



A review on Indian holy plant tulsi (*Ocimum sanctum*) and its medicinal uses

Aryan Sareen

**Department of Pharmacy,
Shree dev bhoomi Institute of Education, Science and
Technology
Dehradun**

ABSTRACT

Tulsi, which is also known as *ocimum sanctum* and holy basil, belongs to the family Lamiaceae. It is a widely known medicinal plant in India which has various medicinal and religious properties. It is also known as Vishnu priya, which means beloved of Lord Vishnu. It has been used for centuries and is derived from Sanskrit.

It has a lot of uses, mainly because it has a wide range of action on human body and all of the parts of the plant can be used. This sacred herb can be recommended for the treatment of skin diseases, arthritis, inflammation and lower the risk of cancer. Tulsi, also called as the queen of herbs, is also known for its ability to relieve stress, anxiety and induce relaxation.

It is commonly used for its antioxidant, antidiabetic, antimicrobial, anti-inflammatory pharmacological actions which are all present in the plant. It is one of the most important Ayurvedic plants. It consists of phytochemicals like tannins, glycosides, saponins, phenol. The holy plant is also found in China, Sri Lanka, Malaysia and Thailand. It can also be used to cure back pain, hiccup, viral infections, stomach diseases and urinary disorders.

Hence it is a renowned traditional plant which makes it more beneficial to use because of its popularity and various uses.

KEYWORDS: Vishnupriya, Antioxidant, Traditional, Ayurvedic, Renowned

SIGNIFICANCE STATEMENT

The manuscript describes the pharmacological activities and uses of Tulsi. We found that tulsi is a very

important plant and has a great future scope for treatment of diseases. We believe that these findings will be interesting to the readers.

DATA AVAILABILITY STATEMENT

My data is not in a repository.

All of my data can be shared openly.

All of the original data that has been used in my research has been included in the references of the manuscript.

The authors declare that all the data supporting the findings of this study are contained within the paper.

ACKNOWLEDGEMENTS

I would like to thank my supervisor Mrs. Santoshi Shah for guiding me and helping me throughout the process.

INTRODUCTION

Tulsi (*Ocimum sanctum* L.), also known as Tulasi in Sanskrit (holy basil in English) is a highly prize culinary and medicinal herb belonging to the Lamiaceae family. It is native to the Indian subcontinent and has been used in Ayurvedic medicine for more than three millennia. Traditionally known for its medicinal benefits, Tulsi is available in two types: Black Tulsi, or Krishna Tulsi, and Green Tulsi, or Ram Tulsi. Eugenol is an essential oil found in Tulsi, as well as compounds such as thymol, ursolic acid, etc.^[1] Tulsi plant is very important for humanity. Due to the complex restorative benefits it provides, Tulsi leaves are widely used in the preparation of Ayurveda recipes. It has been proven to prolong life span. Extricates obtained from the plant are commonly used in the treatment of various diseases, such as the common cold, irritation, indigestion, coronary disease, migraine, stomach problem, kidney stone, heart problem, and many more. Indian basil Tulsi helps in decontamination of the environment. Phytochemicals found in this medicinal plant are a rich source of secondary metabolites. The chemical and taxonomic diversity of these compounds is very high and their function is unclear. There are a large number of Phytochemicals that are widely used in human therapy and in agriculture, veterinary medicine, various scientific research and in various fields, as well as inhibitory effects in vitro on all species of microorganisms.

Tulsi leaves are utilized extensively due to their capacity to promote wellness. It greatly helps with memory because it stimulates the senses. The herb tulsi is known to help with respiratory issues. The mixture of honey, ginger, and tulsi leaves is a very good remedy for bronchitis, the flu, and asthma. Tulsi also lowers cholesterol in the blood and maintains a healthy heart.^[2] Eugenol possesses antioxidant properties and inhibits lipid peroxidation.^[3]

Tulsi was acknowledged by ancient sages as a rejuvenating adaptogen and antistress agent, having the potential to improve longevity and overall health. The leaves, seeds, and roots of the Tulsi plant have all been used for their medicinal qualities in traditional Ayurvedic medicine. The leaves of the medicinal plant Tulsi are extremely

beneficial for sore throats. Simply heat the tulsi leaves in water and have the patient swish with this decoction. Tulsi can help to strengthen the kidneys. Tulsi leaf extracts with 70% ethanol have demonstrated substantial drops in blood glucose levels in rats that are healthy with diabetic rats and elevated blood glucose from glucose feeding brought on by STZ [4-5].

For those suffering from renal kidney stones, a decoction prepared by combining the juice of Tulsi leaves with nectar, when taken consistently for six months, can remove these stones from the urinary tract.

Tulsi has a huge range of therapeutic qualities [6-7]. In the past 20 years, numerous studies, particularly by Indian scientists and researchers, have been conducted to demonstrate this plant's benefits. [8-11]

Over the past few decades, a number of studies conducted by Indian scientists and researchers have suggested the potential therapeutic benefits of *ocimum sanctum* L. and the role of essential oils and eugenol. Numerous pharmacological studies using eugenol and steam-distilled, petroleum ether, and benzene extracts of various Tulsi plant parts have established the plant's therapeutic potential. Tulsi's well-established medicinal properties have led to its descriptions in Ayurveda as Kaphaghna (a suppressant herb) and Sashemani Shwasaharani (an antiasthmatic). [12-14]

Tulsi is beneficial to the heart, aids in digestion, eases coughing, and lessens breathing problems. According to ancient writings by Charaka and Susruta, it has also been used to treat scorpion stings and snake bites. As a result, every portion of the plant has a purpose. Based on conventional wisdom, people continue to use various parts of this plant to treat a variety of illnesses.

But in the world of modern science, these kinds of claims need to be supported by evidence. While scientific research is being done on the ancient traditional claims regarding the medicinal properties of Tulsi, most of the studies are restricted to in vitro and experimental animal models.

Human subjects are used in very few studies. Consequently, an attempt has been made to review.

MAIN TEXT

TULSI MYTHOLOGY AND HISTORY

Tulsi means "one that is incomparable or matchless" in Sanskrit. The ancient Rushi recognized tulsi as one of the most exceptional medicinal herbs a millennium ago. They discovered that the plant was deemed a god and that it was beneficial to health and healing. The herb tulsi has a mythological past. Lord Krishna, a reincarnation of Lord Vishnu, is said to have loved Tulsi.

Subsequently, Tulsi was recognized as one of the eight essential components of any Vedic worship ceremony, guaranteeing that every home and temple had a Tulsi bush nearby. The most revered and honored herb, tulsi, is still planted in the courtyards of the majority of Indian homes. [15]

A Hindu family is often found to have planted Tulsi in their garden as it is believed that Lord Vishnu resides in the house that houses a Tulsi plant. It is worshipped for its might and disease, poverty, ailment and any kind of suffering is kept away from a family that has grown a Tulsi in its premises.

It keeps away insects and bacteria, thus defending the body against germs and diseases. Thus, regular consumption of Tulsi leaves in tea or other food items is proven beneficial for strengthening one's immunity agents external infectious agents.

MORPHOLOGY

The Tulsi plant yields long flowering racemes that are grouped closely in whorls. The hue of these flowers is purple. giving the plant a splash of color. Tulsi seeds are tiny and have a radishes-like yellowish color. Additionally, the plant yields small-sized fruits. Tulsi is usually planted in the aftermath of the rainy season because it needs moisture to grow. It takes several months to cultivate and care for it before it is ready for harvest.

Tulsi is a small shrub that spreads out and grows upright. At maturity, it usually grows to a height of between 30 and 60 cm. The plant's leaves have a pleasing scent and a straightforward structure. The leaves are shaped like ellipses with rounded tips, and they are arranged in an opposite pattern along the branches. The leaf margins are dentate, or toothed. The leaves range in length from 1 to

5 cm on average. In India and Nepal, two morphotypes are mainly cultivated—green leaved and purple leaves.^[16]

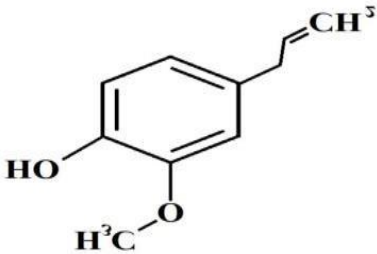

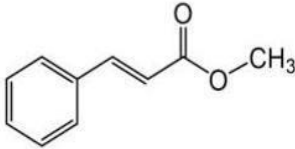
BOTANICAL CLASSIFICATION

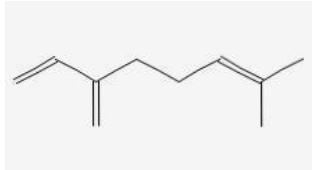
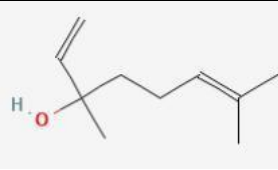
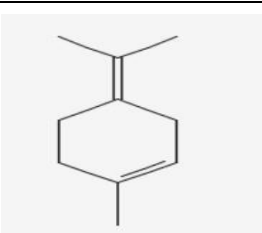
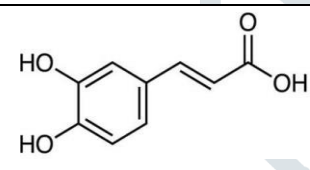
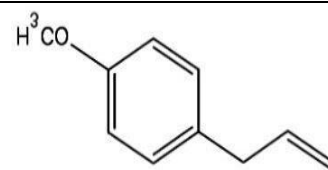
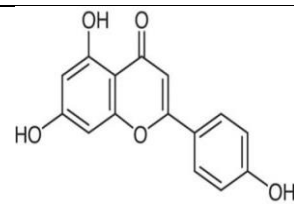
Taxonomic Rank	Taxon
Class	Magnoliopsida
Kingdom	Plantae
Genus	Ocimum
Species	Ocimum Basilicum
Order	Lamiales
Family	Lamiaceae
Division	Magnoliophyta



FIGURE NO.1-RAMA TULSI

CHEMICAL CONSTITUENT

CONSTITUENT	USES
 <p style="text-align: center;">EUGENOL</p>	<p style="text-align: center;">ANTISEPTIC</p>
 <p style="text-align: center;">CAMPHOR</p>	<p style="text-align: center;">ITCHING</p>
	

<p>METHYL CINNAMATE</p>	<p>PROTECTS THE SKIN</p>
<p></p> <p>MYRCENE</p>	<p>DIABETES</p>
<p></p> <p>LINALOOL</p>	<p>ANXIETY</p>
<p></p> <p>TERPINOLENE</p>	<p>ANTI OXIDANT</p>
<p></p> <p>CAFFEIC ACID</p>	<p>ANTI OXIDANT</p>
<p></p> <p>METHYL CHAVICOL</p>	<p>PAIN, STRESS</p>
<p></p> <p>APIGENIN</p>	<p>ANTI VIRAL</p>



MEDICINAL PROPERTIES

- Ginger juice, honey, and Kali mirch are used to treat colds and coughs.
- Because it has antibacterial properties, it is utilized in the production of numerous skin ointments and cosmetics.
- It has antibacterial, antiviral, and antiseptic properties.
- Tulsi has antioxidant properties and reduces blood glucose levels
- Stomach poisoning against "malarial larvae" is demonstrated by its oil.
- It is also used to treat headaches, malaria, common colds, coughs, and stomach problems.
- According to Ayurveda, Tulsi's arrangements can be used for indigestion, intestinal parasites and constipation.^[19]
- It possesses immunomodulatory qualities and serves as an insect repellent. Thus, grains are frequently stored in it.
- Beta-Ursolic acid, a substance found in tulsi, may one day be utilized as an anti-fertility medication.

MECHANISM OF ACTION OF TULSI

The tulsi plant contains a variety of constituents in its different parts, including flavonoids, triterpenoids, saponins, and tannins. Eugenol is found in the volatile oil found in the leaves. Certain constituents have demonstrated a pivotal role in the management and cure of diseases by modulating various biological activities. The following is a description of tulsi's mode of action for managing illness curing: A greater concentration of reactive oxygen produces oxidative stress and damages macromolecules, which leads to pathogenesis. Tulsi plant's antioxidant activity, on the other hand, neutralizes free radical potentiality; the plant also scavenges free radicals. Scavenging free radicals is the main method by which tulsi protects against cellular damage. Furthermore, extracts with concentrations of 100 µg/ml exhibited hydrogen peroxide (20.12%), hydroxyl radicals (12.68%), and superoxide radicals (21.68%) scavenging activity, according to methods for scavenging these three types of radicals.

Tulsi functions as an anti-inflammatory and may help lower inflammation by modifying different genes. Antibacterial drug resistance is a serious health issue that requires a solution. A natural compound has a major part in stopping the growth of bacteria or killing them by breaking their cell walls. The tulsi plant has demonstrated anti-gonorrhoeal efficacy against clinical isolates of methicillin-resistant *Staphylococcus aureus* that produces beta-lactamase against bacteria.^[20]

USES OF TULSI

INSECT BITES

The herb is a preventive, curative, and prophylactic measure for insect bites or stings. After several hours, another teaspoonful of the leaf juice is taken. Applying fresh juice to the affected areas is also necessary. In the event of insect and leech bites, a paste made of fresh roots is also useful.²²

TEETH DISORDERS

Teeth disorders can benefit from the herb. Its leaves can be used to brush teeth after being sun-dried and powdered. It can also be used as toothpaste by combining it with mustered oil to form a paste. This works wonders for massaging the gums, preventing bad breath, and preserving dental health. Additionally, it helps with pyorrhea and other dental conditions.

SKIN DISORDERS

When applied locally, ringworm and other skin conditions can be effectively treated with basil juice. Several naturopaths have also successfully treated leucoderma with it.

EYE DISORDERS

A vitamin A deficiency is typically the cause of night blindness, which can be effectively treated with basil juice. Every night before bed, two drops of black basil juice are applied to the eyes.

MOUTH INFECTIONS

When it comes to mouth infections and ulcers, the leaves are quite effective. Chewing on a few leaves can treat these ailments.

STRESS AND HEADACHES

Basil leaves are thought to be an anti-stress or adaptogen. According to recent research, the leaves provide a considerable level of stress protection. Chewing 12 leaves of basil twice a day can help reduce stress in even healthy individuals. It helps prevent several common elements and purifies blood. A good headache medication is made from basil. For this disorder, a decoction of the leaves may be administered. Applying a mixture of ground leaves and sandalwood powder to the forehead can relieve heat, headaches, and induce a cooling sensation.

HEART CONDITIONS

Basil can help with heart disease and the weakness that comes with it. It lowers blood cholesterol levels.^[24]

ILLNESSES IN CHILDREN

Basil leaf juice works well for common pediatric issues like fever, diarrhea, vomiting, and coughing colds. Taking basil leaves with saffron will speed up the appearance of chicken pox pustules if they are delayed.^[25]

KIDNEY STONE

The kidneys are strengthened by the effects of basil. If taken consistently for six months, the juice of basil leaves and honey will help the urinary tract expel kidney stones.

TULSI IN OUR HOME

Similar to other herbs, tulsi is a tasty way to add flavor to food or brew a great cup of tea. The holy herb is a very low maintenance shrub that is safe for animals to eat. It also has an eye-catching decorative plant appearance. Whether you use it as a daily spice or in your garden, the tulsi plant is a great addition to your home.

PHARMACOLOGICAL ACTIVITIES

ANTI STRESS ACTIVITY

Stress is a widespread disorder that most people experience on a regular basis. It is defined as people's physiological, psychological, and behavioral reactions when they experience an imbalance between their capacity to satisfy their deficiencies and their own shortcomings. Lack of neurotransmitters like dopamine, norepinephrine, and serotonin causes stress reactions. According

to earlier research, *Ocimum sanctum* leaves increase serotonin levels in the brain, which has a protective effect against stress-related behaviors.

Tulsi is a calming herb that works well, especially when taken twice a day. The stress hormone cortisone, which is inhibited by Tulsi leaf extraction, stimulates both acute and chronic noise stress. Additionally, this effect is verified by using animals in experiments or by investigation. High levels of stress damage the body and increase the risk of many illnesses, including immune suppression, peptic ulcers, ulcerative colitis, hypertension, and psychiatric disorders. For these reasons, stress needs to be treated. Stress can have physiological or physical effects. Tulsi enhances memory, lengthens anoxic stress tolerance, and lowers hypoxia.

ANTIOXIDANT ACTIVITY

The antioxidant activities were compared with standard antioxidant ascorbic acid. It simply means not allowing oxidizing chain reactions to occur, which inhibits other molecules' ability to oxidize and release energy to power biological processes. Numerous living things require oxidation. A number of diseases can be caused by free radicals, which are molecules with one or more unpaired electrons that react with other molecules by donating or stealing electrons. These chemicals are extremely reactive and unstable, and they harm cells irreversibly. According to earlier research, the body's free radicals cause a variety of disorders by altering and developing cells. Antioxidants found in a variety of herbal medicinal plants, however, may be able to control this.

Around 80% of people on the planet rely on medicinal plants to supplement their current medical needs. The primary components of life are membrane lipids, proteins, DNA, and carbohydrates; reactive oxygen species have the ability to destroy these. For this reason, a number of illnesses, including diabetes, atherosclerosis, cancer, and liver cirrhosis.

Antioxidants, therefore, shield the human body from free radicals that damage liver microsomes, increase the activity of superoxide dismutase, and inhibit lipid peroxidation by preventing the destruction of reactive oxygen species. The standard antioxidant ascorbic acid is used to compare the antioxidant activities primarily. Some of the studies used a qualitative preliminary phytochemical analysis to identify tannin, steroids, alkaloids, flavonoids, and phenols.^[26]

ANTI BACTERIAL ACTIVITY

This amazing plant contains two antibacterial agents: terpene and carvacrol. The same purpose is likewise served by sesquiterpene B-caryophyllene. This ingredient, which is found naturally in tulsi, is a food additive approved by the FDA. It aids in protecting the body against disease-causing bacteria.

Apart from being an antioxidant, rosmarinic acid is also a good source of anti-inflammatory properties. Another substance in the mixture that has the same purpose is pegenin.

ADAPTOGENIC

Tulsi's adaptogenic qualities make it an ideal remedy for lowering volatile emotions and encouraging mental clarity and calmness. Eugenol and caryophyllene are the two most inactive adaptogens found in tulsi's chemical composition. These are incredibly effective at lowering corticosterone levels, which are the primary cause of stress.

It also enhances memory and lessens the chance of age-related mental health problems. As adaptogens, ursolic acid and oleanolic acid are both very good at lowering stress levels.^[27]

IMMUNOMODULATOR

The immune system must have an immune-modulator in order for the body to stabilize, replenish, and maintain a healthy, balanced immune system. Tulsi's potent immune-boosting properties protect the body from foreign invaders such as viruses, bacteria, allergies, and pathogens while preserving the body's overall balance.^[28]

ANTI DIABETIC ACTIVITY

In streptozotocin-induced diabetic rats, ethanolic extract of *O. Sanctum* Linn decreased the blood glucose, glycosylated haemoglobin and urea with a concomitant increase in glycogen, haemoglobin and protein, respectively. The extensive spectroscopic data analysis reveals that the isolated bioactive compound is elucidated as a tetracyclic triterpenoid. Various species of *Ocimum* were explored and compared for antidiabetic activity. All extracts were able to show antidiabetic activity at 0.5 mg/Kg concentration. The activities are well comparable with the standard drug, glibenclamide. The Methanolic extract of OS showed better antidiabetic activity than other species of *Ocimum* and standard drugs. The data were verified as statistically significant using one-way ANOVA at a 5% significance level ($p < 0.05$).^[29]

A randomised, placebo-controlled cross-over single-blind trial was performed on 40 human volunteers with Type II steroids diabetes. During the four-week trial, subjects alternately received a daily dose of 2.5 g of Tulsi leaves powder or a placebo for two-week periods.

The results showed a 17.6% reduction in fasting blood glucose and a 7.3% decline in postprandial blood glucose on treatment with Tulsi as compared to the blood glucose levels during treatment with placebo.

ANTI ALZHEIMER'S ACTIVITY

Alzheimer's disease is a neurodegenerative condition that primarily results in mood swings, behavioral abnormalities, and cognitive impairment. Alzheimer's disease typically involves dementia; globally, between 17 and 25 million people are estimated to be affected by dementia, which affects 70% of people living in industrialized nations. While there is no known cure for Alzheimer's disease, there are treatments that can lessen some of its symptoms and restore cholinergic function.

According to the review literature, memantine and donepezil medications worsen cognitive impairment in patients with Alzheimer's disease, and they do not improve memory after two clinical trials. As a result, nootropic herbal remedies can strengthen the effects of another anti-Alzheimer's medication. By inducing neuronal death, oxidative stress is another major factor contributing to Alzheimer's disease. The majority of nootropics have an antioxidant effect against Alzheimer's disease.

The primary component of OS, eugenol, has antioxidant activity. Other secondary components include flavones

with pharmacological qualities and fixed oils. The main active ingredient in *O. basilicum* that gives tulsi its medicinal properties is eugenol. Additionally, in rodents, the standardized extract of OS has statistically alleviated the ischemia reperfusion-enhanced oxidative stress and chronic hypoperfusion-enhanced cognitive impairment.

Holy basil has been shown in models of cerebro-degenerative diseases to have memory-enhancing and antioxidant properties. As was already mentioned, oxidative stress and cognitive impairment are linked to Alzheimer's disease. Utilizing neurotoxins like colchicine and ibotenic acid as models, the effect of OS in Alzheimer's disease was evaluated. Ibotenic acid, a structural analogue of glutamate, excites glutamate receptors excitatorily, which causes neuronal enhance necrosis.

ANTI EPILEPTIC ACTIVITY

The word "seizures" refers to the brain's neurons firing, which results. Epilepsy is a common chronic neurological disease that is second only to stroke in terms of prevalence. This disease affects 40 to 60 persons per million annually (98, 100). Thirty percent of the population did not significantly respond to treatment, while between sixty and seventy percent of the population responded favorably to antiepileptic medication. Investigating medications with the best antiepileptic properties and the fewest side effects is crucial, though.

The ethanolic extract of holy basil leaves improves brain neuronal functions, which helps lessen epilepsy symptoms. In order to reduce the T-type Ca^{2+} current in the thalamus, OS extract acts by blocking N-methyl-D-aspartate receptors, which in turn blocks voltage-gated Na^{+} channels. Additionally, the medication affects gamma-aminobutyric acid's (GABA) agonistic potential. Furthermore, OS prolongs the duration of phenobarbitone-enhanced sleep.

The drug has an effective antiepileptic property, as evidenced by the positive reactions against disease and the defensive action that ethanol and chloroform extractives of Holy Basil's stem, leaf, and stem calli hold against tonic hind limb extension (THLE), according to the databases that are currently in place.

ANTIPLASMODIAL ACTIVITY

In a 2012 study on three different species of *Ocimum*, Inbaneson et al. found that extracts from the leaves, roots, stem, and flowers of OS exhibited good antiplasmodial activity. The ethanolic extracts of the tested plants may contain alkaloids, glycosides, flavonoids, phenols, saponins, triterpenoids, proteins, resins, steroids, and tannins, which could account for the in vitro antiplasmodial activity.^[30]

ANALGESIC ACTIVITY

In 1995, Singh and colleagues investigated the analgesic properties of fixed oil derived from the seeds of *Ocimum sanctum* (OS) in mice and rats. The study employed various techniques such as tail flicking, tail clipping, tail immersion, and acetic acid-induced writhing. It was discovered to be efficacious in a dose-dependent manner against writhing induced by acetic acid, indicating that the oil's ability to inhibit writhing is peripherally mediated by the combined inhibitory effects of prostaglandins, histamine, and acetylcholine.^[31]

ANTI ASTHMATIC ACTIVITY

A 50% aqueous ethanol extract of both fresh and dried leaves, along with the volatile and fixed oils of OS, were tested against preconvulsive dyspnea (PCD) in guinea pigs that was induced by histamine and acetylcholine. The guinea pigs were considerably shielded from histamine and acetylcholine-induced pre convulsive dyspnea by the 50% ethanol extract, volatile oil extracted from fresh leaves, and fixed oil from the seeds. Nevertheless, the guinea pigs' resistance to histamine-induced preconvulsive dyspnea was not maintained by the 50% ethanol extract of dried leaves.^[32]

ANTI ULCER ACTIVITY

In Wistar rats, the aqueous extract of *Ocimum sfântum* (100 mg/kg and 200 mg/kg orally) showed a noteworthy protective effect against ethanol-induced gastric ulceration. By increasing the gastric mucosa's antioxidant potential and thereby lowering mucosal damage, OS demonstrates antiulcer activity.^[33] When given intraperitoneally, the fixed oil of OS exhibits strong antiulcer activity against rats' ulcers caused by stress, aspirin, indomethacin, alcohol (ethanol 50%), histamine, reserpine, and serotonin. The antiulcer activity of the fixed oil was attributed to its lipoxygenase inhibitory, histamine antagonistic, and antisecretory properties.^[34]

ANTI FERTILITY ACTIVITY

The total sperm count, sperm motility, and forward velocity of albino rats treated with a benzene extract of *Ocimum sanctum* leaves (250 mg/kg body weight) for 48 days were all reduced. The findings imply that these effects are the result of androgen deprivation brought on by OS leaves' anti-androgenic characteristics. Two weeks after the treatment was stopped, all parameters went back to normal, indicating that the effect was reversible.

The number of sperm in rabbits was observed to have significantly decreased. When OS-treated rabbits received 2 g fresh leaves per rabbit for 30 days, their serum testosterone levels increased significantly and their FSH and LH levels decreased significantly. The findings point to OS's possible application as a reliable male contraceptive method.^[35]

TABLE- Parts of tulsi and extracts used for pharmacological activities

PHARMACOLOGICAL ACTIVITY	PART OF PLANT	EXTRACT USED
Anti depressant activity	leaves	Alcoholic extract
Anti anxiety activity	leaves	Alcoholic extract
Anti plasmodial activity	leaves	Alcoholic extract
Anti fertility activity	leaves	Benzene extract
Anti fungal activity	leaves	Essential oil
Anti helminthic activity	leaves	Essential oil
Anti convulsant activity	stem	Chloroform extract
Eye disease	leaves	Leaf juice
Stimulant/Expectorant	leaves	Leaf juice
Piles	seeds	Fixed oil
Anti ulcer	seeds	Fixed oil
Anti inflammatory activity	Whole plant	Alcoholic extract
Anti oxidant activity	Whole plant	Alcoholic extract
Anti tussive	Areal parts	Aqueous extract
Cardio protective	Whole plant	Fixed oil
Anti stress	Whole plant	Alcoholic extract

LITERATURE REVIEW

Majumdar *et al.*,(2023) This study shows that Tulsi contains essential oils such as eugenol, as well as other compounds like thymol and ursolic acid [2]. Eugenol possesses antioxidant properties and inhibits lipid peroxidation. Extracts of Tulsi leaves containing 70% ethanol have shown significant decreases in blood glucose levels in normal rats, rats with high blood glucose due to glucose feeding, and diabetic rats induced by STZ.

Rao *et al.*,(2023) Unquestionably, this tiny plant is a fantastic source of healing abilities. It has been proven and confirmed from top to bottom and via research that consuming tulsi in any structure is safe. Present-day science respects and acknowledges all of these medical qualities. Tulsi is a herb that protects people from all risks, even those inherent in today's superficial and unsatisfactory way of life.

Chaudhary *et al.*,(2022) The article shows proof that Holy Basil leaves are widely used due to their healing power. The plant helps remove phlegm and catarrhal matter from the bronchial tube. The plant helps to prevent stomach disorders. This herb helps to cure respiratory diseases. The mixture of honey, ginger and Tulsi leaves in the form of decoction is helpful in bronchitis, influenza and asthma.

Radhakrushna *et al.*,(2022) All these medicinal ingredients make Tulsi very important holy basil for longer and peaceful life. It has high traditional value in Hindu as well as other societies. This small plant is certainly a very good source of medicinal properties. Tulsi is appraised as the “Queen of Herbs” on account of its diverse curative abilities & mythological values. Tulsi has indeed an ample range of benefits which is traditionally believed and scientifically proven.

Gulhane *et al.*,(2021) All the part of this plant have its own important in Ayurveda and Siddha systems of medicine. Plant has many pharmacological actions such as anti-diabetic, anticancer, anti-arthritic, wound healing, anti-inflammatory, antiviral, antifungal, antioxidant, anti-asthmatic, antipyretic, memory enhancer, anticoagulant antiulcer. This review article give the information on synonyms, chemical constituents, uses and pharmacological actions of *Ocimum sanctum*.

Satyendra *et al.*,(2021) Not only the *Ocimum sanctum* possess general medicinal properties but is also found efficient as an important constituent predicted to stop the protease of SARS-CoV-2. The natural phyto-constituents present in *O. sanctum* is used a remedial option for Global pandemic COVID-19. Many commercial Ayurveda products are also available to boost the immunity of humans with *Ocimum* as a main component.

Sethi *et al.*,(2020) Experiments show that Tulsi leaves are broadly utilized because of their recuperating power. It is a tonic for the sensory system and in this manner helps a lot in honing the memory. This fragrant plant underpins the evacuation of mucus and catarrhal issue from the bronchial cylinder. It additionally does something amazing in forestalling stomach issue. The herb Tulsi is known to fix the respiratory issues.

Ghosh *et al.*,(2020) The study has evidence that *O. baselicum* minimizes the inflammation, reduces the noxious effect of free radicals and also protects the nerves and tissues; hence it is recognized as a good anti-inflammatory and antioxidant drug. They enhance the elimination of the mucous layer and phlegm from

the bronchial tube. As mentioned, this herbal drug possesses a greater extent of medicinal properties against various diseases.

Sethi *et al.*, (2018) The explored examinations strengthen customary uses and propose tulsi is a viable treatment for way of life related constant maladies including diabetes, metabolic condition, and mental pressure. Further examinations are required to investigate instruments of activity, explain the dose and portion structure, and decide the populaces well on the way to profit by tulsi's helpful impacts.

Mahamood *et al.*, (2018) It is observed from various scientific studies that Tulsi protects from many modern and traditional health-related disorders like radiation, stress, cancers, diabetes, aging, various infections not only in mankind but also in animals and plants. It enhances the immune system to adopt in any environment as adaptogen. It has many vital properties such as anti-stress, anti-cancers, anti-oxidants, anti-inflammatory, anti-microbial, anti-radiation, insecticidal, insect repellent, flavoring, coloring and many other uncountable properties.

Kulkarni *et al.*, (2018) This article concludes that Tulsi is known as Queen of herbs due to its matchless properties. In Ayurveda, it is used as home remedy for treating various diseases. It is investigated that various parts of this plant is used for its anti-inflammatory, ant-fertility, anti-bacterial, hepatoprotective and other therapeutic properties.

Shrinath *et al.*, (2016) Studies with tumor bearing mice have also shown that both Tulsi extract and its flavonoids selectively protect the normal tissues against the tumoricidal effects of radiation. Preclinical studies have also shown that the aqueous extract of the Tulsi leaves; its flavanoids orientin and vicenin, and eugenol, the principal nonpolar constituent present in Tulsi prevent radiation-induced clastogenesis.

Baseer *et al.*, (2016) The study compiles available scientific evidence to identify gaps required to be filled by future research and for the ethnobotanical claims. Traditional uses and scientific evaluation based findings indicate that *Ocimum sanctum* remains to be the most widely used herbal plant. *Ocimum sanctum* has been a good source of traditional medicine that provides a noteworthy basis in pharmaceutical biology and for the development/formulation of new drugs and future clinical uses.

Chandra *et al.*, (2016) It has been found that tulsi can protect organs and tissues against chemical stress from industrial pollutants and heavy metals, and physical stress from prolonged physical exertion, ischemia, physical restraint and exposure to cold and excessive noise. Tulsi have broad-spectrum antimicrobial activities which includes activity against a range of human and animal pathogens. It has been also recommended for use as a hand sanitizer, mouthwash, water purifier, wound healing, preservation of food.

Shanmugam *et al.*, (2016) The phytochemicals compounds of *Ocimum*, alkaloids, flavonoids, phenolics, essential oils, tannins and saponins play a important role in herbal medicine. Bioactive compounds of *Ocimum* responsible for its various medicinal properties and their effects at the molecular level need to be investigated in more detail. Furthermore, pharmacological properties of bioactive compounds in *Ocimum sanctum* are required to confirm the ethnomedicinal claims of *Ocimum sanctum* for pharmaceutical therapeutic applications.

Kumar *et al.*, (2013) The presence of multiple active principles consequently leads to the overall effects of Tulsi which cannot be fully duplicated by the use of purified active principle or with isolated compounds or extracts. They are involved in pharmacological activities against different disease conditions. Benzene as well as

diethyl ether and chloroform extracts; aqueous alcoholic extracts; acetone and methanolic extracts along with essential oils have been routinely used throughout world against various ailments.

Kadian *et al.*,(2012) The vast survey of literature showed that *Ocimum sanctum* has a huge spectrum of activities and antidiabetic, antioxidant, antistress, antihyperlipidemic and antibacterial properties.

Singh *et al.*,(2012) The nutritional and pharmacological properties of the whole herbs in its natural form, as it has been traditionally used, result from synergistic interactions of many different active Phytochemical. The main chemical constituent such as Eugenol, Urosolic acid, Carvacrol, Linalool, Caryophylline, Estragol, Rosmarinic acid, Apigenin and Cirsimaritin have been identified and extracted.

Pandey *et al.*,(2010) Tulsi is a popular home remedy for many ailments such as wound, bronchitis, liver diseases, catarrhal fever, otalgia, lumbago, hiccough, ophthalmia, gastric disorders, genitourinary disorders, skin diseases, various forms of poisoning and psychosomatic stress disorders. It has also aromatic, stomachic, carminative, demulcent, diaphoretic, diuretic, expectorant, alexiteric, vermifuge and febrifuge properties.

PLAN OF THE WORK

- **Collection of plant material**
- **Authentication of plant**
- **Air drying of plant material**
- **Comminution of plant material**
- **Extraction with help of polar and non polar solvent system**
- **Fractionation and sub fraction**
- **Phytochemical tests**
- **Chromatographic studies**

AND OBJECTIVE

AIM: To study the pharmacological activities and uses of Tulsi, also known as *Ocimum Sanctum* Linn.

OBJECTIVE:

1. To provide a comprehensive overview of the botanical characteristics of Tulsi (*Ocimum sanctum*) and its uses

in different cultures and countries.

2. To explore the phytochemical composition of Tulsi, emphasizing key bioactive compounds responsible for its pharmacological activities.

3. To systematically study existing literature on the antioxidant properties of Tulsi, assessing methodologies and summarizing key findings.

4. To investigate the immunomodulatory potential of Tulsi, summarizing studies on its impact on the immune system.

5. To conduct a comparative analysis of Tulsi's pharmacological effects with standard medications, highlighting potential advantages or limitations.

6. To summarize key findings, emphasizing the relevance of Tulsi's pharmacological activities in the context of modern healthcare.

CONCLUSION

Known by most as holy basil, *ocimum sanctum* contains a number of potentially beneficial phytochemicals with strong anti-tumor effects, including cancer. The treatment of colds, coughs, fevers of all kinds, including malaria and dengue, and respiratory conditions like bronchitis, asthma, and influenza that spread widely during specific seasons can all be effectively treated with *ocimum* extracts. Additionally, holy basil extracts have anti-inflammatory, anti-thyroid, anti-cancer, anti-diabetic, anti-oxidant, anti-microbial, and anthelmintic properties.

Tulsi juice can treat vascular and heart problems, eye conditions, and infections of the mouth and teeth. Additionally, it has radioprotective qualities and the ability to regulate the body's immunity levels. Therefore, research on this holy plant can be justified as having great medical value for the human community. Tulsi extract has antiviral properties that may help treat various viral diseases; these claims will need to be confirmed soon. Most likely, this review provides a good detail of properties.

LIST OF ABBREVIATIONS

Not applicable. REFERENCE

[1] Ghosh T. "Indian Medicinal Plant: Perpetual keys in medicinal field". Therapeutic Application of Potential Herbs, 1st Edition. Chapter 1 (2021): 1-12.

- [2] KP Sampath Kumar, Debjit Bhowmik, Biswajit, Chiranjib, Pankaj and KK Tripathi Margret Chandira., Traditional Indian Herbal Plants Tulsi and Its Medicinal Importance Research Journal of Pharmacognosy and Phytochemistry. 2010;2(2):103-108.
- [3] Sethi J., et al. "Evaluation of Hypoglycemic and Antioxidant Effect of Sanctum Ocimum". Indian Journal of Clinical Biochemistry 19.2 (2004): 152-155.
- [4] Chattopadhyay RR. "Hypoglycemic effect of Ocimum sanctum leaf extract in normal and streptozotocin diabetic rats". Indian Journal of Experimental Biology 31.11 (1993): 891-893.
- [5] Grover JK., et al. "Medicinal plants of India with anti-diabetic potential". Journal of Ethnopharmacology 81.1 (2002): 81-100.
- [6] Cragg GM , Newman DJ. Natural product drug discovery in thenextmillennium. Pharm Biol 2001;39:8-17.
- [7] Naquvi JK, Dohare LS, ShuaibM, AhmadIM. Chemical composition of volatile oil of Ocimum sanctum Linn.IntJ Biomedand advanced Res 2012;3:129-131.
- [8] Sarkar A, Pandey DN, Pant MC, 1990. A report on the effect of Ocimum sanctum (Tulsi) leaves and seeds on blood and urinary uric acid, urea and urine volume in normal albino rabbits. Ind. J. Physiol. Pharmacol. 34: 61-62.
- [9] Kumar A, Rahal A, Verma AK, 2011a. In-vitro antibacterial activity of hot aqueous extract (HAE) of Ocimum sanctum (Tulsi) leaves. Ind. J. Vety. Medicine. 31(2): 96-97
- [10] Sarkar A, Pandey DN, Pant MC, 1994. Changes in the blood lipid profile level after administration of Ocimum sanctum (Tulsi) leaves in the normal albino rabbits. Ind. J. Physiol. Pharmacol. 38: 311-312.
- [11] Mandal S, Das DN, Dey K, 1993. Ocimum sanctum Linn – A study on gastric ulceration and gastric secretion in rats. Ind. J. Physiol. Pharmacol. 37: 91-92.
- [12] Shah CS, Qadry JS, 1995. A text book of Pharmacognosy. B. S. Shah Prakashan, New Delhi (India), 11th ed., pp. 155-56.
- [13] Khanna N, Bhatia J, 2003. Antinociceptive action of Ocimum sanctum (Tulsi) in mice: possible mechanisms involved. J. Ethnopharmacol. 88(2-3): 293-296
- [14] Singh E, Sharma S, Dwivedi J, Sharma S, 2012a. Diversified potentials of Ocimum sanctum Linn (Tulsi): An exhaustive survey. J. Nat. Prod. Plant Resour. 2(1): 39-48

- [15] Bhateja Sumit, Arora Geetika. Therapeutic benefits of Holy Basil (Tulsi) in general and oral medicine: A Review. *Int. J. Cite Res. Ayur. Pharm.* 2012; 3(6):761- 764 DOI: 10.7897/2277- 4343.03611.
- [16] Sai Krishna. G, Bhavani Ramesh.T and Prem Kumar P.. "Tulsi" - the Wonder Herb (Pharmacological Activities of *Ocimum sanctum*)., *American Journal of Ethnomedicine*, 2014;1(1):089-095.
- [17] Deepika Gulati, Priyanka, Minakshi Pal, Nidhi, Iqbal. In vitro studies of the *Ocimum sanctum*: Tulsi, Medicinal herb., *American journal of pharmatech research*. 2015;5(6).
- [18] Ashok Kumar Sah, M. Vijaysimha, Md. Mahamood., The Tulsi, Queen of Green Medicines: Biochemistry and Pathophysiology A Review., *International Journal of pharmaceutical science review and research*,2018;50(2):106-114.
- [19] Singh S, Taneja M, Majumdar KD. Biological Activity of *Ocimum Sanctum* L.fixed oil-An Overview. *Ind J of Exp Biology*. 2007; 45:403-412.
- [20] Saleh A. Almatroodi et al., (2020). *Ocimum sanctum*: Role in diseases management through modulating various biological activities. Vol. 12(5), pp 1198- 205.
- [21] KP Sampath Kumar, Debjit Bhowmik, Biswajit, Chiranjib,Pankaj and KK Tripathi Margret Chandira., *Traditional Indian Herbal Plants Tulsi and Its Medicinal Importance Research Journal of Pharmacognosy and Phytochemistry*. 2010;2(2):103-108.
- [22] Sharma, P. Kulshreshtha, S; Sharma, A L. Anti-cataract activity of *Ocimum sanctum* on experimental cataract. *Indian Journal of Pharmacology*, v.30, n.1, 1998:16-20.
- [23] Puri, Harbans Singh (2002). *Rasayana: Ayurvedic Herbs for Longevity and Rejuvenation*. CRC Press. pp. 272- 280. ISBN 9780415284899.
- [24] Jyoti Sethi, Sushma Sood, Shashi Seth, and Anjana Talwar., *Evaluation of Hypoglycemic and Antioxidant Effect of Ocimum Sanctum*., *Indian Journal of Clinical Biochemistry*, 2004, 19 (2) 152-155.
- [25] Devi, P. Uma; Ganasoundari, A.. Modulation of glutathione and antioxidant enzymes by *Ocimum sanctum* and its role in protection against radiation injury. *Indian Journal of Experimental Biology*, v.37, n.3, 1999. March, 262-268.
- [26] Bhooshitha AN, Abhinav Raj Ghosh, Chandan HM, Nandhini HS, Pramod BR, KL Krishna., *Review on Nutritional, Medicinal and CNS Activities of Tulsi (Ocimum. Sanctum)*, *Journal of pharmaceutical science and research*, 2020;12(3):420-426

- [27] Flood, Gavin D. (2001). The Blackwell companion to Hinduism. Wiley- Blackwell. pp. 331. ISBN 9780631215356.
- [28] Chatterjee, Gautam (2001). Sacred Hindu Symbols. Abhinav Publications. pp. 93. ISBN 9788170173977 Simoons,pp.17-18.
- [29] Dr. Umme Amarah, Dr Laxmikanth Chatra, Dr Prashanth Shenai, Dr Veena K. M., Dr Rachana V. Prabhu and Dr Vagish Kumar., Miracle Plant -Tulsi, World Journal of Pharmacy and Pharmaceutical Sciences, 2017:6(1),2017:1567-1581
- [30] Inbaneson S.J., Sundaram R. and Suganthi P. (2012). In vitro antiplasmodial effect of ethanolic extracts of traditional medicinal plant Ocimum species against Plasmodium falciparum. Asian Pac J Trop Med. 5:103-106.
- [31] Singh S. and Majumdar K. D. (1995). Analgesic Activity of Ocimum sanctum and its Possible Mechanism of Action. Pharmaceutical Biology. 33:188-192.
- [32] Singh S. and Aggarwal S.S., (1991): Antiasthmatic & anti-inflammatory activity of ocimum sanctum. Int J of pharmacognosy. 29: 306-10.
- [33] Ghangale.G. R., Mahale T., and Jadhav N. D. (2009). Evaluation of Antiulcer Activity of Ocimum sanctum in Rats. Veterinary World.2: 465-466.
- [34] Pandey G. and Madhuri S. (2010). Pharmacological Activities of Ocimum sanctum (Tulsi): A Review. Int J of Pharmaceutical Sci Rev and Res. 5: 61-66.