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Review Article

A review on Tulsi: from mythological significance to potential medicinal application

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ABSTRACT

Tulsi (Ocimum sanctum), revered in Indian culture as the "Queen of Herbs," holds profound mythological significance and substantial therapeutic importance. This concise review explores Tulsi's rich cultural heritage and its transition into modern therapeutic applications. In Hindu mythology, Tulsi is revered as an incarnation of the goddess Vrinda and is considered sacred due to its association with Lord Vishnu. Its leaves are used in various religious rituals, symbolizing purity and auspiciousness. Beyond its mythological roots, Tulsi boasts a spectrum of medicinal properties validated by scientific research. Tulsi is a potent source of essential oils, flavonoids, and other bioactive compounds that confer diverse pharmacological effects. Its adaptogenic properties help combat stress and enhance resilience. Additionally, Tulsi exhibits antioxidant, antimicrobial, anti-inflammatory, and immunomodulatory activities, making it a versatile remedy in traditional medicine systems like Ayurveda and Siddha. Modern scientific studies have corroborated Tulsi's traditional uses, highlighting its potential in treating respiratory disorders, cardiovascular diseases, and metabolic disorders like diabetes. Furthermore, its neuroprotective properties show promise in managing neurological disorders. The therapeutic potential of Tulsi extends to skincare and oral health, with formulations ranging from herbal teas to topical ointments gaining popularity worldwide. Despite its ancient origins, ongoing research continues to uncover new facets of Tulsi's pharmacological profile, reinforcing its status as a botanical treasure with relevance in contemporary medicine. In conclusion, Tulsi bridges ancient mythology with modern scientific scrutiny, offering a compelling case for its integration into global pharmacotherapies and health practices. This review underscores Tulsi's journey from cultural symbolism to evidence-based therapeutic utility, advocating for its recognition and further exploration in the realm of natural medicine.

Keywords: Tulsi; Herbs; Mythology; Medicinal value; Pharmacological effect.

Introduction

Tulsi or Tulasi is a revered plant that is widely known and respected among Hindus as a symbol of utmost purity. Tulsi is a Sanskrit term that signifies unparalleled excellence, incomparable nature, and immeasurable worth. Tulsi is revered as a highly sacred and divine plant, possessing both physical and

spiritual healing abilities. Since ancient times, it has been revered as a deity in the Hindu religion. In ancient times, the existence of Tulsi in a household was seen as an emblem of the religious and spiritual inclination of that family.

There are numerous types of Tulsi, including Krishna Tulsi, Rama Tulsi, Lakshmi Tulsi, Vana Tulsi, Karpooa Tulsi, and Rudrajata Tulsi, among others. Tulsi is a perennial plant. The plant is a perennial, meaning it lives for more than two years, and its flowers are continuously present throughout the year. The Tulsi plant often displays a green or light red colour and emits a delightful scent. It has an astringent flavour and can grow up to a height of 100 cm. Tulsi is typically found as an indoor plant and also thrives in woodland environments. The botanical name for Tulsi is *Oscimum Sanctum*, and it is commonly referred to as Holy Basil in English. The botanical name itself contains holiness through the inclusion of the word *sanctum* [1].

Many Hindu houses typically cultivate a Tulsi plant in their courtyard. Certain individuals build a little edifice around the Tulsi plant, commonly referred to as Tulsi Peetam or Tulsi Brindavan. Tulsidas, the renowned saint and composer, authored the Tulsi Ramayana (Sri Rama Charitha Manas). Tulsi Manasa Mandir is a renowned tourist destination in Varanasi (Banaras). Tulsi, a perennial plant, is a symbol of Hindu philosophy, tradition, culture, and heritage. It is a natural gift to humanity and is closely connected to people's daily lives. The Kalpa Vriksha of Bhoo Loka is its designated name. Those who daily pluck Tulsi leaves for the pooja and worship Lord Vishnu are considered blessed [1].

Tulsi in the Puranas

The glory of Tulsi is described in various Puranas such as the Padma Purana, Brahma Vaivārtha Purana, Skanda Purana, Garuda Purana, Karthika Purana, and Vishnu Dharmottara Purana. According to the Padma Purana, Tulsi is believed to have originated from the tears of Lord Dhanvantri, a divine healer and avatar of Lord Vishnu. These tears fell over the Amrita, the nectar that Lord Dhanvantri had retrieved from the depths of the ocean during the Ksheera Sagara Madhanam, also known as the Churning of the Ocean of Milk [1].

As per the Padma Purana, Lord Krishna brought Vridadevi, in the guise of a plant called Tulsi, to Earth for the welfare of the people in the material world. Presenting a single Tulsi leaf to Lord Krishna is tantamount to presenting all the flowers, sandalwood paste, and fruits to the deity. Similar to how the Ganga River purifies anyone who bathes in it, Tulsi too purifies all those who adore her in the three realms.

According to the Padma Purana, Tulsi is considered extremely important. It states that providing flowers made of gold, stones, and pearls is not even one sixteenth as significant as offering Tulsi. The sins of

numerous periods can be eradicated through the act of observing, touching, contemplating, paying respects, planting, and utilising Tulsi. All deities inhabit the Tulsi plant from its roots to its tip. The object consistently emanates the fundamental beliefs of gods and sanctifies the surrounding surroundings. The presence of a Tulsi vrindavanam in a house is the reason why it is regarded as sacred.

The latent and imperceptible essence of Vishnu is assimilated through the stalk of the Tulsi leaf and subsequently transformed into the Krishna essence, which continues to circulate through the stalk. Consciousness, known as Chaitanya, is awakened at the base of the Tulsi leaf and emanates into the surrounding atmosphere in the shape of circular patterns. The chaitanya flows via the vessels of the Tulsi leaf. Additionally, the leaves of Tulsi contain particles of Sakti (divine energy). The particles of chaitanya and Krishna principle are transmitted into the atmosphere through the inflorescence [1].

The spiritual and religious importance of Tulsi

The entire Tulsi plant, including its leaves, blossoms, stalks, roots, seeds, and even the Mrittika (clay derived from the Tulsi plant), holds great spiritual, religious, and medicinal importance. Tulsi is known by various names such as Viswavandhana, Brinda, Pushparasa, Krishna Jeevani, Nandini, Viswapavani, Viswapoojitha, and Brindavani. It is alternatively referred to as Lakshmi Swaroopam, representing the deity Lakshmi who is adored by Lord Vishnu. According to belief, Lord Vishnu is thought to reside wherever Tulsi is present, and such a site is regarded a Theertha, or sacred spot. Tulsi Devi is seen as a manifestation of the goddess Lakshmi, thereby earning her name [1].

Tulsi is an essential and obligatory component in the worship of Lord Vishnu, since He experiences great satisfaction when worshipped with Tulsi. Tulsi holds great significance in the Vaishnava Sampradaya, where it is widely utilised, and no religious ceremony or ritual is considered fully accomplished without its presence. Tulsi stems that have been dried are also utilised in the performance of Homas. According to the Brahma Purana, it is recommended to immediately see the Tulsi plant upon waking up. This act is believed to be as beneficial as seeing all the sacred Theerthas (holy places) in three. The entire Tulsi plant, including its leaves, blossoms, stalks, roots, seeds, and even the Mrittika (clay from the Tulsi plant), holds great spiritual, religious, and medicinal importance. Tulsi is known by various names such as Viswavandhana, Brinda, Pushparasa, Krishna Jeevani, Nandini, Viswapavani, Viswapoojitha, and Brindavani. It is sometimes known as Lakshmi Swaroopam,

representing the revered Goddess Lakshmi who is adored by Lord Vishnu. According to belief, wherever Tulsi is present, Lord Vishnu also resides, and such a site is regarded as a Theertha, or a sacred spot. Tulsi Devi is seen as an embodiment of the goddess Lakshmi, thereby earning her name [1].

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Figure 1: Tulsi plants.

Ayurveda and Tulsi

Ayurveda, the world's oldest medical system, is a science that encompasses the study of life. It adopts a holistic approach to health and disease, emphasising the preservation and promotion of good health, as well as the prevention of disease via the adoption of healthy lifestyle habits. These practices encompass the consumption of fresh, minimally processed foods, the utilisation of Rasayanas (formulas) that eliminate ageing and disease, advanced detoxification practices, and regular intake of adaptogenic herbs that enhance the body's ability to maintain equilibrium in the face of various stressors.

Ayurveda utilises a wide range of therapeutic and culinary plants, taking use of India's remarkable biodiversity, which surpasses that of any other medical system. However, among all the herbs utilised, none holds a status that can be compared to tulsi or holy basil (*Ocimum sanctum*).

Tulsi is a fragrant shrub belonging to the Lamiaceae family (tribe ocimeae) and is believed to have originated in north central India. It is presently found naturally in the tropical regions of the eastern continent [2]. In Ayurveda, tulsi is highly regarded and referred to as "The Incomparable One," "Mother Medicine of Nature," and "The Queen of Herbs." It is considered an exceptional "elixir of life" due to its unparalleled medical and spiritual qualities. The user's text is enclosed in tags. In India, tulsi has been included into spiritual rituals and lifestyle practices that offer a wide range of health advantages, which are currently being validated by modern scientific research. This nascent scientific research on tulsi, which corroborates old Ayurvedic knowledge, indicates that tulsi serves as a tonic for the body, mind, and spirit, providing remedies for numerous contemporary health issues.

Tulsi exemplifies Ayurveda's comprehensive approach to health, which emphasises a holistic lifestyle. Tulsi has a spicy and bitter flavour and is believed to deeply permeate the tissues, dry secretions, and balance the kapha and vata doshas. Regular consumption of tulsi is believed to prevent illness, enhance overall health, well-being, and longevity, and aid in managing the pressures of everyday life. Tulsi is also attributed with enhancing the radiance of the skin, mellowness of the voice, and promoting attractiveness, intellect, endurance, and a serene emotional state. The given text is a list of numbers: [3-6]. Tulsi is not only known for its health benefits, but it is also recommended as a remedy for various conditions such as anxiety, cough, asthma, diarrhoea, fever, dysentery, arthritis, eye diseases, otalgia, indigestion, hiccups, vomiting, gastric, cardiac and genitourinary disorders, back pain, skin diseases, ringworm, insect, snake and scorpion bites, and malaria [3,5,6,7].

Chemical Composition of Tulsi

The plant exhibits diverse therapeutic and medicinal attributes as a result of the presence of chemical ingredients or phytochemicals. Various types of phytoconstituents and their actions have been reported in the species *O. tenuiflorum*. The essential oil derived from *O. tenuiflorum* L. contains a significant concentration of Eugenol, comprising around 70% of the oil. Additionally, the oil consists of 11% Beta-Elementene, 8% Beta-Caryophyllene, and 2% Germacrene. The plant's leaves contain a volatile oil

consisting of eugenol and methyl eugenol, with eugenol accounting for 71% and methyl eugenol accounting for 20% of the oil. It contains the hydrocarbons carvacrol, sesquiterpene, and caryophyllene, as well as 62 other compounds. The concentrate of fresh leaves and stem of *Ocimum sanctum* contains phenolic chemicals that have antioxidant effects. The phenolic chemicals identified include isothymusin, circimaritin, circisilineol, apigenin, and rosameric acid, with a large concentration of Eugenol (16). Orientin and Vicenin are two distinct kinds of flavonoids that are obtained from an aqueous leaf extract. Additional compounds such as ursolic acid, orientin, luteolin, apigenin-7-O-glucuronide, molludistin, and luteolin-7-O-glucuronide are also derived from the extract of Tulsi leaves.

This particular species of *Ocimum* also possesses a diverse range of sesquiterpenes and monoterpenes, including bornyl acetate, β elemene, neral, and both α and β pinenes. Additionally, it includes camphene, sitosterol, cholesterol, campesterol, and stigmasterol.

Ocimum sanctum contains five different types of fatty acids: stearic acid, palmitic acid, oleic acid, linoleic acid, and linolenic acid. Tulsi is a rich source of vitamin C, beta carotene, and calcium ions (Ca^{2+}). The plant extract contains tannins, camphor, various flavonoids such as luteolin, orientin, vicenin, and triterpene, as well as urolic acid. Additionally, it contains zinc (Zn), manganese (Mn), and sodium (Na) ions.

The main chemical constituents of *O. tenuiflorum* Linn, present in significant quantities and responsible for various therapeutic activities, include Eugenol ($\text{C}_{10}\text{H}_{12}\text{O}_2$), Oleanolic Acid ($\text{C}_{30}\text{H}_{48}\text{O}_3$), Linalool ($\text{C}_{10}\text{H}_{18}\text{O}$), Ursolic Acid ($\text{C}_{30}\text{H}_{48}\text{O}_3$), Beta-Caryophyllene ($\text{C}_{15}\text{H}_{24}$), Rosemarinic Acid ($\text{C}_{18}\text{H}_{16}\text{O}_8$), Estragole ($\text{C}_{10}\text{H}_{12}\text{O}$), Carvacrol ($\text{C}_{10}\text{H}_{14}\text{O}$), and Methyl Cinnamate ($\text{C}_{10}\text{H}_{10}\text{O}_2$) [8]

Recent Reports on therapeutic potential of Tulsi

Tulsi has been the subject of extensive research in recent years to better understand its potential pharmacological effects. For example, an ethanolic extract of *Ocimum sanctum* (EEOS) caused Lewis lung carcinoma to undergo apoptosis [9], while an aqueous extract of *Ocimum gratissimum* prevented the spread of breast cancer by inhibiting matrix metalloproteases [10]. Additionally, it has been demonstrated that EEOS significantly affects the carcinogen-metabolizing enzymes cytochrome P450, cytochrome b5, and aryl hydrocarbon hydroxylase [11,12]. In addition, it has been shown that tulsi made as a fresh leaf paste, aqueous extract, and ethanolic extract decreases the

occurrence of papilloma and squamous cell carcinoma in hamsters treated with carcinogens [13,14]. Furthermore, human colorectal cancer cells showed tulsi essential oil to promote cytotoxic and apoptotic activities [15]. The aqueous leaf extract and seed oil are said to exhibit chemo-preventive and antiproliferative activity in Hela cells [15]. Tulsi leaves are said to contain 0.7% volatile oil, which is composed of roughly 71% eugenol and 20% methyl eugenol.

The leaves of *Ocimum sanctum* have traditionally been utilised for the treatment of diabetes mellitus. The administration of fresh tulsi leaves as a dietary supplement at a dosage of 2 grammes per kilogramme of body weight for a duration of 30 days resulted in a notable reduction in blood glucose levels in the experimental group. The use of *Ocimum sanctum* resulted in a notable rise in the levels of superoxide dismutase, reduced glutathione, and total thiols. However, it also caused a large decrease in peroxidized lipid levels when compared to the untreated control group. The leaves were discovered to have the ability to neutralise both superoxide and hydroxyl free radicals. The current findings demonstrate that the leaves of *Ocimum sanctum* are effective in reducing blood glucose levels, and the antioxidant activity of these leaves seems to be primarily responsible for the hypoglycemic impact [16].

Neurological disorders refer to illnesses that affect both the central and peripheral nervous system. Put simply, the components of the nervous system include the brain, spinal cord, cranial nerves, peripheral nerves, nerve roots, autonomic nervous system, neuromuscular junction, and muscles. The disorders encompassed in this category are epilepsy, Alzheimer's disease, other forms of dementia, cerebrovascular diseases such as stroke, migraine and other types of headaches, multiple sclerosis, Parkinson's disease, neuroinfections, brain tumours, traumatic disorders of the nervous system caused by head trauma, and neurological disorders resulting from malnutrition.

Epilepsy is a chronic neurological disorder. *Ocimum sanctum* (OS) (tulsi) has analgesic, anticancer, antiasthmatic, antidiabetic, antifertility, hepatoprotective, hypotensive, hypolipidemic, anti-inflammatory, antioxidant, immune modulatory, and antistress properties. A study was conducted to evaluate the anticonvulsant effect of ethanolic extract of leaves of OS and to compare the anticonvulsant effect with the standard sodium valproate in electrically and chemically induced epileptic animal models. A total of 60 albino rats (150-200 g) of male

sex were randomly selected. They were divided into five groups (per model) of six rats each. Control group received normal saline (0.35 ml/100 g), standard group sodium valproate (300 mg/kg), and the test groups were given OS at three different doses (1.75, 4.25, and 8.5 mg/kg). The anticonvulsant activity was screened using maximal electroshock seizure (MES) model and pentylenetetrazole (PTZ) model. Results were analyzed by ANOVA followed by post-hoc turkey's test. The ethanolic extract of OS leaves at doses of 4.25 and 8.5 mg/kg has shown significant anticonvulsant by decreasing the duration of tonic hind limb extension activity in MES model and by prolonging the duration of seizure latency in PTZ model. The ethanolic extract of OS leaves possess anticonvulsant activity which can be comparable with the standard sodium valproate [17].

The cumulative body of research has established a strong connection between diet and nutrition and the occurrence of chronic diseases, the promotion of health, and the optimal functioning of the body. Until recently, this connection had been acknowledged to primarily pertain to brain health and the enhancement of cognitive performance. Various lines of evidence suggest that oxidative stress is involved in the initial stages of Alzheimer's disease and also plays a significant role in triggering and activating multiple cell-signaling pathways that contribute to the formation of lesions caused by certain toxic substances that promote the progression of Alzheimer's disease. Extensive research over the years has consistently demonstrated the overall effectiveness of antioxidant therapy in both preclinical and clinical tests. *Ocimum sanctum* (OS) L., a herb with antioxidant characteristics, has been utilized in Ayurveda for its wide range of therapeutic effects for centuries. This chapter explores the cognitive-enhancing benefits of OS, also known as the queen of herbs [18].

Scientists globally have come to recognize in recent years that the useful duration of any antimicrobial substance is restricted, as a result of the growing emergence of resistance among microbes. As a result, a considerable number of studies have been carried out to discover novel alternative sources of antibacterial compounds, particularly derived from plants. The objectives of this project were to analyze the antimicrobial characteristics of essential oils derived from Australian-grown *Ocimum tenuiflorum* (Tulsi), to measure the volatile components found in flower spikes, leaves, and the essential oil, and to explore the compounds accountable for any observed activity. The minimum inhibitory concentration (MIC) of Tulsi essential oil against specific microbiological infections was determined using broth micro-dilution. At

concentrations of 4.5% and 2.25%, the oils effectively halted the growth of *Staphylococcus aureus* (including MRSA) and *Escherichia coli*. However, these concentrations only partially inhibited the growth of *Pseudomonas aeruginosa*. Out of the 54 chemicals that have been found in Tulsi leaves, flower spikes, or essential oil, three specific compounds are suggested to be accountable for this particular effect. These compounds are camphor, eucalyptol, and eugenol. Tulsi essential oil has the potential to be an effective topical antibacterial agent for treating skin infections caused by important pathogens such as *S. aureus* (including MRSA), *P. aeruginosa*, and *E. coli* [19].

Conclusion

The Tulsi plant consists of several bio-organic compounds, including methyl chavicol, camphor, limonene, camphene, (E)- β -ocimene, linalool, bicyclogermacrene, α -terpineol, 1,8-cineole (7.6%), germacrene D, and β -caryophyllene. The minor ingredients of basil oil include (+)-delta-cadinene, 3-carene, alpha-humulene, citral, and (-)-trans-caryophyllene. The leaf of EO contains methyl eugenol, (E)-cinnamyl acetate, eugenol, and beta-elemene as its primary ingredients, which exhibit various biological effects. The essential oil (EO) of this insect repellent is widely recognized for its effectiveness, which can be attributed to the presence of camphor, caryophyllene oxide, cineole, methyl-eugenol, limonene, myrcene, and thymol. Tulsi leaves are extensively utilized in various traditional medicinal practices such as Ayurveda, Greek, Roman, Siddha, and Unani. Tulsi leaves are extensively utilized in the formulation of Ayurvedic remedies for the management of various ailments and conditions. The plant has a wide range of therapeutic uses, including treating conditions such as cardiopathy, hemopathy, leukoderma, asthma, bronchitis, catarrhal fever, otalgia, hepatopathy, vomiting, lumbago, hiccups, ophthalmia, gastropathy, genitourinary disorders, ringworm, verminosis, and skin illnesses. Tulsi is renowned for its efficacy in treating bronchitis, bronchial asthma, malaria, diarrhea, dysentery, skin illnesses, arthritis, severe eye ailments, persistent fever, and bug bites. Additionally, it is employed for the purpose of preventing gastrointestinal diseases. The plant components of OS and their chemical compounds have diverse medicinal effects. Plants have potent anti-inflammatory, analgesic, antipyretic, antidiabetic, hepatoprotective, hypolipidemic, antistress, and immunomodulatory properties, making them a rich source of biological and pharmacological activity. The Tulsi plant and eugenol have effects on various systems in the body, including the immunological system, reproductive system, central

nervous system, cardiovascular system, gastrointestinal system, urinary system, and blood biochemistry. Tulsi possesses significant therapeutic properties for treating several ailments including cardiovascular disease, migraines, gastrointestinal disorders, hepatitis, malaria, tuberculosis, dengue fever, and swine flu. The utilization of leaf powder and essential oil is quite beneficial for maintaining dental health and promoting the well-being of gums. The Tulsi plant is an excellent repellent for flies, mosquitoes, and insects. The EO has the potential to inhibit mosquito growth and manage malaria. The local population utilizes Tulsi for a variety of herbal products, including mixtures, syrups, green tea, and sat. Regular consumption of Tulsi leaves aids in managing diabetes and its related complications. The phytochemicals, nutritional components, and mineral constituents found in various plant species can be utilized by physicians and pharmacists to develop antidiabetic therapeutic formulations using safe and non-toxic herbal medicines. These substances can serve as nutrient sources and can be utilized as alternatives to manufactured antidiabetic medications. Undoubtedly, indigenous medicinal plants can be utilized to optimize the manufacture of economically viable pharmaceuticals as a substitute for synthetic medications in the treatment of diabetes. There is a requirement for natural plant materials that may be utilized to create anti-diabetic formulations that can effectively lower blood glucose levels compared to current standard anti-diabetic medications. Local communities utilize a variety of herbal preparations, derived from endemic plant species, as ethnomedicines. These preparations are often crude extracts made from flowers, fruits, and roots.

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Conflict of Interest

None declared.

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