

OCIMUM SANCTUM (HOLY BASIL): A COMPREHENSIVE REVIEW OF ITS IMMUNOMODULATORY AND ANTI-INFLAMMATORY PROPERTIES

Roshani Singh^{*1}, Sahil Srivastava²

¹Vijay Pharmacy College (Dept. of Pharmacy) Gulalpur, Jaunpur (U. P.), India.

²Shri Ram Institute of Technology- Pharmacy (Dept. of Pharmacology), Jabalpur (M.P.), India.

Article Received on 04 Sept. 2026,

Article Revised on 25 Sept. 2026,

Article Published on 01 Oct. 2026,

<https://doi.org/10.5281/zenodo.23032840>

*Corresponding Author

Roshani Singh

Vijay Pharmacy College (Dept. of Pharmacy) Gulalpur, Jaunpur (U. P.), India.



How to cite this Article: Roshani Singh^{*1}, Sahil Srivastava². (2026). Ocimum Sanctum (Holy Basil): A Comprehensive Review of Its Immunomodulatory And Anti-Inflammatory Properties. World Journal of Pharmaceutical Research, 15(19), 235–261.

This work is licensed under Creative Commons Attribution 4.0 International license.

ABSTRACT

Plants have played an important role in human healthcare and traditional medicine for thousands of years. Ocimum Sanctum is one of them. Ocimum Sanctum contains many active phytoconstituents like; Eugenol, Rosmarinic acid, Ursolic acid, Linalool and Epigenin. Ocimum Sanctum demonstrates remarkable potential in antioxidant, anti-inflammatory, antimicrobial and immunomodulatory. The immunomodulatory properties of tulsi have enhanced the body's natural defense mechanisms, while its anti-inflammatory properties may aid in reducing inflammation-associated disorders. These biological properties make tulsi a valuable natural remedy for maintaining health and preventing disease. Holy basil represents a promising natural resource for the development of herbal medicines and nutraceutical products. Holy basil also holds a

supreme place in the ancient Vedic scriptures and integrated into daily life by Hindus through religious worship. Holy Basil also used to treat skin disease like; acne, pimples, rashes, itching, etc. Holy basil has been used in Ayurvedic medicine for more than 3000 years. Overall, the growing scientific evidence supporting the therapeutic potential of Tulsi highlights its importance as a valuable natural resource for future healthcare applications.

KEYWORDS: Ocimum Sanctum, Holy Basil, Immunomodulatory activity, Anti-inflammatory activity, Phytochemicals, Medicinal plants.

1. INTRODUCTION

Ocimum Sanctum (Tulsi), also referred to as “Holy Basil” in English and “Tulsa” in Sanskrit, is a significant aromatic and medicinal plant in the “Lamiaceae” family. It has been widely used in traditional Indian medicine for centuries because of its diverse therapeutic properties. Tulsi is native to the Indian subcontinent and occupies a significant place in Ayurveda. For centuries, traditional Indian medicine has made extensive use of it due to its numerous therapeutic properties.

The plant is classified in two varieties, namely Rama Tulsi (green-leaved type) and Krishna Tulsi (black-leaved type). Tulsi contains numerous bioactive constituents such as eugenol, ursolic acid, rosmarinic acid, and flavonoids, which contribute to its pharmacological activity. Owing to these constituents, Tulsi exhibits antioxidant, anti-inflammatory, antimicrobial, antidiabetic, and immunomodulatory effects.^[1]

Different parts of the plants, particularly Leaves are traditionally utilized for managing respiratory disorders, fever, digestive disturbances, stress, and various microbial infections. Because of its broad spectrum of medicinal benefits, Tulsi continues to be recognized as a valuable herb in both traditional and modern healthcare systems.^[1]

Various parts of the plant, particularly the leaves and essential oil, possess expectorant, antiemetic, analgesic, and antipyretic activities, which may help in managing respiratory disorders, nausea, pain, and fever.^[2]

Experimental studies have further demonstrated that Tulsi extracts can help regulate blood glucose levels, suggesting potential benefits in the metabolic disorder diabetes.^[2]

Apart from its medicinal importance, Tulsi holds a special and religious status in India. The plant is commonly cultivated in households and associated with spiritual practices and traditional beliefs.^[3]

According to Hindu mythology, the name “Tulsi” is associated with Goddess Tulsi (Vrinda), who is regarded as a devoted consort of Lord Vishnu. Because of its religious significance, the plant is used in various spiritual practices.^[7]



Figure 1: Rama Tulsi (green-leaved tulsi).



Figure 2: Krishna Tulsi (black-leaved tulsi).

1.1. Synonyms of Tulsi in Indian languages

Tulsi (*Ocimum Sanctum*), commonly known as Holy Basil, is recognized by different names across various languages and cultures.^[5]

In Sanskrit, it is known as **Tulsi, Manjari, or Ajaka.**

In Assamese, it is known as **Tuloxi or Tulassi.**

In Bengali, it is known as **Tulsi, Kalo Tulsi, or Kural.**

In Gujarati, it is known as “**Sabje**” or “**Talasi.**” In Kannada, it is known as **Karitulsi or Tulasiya.** In Dogri, it is known as **Niyan Posh.**

In Malayalam it is known as “**Pachcha**” and “**Kunnakam.**”

In Manipuri, it is known as **Mayangton**.

In Marathi, it is known as “**sabja**” or “**Tulasa**.”

1.2. Synonyms of Tulsi in international languages or countries^[5]

Common name	Language	Religion/ Country
Laun, Pinzainpinzin	Burmese	Myanmar
Loh lakh, Yu being choi	Chinese	China
Basillie, sweet basil	English	England
Herbe Royale	French	France
Tulsi pata, Babari phil	Nepali	Nepal
Madurutala, Maduri Tulla	Sinhalese	Sri Lanka

1.3. Taxonomical classification of Tulsi^{[5][6]}

Kingdom	Plantae
Sub Kingdom	Tricheobionta
Division	Magnoliophyta
Suprdivision	Spermatopta
Class	Dicotyledonae
Order	Lamiales
Family	Lamiaceae
Genus	Ocimum
Species	Ocimum Sanctum
Phylum	Spermatophyta (Angiospermae)

2. Morphology and Geographical Distribution of Tulsi (Ocimum Sanctum)

Tulsi (*Ocimum Sanctum*) is an aromatic, erect, and highly branched medicinal shrub that generally attains a height of 30-60 cm at maturity. The leaves are simple, oval-shaped, fragrant, and arranged oppositely on the stem, with serrated margins.^[4] Generally measuring 2-5 cm in length, the leaf possesses a strong aroma due to the presence of volatile essential oil.^[5] Its flowers are small and borne in compact clusters, usually displaying a purple coloration. The plant produces small fruits containing reddish-yellow seeds. Tulsi is commonly cultivated after a rainy season and harvested when sufficient vegetative growth has been achieved.^[4]

The stem of *Ocimum Sanctum* is typically four-sided in shape and becomes slightly woody near the base as the plant matures. Tulsi has a taproot system that penetrates deep into the soil, provide structural support and nutrient absorption.^[5]

In India, the plant is widely distributed from the Himalayan region up to an altitude of approximately 1800 meters. It is also cultivated and found in countries such as Malaysia, Australia, West Africa, and some Arab nations.^[8]



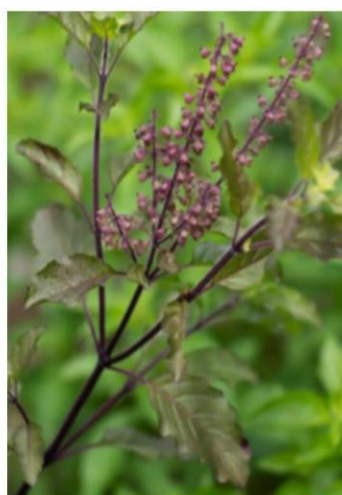
Figure 3: Leaves of Tulsi.



Figure 4: Flower of Tulsi.



Seeds of tulsi



Stem of tulsi

Figure 5: Seeds and Stem of Tulsi.

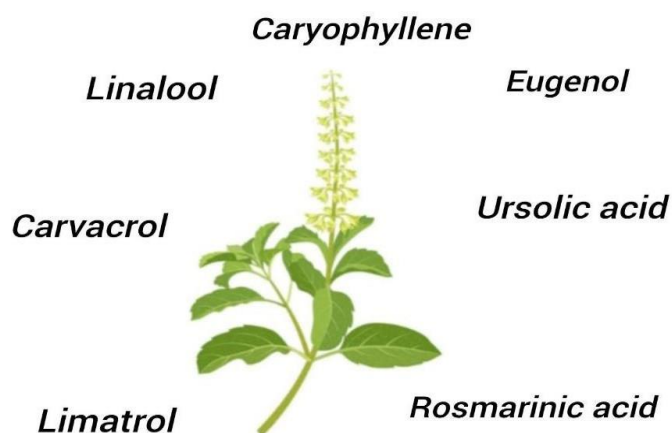
3. Phytochemical constituents of Tulsi (*Ocimum Sanctum*)

The phytochemical composition of *Ocimum Sanctum* is complex and consist of numerous biologically active compound. The concentration of these constituents may vary depending on the variety of plant, cultivation practices, environmental conditions, processing methods, and storage conditions.

The therapeutic properties of Tulsi are attributed to the synergistic action of several bioactive

compounds. Major phytochemicals present in Tulsi include:

- Eugenol
- Ursolic acid
- Rosmarinic acid
- Carvacrol
- Linalool
- Limatrol
- Caryophyllene
- Methyl chavicol (Estragole)
- In addition, the seed contain fatty acids and phytosterols. Seed mucilage is rich in sugars, while anthocyanins are present in green leaves. The carbohydrate fraction mainly consist of xylose and polysaccharides.^[9]



Tulsi contains several bioactive constituents such as Flavonoids, Terpenoids, Phenolic compounds, Tannins, Saponins, and Glycosides that contribute to its therapeutic properties. Among these, Eugenol is considered one of the major constituents present in the essential oil and is responsible for many pharmacological activities.^[10]

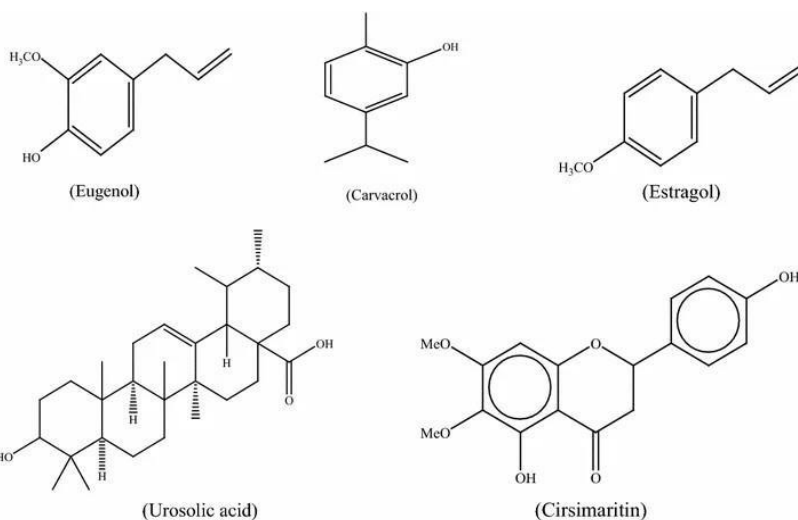
The plant also contains important phenolic compounds such as Gallic acid, Catechin, Syringic acid and Vanillin, which exhibit antioxidant, anti-inflammatory, and antimicrobial effects. Studies on various solvent extracts, particularly methanolic and ethanolic extracts, have identified compounds such as caffeic acid, rosmarinic acid, luteolin, and isosakuranetin.^[10]

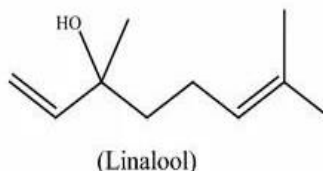
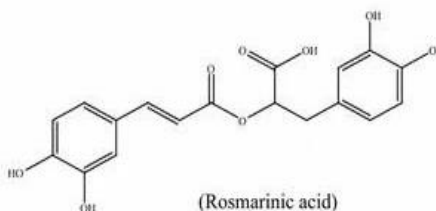
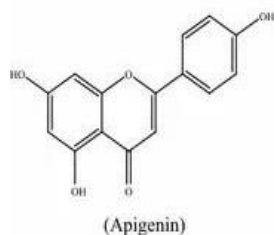
Table 1: Bioactive phytochemicals of Ocimum Sanctum and Their recommended pharmacological properties.

Bioactive Phytochemical	Chemical Class	Major Pharmacological activity	Plant part reported
Quercetin	Flavonoid	Antioxidant; protect cells against oxidative stress	Leaves
Isoquercitrin	Flavonoid glycoside	Antiprotozoal activity against <i>Entamoeba histolytica</i>	Leaves
Luteolin	Flavonoid	Antileishmanial activity	Leaves
Orientin	Flavonoid	Cytotoxic activity against colon cancer cell lines	Aerial parts
Syringic acid	Phenolic acid	Antibacterial activity against <i>Escherichia coli</i> and <i>Proteus mirabilis</i>	Aerial parts
Gallic acid	Phenolic acid	Broad-Spectrum antibacterial activity	Aerial parts
Vanillin	Phenolic aldehyde	Anticancer activity against lung cancer cells	Aerial parts
Citrusin C	Flavonoid derivative	Free radical scavenging (antioxidant) activity	Leaves
Ursolic acid	Pentacyclic triterpenoid	Cytotoxic and anticancer potential	Leaves
Oleanolic acid	Pentacyclic Triterpenoid	Antileishmanial activity	Leaves

This table provides a summarized overview of selected phytochemicals isolated from *Ocimum Sanctum*, their principal biological activities, and the plant part from which they are reported. The information has been compiled from published scientific studies cited in this review.

These compounds have been reported to exhibit diverse pharmacological activities, highlighting the therapeutic significance of Tulsi in traditional and modern medicine.^[10]





4. Pharmacological activities of *Ocimum Sanctum* (Tulsi)

Ocimum Sanctum, or tulsi, has garnered a lot of scientific interest due to its wide range of pharmacological effects. Antifertility, antiulcer, antipyretic, antiplasmodial, hepatoprotective, antioxidant, antifungal, anti-diabetic, cardioprotective, anti-convulsant, anti-inflammatory, and immunomodulatory are the main pharmacological characteristics of tulsi.

- 1) **Antifertility:** Research on animals suggests that tulsi leaf extract may have reversible antifertility potential in males by lowering sperm count, motility, and reproductive hormone levels.^[11]
- 2) **Antiulcer:** Tulsi has gastroprotective properties by decreasing the secretion of gastric acid, increasing the production of mucus, and shielding the stomach mucosa from ulcers caused by stress and drugs.^[11]
- 3) **Antipyretic:** In experimental models, fixed oil and leaf extracts of Tulsi have demonstrated fever-reducing activity, potentially by inhibiting prostaglandin synthesis.^[11]
- 4) **Antiplasmodial:** Alkaloids, flavonoids, terpenoids, and phenolic compounds are among the phytochemicals found in Tulsi that exhibit inhibitory activity against plasmodium species, suggesting possible antimalarial qualities.^[11]
- 5) **Hepatoprotective:** By lowering oxidative stress and enhancing antioxidant defense systems, Tulsi shields liver tissue from chemically caused harm. There have also been reports of synergistic effects with hepatoprotective agents.^[11]
- 6) **Antioxidant:** Natural antioxidant compounds found in tulsi leaves aid in shielding cells from oxidative damage. Treatment with *Ocimum Sanctum* extracts reduces lipid peroxidation while increasing the activity of antioxidant enzymes like superoxide dismutase (SOD), catalase (CAT), and glutathione (GSH), according to research done in cadmium-induced toxicity models.^[12]

- 7) **Antifungal:** Ocimum Sanctum leaf extract has significant antifungal properties against a variety of pathogenic fungi, especially dermatophytes that cause skin infections. According to laboratory studies, tulsi extract can be used to treat superficial fungal infections because it inhibits the growth of fungi at the right concentrations.^[12]
- 8) **Anti-diabetic:** Tulsi has been shown to have antidiabetic properties in a number of experimental investigations. Tulsi leaf extract dramatically reduces blood glucose levels and enhances overall metabolic function in streptozotocin-induced diabetic animal models. Additionally, the plant exhibits protective effects on pancreatic tissue, suggesting a potential role for it in the management of diabetes.^[12]
- 9) **Cardioprotective:** Research has shown that Ocimum sanctum offers defense against cardiac damage caused by experiments. Tulsi extract treatment lowers biochemical markers linked to myocardial injury, enhances antioxidant defense mechanisms, and lessens oxidative damage. These findings support its potential cardioprotective benefits.^[12]
- 10) **Anticonvulsant:** Tulsi has anticonvulsant qualities, according to experimental research. In animal models, leaf and stem extracts have been shown to lessen the frequency and intensity of seizures, indicating that the plant's bioactive components may have neurological protective effects.^[12]
- 11) **Anti-inflammatory Activity of Tulsi (Ocimum Sanctum):** Ocimum sanctum has been shown in experiments to have strong anti-inflammatory qualities. Carrageenan is often used to induce inflammation in animal models, and then various doses of Tulsi leaf extract are given. The extract's capacity to inhibit inflammatory reactions is demonstrated by the dose-dependent reduction of paw swelling. These findings suggest that Tulsi may serve as a natural therapeutic agent for inflammatory disorders.^[12]

Evidence from in vitro studies

These findings suggest that tulsi could be used as a natural remedy for inflammatory diseases. Its anti-inflammatory potential using a variety of in vitro experimental models. The results of these investigations consistently show that Tulsi has the capacity to reduce inflammatory reactions by controlling a number of molecular targets and biochemical pathways.^[15]

The inhibition of cyclooxygenase (COX) enzymes, especially COX-2, is one of the main mechanisms underlying its anti-inflammatory action. The inducible enzyme COX-2 catalyzes the transformation of arachidonic acid into prostaglandins, which are vital mediators of pain,

swelling, redness, and inflammation. COX-2 inhibitory effects, which limit inflammatory responses and prostaglandin synthesis.^[15]

Tulsi has the capacity to inhibit the activity of lipoxygenase (LOX) enzymes in addition to cyclooxygenase. Leukotrienes, another class of inflammatory mediators linked to allergic reactions, asthma, rheumatoid arthritis, and chronic inflammatory diseases, are produced by LOX enzymes. Tulsi lowers leukotriene production, tissue inflammation, and immune cell recruitment by reducing LOX activity.^[15]

Further studies have shown that Tulsi controls the synthesis of a number of pro-inflammatory cytokines, such as interleukin-1 beta (IL-1 β), interleukin-6 (IL-6), and tumor necrosis factor-alpha (TNF- α). Chronic inflammatory disorders are linked to excessive secretion of these cytokines. In order to suppress inflammatory signaling and avoid excessive immune activation, tulsi extracts dramatically reduce the expression of these cytokines.^[15]

Tulsi also modulates intracellular signaling pathways like nuclear factor-kappa B (NF- κ B) as part of its anti-inflammatory action. One important transcription factor that regulates the expression of inflammatory genes is NF- κ B. According to experimental data, Tulsi suppresses NF- κ B activation, which lowers the expression of adhesion molecules, cytokines, and inflammatory enzymes. Tulsi is an effective natural anti-inflammatory agent in lab studies because of these combined effects, which show that it acts on multiple molecular targets.^[15]

Evidence from In Vivo studies

Ocimum sanctum's anti-inflammatory qualities have also been confirmed in a number of in vivo animal models that closely mimic inflammatory conditions in humans. These studies confirm that Tulsi effectively reduces both acute and chronic inflammation.^[15]

These studies show that Tulsi effectively reduces both acute and chronic inflammation in the carrageenan-induced paw, one of the most widely used experimental models. Extracts considerably reduces paw swelling, demonstrating their efficacy in preventing the development of edema in both the early and late stages of inflammation. While prostaglandin production is linked to the later phase, histamine and serotonin play a major role in the early phase. Tulsi's broad-spectrum anti-inflammatory action appears to be demonstrated by its inhibitory effects during both stages.^[15]

Tulsi has been shown to lessen joint swelling, inflammatory cell infiltration, cartilage

degradation, and tissue degeneration in models of chronic inflammation, such as adjuvant-induced arthritis and collagen-induced arthritis. Following treatment with Tulsi extracts, histopathological analyses have shown reduced inflammatory cell accumulation and preservation of normal tissue architecture.^[15]

Additionally, a number of experimental studies have demonstrated improvements in the clinical symptoms of arthritis, such as decreased oxidative damage, enhanced joint mobility, and less pain. The modulation of inflammatory mediators, inhibition of oxidative stress, and suppression of cytokine release are the main causes of these positive effects. *Ocimum sanctum* may have significant therapeutic value in the treatment of inflammatory diseases, according to the consistency of these results across various experimental models.^[15]

Materials and Procedures

Fresh *Ocimum sanctum* leaves were gathered, dried in the shade, and then ground into a fine powder. The maceration method was used to extract the powdered material using distilled water. Before being used again, the extract was filtered, concentrated, and kept chilled.^[13]

The anti-inflammatory activity was evaluated in albino rats that were split into three treatment groups: a control group, a group that received standard medication (indomethacin), and groups that received varying doses of the tulsi extract. Experimental paw edema was created, and the anti-inflammatory effect was assessed by measuring the decrease in edema volume. After calculating the percentage inhibition of inflammation, the data were statistically examined using one-way ANOVA and the relevant post hoc tests. A p-value was deemed statistically significant if it was less than 0.05.^[13]

12) Immunomodulatory mechanism of *Ocimum Sanctum* (Tulsi)

Through a variety of biological processes, *Ocimum sanctum* (Tulsi) is well known for its capacity to bolster and control the immune system. Eugenol, ursolic acid, rosmarinic acid, apigenin, luteolin, caryophyllene, and flavonoids are among the many bioactive phytochemicals found in the plant that cooperate to enhance immune defense while preserving immune homeostasis. These components lessen inflammation, shield immune cells from oxidative damage, and aid the body in fending off microbial infections.^[14]

Tulsi is effective against bacteria like *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Candida albicans*, and some respiratory viruses, according to a number of

experimental studies. Tulsi is a useful natural antimicrobial agent because it directly inhibits pathogen growth while also boosting immune defense.^[14]

Enhancement of Cellular and Humoral Immunity

Tulsi has a beneficial effect on the immune system's innate and adaptive branches. Cell-mediated immunity is enhanced through activation of macrophages, neutrophils, natural killer (NK) cells, T-lymphocytes, and macrophages are all activated to improve cell-mediated immunity. Cytotoxic T cells, enhancing immune surveillance and pathogen eradication. It also stimulates the production of interferon-gamma (IFN- γ) and interleukin-2 (IL-2). Additionally, it increases the synthesis of interleukin-2 (IL-2) and interferon-gamma (IFN- γ), two crucial cytokines involved in cellular immune responses and T-cell activation. B-lymphocyte growth and increased production of antibodies. There have been reports of increased immunoglobulin levels, including IgG and IgM, after taking tulsi supplements. Tulsi contains certain polysaccharides and flavonoids that may activate Toll-like receptor (TLR)-mediated signaling pathways, improving antibody-mediated defense against infectious agents and antigen recognition.^[14]

Tulsi's various phytochemicals work together to produce its immunomodulatory effects rather than just one of them. Tulsi contributes to comprehensive immune support through antimicrobial activity, stress reduction, innate and adaptive immunity enhancement, inflammatory mediator regulation, antioxidant protection, and regulation of inflammatory mediators. Complement traditional treatment approaches for the management and prevention of inflammatory and infectious diseases.^[14]

13) Radioprotective effect of Ocimum Sanctum (Tulsi)

Although radiotherapy is frequently used to treat cancer, it can also harm the healthy tissues that surround the tumor. Radioprotective agents enable efficient radiation therapy while reducing this undesired radiation-induced damage. Many synthetic radioprotective compounds have shown limited clinical usefulness because of their toxicity at effective doses. As a result, medicinal plants with safer therapeutic profiles are now receiving more attention.^[19]

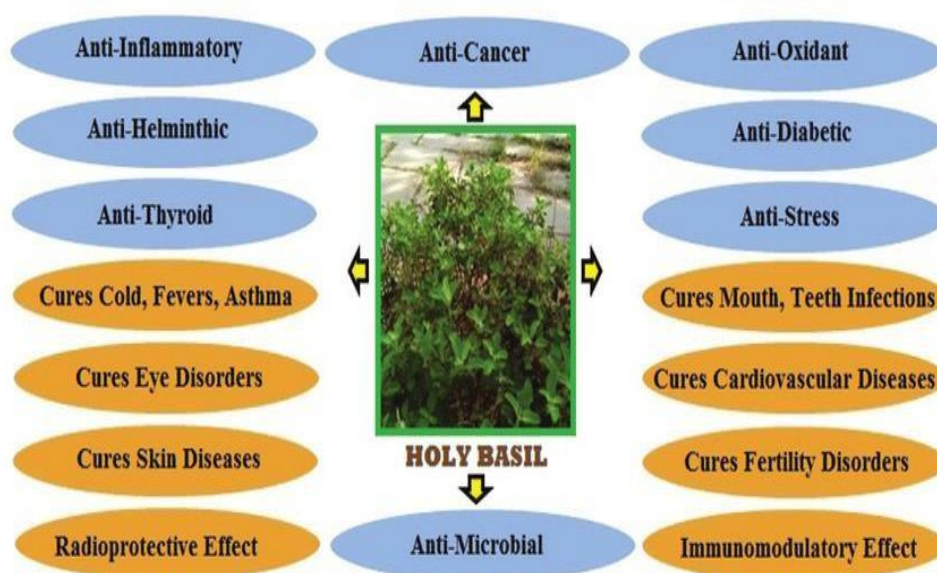
In numerous experimental investigations, *Ocimum sanctum* (Tulsi) has shown notable radioprotective activity. Its bioactive phytochemicals, which include eugenol and flavonoids like orientin and vicenin, are primarily responsible for the protective effect. These substances

have been shown to increase survival in experimental animal models and lessen radiation-induced cellular damage. Additionally, research indicates that tulsi extract selectively shields healthy tissues from radiation's anticancer effects on tumor cells.^[19]

The radioprotective mechanism of Tulsi is associated with its strong antioxidant and free radical scavenging properties. Tulsi's radioprotective mechanism is associated with its powerful antioxidant and free radical scavenging properties. Radiation-induced DNA damage and chromosomal abnormalities. Preliminary clinical observations also indicate that Tulsi may provide protection against radiation-associated toxicity, although larger, well-designed clinical trials are required to confirm its safety and effectiveness.^[19]

Tulsi appears to be a promising natural radioprotective agent based on the evidence currently available. To determine its therapeutic role and maximize its use in patients receiving radiation therapy, more experimental and clinical research is required.^[19]

14) Thyroid-Modulating Activity: Studies have reported that *Ocimum sanctum* extract may influence thyroid hormone levels. Administration of the extract at a dose of 0.5 g/kg body weight for 15 days was found to significantly reduce serum thyroxine (T4) levels.



5. Dosage form developed from Tulsi extract

Tulsi (*Ocimum sanctum* L.) extract has been incorporated into a variety of pharmaceutical dosage forms to improve its stability, patient compliance, and therapeutic efficacy. Traditional preparations such as fresh juice and herbal tea continue to be widely used, while

modern formulations including tablets, capsules, syrups, mouthwash, gels, and topical creams have been developed to provide convenient and standardized delivery of its bioactive constituents. These dosage forms enhance the medicinal potential of Tulsi for the management of various health conditions.

5.1. Types of Dosage forms

1. Traditional dosage forms
2. Modern dosage forms

1. Traditional dosage forms

a). Tulsi Fresh Leaf Juice (Swarasa) Composition

Fresh leaves of *Ocimum sanctum* are used to prepare the juice.

Method of Preparation

The leaves are thoroughly washed and crushed or blended to obtain the fresh juice. It may be consumed directly or mixed with natural ingredients such as honey or ginger for better taste.

Therapeutic Uses

Tulsi fresh juice is traditionally used to support respiratory health, improve digestion, strengthen immunity, and help relieve symptoms associated with cough, cold, and mild fever.

Recommended Use

Approximately 5–10 mL of freshly prepared juice may be taken one or two times daily, preferably before meals.

b). Tulsi Herbal Tea (Phanta) Composition

Prepared from dried Tulsi leaves; herbs such as ginger, cardamom, or black pepper may be added to improve flavour and therapeutic value.

Method of Preparation

Dried Tulsi leaves are infused in hot water for about 5–10 minutes. The infusion is then filtered and consumed warm.

Therapeutic Uses

Tulsi herbal tea is widely consumed as a refreshing beverage that may help reduce stress, promote overall wellness, and support immune function.

Recommended Use

One cup of Tulsi tea can be taken once or twice daily according to individual preference.



Figure 6: Tulsi Herbal Tea.

c). Tulsi-Containing Medicated Ghee Composition

Tulsi leaves, Guruch, Cow's ghee.

Method of preparation

A traditional medicated ghee preparation can be prepared using Tulsi leaves and Guruch (*Tinospora cordifolia*). The plant materials are processed with water and subsequently incorporated into cow's ghee to obtain a homogeneous preparation. After filtration, the medicated ghee is stored for further use.

Therapeutic uses

This preparation has been described for use in blood-related disorders and certain skin conditions, including conditions characterized by depigmentation.

2. Modern dosage form**a). Tulsi Capsules/ Tablets Formulation composition**

Standardized *Ocimum sanctum* (Tulsi) extract is commonly incorporated into capsules or tablets in doses ranging from 100–500 mg. The formulation generally contains pharmaceutical excipients such as microcrystalline cellulose (diluent), magnesium stearate (lubricant), and colloidal silicon dioxide (glidant). Capsules are usually prepared using either hard gelatin or HPMC shells for vegetarian formulations.

Preparation

The standardized Tulsi extract is blended uniformly with the required excipients and processed into capsules or compressed into tablets under controlled manufacturing conditions

to ensure consistent quality and dosage.

Therapeutic Uses

Tulsi capsules and tablets are widely used as herbal supplements to promote immune health, stress management, antioxidant protection, and overall well-being. They also provide a convenient and accurate method of oral administration.

Recommended Dose

Generally, one to two capsules or tablets may be taken once or twice daily with water, preferably after meals, or according to the advice of a healthcare professional.



Figure 7: Tulsi Tablets.

b). Tulsi Syrup

Formulation Composition

Tulsi syrup is prepared by incorporating 5–15% standardized Tulsi extract into an aqueous base containing sweetening agents such as sucrose syrup, sorbitol, or glycerin. Suitable preservatives (e.g., sodium benzoate) and natural flavoring agents are added to improve stability and palatability.

Preparation

The Tulsi extract is dissolved or dispersed in the syrup base, followed by the addition of sweeteners, preservatives, and flavoring agents. The final preparation is mixed thoroughly to obtain a uniform liquid formulation.

Therapeutic Uses

Tulsi syrups are commonly used to provide relief from cough, sore throat, and common cold symptoms. They are especially suitable for children and individuals who have difficulty swallowing solid dosage forms.

Recommended Dose

The usual dosage is 5–10 mL, two to three times daily, or as directed by a healthcare professional.



Figure 8: Tulsi Syrup.

c). Tulsi Oral Drops Composition

Tulsi extract or Tulsi essential oil (approximately 1–5%)

Solvent system: glycerin, propylene glycol, and ethanol (optimized ratio)

Preservative: sodium benzoate

Method of Preparation

The Tulsi extract is blended with a suitable solvent mixture until a clear and homogeneous solution is obtained. Preservatives are incorporated to improve product stability and extend shelf life. The finished formulation is then filled into dropper bottles for convenient administration.

Applications

Tulsi oral drops provide a concentrated herbal preparation that can be taken in small

quantities.

They are commonly used to support immune function, promote respiratory wellness, and maintain general health. Their liquid form allows easy consumption and rapid absorption.

Recommended Use

Mix 1–2 drops with lukewarm water, herbal tea, or another preferred beverage. It may be consumed 2–3 times daily, or as advised by a healthcare professional.



Figure 9: Tulsi Oral Drop.

d). Tulsi Oral Spray

Composition: Tulsi aqueous extract (1–5%)

Solubilizer: Polysorbate 80

Humectant: Glycerin

Preservatives: Potassium sorbate and sodium benzoate

Flavoring agents: Peppermint oil or menthol

Method of Preparation

The Tulsi extract is dispersed in an aqueous base containing suitable solubilizers and stabilizing agents. After thorough mixing, the formulation is filled into spray containers equipped with a metered pump to ensure accurate delivery.

Applications: Tulsi oral spray offers a convenient method for delivering herbal ingredients directly to the mouth and throat. It is widely used to soothe throat irritation, reduce unpleasant

breath, and provide localized antimicrobial support.

Recommended Use

Spray 1–2 times into the mouth or throat as required, following the product label or healthcare advice.

***Active components:** Ociciside A and B, which are adaptogenic triterpene compounds present in Tulsi.

6. Safety and Toxicity Profile of Tulsi (*Ocimum Sanctum*)

Due to its widespread use in traditional medicine and growing scientific validation, *Ocimum sanctum* (Tulsi) has gained widespread recognition for its favorable safety profile. Tulsi is generally well tolerated when taken within suggested therapeutic dosages, according to experimental and clinical research. Its use as a medicinal herb for long-term health management is supported by toxicological evaluations that consistently show a wide margin of safety.^[16]

Studies on acute toxicity in lab animals have revealed a high median lethal dose (LD₅₀), indicating very little acute toxicity. Similarly, even after extended administration, repeated-dose and sub-chronic toxicity studies have found no appreciable structural or functional abnormalities in major organs, such as the liver, kidneys, heart, and nervous system. These results show that under typical experimental conditions, tulsi does not cause detrimental systemic effects.^[16]

Reassuring results have also been reported in studies assessing developmental and reproductive toxicity. No negative effects on fetal growth, embryonic development, or fertility have been linked to therapeutic doses of Tulsi. However, exceedingly high doses outside of the advised range may result in unfavorable biological effects, underscoring the significance of dose optimization.^[16]

Additional evidence for the safety of tulsi supplementation comes from human clinical studies. When taken on an empty stomach, the majority of reported adverse events are mild and self-limiting, mainly involving gastrointestinal discomfort like nausea, fullness in the abdomen, or stomach irritation. By taking Tulsi preparations with food, these symptoms can frequently be reduced and usually go away without medical help.^[16]

People who are sensitive to plants in the Lamiaceae family may experience hypersensitivity,

even though allergic reactions are rare. As a result, people who are susceptible should exercise caution.^[16]

It's critical to consider potential herb-drug interactions. Due to its mild antiplatelet and glucose-lowering qualities, tulsi has mild antiplatelet effects when taken with anticoagulant or antidiabetic medications. Tulsi should be used under medical supervision if you take warfarin, aspirin, insulin, or oral hypoglycemic medications to prevent bleeding or an excessive drop in blood sugar.^[16]

According to available toxicological and clinical data, tulsi is generally a safe herbal remedy when taken as directed. To establish standardized dosage recommendations and thoroughly assess its safety in specific populations, such as children, pregnant women, nursing mothers, and people with chronic illnesses, more long-term, well-designed clinical studies are necessary.^[16]

7. Multifunctional therapeutic activities of Tulsi

Ocimum sanctum (Tulsi) has a number of other pharmacological activities that add to its therapeutic significance in addition to its well-known antioxidant, anti-inflammatory, and immunomodulatory qualities. Promising anticancer effects, such as inhibition of tumor cell proliferation, induction of programmed cell death (apoptosis), and modification of molecular pathways implicated in carcinogenesis, have been shown in experimental studies. Additionally, tulsi has been shown to improve endogenous detoxification processes, which makes it easier to get rid of toxic substances and hazardous metabolites.

Additionally, research indicates that Tulsi offers defense against chemical and environmental pollutants. Its capacity to lessen oxidative DNA damage and maintain cellular integrity after radiation exposure are the main reasons for its radioprotective action. Studies on animals have also revealed a protective role against heavy metal toxicity, especially mercury-induced toxicity, by maintaining normal physiological functions and boosting antioxidant defense. All of these results point to Tulsi's wide therapeutic potential as a multipurpose medicinal plant with uses that go beyond traditional disease treatment.^[17]

8. Future perspectives of *Ocimum Sanctum* (Tulsi)

Future studies should focus on standardizing tulsi extracts in order to ensure consistent quality, efficacy, and safety across herbal formulations. Sophisticated drug delivery

techniques like nanoformulations may improve the bioavailability and therapeutic efficacy of phytochemicals derived from Tulsi. More genetic improvement projects and better cultivation methods may boost the yield of pharmacologically active components. Large-scale randomized clinical trials are essential to validate traditional therapeutic claims and facilitate the integration of Tulsi-based products into modern healthcare systems. Furthermore, increasing its use in nutraceuticals, functional foods, and preventive medicine could boost its value both commercially and medically.^[18]

9. CONCLUSION

Ocimum sanctum (Tulsi) is one of the most valuable medicinal plants in traditional and modern healthcare due to its broad spectrum of pharmacological activities. The therapeutic potential of Tulsi is mainly attributed to its diverse bioactive phytochemicals, including eugenol, ursolic acid, rosmarinic acid, flavonoids, and other phenolic compounds. Scientific evidence from both in vitro and in vivo studies demonstrates that Tulsi possesses significant immunomodulatory and anti-inflammatory properties by regulating inflammatory mediators, inhibiting oxidative stress, and enhancing both innate and adaptive immune responses. In addition to these activities, Tulsi exhibits antioxidant, antimicrobial, hepatoprotective, cardioprotective, antidiabetic, and several other beneficial pharmacological effects, making it a multifunctional medicinal herb. Toxicological studies also indicate that Tulsi is generally safe when consumed within recommended therapeutic doses, although further long-term clinical investigations are required to establish standardized dosage and safety in specific populations. Overall, the available scientific evidence supports the traditional use of Tulsi as a promising natural therapeutic agent for the prevention and management of inflammatory and immune-related disorders. Future well-designed clinical trials and standardized herbal formulations will further strengthen its application in evidence-based medicine and promote its integration into modern healthcare systems.

REFERENCE

1. Sareen, A., Shah, S., & Patil, S. A review on the Indian plant Tulsi (*Ocimum sanctum*) and its medicinal uses. *_Systematic Review Pharmacy*, 2024; 15(5): 176-182.
2. Dwivedi, P., Majumdar, A., Thakkar, B., Saxena, S., & Tripathi, V. Tulsi (*Ocimum Sanctum*): Health benefits and nutritional wonders. *Acta Scientific Nutritional Health*, 2023; 7(9): 16-21.
3. Cohen MM. Tulsi – *Ocimum sanctum*: A herb for all reasons. *J Ayurveda Integr Med.*, Oct-

- Dec. 2014; 5(4): 251-9. Doi: 10.4103/0975-9476.146554. PMID: 25624701; PMCID: PMC4296439.
4. Kulkarni, K. V., & Adavirao, B. V. A review on: Indian traditional shrub Tulsi (*Ocimum Sanctum*): The unique medicinal plant. *Journal of medicinal plants studies*, 2018; 6(2): 106-110.
 5. Altamash, M., Kazi, K., Mukrram, S., Kundhare, A., & Danish, A. *Ocimum sanctum* (Tulsi): A comprehensive review of its botanical, phytochemical, and pharmacological profile. *International Journal of Pharmaceutical Sciences*, 2025; 3(6): 3172–3178.
 6. Omm Sahu. A Comprehensive Review on *Ocimum tenuiflorum*. *J Ayurveda Integr Med Sci* [Internet], 2025 Aug. 5 [cited 2026 Jun. 8]; 10(7): 193-200.
 7. Dharsono, H. D. A., Putri, S. A., Kurnia, D., Dudi, D., Satari, M. H. *Ocimum* species: A review on chemical constituents and antibacterial activity. *Molecules*, 2022; 27(19): 6350.
 8. Verma, S. Chemical constituents and pharmacological action of *Ocimum Sanctum* (Indian holy basil-Tulsi). *The general of Phytopharmacology*, 2016; 5(5): 205-207.
 9. Rahman, S., Islam, R., Kamruzzaman, M., Alam, K., & Jamal, A. H. M. *Ocimum Sanctum* L.: A review of phytochemical and pharmacological profile. *American journal of drug discovery and development*, 2011; 1(1): 1-15.
 10. Singh, S., Trivedi, M., & Srivastava, R. Bioactive phytocompounds of *Ocimum sanctum* and their multifaceted pharmacological properties: A mini-review. *The American Journal of Applied Sciences*, 2026; 8: 94–100.
 11. Solanki, Y., & Agrawal, V. Pharmacological activities of *Ocimum sanctum* (Tulsi): A review. *International Research Journal of Modernization in Engineering Technology and Science (IRJMETS)*, 2024; 6(1).
 12. Lakshmi, V. J., Ganta, S., Manasa, K., Ramya, P., Mani, U., & Sharma, S. An overview on pharmacological activities of Tulsi (*Ocimum sanctum*). *International Journal of Novel Research and Development (IJNRD)*, 2023; 8(3). ISSN: 2456-4184.
 13. Mirje, M. M., Zaman, S. U., & Ramabhimaiah, S. Evaluation of the anti-inflammatory activity of *Ocimum sanctum* Linn (Tulsi) in albino rats. *International Journal of Current Microbiology and Applied Sciences*, 2014; 3(1): 198–205.
 14. Jadhav, P., Shaikh, A. Z., Bachhav, R. S., Rawal, D., & Lohar, S. A review: Study of Tulsi as immune booster. *International Journal for Research in Applied Science & Engineering Technology (IJRASET)*, 2025; 13(5).
 15. Yadav, A. N., Gupta, V., Malik, J. K., Singh, G., & Bhardwaj, Y. Anti-inflammatory potential of *Ocimum sanctum* (Tulsi): A comprehensive review of phytochemistry and

- enzyme inhibition mechanisms. *International Journal of Pharmaceutical Science and Medicine*, 2025; 3(4): 142–150.
16. Karanth, J., Rakshith, C. J., Chandana, G. L., & Sharath Chandra, S. P. The molecular pharmacology of Tulsi (*Ocimum sanctum*): A review of its historical use and current understanding. *Journal of Natural Remedies*, 2025.
17. Abbas, S. S., Masih, A. P., & Sadia, Z. (2026). The Sacred Basil *Ocimum sanctum* L.: An ethnomedicinal plant with broad therapeutic potential. In *Current Research in Medicinal Plant Science*, 119–140. Nature Light Publication.
18. Sharma, S. K., & Singh, P. Bioactive secrets of the *Ocimum sanctum* Linn. (Tulsi). *GSC Biological and Pharmaceutical Sciences*, 2026; 34(2): 304–310.
19. Patel, R. R. Tulsi (*Ocimum sanctum* Linn.): A review on phytopharmacology and therapeutic potential. *Journal of Bioequivalence & Bioavailability*, 2017; 12(6): 407.
20. Pawar, R. R., & Mote, U. Dosage forms based on Tulsi. *International Journal of Research Publication and Reviews*, 2025; 6(10): 2974–2981.
21. Upadhyay, R. K. (2017). Tulsi: A holy plant with high medicinal and therapeutic value. *International Journal of Green Pharmacy*.
22. Sunny, S. (n.d.). Priya Patyal, *Ocimum sanctum* (Tulsi) “Queen of All Medicinal Herbs”: A review.
23. Government of India, Ministry of Health and Family Welfare. The Ayurvedic Pharmacopoeia of India, 2001; Part I(I): 162. Government of India.
24. Dr. Sharda Ayurveda. (n.d.). Health benefits of Tulsi (Holy Basil): Uses and remedies.
25. Healthy Ayurveda, November 13, 2014; 15. delicious *Ocimum sanctum* benefits.
26. Athare, A. T., Shete, A. R., & Salve, M. T. Formulation and evaluation of combination tablet of Ashwagandha and Tulsi. *World Journal of Pharmaceutical Research*, 2025; 14(11): 1570–1584.
27. Almatroodi, S. A., Alsahli, M. A., Almatroudi, A., & Rahmani, A. H. *Ocimum sanctum*: Role in diseases management through modulating various biological activity. *Pharmacognosy Journal*, 2020; 12(5): 1198–1205.
28. Pattanayak, P., Behera, P., Das, D., & Panda, S. K. *Ocimum sanctum* Linn. A reservoir plant for therapeutic applications: An overview. *Pharmacognosy Reviews*, 2010; 4(7): 95–105.
29. Sinoriya, S. K., & Singh, K. Review on therapeutic uses of Tulsi with its phytochemical constituents in different kind of extracts. *Journal of Plant Science Research*, 2024; 11(2): 263.

30. Mishra, S. K. A review paper on Tulsi plant (*Ocimum sanctum* L.). *Journal of Emerging Technologies and Innovative Research*, 2022; 9(1): 515–524.
31. Gulhane, N. S., Ghode, C. D., Jadhav, A. G., & Patil, P. A. Study of medicinal uses of *Ocimum sanctum* (Tulsi). *Journal of Pharmacognosy and Phytochemistry*, 2021; 10(2): 1427–1431.
32. Jhansi, V., & Priya, L. & Kumar, S. A Review On Pharmacological Effects of Tulsi (*Ocimum Sanctum*). *American Journal of PharmTech Research*, 2021; 11(2): xx-xx.
33. N. Nagarajan, M. Senthil Kumar; Queen of herb – *Ocimum sanctum* Linn (Tulsi) and its medicinal importance – A review. *AIP Conf. Proc.*, 11 July 2022; 2473(1): 020011.
34. Arya, R., Faruquee, H. M., Shakya, H., Rahman, S. A., Begum, M. M., Biswas, S. K., Apu, M. A. I., Islam, M. A., Sheikh, M. M. I., & Kim, J.-J. Harnessing the Antibacterial, Anti-Diabetic and Anti-Carcinogenic Properties of *Ocimum sanctum* Linn (Tulsi). *Plants*, 2024; 13(24): 3516.
35. Funde, D. S., Omkar, Omika, & Ashwini. Tulsi in Ayurveda: Scientific Advances Supporting Its Rasayana and Therapeutic Claims. *International Journal of Phytomedicine*, 2025; 17(2).
36. Kumar, K. P. S., Bhowmik, D., Biswajit, Chiranjib, Pankaj, Tripathi, K. K., & Chandira, M. Traditional Indian herbal plants Tulsi and its medicinal importance. *Research Journal of Pharmacognosy and Phytochemistry*, 2010; 2(2): 93–101.
37. Saxena R. C., Singh R., Kumar P., et al. Efficacy of an Extract of *Ocimum tenuiflorum* (OciBest) in the Management of General Stress: A Double-Blind, Placebo-Controlled Study. *Evidence-based Complementary and Alternative Medicine*, 2012; 2012: 1–7. Doi: 10.1155/2012/894509.
38. Gupta P., Yadav D. K., Siripurapu K. B., Palit G., Maurya R. Constituents of *Ocimum sanctum* With Antistress Activity. *Journal of Natural Products*, September 2007; 70(9): 1410–1416. Doi: 10.1021/np0700164.
39. AlGhalban F. M., Khan A. A., Khattak M. N. K. Comparative Anticancer Activities of *Ficus carica* and *Ficus salicifolia* Latex in MDA-MB-231 Cells. *Saudi Journal of Biological Sciences*, June 2021; 28(6): 3225–3234. Doi: 10.1016/j.sjbs.2021.02.061.
40. Boonyanugomol W., Rukseree K., Prapatpong P., et al. An In Vitro Anti-Cancer Activity of *Ocimum tenuiflorum* Essential Oil by Inducing Apoptosis in Human Gastric Cancer Cell Line. *Medicina*, July 2021; 57(8): 784. Doi: 10.3390/medicina57080784.
41. Karthikeyan K., Gunasekaran P., Ramamurthy N., Govindasamy S. Anticancer Activity of *Ocimum sanctum*. *Pharmaceutical Biology*, January 1999; 37(4): 285–290. Doi:

- 10.1076/phbi.37.4.285.5801.
42. Indrayudha P., Hapsari H. S. Cytotoxic Activity of Combined Ethanolic Extract of *Cinnamomum burmannii* and *Ocimum tenuiflorum* Linn Against T47D Cancer Cells. *Archivos Venezolanos de Farmacología y Terapéutica*, 2021; 40(2).
43. Lam S. N., Neda G. D., Mohd Salleh R. The Anticancer Effect of *Ocimum tenuiflorum* Leaves. *Food Research*, November 2017; 2(2): 154–162. Doi: 10.26656/fr.2017.2(2).251.
44. Çetinkaya M., Baran Y. Therapeutic Potential of Luteolin on Cancer. *Vaccines*, Feb., 2023; 11(3): 554. Doi: 10.3390/vaccines11030554.
45. Lotfi N., Yousefi Z., Golabi M., et al. The Potential Anti-Cancer Effects of Quercetin on Blood, Prostate and Lung Cancers: An Update. *Frontiers in Immunology*, 2023 Feb.14. doi: 10.3389/fimmu.2023.1077531.
46. Yan X., Qi M., Li P., Zhan Y., Shao H. Apigenin in Cancer Therapy: Anti-Cancer Effects and Mechanisms of Action. *Cell and Bioscience*, 2017; 7(1). doi: 10.1186/s13578-017-0179-x.
47. Prasher P., Sharma M., Singh S. K., et al. Luteolin: A Flavonoid With a Multifaceted Anticancer Potential. *Cancer Cell International*, December. 2022; 22(1): 386. Doi: 10.1186/s12935-022-02808-3.
48. Rauf A., Wilairatana P., Joshi P. B., et al. Revisiting Luteolin: An Updated Review on Its Anticancer Potential. *Heliyon*, March 2024; 10(5). doi: 10.1016/j.heliyon.2024.e26701.
49. Shetty S., Udupa S., Udupa L. Evaluation of Antioxidant and Wound Healing Effects of Alcoholic and Aqueous Extract of *Ocimum sanctum* Linn in Rats. *Evidence-Based Complementary and Alternative Medicine*, 2008; 5(1): 95–101. Doi: 10.1093/ecam/nem004.
50. Umamageswari A., Kudagi B. L. Anti-Inflammatory and Analgesic Properties of *Ocimum sanctum*: A Comparative Study Using Animal Models. *International Journal of Basic and Clinical Pharmacology*, 2015; 4(5): 981–986. Doi: 10.18203/2319-2003.ijbcp20150878.
51. Singh S., Majumdar D. K. Anti-Inflammatory and Antipyretic Activities of *Ocimum sanctum* Fixed Oil. *International Journal of Pharmacognosy*, January 1995; 33(4): 288–292. Doi: 10.3109/13880209509065380.
52. Arora R., Malhotra P., Sharma A., Haniadka R., Yashawanth H. S., Baliga M. S. Medicinal Efficacy of Indian Herbal Remedies for the Treatment of Arthritis. In: Watson R. R., Preedy V. R., editors. *Bioactive Food as Dietary Interventions for Arthritis and Related Inflammatory Diseases*. San Diego: Academic Press, 2013; 601–617.
53. Chaiyana W., Anuchapreeda S., Punyoyai C., et al. *Ocimum sanctum* Linn. As a Natural

- Source of Skin Anti-Ageing Compounds. *Industrial Crops and Products*, January 2019; 127: 217–224. Doi: 10.1016/j.indcrop.2018.10.081.
54. Mukherjee R., Dash P. K., Ram G. C. Immunotherapeutic Potential of *Ocimum sanctum* (L) in Bovine Subclinical Mastitis. *Research in Veterinary Science*, August 2005; 79(1): 37–43. Doi: 10.1016/j.rvsc.2004.11.001.
55. Jaggi R. K., Madaan R., Singh B. Anticonvulsant Potential of Holy Basil, *Ocimum sanctum* Linn., and Its Cultures. *Indian Journal of Experimental Biology*, November 2003; 41(11): 1329–1333.
56. Asha M. K., Prashanth D., Murali B., Padmaja R., Amit A. Anthelmintic Activity of Essential Oil of *Ocimum sanctum* and Eugenol. *Fitoterapia*, August 2001; 72(6): 669–670. Doi: 10.1016/s0367-326x(01)00270-2.
57. Panda S., Kar A. *Ocimum sanctum* Leaf Extract in the Regulation of Thyroid Function in the Male Mouse. *Pharmacological Research*, August 1998; 38(2): 107–110. Doi: 10.1006/phrs.1998.0338.
58. Cohen M. M. Tulsi—*Ocimum sanctum*: A Herb for All Reasons. *Journal of Ayurveda and Integrative Medicine*, 2014; 5(4): 251–259. Doi: 10.4103/0975-9476.146554.
59. Makwana M., Rathore H. Prevention of Hepatorenal Toxicity of Acetaminophen With *Ocimum sanctum* in Mice. *International Journal of Pharmacy and Technology*, January 2011; 3: 1385–1396.
60. Kurkure N., Mahaprabhu R., Jangir B. L., Bhandarkar A., Rahangadale S. Ameliorative Effect of *Ocimum sanctum* on Meloxicam Induced Toxicity in Wistar Rats. *Toxicology International*, July 2011; 18(2): 130–136. Doi: 10.4103/0971-6580.84265.
61. Shukla P., Tabassum S., Khanna A. Role of *Ocimum sanctum* as a Genoprotective Agent on Chlorpyrifos-Induced Genotoxicity. *Toxicology International*, 2011; 18(1): 9–13. Doi: 10.4103/0971-6580.75845.
62. Shah K., Verma R. J. Protection Against Butyl P-Hydroxybenzoic Acid Induced Oxidative Stress by *Ocimum sanctum* Extract in Mice Liver. *Acta Poloniae Pharmaceutica*, 2012; 69(5): 865–870.
63. Shyamala A. C., Devaki T. Studies on Peroxidation in Rats Ingesting Copper Sulphate and Effect of Subsequent Treatment With *Ocimum sanctum*. *Journal of Clinical Biochemistry and Nutrition*, 1996; 20(2): 113–119. Doi: 10.3164/jcbtn.20.113.
64. Ubaid R. S., Anantrao K. M., Jaju J. B., Mateenuddin M. Effect of *Ocimum sanctum* (OS) Leaf Extract on Hepatotoxicity Induced by Antitubercular Drugs in Rats. *Indian Journal of Physiology and Pharmacology*, October. 2003; 47(4): 465–470.

65. Halder N., Joshi S., Gupta S. K. Lens Aldose Reductase Inhibiting Potential of Some Indigenous Plants. *Journal of Ethnopharmacology*, May 2003; 86(1): 113–116. Doi: 10.1016/s0378-8741(03)00052-7.
66. Pattanayak P., Behera P., Das D., Panda S. K. *Ocimum sanctum* Linn. A Reservoir Plant for Therapeutic Applications: An Overview. *Pharmacognosy Reviews*, 2010; 4(7): 95–105. Doi: 10.4103/0973-7847.65323.
67. Prakash P., Gupta N. Therapeutic Uses of *Ocimum sanctum* Linn (Tulsi) With a Note on Eugenol and Its Pharmacological Actions: A Short Review. *Indian Journal of Physiology and Pharmacology*, April 2005; 49(2): 125–131.
68. Mohan L., Amberkar M. V., Kumari M. *Ocimum sanctum* Linn (TULSI) – An Overview. *International Journal of Pharmaceutical Sciences Review and Research*, March 2011; 7(1): 51–53.