad breath and maintaining the health of your mouth. In addition, it can be utilized to massage the gums and prevent gingivitis.

4. CONCLUSION

A plant with magical qualities is called tulsi. In Indian Ayurveda, it is a medication. Conventional medical professionals frequently employ medicinal plants daily to treat various ailments. Tulsi is advocated for treating systemic disorders in traditional medical systems; however, there is relatively little information on its oral usage. Due to its antibacterial, anti-inflammatory, ulcer healing, antioxidant, and immunomodulatory effects, it may also help treat oral disorders. Additionally, It provides a wealth of minerals, including vitamins C and A, calcium, zinc, and iron, all of which are important for the growth and upkeep of oral tissues. To assess its miracle qualities in dentistry, more research is needed.

5. AUTHORS CONTRIBUTION STATEMENT

Dr. Ashutosh Burungale collected data, edited the manuscript, designed and added to the theoretical concept. Dr. Ravikant Sune analyzed the data, added a few important points, and guided it.

6. CONFLICT OF INTEREST

Conflict of interest declared none.

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