

Tulsi: An Important Medicinal and Therapeutic Herb

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ABSTRACT:

Ocimum Sanctum is the botanical name for this medicinal plant, which belongs to the Lamiaceae family. Known as the "queen of herbs," tulsi is widely used and has many therapeutic uses. Every part of the plant, including the seeds and leaves, is advantageous. Other names for tulsi include "the Incomparable One" and "the Mother of Natural Medicine." India, Myanmar, Sri Lanka, Bangladesh, Southwest Asia, China, Thailand, and Malaysia are all places where you can find tulsi. The plant can reach a height of 30 to 60 cm and is an upright, densely branching subshrub. It has simple, green, highly scented leaves and hairy stems. It is widely grown for its medicinal qualities and is indigenous to the tropics.

Keywords: Tulsi, *Ocimum Sanctum*, Chemical Constituents, Pharmacological Activity.

INTRODUCTION :

Tulsi (Holy Basil) belongs to the Lamiaceae family and has the scientific name *Ocimum Sanctum*. Tulsi, often known as the "Queen of Herbs," has several therapeutic characteristics used in herbal medicines. Green Tulsi (Ram Tulsi) and Black Tulsi (Krishna Tulsi) have essentially identical qualities. Tulsi, often known as Holy Basil, is a significant emblem in Hinduism. Tulsi is also known as Vishnupriya, which translates to "person who pleases Lord Vishnu." Tulsi is widely venerated in India. Tulsi has been utilized in Ayurvedic medicine for centuries due to its various therapeutic effects. All plant components are functioning, including leaves and seeds. Tulsi is known to boost physical endurance and provide overall vitality. Holy Basil's stem and leaves contain several elements that may have both physical and biological properties. Tulsi is traditionally consumed in several forms, including herbal tea, dried powder, fresh leaves, and combined with honey or ghee. Tulsi contains eugenol, indicating its potential as a COX-2 inhibitor. This is consistent with study findings. Tulsi is considered an essential part of a Hindu home. Tulsi is revered as holy or god basil in the Indian subcontinent. Tulsi is widely used in Indian homes due to its nutritional, therapeutic, and spiritual benefits. Tulsi is also known as 'the Incomparable One' and 'the Mother of Natural Medicine'. It is thought to safeguard the home and family from negative impacts. Tulsi leaves are consumed as tea, while wood and seeds are used to create a garland. This string of beads is used for meditation, concentration, and devotional practice, connecting the mind and soul. The sacred plant is said to have the presence of God Rudra in the blooming tops, Bramha in the roots, and Vishnu in the leaves and stems. Holy Basil leaves are often utilized for their therapeutic properties. The herb removes phlegm and catarrhal debris from the bronchial tube. The plant helps to avoid gastrointestinal problems. This plant can treat respiratory disorders. A infusion of honey, ginger, and Tulsi leaves can help treat bronchitis, influenza, and asthma. During the rainy season, Tulsi leaves may effectively combat infections such as malaria and dengue. Extracting juice from Holy Basil leaves is the most effective way to reduce fever. Tulsi promotes heart health and lowers blood cholesterol levels.⁵ Holy basil is available in many places, including India, Burma, Sri Lanka, the Himalayas, Bangladesh, Southwest Asia, China,

Thailand, and Malaysia. Tulsi may be found in dry sand locations including Hainan, Sichuan, Taiwan, Cambodia, Indonesia, Laos, Myanmar, the Philippines, Vietnam, Africa, Southwest Asia, and Australia.

CLASSIFICATION:

Genus *Ocimum* has various species • *Ocimum sanctum* Linn (Tulsi) • *Ocimum grtissium* (Ram Tulsi) • *Ocimum canum* (Dulal Tulsi) • *Ocimum bascillicum* (Ban Tulsi) • *Ocimum kilimandschricum* • *Ocimum americanum*

TAXONOMY :

Kingdom - Plantae

- Division - Magnoliophyta
- Class - Magnoliopsida
- Order – Lamiales
- Family – Lamiaceae
- Genus - *Ocimum*
- Species - *Sanctum*
- Binomial name - *Ocimum sanctum* Linn

VERNACULAR NAMES: Hindi: Kalatulasi, Tulasi; Kannada: Vishnu Tulasi, Kari Tulasi, Sri Tulasi, Tulashigida; English: Holy Basil; Malayalam: Tulasi, Trttavu Karuttarttavu, Niella Tirtua, Shiva Tulasi; Telugu: Tulasi, Gaggera Chettu; Bengali: Tulasi, Krishna Tulshi; Gujarati: Tulasi, Talasi; Punjab: Ban Tulsi; Marathi: Tulasas, Tulasi; Konkani: Tuls

BOTANICAL STUDY : In the Indian subcontinent, tulsi is a common herb. The plant grows naturally in the warm tropical climate. The plant can grow to a height of two to four feet. The plant blooms in the interim between winter and spring. Tulsi has an astringent taste and a potent aroma. Tulsi leaves are extracted to produce biologically active compounds including apigenin, luteolin, and ursolic acid. The light variety, also called Rama Tulsi, and the dark variation, also called Krishna Tulsi, are the two main varieties of Tulsi. Thai basil and tulsi are closely related. This is hairless and smooth, unlike the slightly hairy Tulsi.

TULSI VARIATIONS:

Dark Tulsi, also known as Krishna Tulsi; Green Tulsi, also known as Rama Tulsi.



Figure 1: Dark Tulsi or Krishna Tulsi



Figure 2: Green Tulsi or Rama Tulsi

TULSI HISTORY AND MYTHOLOGY IN INDIA :

Tulsi means "one that is incomparable or matchless" in Sanskrit. A millennium ago, the ancient Rushi recognized tulsi as one of the most extraordinary medicinal plants. They noted that the plant had therapeutic and medical properties and was regarded as a divinity. There are legends surrounding the tulsi plant's origins. Lord Krishna, a reincarnation of Lord Vishnu, is said to love tulsi. In order to guaranty that every house and temple had at least one Tulsi shrub nearby, Tulsi was made one of the eight essential components of any Vedic worship rite.

HOLY BASIL IN RELIGION :

In India, holy basil is a part of all religions, including Christianity and Hinduism. Although the Bible makes no mention of or connection to tulsi, it is thought that the herb was present at the site of Christ's crucifixion. Many legends originate from mythology, but the most famous one comes from the Shiva Purana. According to tradition, Lord Shiva blocked the path of the guru Brihaspati and Indra when they first met him at Mount Kailash with his matted hair and dazzling face.

. To test Indra, Lord Shiva assumed the form of a yogi. When the yogi refused to move aside, Indra became furious. Indra pushed the man aside with his thunderbolt. Lord Shiva became enraged by Indra's right actions, which made his eyes crimson and startled Indra. In a fit of wrath, Lord Shiva opened his third eye and killed Indra. Brihaspati, however, acknowledged Lord Shiva and requested pardon for Indra's deeds. Lord Shiva was persuaded by Brihaspati to discharge fire from his eye to the ocean, where it changed into a child known as Jalandhara. When Jalandhara became extremely powerful, the teacher Shukra made him the king of demons. Jalandhara later wed Vrindha, the demon Kalanemi's daughter. Jalandhara was in charge. Lord Vishnu accepted Jalandhara's invitation to live in Kshira Sagara. Jalandhar became the Emperor of three planets and vanquished all the gods while he was away. Even though Jalandhara was the son of Lord Shiva, the devas rejected him as their ruler. The devas were displeased with the defeat and sent Narada to visit Jalandhara. After praising Parvati's beauty, Narada described Shiva's home and Kailash's beauty. Lord Vishnu is moved by Jalandhar's bravery and grants him any blessing he asks for. Lord Vishnu accepted Jalandhara's invitation to live in Kshira Sagara. Jalandhar became the Emperor of three planets and vanquished all the gods while he

was away. Even though Jalandhara was the son of Lord Shiva, the devas rejected him as their ruler. The devas were displeased with the defeat and sent Narada to visit Jalandhara. Before describing Shiva's home and Kailash's magnificence, Narada lauded Parvati's attractiveness. Parvati became enraged when Jalandhar failed to trick her.

OCIMUM SANCTUM LINN (TULSI) – A PLANT FORM GENUS OCIMUM

One plant in the Labiate family that is well-known for its medicinal qualities is ocimum. *Ocimum Sanctum* Linn, *Ocimum gratissimum*, *Ocimum canum*, *Ocimum basilicum*, *Ocimum kilimandscharicum*, *Ocimum ammericanum*, *Ocimum camphora*, and *Ocimum micranthum* are a few species of *Ocimum*. Growing all across the world, this plant has important medicinal properties. *Ocimum Sanctum* Linn is known as Holy Basil in English and Tulsi in Hindi. India is home to the upright, soft-haired tulsi plant.

Taxonomic history of *Ocimum*

The *Ocimum* has a problematic circumscription. There are around 30-160 annual and perennial herb and shrub species found throughout the tropics and subtropics of Asia, Africa, Central and South America. Basil's botanical identity is challenging due to variations in growth, habit, and fragrant composition across *Ocimum* species. The following plants are commonly farmed for their economic and medical significance worldwide. *O. africanum* Lour, *O. americanum* L., *O. basilicum* L., *O. minima* L., *O. gratissimum* L., and *O. tenuiflorum*. In 1753, L. Linneaus described *Ocimum* and identified five species. Paton and Bentham classified the *Ocimum* genus into *Ocimum*, *Gymnoeum* Benth, and *Hierocimum* Benth, with around 40 species. Bentham classified *Ocimum* as three sub-sections based on its calyx, morphology, and section: *Ocimum*, *Hiantia* Benth, and *Gratissima*. Pushpangadan classified Basil Taxa into two groups: *Basilicum*, which includes annual herbs or perennials with ellipsoid, black, intensely mucilaginous seeds with a basic chromosome number of $x=12$, and *Sanctum*, which includes perennial shrubs with brown globose, weakly mucilaginous or non mucilaginous seeds with a basic chromosome number of $x=8.11$.

Morphology:

Tulsi (Holy Basil) has a purple branched stem that is 35-70 cm tall, sub quadrangular, and covered in silky, spreading hair. Tulsi leaves range in size from 1.7 to 3.3 cm in width and 2.5 to 5 cm in length, with serrate margins and gland-dotted surfaces. The base can be acute or obtuse, and the petioles are 1.3-2.5 cm long and hairy. The bracts measure 3mm in diameter and are broadly oval. The calyx is thin, hairy, and bilabiate. The upper lip is smaller than the lower lip. The corolla is purple and 4mm in size, with a bilabiate upper lip and hairy back. The stamens are thin and exserted, with the upper pair having a tiny branch at the base. The nutlets are smooth, golden with black markings, broadly elliptic, and 1.26 mm long. The seeds are brownish. The taste is intense, with a strong aromatic odor. Tulsi is a member of the *Lamiaceae* family, specifically the Basil genus. Tulsi, an aromatic plant, is both cultivated and a weed that has spread globally. The plant's green leaves have a powerful smell. Purple blooms in racemes form tight whorls. In India and Nepal, two morphotypes are often grown: green-leaved and purple-leaved.

Horticulture :

Tulsi grows in warm climates and is widely farmed, particularly in India. Holy Basil is typically planted in damp soil at elevations around 1800m above sea level. This is according to ancient Ayurvedic texts. Tulsi is commonly found throughout Asia and Africa, with its origins in the Himalayas and Andaman-Nicobar Islands.

The moist soil pattern where *Ocimum sanctum* grows can indicate differences in rainfall, plant growth, and therapeutic properties.

Cultivation:

Basil grows 30-130cm tall and has light green, silky leaves measuring 3-11cm long and 1-6cm wide on the opposite side. The blooms are white, tiny, and placed on a terminal spike. In Lamiaceae, the four stamens and pistil are located over the inferior lip of the corolla rather than under the upper one. After entomophilous pollination, the corolla breaks off and the four achenes form inside the bilabiate calyx. Holy Basil thrives in hot, dry circumstances, while Tulsi is susceptible to cold. Tulsi behaves as an annual plant under frosty conditions. Tulsi is best grown outdoors, but can also be cultivated indoors in a pot. It thrives on an equator-facing windowsill. Tulsi thrives in intense sunlight and should be protected from freezing drafts, making a greenhouse or row cover a great choice. Holy basil can thrive in a cellar with fluorescent lighting.



Figure 3 13 and Figure 4 Cultivation of Tulsi plant

Chemical Constituent :

Tulsi has a complex chemical composition with various nutrients and physiologically active chemicals. Tulsi's active component is difficult to standardize due to its botanical and biochemical complexity. Tulsi leaves include eugenol and ursolic acid, which are the main active components and source of essential oil. Tulsi contains only ursolic acid as its main component. The chemical inhibits fertility in male mice and rats of both sexes. Ursolic acid has anti-estrogenic effects, lowers sperm count, and inhibits spermatogenesis. The Tulsi plant extracts eugenol, a phenolic component that contributes significantly to the essential oil. Essential oils derived from fresh *Ocimum sanctum* leaves contain significant amounts of Eugenol, which contributes to their medicinal value. Tulsi's other chemical components include α -pinene, α -thujene, nonane, and octane. Benzene, (Z)-3-hexanol, ethyl 2-methyl butyrate, β pinene, toluene, camphene, citronellal, sabinene, dimethyl benzene, myrecene, ethyl benzene, limocene. cis- β -ocimene, 1,8-cineole, p-cymene Terpinolene, Butyl-benzene, Linalool, α -cubebene, Eugenol, methyl eugenol, and β -elemen. Allo-oc-Imene, E - Cinnamon, Isoeugenol, Lactate, Isocaryophyllene, β -Caryophyllene, α guaiene, α -amorphene, α -humulene, and γ -humulene. 4,11-Carvacrol, Seinadiene, α -terpeneol, α -Selinene, Isoborneol, Borneol, germacrene-D, β -selinene, Myrtenylformat, Geraneol, and α -murolene. Calamene, cadinene, and δ -cuparene Nerolidol, Iedol. Caryophyllene Oxide, Elemol, Tetradecanal, Humulene oxide, α guaiol, T-cadinol, α -bisbolol, and (EZ)-

famesol. Cissesquisainene Isorientin Hydrate. Selin-11-en-4- α -ol, 14-hydroxy- α -humulene, and ursolic acid. Luteolin, Apigenin, Apigenin-7-O-glucuronide, Vicenin-2, and Luteolin-7-O-glucuronide. Tulsi contains rhymol, eugenol, and camphor, which are responsible for its medicinal properties. The mucilage contains sugars, xylose, and polysaccharides. The oils in the seeds contain fatty acids and sitosterol. Basil is a therapeutic herb rich in antioxidants that prevent cell damage and promote the generation of disease-fighting antibodies by up to 20%.

Benefits of Tulsi's phytoconstituents

Apigenin, found in Tulsi, stimulates neurogenesis. Bisabolol exhibits wound healing, anti-inflammatory, antibacterial, anti-irritant, and anti-cancer properties. Tulsi essential oils have insect repellent properties, making Borneol effective. Coffee acid also possesses anti-cancer, antioxidant, and antifungal properties. Calamine's presence indicates dermatological activity. Tulsi contains Esculetin, which makes it useful as an anticoagulant, sunscreen lotion, and medical diagnostic tool.

Disadvantages of elements in tulsi.

Overdose of Tulsi and its derivatives can harm reproductive health for both men and women. This can lead to poor testes weight, sperm mortality, and reduced sperm counts. Additionally, antiestrogen action has been discovered. The negative effects in females can trigger contractions, leading to termination during pregnancy. It also influences lactation. Females may experience cramps, back pain, diarrhoea, bleeding, and other symptoms.

Scientific investigations have shown that Tulsi can cause acute negative effects such as lead poisoning, dental difficulties, hypoglycemia, prolonged bleeding, and weak blood. It's hepatotoxic.



Figure 5: A mature Vrinda (Tulsi) plant growing in the greenhouse (A) is used for the culture initiation, (B) multiplication, and (C) under *in vitro* conditions. Healthy shoots grow in rooting medium (D) and rooted plantlets after four weeks of growth (E). Greenhouse acclimatisation (F, G) and field-grown Vrinda (Tulsi) plants (H)

Tulsi studies in vitro

Tissue cultures are a traditional method for *in vitro* plant regeneration, particularly for medically significant plants that are difficult to replicate naturally. This approach is also used to research the molecular development of plants, resulting in increased output molecules. A controlled environment system is great for cloning

medicinal plants as it regulates growing conditions such as water, light, and soil. Greenhouses and in vitro procedures provide a regulated environment for growing plants. In vitro culture in medicinal plants delivers all nutrients in a pathogen-free environment.

USES OF TULSI

Tulsi In Ayurvedic Medicine

Tulsi contains essential oils and antioxidants that can significantly reduce stress on the body. Tulsi is a powerful medicinal herb that can help alleviate mental tension. Tulsi is currently being used by individuals outside of Hinduism and India due to its powerful healing effects. It helps regulate stress by balancing several bodily systems. Tulsi extracts are utilized in traditional Indian Ayurvedic therapy. Tulsi is used in Ayurvedic medicine to treat various ailments, including colds, headaches, stomach issues, inflammation, infections, heart disease, poisoning, cataracts, and malaria. Tulsi operates on and enhances the neurological system. It supports the heart. It serves as an appetizer and aids digestion. It promotes digestion and reduces gas. Tulsi's detoxifying capabilities help remove pollutants from the blood. Additionally, it has been shown to reduce cholesterol levels. Its antibacterial and anti-parasitic characteristics make it effective against a variety of infectious disorders. Recent research suggests that Tulsi may provide protection against radiation poisoning. Tulsi has been found to have anticancer effects. Some believe that consuming Tulsi leaves on a daily basis helps prevent cancer.

Tulsi In Modern Medicine.

Tulsi may have been useful in treating disorders such as ulcers, high cholesterol, Type-2 diabetes, obesity, and impaired immune systems (such as cancer and AIDS). Tulsi's traditional use in Ayurveda may be due to its intrinsic properties, including essential oils with anti-inflammatory compounds like eugenol and acids with antioxidant and anti-inflammatory properties. Ayurveda claims that Tulsi can treat a wide range of conditions.

Natural Medicine Uses

In Sidha, Unani, and Ayurvedic medicine, Tulsi is used to cure skin disorders, fevers, coughs, and internal diseases. In Ayurvedic medicine, bronchitis is treated with a drink tonic containing Tulsi leaves, cardamom, or lemon juice. Historically, all three therapeutic systems relied on natural medicines and treatments, primarily derived from herbs and plants.

Tulsi in Your Home

Tulsi, like other herbs, can be used to enhance the flavor of food or tea. The holy herb is easy to grow, safe for animals, and aesthetically pleasing as a decorative plant. The Tulsi plant is a valuable addition to every family, whether as a spice or in the garden.



Figure 6: The organic tea of Tulsi

PHARMACOLOGICAL ACTIVITIES :

Antimicrobial Activity :

The antibacterial activity of leaf extract and local river water in *Ocimum sanctum* was evaluated at different concentrations. The treated water concentration outperformed the other extract concentration after 15-16 hours. After 14-16 hours, the extract exhibits around 95-98% antibacterial activity when treated with water. The minimal bacterial concentration (MBC) was determined using extract concentration. Using the spread plate method, it was shown that bacterial cell concentrations gradually decreased over an hour. Concentrated water treatment at a PH range of 6.8-7.0 for 15-16 hours resulted in the highest antibacterial activity in both samples, indicating that this plant extract effectively killed hazardous human organisms.² The extract of *O. sanctum* is effective against *E.coli*, *Shigella*, *Staphylococci*, *Streptococcus aureus*, *Enterobacteria*, *Pseudomonas Aeruginosa*, *Salmonella typhi*, *Klebsiella pneumoniae*, *Candia albicans*, and *Mycobacterium TB*. *O. Sanctum* essential oils and eugenol extract have effective antimicrobial properties against *Caenorhabditis elegans*. The extracts of its leaves, including Eugenol, triglyceride, and essential oils, have been shown to be effective against larvae of *Aedes aegypti*, *Culex fatigans*, and *C. quinquefasciatus*. They also function as a larvicide against these microorganisms. Urosolic acid, oils, linoleic acid, and eugenol exhibit the highest activity. Antibacterial effects are compared with penicillin and ciprofloxacin.

Anti-stress Activity :

Stress is a common disorder that many people experience frequently. Individuals' psychological, physiological, and behavioral responses to a lack of balance between their shortcomings and their abilities to address them are referred to as dysregulation. Stress can result from a deficiency of neurotransmitters like dopamine, norepinephrine, and serotonin. Previous research suggest that *Ocimum sanctum* leaves can reduce stress by increasing serotonin levels in the brain. Tulsi is a relaxing plant that can be taken twice daily for optimal results. Tulsi leaf extract reduces both acute and chronic noise stress by inhibiting the stress hormone cortisol in the plasma. Animal studies confirm this effect. High levels of stress can harm the body and lead to several ailments, including psychiatric disorders, immunological suppression, peptic ulcers, hypertension, and ulcerative colitis. Therefore, it is crucial to address this issue. Stress can have an impact on both physical and physiological processes. Tulsi enhances memory, increases survival duration under anoxic stress, and lowers hypoxia. There are several types of stress, such as

Toxicant stressors include chemicals, heavy metals, and radiation. Experimental studies have shown that Tulsi can reduce toxic effects that cause genetic, immunological, and cellular damage. Tulsi offers protection

against industrial pollutants, pharmaceutical medications, heavy metals, and radiation's harmful effects. Holy basil reduces radiation-induced oxidative damage to cells and chromosomes by removing free radicals. Experimental animals will experience less organ damage and improved post-radiation survival rates.

Physical stress is caused by harmful substances and radiation. This includes exposure to extreme noise, physical exertion, extreme cold, and physiological and metabolic stress. Tulsi enhances aerobic metabolism, reduces oxidative stress, and maintains physiological and biochemical parameters impacted by physical exertion. Previous research indicates that oxidative stress can damage cells and tissues.

Anti-Cancer Activity :

Fresh *Ocimum sanctum* leaves were found to improve performance in experimental animals. The methanolic extract of *Ocimum* variants reduces nitric oxide, maintaining cancer-preventive properties. Tulsi has been shown to reduce the incidence of benzo (a) pyrene-induced neoplasia and 3-methyl di-methyl amino azobenzene-induced hematomas in experimental mice. *O. sanctum* has shown antitumor efficacy against human fibrosarcoma cells in vitro. The cells had reduced cytoplasm and condensed nuclei, with fragmented DNA observed in agarose gel electrophoresis.

Studies indicate that *Ocimum sanctum* has significant anticancer properties.

O. sanctum L. seed oil shown chemopreventive efficacy against 20-methyl cholanthrene-induced fibrosarcoma tumors in Swiss Albino mice's thighs. Supplementing the oil at the maximum acceptable dose (100 µl/kg body weight) significantly reduced 20-methyl cholanthrene-induced tumor incidence and volume. Supplementing mice with seed oil resulted in improved survival rates and delayed tumor onset. The study found that *O. sanctum* L. leaf extract prevents chemical carcinogenesis by preventing metabolic activation of the carcinogen. Tulsi has been shown to have anticarcinogenic properties on several organs, including the liver, pancreas, lungs, brain, skin, bone marrow, uterine, cervical, peptic ulcer, gastric ulcer, bladder, leukemia, and breast cancer. Tulsi products contain eugenol, urosolic acid, oleanolic acid, and ethanolic extract, which have potent anticarcinogenic properties. The investigations demonstrated the ability to inhibit carcinogenic genes, modulate carcinogens, and inactivate cancer-causing enzymes such cytochrome P-450, cytochrome b5, and hydrocarbon hydroxylase. To prevent cancer, Tulsi has been shown to cause apoptosis and destroy genetic material.

Antiepileptic Activity

Seizures occur when neurons in the brain discharge, resulting in. Epilepsy is the world's second most common chronic neurological condition after stroke, characterized by recurrent seizures. This disease affects approximately 40-60/1,000,000 people each year (98,100). Approximately 60-70% of people responded positively to antiepileptic medicines for seizures, while 30% did not respond significantly. Further research is needed to identify the most effective antiepileptic medications with minimal adverse effects. This condition occurs through three key processes, including:

1. An imbalance of excitatory and inhibitory neurotransmitters, specifically GABA and glutamate.
2. Activation of voltage-dependent sodium channels.
3. Activation of the NMDA receptor increases the influx of calcium ions.

The ethanolic extract of Holy Basil leaves improves neuronal function in the brain, reducing epileptic symptoms. OS extract inhibits voltage-gated Na⁺ channels and N-methyl-D-aspartate receptors, reducing the T-type Ca²⁺ current in the thalamus. Additionally, the medication affects the agonistic properties of gamma-aminobutyric acid (GABA). OS increases phenobarbitone-induced sleep duration. Ethanol and chloroform extracts of Holy Basil's stem, leaf, and stem calli have been shown to have antiepileptic properties, as evidenced by their defensive action against tonic hind limb extension (THLE) and positive disease reactions.

Antioxidant Activity

By using standard antioxidant ascorbic acid, the antioxidant activities were compared. It is nothing but refusing the generation of oxidising chain reactions, which leads to suppressing the oxidation of other molecules to produce energy to fuel biological processes. Oxidation is necessary for several living organisms. Free radicals possess one or more unpaired electrons that react with another molecule by taking or giving electrons, leading to the causation of several diseases. These are unstable and highly reactive substances that cause irreversible damage to cells. As per the previous data, free radicals inside the body manifest various disorders' cellular changes and development. Antioxidants found in herbal medicinal plants may help treat this issue. Medicinal plants are used by almost 80% of the world's population to improve health. Membrane lipids, proteins, DNA, and carbohydrates are essential for life but can be damaged by reactive oxygen species. This leads to a variety of illnesses, including liver cirrhosis, atherosclerosis, cancer, and diabetes. Antioxidants protect the human body from free radicals that damage liver microsomes, improve superoxide dismutase activity, and reduce lipid peroxidation. The antioxidant properties are compared to those of ascorbic acid, a typical antioxidant. Some research used qualitative phytochemical analysis to discover phenols, alkaloids, flavonoids, and steroids.

CONCLUSION

Tulsi's therapeutic capabilities make it an essential ingredient for a peaceful lifestyle. Extensive study has shown that Tulsi can be consumed safely in all forms. This plant is known as the "Queen of Herbs" in India due to its medicinal virtues, which are accepted in modern medicine. Tulsi offers protection against radiation, stress, cancer, diabetes, aging, and infections in humans, animals, and plants. It has numerous beneficial characteristics, including anti-stress, anti-cancer, antioxidant, anti-inflammatory, antibacterial, anti-radiation, insecticidal, repellent, flavoring, and coloring. It functions as an adaptogen, boosting the immune system. This plant is unique due to its medical, nutritional, and spiritual characteristics. Tulsi's pharmacological effects are mostly attributed to its phytoconstituents, eugenol and ursolic acid. Tulsi is known as the "Incomparable One" and the mother of natural medicine.

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