

# Cultivation, Extraction, Identification and Various Pharmacological Activity of Holy Basil Oil

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**Abstract:** *Ocimum sanctum* is commonly known as Holy Basil Oil, is a fruit rich in essential oils with a wide range of potential health benefits. This review paper explores the chemical composition, extraction methods, and biological activities of *Ocimum sanctum* essential oil. The major constituents of HBEO include eugenol, beta caryophyllene, and linalool. These compounds have been shown to possess antimicrobial, antioxidant, anti-inflammatory, and anticancer properties. The potential applications of HBEO in various fields, including Ayurveda and herbal medicine, aromatherapy and essential oil, cosmetics, and pharmaceuticals, are also discussed. Further research is needed to fully understand the mechanisms of action of HBEO and to explore its potential as a safe and effective natural remedy. This review paper explores various extraction techniques for obtaining essential oil from Holy basil, The chemical composition of the extracted essential oil, primarily consisting of eugenol is discussed, along with its potential health benefits and applications. The paper also highlights the importance of sustainable extraction practices and the potential for valorizing tulsi by-products to obtain valuable essential oils.

**Keywords:** Holy basil oil, cultivation, extraction, identification, antioxidant property, Anticancer, antioxidant, antiulcer, antidiabetic, antimicrobial

## I. INTRODUCTION

*Ocimum sanctum* (Tulsi) renowned as; “Queen of herbs”, the legendary “Incomparable one”, “The Mother medicine of nature”, is regarded as one of the holiest and most cherished of the many healing and health-giving herbs of the Orient. Medicinal, religious and culinary uses of Tulsi have been reported from the ancient times for centuries in China, India and the rest of the Asian countries, North Africa and Australia. Genus *Ocimum* was described in 1753 by Linnaeus, who listed five species in it. The Pauranic mythology calls Tulsi; VishnaPriya, “Beloved of Lord Vishnu” and that’s one of the reasons that Hindus pray Tulsi as a goddess in the India. [Shishir Mahajan, Et. al. 2019]

Tulsi is an important medicinal plant that belongs to the Lamiaceae family. Morphologically it is a perennial aromatic evergreen undershrub with pubescent branchlets having pale green leaves which are glandular, ovate or oblong in shape, base is acute, deeply serrated, pubescent on both surfaces, oppositely arranged and about 3-7 cm in length including petioles which are 4 to 12 mm long, 1 to 2.5 cm wide; indumentum of long white adpressed hairs or sometimes glabrous above; petiole 4-10 mm. Inflorescence is vertical, flowers are purplish white in simple or much branched racemes; bracts usually deciduous, forming a small coma, ovate, entire, cuspidate; pedicel 3 mm, erect, slightly curved. [Motte. Sushma, Et al. 2020].

The leaves of this plant on steam distillation yield a bright yellow colour volatile oil possessing a pleasant odour with an appreciable note of clove oil. The plant contains mainly phenols, aldehydes, tannins, saponin and fats. The essential oil major components are eugenol (71%), [Dr. Khursheed Ahmad Ansari. Et al 2015]. The majority of the eugenol essential oil is found in the part of the leaves, with smaller amounts found in the seeds, stem and roots.

India along with southeast Asia and Australia accounts for almost half the production in the world. Tulsi

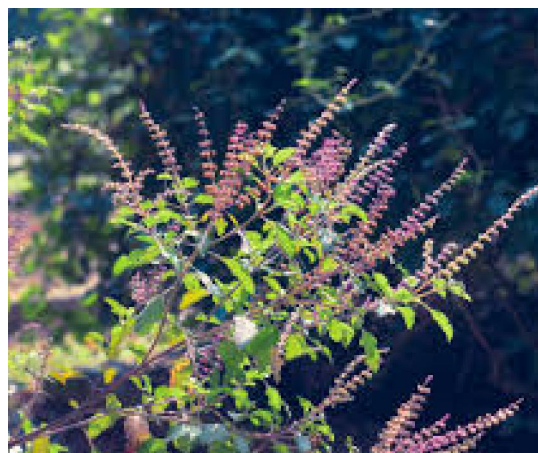


Fig.1& 2 . tulsi plant.

Some of the phytochemical constituents of tulsi are oleanolic Acid, ursolic acid, rosmarinic acid, eugenol, carvacrol, Linalool,  $\beta$ -caryophyllene (about 8%).Tulsi essential oil consists mostly of eugenol (~70%)  $\beta$ -Elemene (~11.0%),  $\beta$ -caryophyllene (~8%) and germacrene(~2%), with the balance being made up of various trace Compounds, mostly terpenes.antibacterial, antioxidant, biological, and herbal fragrance. [Dr. Khursheed Ahmad Ansari. et al2015].



Fig. 3 & 4. Holy basil oil

#### Scientific Classification

Kingdom : Planteae  
Class: Magnoliopsida  
Order: Lamiales  
Family: Labiateae or Lamiaceae  
Genus: Ocimum  
Species: Sanctum

#### CULTIVATION

Ocimum sanctum is native to India Egypt, France, Italy, USA and Iran. In addition, Basil is found in Tropical regions. It grows in warm climates, it is aromatic and bright Green to purple.[Bano N.2017 et al. 2017] Ocimum sanctum can be propagated through seeds, cutting, layering and tissue culture. For propagation Use fresh seeds or healthy cuttings for best results. Keep the soil consistently moist during the propagation process. Provide adequate light and warmth for the new plants. Transplant the new plants to individual pots or gardens once they are strong enough. Plant is sufficiently

hardy and it can be grown on any type of soil except the ones with highly saline, alkaline or water logged conditions. However, sandy loam soil with good organic matter is considered ideal. The crop has a wide adaptability and can be grown successfully in tropical and sub-tropical climates. Long days with high temperature have been found favorable for plant growth and oil production.

The first harvest is done after 90 days of planting and subsequently it may be harvested at every 75 days interval. The crop is harvested at full bloom stage by cutting the plants at 15 cm from ground level to ensure good regeneration for further harvests. The yield and oil content is more in plants harvested during bright sunny days. On an average, tulsi gives about 10,000 kgs of fresh herbage per hectare per year. The herb contains about 0.1 to 0.23 per cent oil and it about 10-20 kg of essential oil per hectare. Irrigated tulsi gives higher herbage yield (upto 20 ton and oil yield (upto 40kg/ha).

**EXTRACTION:****MATERIAL AND METHOD:****Collection of plant material:**

- Fresh tulsi leaves were purchased from a local market or from kitchen garden of house
- washed thoroughly under tap water.
- The leaves are chopped using a sterile knife and shade dried for 4-5 days at room temperature.
- The dried leaves were pulverized using an electric blender and stored in airtight containers for further use.

**Preparation of the Sample:**

- The leaves were dried in order to reduce the initial moisture content (90 % of humidity), in an oven with air renewal and circulation. The drying temperature was 50 °C and was kept constant for 5 hours until constant moisture.
- After drying, the sheets were grinded in order to increase the contact surface reducing the resistance to oil extraction. The dried leaves were placed in sealed plastic bags, protected from light and moisture, and stored in a refrigerator with low humidity[[Nídia Alves de Barroset al.2013].

**Material/Instruments Used:** The materials/instruments used for this work were round bottom flask, Basket heater, distillation unit, thermometer, measuring cylinder, conical flask, separating funnel, soxhlet apparatus.

**Extraction of Oil by Hydrodistillation extraction.**

- The extraction was done in a Clevenger apparatus, coupled to a bottom Flask of 500 mL
- It was added 30 g of crushed leaves of basil and 300 mL of water into the flask. The Extraction time was fixed at 4 hours. The extract oil was diluted in hexane and filtered after separation. Then,
- It was dried using Na<sub>2</sub>SO<sub>4</sub> to remove the water and after that, the solutions were separated by rota evaporator.

**Extraction of oil by soxhlet apparatus:**

- Essential oil extraction from orange peels was done using the Soxhlet method.
- The extractions were performed in a triplicate way. It was used, approximately 5 gm of basil, with 200 mL of hexane. The extraction time was fixed in 4 hours, after reaching the boiling
- Temperature around 69 °C

**IDENTIFICATION TEST:****Tannins:**

- Take 2ml of tulsi filtrate and add 5ml distilled water.
- heat at 80-100 °C for 10 min in water bath, then filter it after that add 1% Ferric chloride (5-6 drops).
- Greenish black color indicates the presence of tannins.

**Glycosides:**

- Extract was hydrolyzed with HCl solution and neutralized with NaOH solution.

- Few drops of fehling's solution A & B were added.
- Brick red precipitate showed the presence of glycosides.

**Reducing sugar:**

- Extract was shaken with distilled water and filtered.
- Filtrate was boiled with fehling's solution A&B for 10 min.
- Orange & red precipitate indicates the presence of reducing sugar.

**Amino acid :**

- Take tulsi extract , add 5 ml distilled water and filter it
- Add 2-3 ml Ninhydrin reagent and Heated
- Purple colour indicates presence of amino acid.

**Phenolic compound:**

- Take 2 ml of sample and add 2-3 ml of ferric chloride
- Greenish black colour indicates presence of phenolic compound .

**PHARMACOLOGICAL ACTIVITY:****Anticancer:**

In modern world, cancer is a leading cause of death. Cancer Treatment options such as surgery, radiotherapy and chemotherapy are Costly, have serious side effects and residual morbidity. It has been found That ethanolic extract of Tulsi produces a reduction in tumor size and An increase in the life expectancy of mice that have Sarcoma-180 solid Tumors. This result haalso been demonstrated by anticancer activity Of Ocimum sanctum in Lewis lung carcinoma animal model. Ursolic Acid has anticancer property. O. sanctum provides a protective effect On DNA from harmful radiations. O. sanctum is significantly useful Against a variety tumorigenesis states. The administration of aqueous And alcoholic extracts of O. Sanctum.

**Antiviral activity:**

The essential oils like Eugenol of Tulsi leaves produce anti-viral Activity . Different types of extracts of Ocimum sanctum have Anti-viral activity against different viruses e.g. Hematopoietic Necrosis Virus (IHNV) , polio virus type 3 , herpes virus (HSV), Hepatitis B virus, New castle Disease Virus. Ethanolic extract of Tulsi Plant leaves in a range of 22.5 mg/ml concentration inhibit replication Of polio type 3 virus in VERO cells.

**Anti-ulcer activity:**

The pathophysiology of peptic ulcer dieses involves an imbalance between offensive (acid, pepsin, and H. pylori) as well as suspicious aspects. The antiulcer activity of Tulsi can be attributed to several mechanisms, including Inhibition of gastric acid secretion Protection of the gastric mucosa.

**Anti-diabetic activity:**

A metabolic disorder is called Diabetes. A system, through which our body utilizes the digested food energy and growth, is known as metabolism. Tulsi exhibits antidiabetic activity, as was revealed in one study, it Was observed that aqueous extract of Tulsi significantly lowers the blood Glucose level in diabetic rats . Similarly, other studies also confirm A fall of fasting blood sugar level and HBA1c was also contributed By the hypoglycemic effect of Tulsi. Tulsi is also effective for Metabolic syndromes can be used as adjunct with other therapies [8]. It is effective in liver disease and improves the metabolic breakdown of Toxins. It helps to balance plasma glucose levels and insulin mediated



**Antifungal and Antibacterial activity:**

Tulsi (*Ocimum sanctum*) has been reported to possess antifungal activity, which can help prevent and treat fungal infections. The antifungal activity of Tulsi can be attributed to its various bioactive compounds, including: eugenol, flavonoid, carvacrol. In vitro antifungal activity was also observed against *Candida* species also when oil from *O. gratissimum* L. was used. *Ocimum* shows strong antibacterial activity against *Klebsiella* (causes pneumonia and urinary tract infections), *E. coli*, *Proteus* & *Staphylococcus aureus* and *Vibrio cholerae*. Studies have shown *O. basilicum* act as a strong essential oil from *Ocimum* sp which contains eugenol, carvacrol, methyl eugenol, Caryophyllene are considered mainly to be responsible for various antimicrobial properties.

**Antifertility Activity :**

One of the major constituents of the Tulsi leaves is Ursolic acid and it has been reported that it possesses anti-fertility effect. This effect has been attributed to its anti-estrogenic activity which may be responsible for arrest of spermatogenesis in males and due to inhibitory effect on implantation of ovum in females. This constituent may prove to be a promising anti-fertility agent devoid of side effects. In males, Tulsi leaves reduce spermatogenesis by retarding Sertoli cells activity [Dr. Vinod Singh et al 2010].

**II. CONCLUSION**

This review paper has comprehensively explored the cultivation, extraction, identification, and authentication of holy basil oils. We have delved into various aspects of holy basil oil production, from the optimal growing conditions and harvesting techniques to the diverse extraction methods available. In conclusion, Holy Basil Oil (HBO) is a valuable plant extract with various pharmacological activities. The cultivation of Holy Basil (*Ocimum sanctum*) is easy and widespread, making it a readily available resource. The extraction of HBO can be done through various methods, including steam distillation and solvent extraction. The identification of HBO's chemical composition has revealed a diverse range of bioactive compounds, including eugenol, carvacrol, ursolic acid, and flavonoids. These compounds contribute to HBO's pharmacological activities, which include antibacterial, antifungal, antiviral, anti-diabetic and antifertility activity. The chemical composition and identification of HBO's key compounds within have been discussed, highlighting the importance of chromatographic and spectroscopic techniques for their accurate analysis. Additionally, the review has emphasized the significance of authentication methods to ensure the quality, purity, and traceability of HBO in the market.

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**REFERENCES**

- [1]. WORLD JOURNAL OF CURRENT MEDICAL AND PHARMACEUTICAL RESEARCH Extraction of Kapura Tulasi (*Ocimum kilimandscharicum*) leaves: Phytochemical studies and Anti diabetic activity of the Ethanolic Extracts Motte. Sushma 1, Lahari. Sidde2, Bandi. Jayanthi3
- [2]. Journal of Bioequivalence & Bioavailability Bano N1, Ahmed A2, Tanveer M2, Khan GM2 And Ansari MT1(2017)
- [3]. Article ID: WMC001046 *Ocimum Sanctum* (tulsi): Bio-pharmacological Activities Author(s): Dr. Vinod Singh, Ms. Sarikaamdekar, Dr. Omparakash Verma Corresponding Author: Dr. Vinod Singh, Associate Professor and Head, Microbiology, Barlatullah University, Barkatullah University (22 Oct 2010)
- [4]. International Journal of Applied Research 2015; 1(3): 148-151 Study of Plant Tulsi and its benefits for human beings Dr. Khurshheed Ahmad Ansari Farman
- [5]. European Journal of Biomedical AND Pharmaceutical sciences <http://www.ejbps.com> ISSN 2349-8870 Volume: 6 Issue: 6 106-109 Year: 2019 OCIMUM SANCTUM (LINN.); THE QUEEN OF HERBS Shishir Maharjan Department of Pharmacy, Institute of Medicine, Tribhuvan University

- [6]. R Miller, S Miller, Tulsi Queen of Herbs India's Holy Basil, 2003.
- [7]. A Kumar, A Rahal , S Chakraborty, R Tiwari, S K Latheef , K Dhama, Ocimum sanctum (Tulsi): a miracle herb and boon to medical science – A Review. International Journal of Agronomy and Plant Production, 2013; 4(7): 1580-1589.
- [8]. L Mohan, Amberkar MV, M Kumari, Ocimum sanctum Linn(tulsi) -an overview International Journal of Pharmaceutical Sciences Review and Research, 2011; 7(1): 51-53. 16. B Joseph, V M Nair, Ethanopharmacological and Phytochemical Aspects of Ocimum sanctum Linn-The Elixir of Life. British Journal of Pharmaceutical Research, 2013; 3(2).
- [9]. Ghasemi E, Golshahi H, Mehrzade E, Antibacterial activity of Ocimum sanctum extract against E. coli, S. aureus and P. aeruginosa. Clin. Biochem., 44, 2011, S352-S352. 17. Goyal P, Kaushik P, In vitro evaluation of antibacterial activity of various crude leaf extracts of indian sacred plant, Ocimum sanctum L. Brit. Microbiol. Res. J., 1, 2011, 7019)
- [10]. E Singh, S Sharma, J Dwivedi and S Sharma Diversified potentials of Ocimum sanctum Linn (Tulsi): An exhaustive survey. Scholars Research Library, 2012; 2(1): 39-48.