

Study of medicinal properties of *Ocimum sanctum* L. and their therapeutic importance

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ABSTRACT

Tulsi (*Ocimum sanctum* L.), commonly *known as* holy basil, is a major medicinal plant of the Indian subcontinent. It is recognized for its diverse medicinal properties in Ayurvedic and Siddha systems of medicine. In traditional medical texts, the use of basil is described for the treatment of various physical and mental diseases. Modern scientific research—especially in vitro, animal, and limited human studies—has shown that basil has many pharmacological functions, such as: adaptogenic, antimicrobial, sedative, cardioprotective, immunomodulatory. Till now, no comprehensive and validated survey of human studies focused on the therapeutic effectiveness and safety of Tulsi was available. To fill this gap, I conducted a detailed written review of human studies on the therapeutic effects of basil after consumption. For this purpose, I searched for research papers and texts on Tulsi from many scientific sources and electronic databases such as Cochrane Library, Google Scholar, Embase, Medline, PubMed, Science Direct and Indian Traditional Medicine Database. A total of 24 human studies were compiled in this discovery, in which various therapeutic benefits of basil were confirmed. These studies have noted the following effects of Tulsi, including improvement in metabolic disorders (e.g. diabetes, obesity, hyperlipidemia), supportive effects in cardiovascular diseases, immune system strengthening properties, improvement of stress and cognitive functions

Tulsi consumption was found to be safe in all studies, as no significant adverse effects were reported in any of the studies. These results provide scientific confirmation of the use of basil in traditional medicine. At the same time, there are indications that basil can become an effective natural treatment option for lifestyle-related chronic diseases such as diabetes, stress, and metabolic disorders.

Key words: Antioxidant, Anti-inflammatory, Anti-bacterial, Cough and Cold, Tulsi

INTRODUCTION

Basil (*Ocimum sanctum* L. Tulsi in Hindi and Sanskrit and *Holy Basil* in English, is an aromatic and versatile herb from the Indian subcontinent, which has been used in Ayurvedic medicine for about 3000 years. It is a plant of the Lamiaceae family, which is considered extremely important from a religious, medicinal and environmental point of view. It has been called the "remedy of life" in Ayurveda because it is helpful in the treatment of many serious diseases such as cold, cough, fever, inflammation, stomach problems, heart disease, migraine, asthma, and kidney stones, etc. Its leaves are highly aromatic and have amazing power to remove mucus, improve digestion, and boost immunity. The basil plant is on average 30–60 cm high and its leaves are inverted, oval and hairy. It is easily found in homes, gardens, and temples. The specialty of the basil plant is that it purifies the environment by absorbing carbon dioxide and releases oxygen in the morning, which is beneficial for respiratory patients. It also helps to keep mosquitoes and other pests away. In the rainy season, when diseases like malaria and dengue are on the rise, basil tea or juice is effective in reducing fever. A decoction made from its leaves, especially when combined with honey and ginger, is extremely useful in diseases such as bronchitis, flu and asthma.

Basil juice is beneficial when consumed with honey for gargling in sore throat and to remove kidney stones. It also helps keep the heart healthy by reducing cholesterol in the blood. Tulsi is also highly revered from a religious point of view — in many Hindu households, it is worshipped as Goddess Tulsi and is mentioned

in many mythology. Thus, Tulsi is not just a sacred plant but a vibrant dispensary, offering a fusion of natural medicine, environmental protection, and spiritual life. Its regular use not only improves health, but it also provides balance and energy to our lives.

Medicinal Properties of Tulsi

Basil is an anti-cramp, appetite enhancer, gout-out, choleric, and gastric sedative herb that is useful in digestive problems such as stomach cramps, stomach irritation, vomiting, intestinal irritation, constipation and gastroenteritis. It is also used as an anti-convulsant in whooping cough. The antioxidant properties present in basil protect the body from free radicals and are helpful in reducing blood sugar levels, making it useful for diabetics. Tulsi lowers total cholesterol levels, which benefits heart patients. It is also helpful in controlling blood pressure, making it a beneficial medicine for people suffering from high blood pressure.

Health benefits of tulsi in our daily life

The basil plant has many medicinal properties. Its leaves are nerve enhancers and increase memory power. They help in removing phlegm from the trachea and strengthen the stomach and help in bringing sweat from the body. Its seeds are glutenous and useful from a medicinal point of view. Tulsi leaves are effective in the treatment of fever, especially during the rainy season when diseases like malaria and dengue spread, at that time their tender leaves are boiled with tea and drinking it increases immunity and prevents infection. In high fever, a decoction of basil leaves, boiling in half a liter of water with ground cardamom, mixing sugar and milk reduces the temperature. The juice of basil leaves is also helpful in reducing fever, which should be mixed with fresh water and given at intervals of every 2-3 hours (Kothari et al, 2008).

Respiratory Disorders

Tulsi is considered to be a highly effective medicine for treating diseases of the respiratory system in Ayurveda. It is an important component of many Ayurvedic cough syrups and cough decontaminants, which helps to flush out mucus accumulated in the lungs in diseases such as bronchitis and asthma. Basil leaves are naturally mucus eliminators, clearing the respiratory tract and making it easier to breathe. Chewing basil leaves during colds provides relief in throat and nose infections. Along with this, it is beneficial to drink boiled water with basil leaves in case of a sore throat or infection. This boiled water softens the throat and reduces inflammation. Gargling with this water also reduces swelling and pain of the throat, which removes sore throat and clears the voice. A decoction of basil leaves made with honey and ginger is considered to be very effective in the treatment of bronchitis, asthma, influenza, cough and cold. This mixture of basil with ginger and honey not only helps to remove mucus, but also increases the body's immunity, which leads to quick recovery of diseases. (Staples et al, 1999,).

In addition, a decoction of cloves and ordinary salt with basil leaves also helps to immediately reduce the symptoms of influenza or a severe cold. To make this decoction, leaves, cloves and salt are boiled in half a liter of water until half of the water remains. Drinking it provides great relief in throat irritation, phlegm and cough due to colds. This mixture cleanses the respiratory system and helps fight off infections. (Kuhn et al.), 2007). . .

Thus, basil is not only helpful in the treatment of diseases, but consuming it regularly strengthens the respiratory system and prevents many types of respiratory problems. It continues to hold its special place in Ayurveda as a natural and safe medicine. (Puri et al.), 2002). . .

Kidney Stone

Tulsi is considered to be extremely beneficial for kidney health and its strengthening effect helps in improving kidney function. The combination of basil leaf juice and honey proves to be very effective, especially in a problem like kidney stones. Tulsi leaves contain natural compounds that help break down

stone-forming crystals in the urine and flush them out through the urinary tract. When the juice of basil leaves is regularly mixed with honey and consumed for six months, this mixture cleanses the urinary system, reduces the size of stones and reduces blockages that accumulate in the urinary tract. Honey makes this mixture tasty as well as enhances its medicinal properties. This procedure not only aids in stone removal but also relieves kidney inflammation and other infections. This treatment of Tulsi is considered a safe and effective option in Ayurvedic medicine, especially for those who suffer from kidney stones and need to avoid surgery to remove the stones. Thus, regular consumption of basil improves kidney function and a problem like stones can be overcome in a natural way. (Biswas and Biswas, 2001). . .

Heart Disorders

Basil is considered to be extremely beneficial in heart disease and related weakness. Its leaves contain ingredients that help reduce cholesterol levels in the blood, reducing the likelihood of fat accumulation in the arteries. Thus, the consumption of basil is helpful in keeping the heart healthy and reduces the risk of cardiovascular diseases. Regular use of it leads to improved blood circulation, providing the heart muscle with the necessary nutrition and oxygenation. This, in turn, improves heart weakness and enhances overall heart health (Jyoti et al, 2004).

Children's Ailments

Tulsi leaf juice is very beneficial in common pediatric problems like cough, cold, fever, diarrhea and vomiting. Its medicinal properties strengthen the immune system of children and help fight diseases. The juice of basil leaves reduces cough and cold in children and controls fever. Apart from this, it also provides relief in digestive troubles like diarrhea and vomiting. If smallpox rash in children emerges late or is taking time to heal, consuming basil leaves with saffron helps the rash heal quickly and reduces the impact of infection. This Ayurvedic treatment is believed to be helpful in restoring the health of children faster (Devi et al, 1999).

Stress and Headaches

Basil leaves are considered to be 'adaptogens' i.e. anti-stress herbs. This means that basil helps the body fight physical, mental, and environmental stressors and maintains overall health. Modern research has proved that basil leaves not only protect against stress, but also reduce the negative effects of stress. It is helpful in calming the nervous system and provides mental stability.

Healthy individuals can also chew about 12 leaves of basil twice a day to keep their body stress-free and strong. This purifies the blood and helps flush out many toxins accumulated in the body. Regular consumption of basil increases physical energy and reduces mental fatigue.

Basil also has a special place in the treatment of headaches. A decoction of basil leaves can be made and given for headaches, which is effective in reducing pain. In addition, to reduce headaches and stress caused by heat, crushed basil leaves are mixed with sandalwood paste and applied on the forehead. Not only does it relieve headaches, but it also provides coolness and coolness to the skin.

Thus, Tulsi is not only a medicinal plant, but it is also extremely important for stress management and physical and mental health. It has been used in Ayurvedic medicine for centuries and modern science also recognizes its properties.

Eye Disorders

Basil juice is considered an effective natural remedy for eye pain and night blindness, especially when this problem is caused by vitamin A deficiency. The nutrients and antioxidants present in basil protect the eyes and enhance their healing capacity. Putting two drops of fresh black basil juice in the eyes before going to bed daily provides relief from eye irritation, fatigue and pain. Also, it is helpful in reducing vision problems

like night blindness. This remedy, being natural, takes care of the eyes without damaging them. However, consultation with a doctor is necessary in severe or long-lasting eye problems.

Mouth Infections

Basil leaves are extremely effective in treating mouth ulcers and infections. The antibacterial and anti-inflammatory properties present in basil help in the quick healing of mouth injuries and ulcers. If chewed some fresh basil leaves, they can reduce the irritation and pain of mouth ulcers and also prevent infection. In addition, basil protects against inflammation and bacterial infections by clearing the inside of the mouth. Therefore, basil leaves are considered very useful as a natural home remedy.

Insect Bites

This herb of basil works as an effective antiseptic and preventive remedy for insect stings or bites. It is extremely helpful in preventing irritation, inflammation, and infection caused by insect bites. Taking a teaspoon of juice of basil leaves and applying it on the affected area provides relief. It should be repeated again after a few hours so that the effect remains and the infection does not spread. Also, applying a paste of fresh basil roots on the bites of insects and leeches reduces swelling and provides relief in pain. The natural antiseptic ingredients present in basil protect the skin and help wounds heal quickly. Thus basil not only protects against bites, but also plays an important pharmacological role in the treatment of post-bite effects (Sharma et al., 2019), 1998).

Tulsi used as Traditional Indian Ayurvedic Medicine

The Tulsi plant is considered to be an extremely potent medicinal herb by Organic India, an organization dedicated to the field of organic agriculture and sustainable development, whose key quality is its ability to reduce stress. The abundance of essential oils and antioxidants in basil is extremely effective in reducing the negative effects of stress on the body. The plant has traditionally been in use in Indian Ayurvedic and Unani systems of medicine, but now its medicinal properties are being recognized in other regions of the world as well. Basil is considered as an adaptogen, which balances various body processes and aids in stress management. Its extract is used in the treatment of colds, headaches, stomach ailments, inflammation, infections, heart disease, poisoning, cataracts, and malaria. Basil strengthens the nervous system, improves heart health, increases appetite, and promotes digestion. It prevents flatulence by facilitating the secretion of digestive enzymes. The detoxifying properties of basil purify the toxins present in the blood and the ability to provide protection against radiation poisoning is also found in basil. Also, the anti-cancer properties of basil are also mentioned, and it is said that consuming a leaf of basil daily provides protection against cancer. In addition to its religious significance, its medicinal significance is also extremely broad, earning it the term "elixir of life" as it promotes longevity. Tulsi extract is used in the prevention and treatment of common and serious diseases such as colds, headaches, stomach diseases, inflammation, heart disease, poisoning and malaria. The essential oil derived from camphor basil is primarily used for medicinal purposes, while in recent years it has also started to be included in herbal cosmetics. According to the Plant Culture Project of the United Kingdom's Medicines and Healthcare Products Regulatory Agency (MHRA), basil has been used in the treatment of skin problems such as eczema, ringworm, and insect bites. Apart from this, it also works as an effective antibacterial drug in reducing fever, improving the lungs and digestive system, reducing the effects of colds, removing toxins and preventing infections. Tulsi is thus revered as a versatile medicinal herb not only in Ayurveda but also globally, which is extremely beneficial for health and longevity.

Tulsi in Modern Medicine

Research on Tulsi (Tulsi plant) in the field of modern medicine has made it clear that Tulsi can be effective in the treatment of many serious health problems. These include ulcers, high cholesterol, type 2 diabetes,

obesity, and weakened or suppressed immune systems (such as in diseases such as cancer and AIDS). These effects of basil are due to the organic compounds found inside it, with essential oils, antioxidants, and anti-inflammatory elements prominent.

Medicinal Properties of Tulsi:

Tulsi essential oil contains a powerful anti-inflammatory compound called eugenol, which helps reduce inflammation and infection. Additionally, basil also contains many antioxidant acids, which protect the body from damage caused by free radicals. These properties scientifically support the traditional uses of Tulsi in Ayurveda. Therefore, Tulsi has been used for centuries in the treatment of many diseases in the Ayurvedic system of medicine. The basil plant is extremely suitable for growing in your home. Not only is this plant rich in medicinal properties, but it is also a great choice for enhancing the flavor of your food and making delicious tea. The basil plant is easy to grow in a decorative pot, it is not harmful to animals and because of this it is safe even for homes with children and pets. Placing basil in the garden or kitchen is not only beneficial for health, but it also provides freshness and beauty to the environment.

Researchers have found that basil leaves can increase the functionality of pancreatic beta cells, leading to better insulin production, reports diabeteshealth.com from the perspective of Western medicine. Insulin regulates blood sugar levels in the body, so it is especially important for diabetics. In one study, patients with type 2 diabetes were given 2.5 grams of basil powder, which resulted in a clear reduction in their blood sugar levels, while there was no such effect in patients taking a placebo. Although no serious interactions with medications related to the use of basil have been reported so far, caution should be exercised when using basil with insulin or insulin secretory drugs (such as drugs of the class of sulfonylureas such as glyburide, glipizide, amaryl, and others such as Prandin or Starlix). Because basil can increase the efficiency of insulin, it can also cause blood sugar levels to drop excessively, leading to hypoglycemia (abnormally low blood sugar). Therefore, diabetics who wish to use Tulsi must consult their doctor or health expert before starting it to evaluate the possible interactions between the drugs.

Natural Medicinal Uses:-

Siddha, Unani, and Ayurvedic systems of medicine use Tulsi for the treatment of a variety of skin diseases, fever, cough, and internal diseases. In Ayurvedic medicine, a liquid tonic made from basil leaves is used in the treatment of bronchitis, which Indians take by mixing it with cardamom or lemon juice. All three of these systems of medicine have been around since ancient times and are based on natural remedies, which primarily consist of herbs and plants.

Snake and Insect Bites

Basil oil is rich in natural antiseptic and anti-inflammatory properties, making it extremely useful in treating infections and inflammation-related problems. Compounds like eugenol present in its oil help in destroying bacteria when applied to the skin and protect against infection of wounds. This is the reason why basil is used in traditional medicine to treat wounds, burns, insect bites and inflammation on the skin. Basil has been considered poisonous in ancient medical traditions. Even in fatal situations like snake bites, all parts of the basil plant — leaves, stems, seeds — are ground or mixed with other medicinal plants and applied to the cut area by making a paste, which helps in reducing the effect of the venom. Also, basil is also swallowed, which helps in reducing the effect of poison inside the body. Thus basil is also recognized as a traditional anti-poison medicine.

Nutrition Value

Tulsi is a highly nutritious and medicinal herb, which not only provides the body with the ability to fight diseases, but its nutritional elements also play an important role in maintaining health. The vitamins and minerals found in it make it a complete *herbal tonic*. Nutritional information (in 100 grams of basil leaves):

Calories (energy) – about 30 kcal, Protein – 4.2 g, Fat – 0.5 g, Carbohydrates – 2.3 g, Calcium – 25 mg, Phosphorus – 287 mg, Iron – 15.1 mg Vitamin C – about 25 mg, chlorophyll and phytonutrients – abundant, zinc, magnesium, manganese, potassium – present in small amounts

Phytochemical Constituents

Tulsi is a medicinal plant with a highly complex chemical composition, which contains many nutrients and biologically active compounds. The amount of these compounds can vary not only in different species of basil, but also between plants growing in the same field. Additionally, the proportion of these components also depends on the method of cultivation, the time of harvesting, the process of processing and storage conditions, which to date have not been fully scientifically understood. The traditionally used medicinal and nutritional properties of Tulsi are the result of the synergistic interaction of various active compounds. For this reason, the overall effects of basil cannot be fully reproduced through just one isolated compound or extract. This botanical and biochemical complexity of basil remains a challenge to modern science even today, and its standardization has not yet been possible.

The volatile oil of basil leaves mainly contains compounds such as eugenol (1-hydroxy-2-methoxy-4-allylbenzene), eugenol, urosolic acid, carvacrol, linalool, limatrol, caryophyllene, and methyl carvicol (also known as astragol). At the same time, the volatile oil of basil seeds contains fatty acids and sitosterols. The mucilage of the seeds contains some amount of sugars, while anthocyanins are found in the green leaves. The sugars found in basil are mainly made up of xylose and polysaccharides. Basil is considered a general tonic and can increase physical stamina, but it does not contain caffeine or any other stimulants.

The stems and leaves contain bioactive components such as saponins, flavonoids, triterpenoids, and tannins, which can produce various pharmacological effects. Additionally, several phenolic compounds have also been identified in basil, which have anti-inflammatory and antioxidant properties. Prominent among them are rosmarinic acid, apigenin, sircimaritin, isothymucin and isothymonin. Tulsi has been found to contain two important water-soluble flavonoids — orientin and visenine — that are known to be able to provide protection against radiation-induced chromosomal damage, especially in human blood lymphocytes.

Antioxidant - The polyphenol "rosmarinic acid" found in the chemical composition of basil is an extremely effective antioxidant. This compound protects against cellular damage caused by free radicals present in the body. Free radicals can damage the structure of the body's cells, leading to problems such as inflammation, old age, heart disease, cancer, etc. over time. Rosmarinic acid preserves cells by blocking this process of oxidation. When there is excessive oxidative stress in the body during the process of oxygen metabolism, it can damage cell membranes, proteins, and DNA. Rosmarinic acid interferes with this process by inactivating the activity of free radicals and reducing oxidative stress. Thus this compound helps in maintaining cellular health. (Simmons and Frederick 1998).

Antibacterial – Basil contains several important biological components, including antibacterial ingredients like carvacrol and terpenes. In addition, sescuterpene B-caryophyllene also possesses antibacterial properties and is recognized as a food additive approved by the FDA. These compounds are helpful in protecting the body from disease-causing bacteria. In terms of anti-inflammatory properties, rosmarinic acid is not only a powerful antioxidant but also an effective anti-inflammatory. The paganin found in basil also plays an important role in reducing inflammation. But the most prominent anti-inflammatory ingredient in basil is eugenol, which is also helpful in controlling blood sugar levels in the body. Eugenol enhances the function of the beta cells of the pancreas, thereby improving the secretion of insulin and resulting in balanced sugar levels.

Adaptogenic – Basil is an excellent adaptogenic plant, which regulates recurrent mood swings and provides peace of mind and clarity. The eugenol and caryophyllene found in the chemical formula of basil are the major adaptogen agents, which are extremely effective in reducing the levels of the stress-enhancing hormone corticosterone in the body. Corticosterone is considered one of the leading causes of stress. Additionally, these compounds are helpful in improving memory and reduce the risk of mental problems associated with aging. The ursolic acid and oleanolic acid found in basil also have adaptogenic effects and play an important role in reducing stress levels. (Gavin 2001).

Immuno-modulator – The body needs to have immuno-modulators that stabilize, restore and balance the immune system. Tulsi has excellent immune-boosting properties, enabling the body to fight off external harmful elements such as bacteria, viruses, germs, and allergens. Thus, basil maintains the overall immune balance in the body and improves health. (Chatterjee, 2001)

CONCLUSION

Tulsi, despite being a small plant, is a wonderful source of medicinal properties, which is considered essential for a more peaceful life. It has been proven through scientific researches that the consumption of Tulsi in any form is safe and its medicinal properties have been fully accepted by modern science. Tulsi is extremely beneficial for human health, especially in today's fast-paced and stressful lifestyle, hence it is called the king of herbs of India. Tulsi is widely used in Ayurveda, as it not only has medicinal properties, but it also strengthens the immune system. Tulsi is grown in almost all Indian homes and the water filled with its leaves is useful for relieving a sore throat, as well as it can be used to rinse. Chewing basil leaves provides relief in colds and coughs. Eating basil leaves in the morning purifies the blood. Dried basil leaves can be mixed with water and used as a toothpowder, which protects the entire respiratory system. Many of the medicinal properties of basil are also useful as a home cleanser and provide relief in the itching of the body. It is also helpful in controlling dandruff, especially when basil oil is used by mixing it with coconut oil. Mixing the juice of basil leaves and ginger juice provides relief from stomach irritation, cramps and stomach worms.

Thus, Tulsi is not only a medicinal plant, but it is also an important part of many traditional and home remedies, which are helpful in keeping human life healthy and empowered.

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