



## Antioxidant potential of *Ocimum Sanctum*: A review

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### KEYWORDS

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### ABSTRACT:

The medicinal plant tulsi has therapeutic properties that make it very good for human life. Tulsi is a powerful antioxidant. The ayurvedic herb tulsi is used for its therapeutic effects. It is the cornerstone of India's ayurvedic holistic health system. Every part of the Tulsi plant is utilized to treat a variety of illnesses, such as the human tooth loss treatment Tulsi leaf extract. It is a medicinal plant. Tulsi is also helpful for respiratory infections, bronchitis, and malaria in the skin. (Phimphilai S., Wangcharoen W.) It serves as a tonic for boosting memory and a therapy for alternating fever and diabetes. Compounds that carry out the neutralization reaction are known as antioxidants. Neutralization reactions support cellular balance and lengthen cellular life. The neutralization reaction is maintained by a variety of mechanisms, such as the enzymatic antioxidant system. For instance, vitamin C functions as an antioxidant and is an enzyme that supports the neutralization reaction. Minerals and synthetic substances sustain the neutralizing reaction. Each molecule has the capacity to continue the neutralization process that serves as an antioxidant.

### 1. Introduction

*Ocimum sanctum*, often known as tulsi, is a medicinal herb that is a member of the Lamiaceae family. Tulsi is referred to as the "queen of herbs"[1] There are two well-known varieties of tulsi: green (Rama tulsi) and black (Krishna Tulsi). Both varieties of tulsi have a wide range of therapeutic benefits, including the ability to ward off various illnesses, throat infections, and fevers of all kinds. Ayurveda uses the plant tulsi for its healing properties. It is a pillar of India's ayurvedic, all-encompassing healthcare system. Every portion of the *O. sanctum* plant is used to treat a number of illnesses, and Tulsi leaf extract is also utilized to treat tooth loss in people. [2] A member of the Lamiaceae family that is most like *O. sanctum* and a different plant like *Mintth Spicata* in nature. Both mint and tulsi have strong aromas. The plant is a little dicot. Tulsi is a tiny plant with upright branches that range in height from 30 to 60 cm. It has hairy stem, squirred form, and green leaves. A raceme is an inflorescence with decussately arranged leaves (Phyllotaxy).[3]

It also emits enlivening odors. Every residence has a tulsi plant since it is seen to be very significant. Tulsi has an additional advantageous quality for human existence that has been documented in Classical Hindu literature (Charaka Samhita).

Due to the Tulsi plant's therapeutic qualities, India adopted it. The Tulsi plant has a variety of

advantageous compounds that are very beneficial to human existence. Tulsi was utilized differently in the past. Tulsi has different types of activity like antioxidant, anticancer, and antidiabetic.[4].It is a medicinal herb. Tulsi is also helpful for scalp malaria, bronchitis, respiratory infections, and mouth infections. It is used to treat diabetic patients. is used as a tonic to improve memory and as an alternative to fever. Rats with diabetes are given *O.sanctum* to reduce their blood sugar levels. In healthy rats, the *O. sanctum* extract enhances the effects of exogenous insulin.[5] Antioxidants and free radical scavengers have been demonstrated to be effective in defending against faulty oxygen. A distinct kind of chemical molecule found in tulsi is incredibly beneficial to our bodies. It assists in preventing the negative effects of the poisonous drug [6] Antioxidant activity in *O. sanctum* has been documented by several types of researchers. It clarifies the workings of antioxidants and shows that *O. sanctum* exhibits strong antioxidant activity.[7]

S.N.	PHYTOCHEMICAL	AMOUNT
1.	Saponins	0.13-0.75%
2.	Orientin (flavone-C Glycosides )	1.02-1.77mg/g
3.	Tannins	5-14%
4.	Vicenin (flavone-C Glycosides )	0.52-1.68mg/g
5.	Carbohydrate	54-75%
6.	Isoorientin (Flavone-C Glycosides)	0.39-1.49mg/g
7.	Anthraquinones	00-0.015%



8.	Alkaloids	0.91-1.28%
9.	Rosmarinic acid	2-27.4mg/g
10.	Eugenol	15.91%

**Table-1:** Phytochemical composition in *Ocimum sanctum* plant

S.N.	ELEMENT	AMOUNT
1.	Nitrogen(N)	2.15-4.35%
2.	Phosphorus (P)	0.24-0.35%
3.	Potassium(K)	2.36-3.08%
4.	Calcium(C)	0.95-1.32%
5.	Iron(Fe)	78.5-88.5%

**Table-2:** Element and its amount present in *O. sanctum* plant

## 2. Antioxidant compounds and their health benefits:

The substance has additional electrons that can balance out faulty oxygen and offer protection.[8] Antioxidants also aid in protecting against cell damage. Antioxidant compounds give up their extra electron, and this extra electron binds with deficient oxygen to counteract its effects. Antioxidant is a Greek term that means "against," and "oxy" refers to oxidation (loss of an electron). Scientist Berthollate first noticed that some substances slowed down the oxidation reaction in 1779. After some time, Davy, a scientist, noticed the same mechanism in 1817.

Antioxidants serve as a nutritional complement for our bodies.[9] Several *O. sanctum* extracts, including the leaves, roots, and stem extract, support the maintenance of a healthy body. Nonetheless, there are numerous dietary kinds with antioxidant activity. Considering that they function as pro-oxidants, antioxidants play a crucial part in oxidative stress.[10] The entire plant has natural nutritional and therapeutic qualities *O. sanctum* is utilized in accordance with custom. For its antibacterial, anti-diabetic, anti-fertility, wound-healing, radioprotective, and other medicinal properties.[11]

## 3. Type of antioxidants in plant system

Antioxidants are substances that can lessen the harm done to cells by free radicals (a free radical is an electron that moves around inside a cell without being bound, inactivating the activity of other cellular components). Various antioxidants function at various levels and stop free radicals from attaching to the substance [12] It is a herb used for healing.

In order to counteract oxidative damage, ROS (reactive exogenous species) are found in the chloroplast, mitochondria, plasma membrane, apoplasmic space, and micro bodies like microsomes and peroxisome. ROS cause several forms of cell damage and cell ageing. Two different forms of ROS defense mechanisms exist in biological cells. The cell is equipped with an extremely effective antioxidant defense mechanism

that includes both enzymatic and non-enzymatic elements.[13]

Several enzymes are produced by plants in the plant system to avoid the formation of free radicals. Superoxide is primarily found in stressful situations, and certain enzymes like superoxide dismutase (SOD) stop the production of reactive oxygen species.[14] In the plant system, ascorbate peroxidase (APX), glutathione peroxidase (GPX), catalase (CAT), and peroxidase work as antioxidants to detoxify H<sub>2</sub>O<sub>2</sub>.

Antioxidants that are not enzymes operate in a cyclic fashion. Like ascorbate, glutathione, tocopherol, flavonoids, alkaloids, and carotenoids, a non-enzymatic antioxidant. Similar to enzymatic antioxidants, all nonenzymatic antioxidants, such as glutathione peroxidase cycle, eliminate free radicals. When H<sub>2</sub>O<sub>2</sub> (ROS) and glutathione interact in the glutathione peroxidase cycle, H<sub>2</sub>O<sub>2</sub> is transformed into water.[15]

### 3.1 DPPH radical scavenging activity

*O. sanctum's* antioxidant qualities confer a wide range of health advantages. A typical technique for assessing the antioxidant activity of natural substances like plant extracts is the DPPH (2, 2-diphenyl-1-picrylhydrazyl) test. In this test, antioxidants in the sample diminish DPPH radicals, which are stable free radicals, causing a purple color to turn yellow.[16] Another study used the DPPH assay to demonstrate the antioxidant activity of several solvent extracts of *Ocimum sanctum* leaves. The analysis revealed that the methanol extract, with an IC<sub>50</sub> value of 20.31 g/mL, exhibited the strongest antioxidant activity. Significant antioxidant activity was also demonstrated by the ethanol and water extracts, with IC<sub>50</sub> values of 26.36 and 32.74 g/mL, respectively [17]

Accordingly, these results indicate that *Ocimum sanctum* plant extracts have considerable DPPH radical scavenging activity, which may explain some of its health advantages. It is crucial to understand that different tests might be necessary to completely assess the antioxidant capacity of natural substances and plant extracts because their DPPH radical scavenging activity cannot be entirely attributed to their antioxidant activity.

### 3.2 Hydroxyl radical scavenging assay

This technique is frequently used to assess the antioxidant activity of plant extracts. The hydroxyl radical scavenging assay measures a substance's capacity to neutralize hydroxyl radicals, which are highly reactive and can harm biomolecules like DNA, proteins, and lipids. The assay analyses the suppression of the interaction between hydroxyl radicals and the sugar 2-deoxyribose in the presence of hydrogen peroxide and a metal ion (such as Fe<sup>2+</sup>) (H<sub>2</sub>O<sub>2</sub>). The



assay is based on the idea that the 2-deoxyribose and hydroxyl radical produced in the reaction system will react to form malondialdehyde (MDA), which can be measured using a colorimetric method.

### 3.3 ABTS

Another frequently used technique to assess the antioxidant activity of plant extracts is the ABTS (2, 2'-azinobis-(3-ethylbenzothiazoline-6-sulfonic acid)) radical scavenging assay. Here is an illustration of a study report describing the *Ocimum sanctum* ABTS radical scavenging activity assay. The ABTS+• decolorization assay was used in this work to assess the *Ocimum sanctum* essential oil's capacity to scavenge ABTS radicals. The essential oil had shown a dose-dependent scavenging action against ABTS radicals, according to the authors.

### 3.4 The Phosphomolybdate assay

It is a technique that is frequently used to assess the overall antioxidant activity of plant extracts.[18] This assay can be employed in the instance of *Ocimum sanctum* to assess the plant's antioxidant capacity. The phosphomolybdate assay was performed to assess the antioxidant capacity of several *Ocimum sanctum* leaf extracts. The methanolic extract, followed by the ethanolic and aqueous extracts, exhibited the strongest antioxidant activity, according to the scientists.

The phosphomolybdate assay was employed in a different study by Rajeswari and Uma (2011) to assess the antioxidant activity of *Ocimum sanctum* extracts produced using various solvents. The ethyl acetate

extract, followed by the methanol and water extracts, exhibited the strongest antioxidant activity, according to the authors.[19]

Figure-1 illustrates the antioxidant activity of tulsi and vitamin C. In comparison to Tulsi, vitamin must exhibit more scavenging activity at a concentration of 100ug/ml. When compared to Vitamin C, tulsi had greater scavenging activity at concentrations of 300 and 400 ug/ml. This comparison assists in determining the greatest antioxidant naturally\_[20] (Tulsi and vitamin C both have antioxidant properties, although vitamin C is more effective.

### 6. Medicinal aspects of the Tulsi plant.

Shetty et.al, describe the wound-healing properties of *O. sanctum* in rats. He is investigating the high wound healing activity of *O.sanctum* .it is very useful to high injury and keloids and hypertrophic scars.

Grovel et al. say that permanent consumption of *O.sanctum* extract for 30 days in normal rats gains lower glucose levels which is why *O.sanctum* extract is very useful for hyperinsulinemia. That type of investigation further leads to the formation of a new drug for hyperinsulinemia.

Vintra et al. describe the radio-protecting effect of *O.sanctum*. Two soluble components of the *O.sanctum* plant help to protect against radiation. Radiation causes lethal diseases like mutation. The mutation may be leading to Ontogenesis (Cancer). The aqueous effect of the extract of *O.sanctum* leaves protects against the lethal mutation of cell

S.N.	EXTRACT OF TULSI PLANT	BENEFICIAL FOR DISEASE	REFERENCES
1.	Ethanolic extract of <i>O.sanctum</i>	Normal wound healing, Decrease the blood glucose level	(Karthikeyan K, et al. 1999)
2.	Hydro-alcoholic extract <i>O.sanctum</i>	Cardio-protective effect	(Sharma M et al. 2001)
3.	Aqueous extract of <i>O.sanctum</i>	Radio-protective effect	(DeviPU, et al. 1999)
4.	Polysaccharides obtained from <i>O.sanctum</i>	Prevent oxidative damage and other healing properties.	(Subramanian M, et al. 2005)
5.	Methanolic extract of <i>O.sanctum</i>	Cerebral reperfusion injury and gastroprotective.	(Goel RK, et al. 2005)
6.	Benzene extract of <i>O.sanctum</i>	Anti-fertility	(Ahmed M et al. 2002)
7.	Alcoholic extract of <i>O.sanctum</i>	Antinociceptive (analgesic)	(Khanna N, et al. 2003)

Antioxidants protect our bodies by working on neutralisation reactions through a variety of ways. Always, antioxidants counteract the effects of faulty oxygen. antioxidant defence from free radicals.[21]

An unpaired and unstable collection of electrons is referred to as a free radical. Every electron seeks stability, thus when a free radical electron is added to a cell's chemistry, it destroys the cell's process, causing harm to the cell or premature ageing of the cell.[22]

### 7. Conclusion

Current study has been focused on the consequences of low oxygen levels in our body. Defective oxygen causes cell damage and accelerates cell ageing. Pollution causes the formation of faulty oxygen. Any person who takes food devoid of antioxidants has significant immunological weakened because damaged cells result from faulty oxygen. A great choice for all-natural antioxidants is *O. sanctum*. Every portion of the *O. sanctum* plant, including the essential oil, has antioxidant properties.



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