



## ETHNOMEDICOBOTANICAL STUDY ON *OCIMUM SANCTUM* L. (TULSI) - A REVIEW

A.N.M MAMUN-OR-RASHID, MD. MOSHIUL AZAM, BIPLAB KUMAR DASH, FATEMA BINTE HAFIZ,  
MONOKESH KUMER SEN\*

Department of Biotechnology & Genetic Engineering, Faculty of Applied Science & Technology, Islamic University, Kushtia-7003, Bangladesh.  
Email - monokesh@gmail.com

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### ABSTRACT

**Objective:** Ethnomedicobotanical study of different plant parts of *Ocimum sanctum* L., belonging to the family Lamiaceae, popular for its medicinal and religious value in Hinduism of Bangladesh. **Methods and materials:** This review has been conducted to pile up information that is available in different scientific literatures and this update compendium documentation has focused on some of the traditional and pharmacological aspects and phytochemical constituents. **Results:** From the result it reveals that wide numbers of phytochemical constituents have been isolated from the plant e.g. aesculectin, orientin, vallinin, eugenol, alkanoids and is proved to have potential for medical effects like hepatoprotective, neuroprotective, cardioprotective, chemopreventive, immunomodulatory, antioxidant, antimicrobial, anticancer, antiulcer, antiinflammatory, antipyretic and various other important medicinal properties. **Conclusion:** The effects of *O. sanctum* may delay the development some life threatening complications and this work stimulates the researchers for further research on the potential use of this medicinal plants having pharmaceutical potential.

**Key words:** *Ocimum sanctum*, ethnomedicobotanical, traditional, phytochemical, pharmacological

### INTRODUCTION

The ethnic and rural people of Bangladesh have preserved a large bulk of traditional knowledge of medicinal uses of plants growing around them. This knowledge is handed down to generations through word of mouth and is extensively used for the treatment of common diseases and conditions. In the last few years there has been an exponential growth in the field of herbal medicine and these drugs are gaining popularity both in developing and developed countries because of their natural origin and less side effects. An estimate suggests that about 13,000 plant species worldwide are known to have been used as drugs. Plant-based natural constituents can be derived from any part of the plant like bark, leaves, flowers, roots, fruits, seeds and so on. [1]

Medicinal plants are used by 80% of the world population as the only available medicines especially in developing countries. [2] The beneficial medicinal effects of plant materials typically result from the combinations of secondary metabolites present in the plant. Scientific examination of the remedies could lead to standardization and quality control of the secondary metabolites to ensure their safety. [1] Over the past 20 years, there has been an increased interest in the investigation of natural materials as sources of new antibacterial agents. In the recent years, the development of resistance of pathogens against antibiotics has become a difficult issue caused by the indiscriminate use of modern antibiotics. [3],[4],[5] Considering the high cost of the synthetic drugs and their side effects, wide varieties of natural plants can be considered as a vital source for anti-microbial agents. [6] However, due to over population, urbanization and continuous exploitation of these herbal reserves, the natural resources along with their related traditional knowledge are depleting day by day. [7]

*Ocimum sanctum* L. (also known as *Ocimum tenuiflorum*, Tulsi) has been used for thousands of years in Ayurveda for its diverse healing properties. The sacred, Tulsi is renowned for its religious and spiritual sanctity, [8] as well as for its important role in the traditional Ayurvedic and Unani system of holistic health and herbal medicine. In traditional system of medicine, different parts of *O. sanctum* have been recommended for the treatment of bronchitis, malaria, diarrhoea, dysentery, skin disease, arthritis, eye diseases, insect bites and so on. The *O. sanctum* has also

antifertility, anticancer, antidiabetic, antifungal, antimicrobial, analgesic and antispasmodic actions. Locally, it is taken in many forms, as herbal tea, dried power or fresh leaf. [1],[9],[10]

The present review circumscribes all available update information of *O. sanctum* Linn. It encourages the researchers for further research on the potential use of this medicinal plant.

### Taxonomy of *O. sanctum*:

Kingdom	Plantae
Class	Magnoliopsida
Order	Lamiales
Family	Lamiaceae
Genus	<i>Ocimum</i>
Species	<i>O. tenuiflorum</i>
Binomial name	<i>Ocimum tenuiflorum</i> or <i>Ocimum sanctum</i> L.

### Monograph

Bengali name: Tulsi  
English name: Holy Basil  
Scientific name: *Ocimum sanctum* L.  
Family: Lamiaceae  
Duration: Perennial  
Growth habit: Multi-branched shrub  
Bangladesh nativity: Native

### Morphology

*O. sanctum* L. (Tulsi) is an erect, much branched sub-shrub 30-60cm tall, with simple opposite green or purple leaves that are strongly scented and hairy stems. Leaves have petiole and are ovate, up to 5cm long, usually somewhat toothed. Flowers are purplish in elongate racemes in close whorls. [1]

### Distribution

*O. sanctum* is native throughout the world tropics and widespread as a cultivated plant and an escaped weed. It is cultivated for religious and medicinal purposes and for its essential oil. [1]

### Phytochemistry

The chemical composition of *O. sanctum* is highly complex, containing many nutrients and other biologically active

compounds, the proportions of which may vary considerably between strains and even among plants within the same field. The

various chemical constituents of *O. sanctum* are shown in **Table 1**

**Table 1: Chemical constituents of *O. sanctum***

Plant parts	Extracts	Chemical constituents	References
Leaves / areal parts	Alcoholic extract	Aesculectin, Aesculin, Apigenin, Caffeic acid, Chlorogenic acid, Apigenin, Apigenin-o-glucuronide, Triacontanol ferulate, Vicenin-2, Circineol, Gallic acid, Galuteolin, Isorientin, Isovitexin, Isovitexin, Circineol, Luteolin, Molludistin, Orientin, Procatechuic acid, Stigmasterol, Urosolic acid, Vallinin, Viceni, Vitexin, Vllinin acid	[11],[1],[12],[10]
Whole plant	Vitamin and mineral contents	Vitamin C, Vitamin A, Vitamin E, Calcium, Phosphours, Chromium, Copper, Carotene, Zink, Iron, Nickel	[13],[1],[12]
Leaves	Essential oil	Aromadendrene oxide, Benzaldehyde, Borneol, Bornyl acetate, Camphor, Caryophyllene oxide, cis- $\alpha$ -Terpineol, Veridifloro, Cubenol, Cardinene, D-Limonene, Eicosane, Eucalyptol, Eugenol, Methyl Eugenol, Farnesene, Farnesol, Furaldehyde, Germacrene, Heptanol, Humulene, Limonene, n-butylbenzoate, Ocimene, Oleic acid, Sabinene, Selinene, $\alpha$ -Camphene, $\alpha$ -Myrcene, $\alpha$ -Pinene, $\beta$ -Pinene, $\alpha$ -Thujene, $\beta$ -Guaiene, $\beta$ -Gurjunene, Methyl Chavicol, Linalool, Cirsilineol, Circimaritin phytol, Isothymusin, Apigenin, Rosameric acid, Octane, Nonane, Benzene, ledol, Cadinene, Borneol	[14],[15],[1],[16],[12],[10]
Seeds	Fixed oil	Linoleic acid, Linolenic acid, Oleic acid, Palmitric acid, Stearic acid, Sitosterol, Dilinolenolins, Linodilinolin, Hexoureic acid	[17],[1],[12],[18]
Whole plant	Secondary metabolites	Alkanoids, Steroids, Tannins, Phenol compounds, Flavonoids, Resins, Fatty acids, Gums	[19]

**Folk Remedies and Traditional Uses**

Tulsi is considered to be an adaptogen, balancing different processes in the body and helpful for adapting to stress. It is regarded in Ayurveda as a kind of 'elixir of life' and believed to

promote longevity. Its extracts are used in ayurvedic remedies for common colds, headaches, stomach disorders, inflammation, heart disease, various forms of poisoning and malaria. However, the various traditional uses of the *O. sanctum* are mentioned in **Table 2**.

**Table 2: Folk remedies and traditional uses of *O. sanctum***

Types of use	Diseases	Parts used and method	References
Digestive	Dysentery, Diarrhea, Ulcers, Gastric, Digestive disorders	Chewing of leaves	[20],[18]
Respiratory	Bronchial asthma, Chronic fever, Flu, Cold, cough, Sore throat	Leaf juice with honey	[21],[1],[18]
Cardiovascular	Heart disease	-	[21],[1],[10]
Hepatic diseases	Malaria fever	-	[18]
Detoxification	Insect bite, Snake bite, Various forms of poisoning	Chewing of leaves	[21],[1],[10]
Miscellaneous	Convulsions, Diabetes, Emetic syndrome, Common colds, Headaches, Inflammation, Earache, Colic pain, Migraine headaches, Fatigue, Skin diseases, Wound, Insomnia, Arthritis, Night blindness, Immunological disorders, Infections of mouth	Leaf extract	[20],[21],[1],[18]

**Pharmacology**

Following the uses in traditional system of medicines, it has been used in different life threading diseases. The plant was found to be very useful against cancer, diabetics, ulcer, and bacterial

infection. Some of the reported pharmacological activities of *O. sanctum* are mentioned with scientific evidences in **Table 3**.

**Table 3: Pharmacological activities of *O. sanctum***

Pharmacological Activity	Plant Parts	Extracts	Test organisms	References
Analgesic	Leave, Seeds	Aqueous suspension, Fixed oil	Mice	[10]
Antiulcer	Seeds	Fixed oil, Methanolic extract	Rat	[22],[23],[24],[25],[1],[26]
Antidepressant	Leaves	Alcoholic extract	Rat	[27]
Antianxiety	Leaves	Alcoholic extract	Rat	[27]
Antitussive	Areal parts	Aqueous and Alcoholic extract	-	[28]
Antithyroidic	Leaves	Leaf extract	Rat	[29]
Antistress	Whole plant	Alcoholic extract	Rat	[30],[31],[1],[10]
Effect on central nervous system	Whole plant	Ethanol and Chloroform extract	Mice	[32],[33],[34],[35],[36],[1],[26]
Antispasmodic	Leaves	Leaf infusion	-	[18]
Antipyretic	Seeds	Fixed oil	Rat	[37]
Antiplatelet	Leaves	Alcoholic extract	-	[38]

Antioxidant	Whole plant	Alcoholic and Aqueous extract, Essential oil	-	[39],[40],[41],[14],[42],[43],[44],[1],[26],[10]
Antiinflammatory	Whole plant	Alcoholic extract, Fixed oil, Linoleic acid	Rat	[45],[46],[47],[48],[1]
Antihypertensive	Seeds	Fixed oil	-	[37]
Antihyperlipidemic	Seeds, Leaves	Fixed oil, essential oil	-	[49]
Antihelminthic	Leaves	Essential oil	-	[50]
Antifungal	Leaves	Essential oil, Leaf extract	<i>C. falcatum</i> , <i>C. albicans</i> , <i>C. penniseli</i> , <i>A. niger</i> , <i>A. tenius</i> , <i>Helminthosporium</i> sp.	[11],[51],[26],[52]
Antifertility	Leaves	Benzene extract	Albino rat	[53],[1]
Antiemetic	Leaves	Leaf extract	-	[54]
Antidiabetic	Whole plant	Aqueous decoction, Ethanol extract	Rat	[55],[56],[57],[58],[59],[1],[26]
Anticonvulsant	Stem, Leaves	Alcoholic and Chloroform extract	-	[33]
Radioprotective	Leaves	Alcoholic and Aqueous extract	Mice	[60],[40],[61],[62],[1],[26]
Neuroprotective	Leaves	Alcoholic extract	-	[63]
Larvicidal	Seeds	Fixed oil	<i>Aedes aegypti</i>	[64]
Memory enhancer	Whole plant	Aqueous and Alcoholic extract	Mice	[34],[65]
Immunomodulatory	whole plant	Seed oil, Aqueous extract	Rat	[66],[67],[68],[69],[10]
Hepatoprotective	Leaves	Hydroalcoholic extract	Albino rat	[70]
Eye disease	Leaves	Leaf juice	-	[1]
Demulcent/stimulant	Leaves	Leaf juice	-	[11]
Genoprotective	Leaves	Hydroalcoholic extract	Rat	[71]
Chemopreventive	Seeds	Fixed oil	Mice	[72]
Cardioprotective	Whole plant	Fixed oil, Hydroalcoholic extract	Dog, Wister rat	[73],[31],[1],[26],[18]
Anticoagulant	Fixed oil	Fixed oil	-	[74]
Anticataract	Leaves	Aqueous extract	Selenite-induced experimental cataractogenesis	[75],[37]
Anticataleptic	Leaves	Alcoholic extract	-	[76]
Anticancer	Leaves, Seed oil	Aqueous and Alcoholic extract	Rat, Rodent, Swiss albino mice	[72],[1],[10]
Antibacterial	Leaves	Aqueous, Chloroform and Alcohol Extract, Fixed oil, Linoleic acid	<i>S. aureus</i> , <i>B. subtilis</i> , <i>B. cereus</i> , <i>B. pumilus</i> , <i>B. thuringiensis</i> , <i>S. typhi</i> , <i>E. coli</i> , <i>P. aeruginosa</i> , <i>Klebsiella</i> , <i>Proteus</i> , <i>V. cholera</i> , <i>C. albicans</i> , <i>Shigella</i> sp., <i>Enterobacteria</i> sp., <i>K. pneumonia</i> , <i>M. tuberculosis</i> , <i>M. pyogenes</i> , <i>N. gonorrhoeae</i>	[77],[75],[78],[19],[1],[79],[26]
Antiasthmatic	Leaves	Essential oil before and after flowering	Multi-drug resistant <i>S. Aureus</i>	[52]
Antiasthmatic	Leaves	Hydroalcoholic extract	-	[80]
Antiarthritic	Seeds	Fixed oil	Rat	[81]
Antifatigue	Leaves	Ethanol extract	Rat	[82]
Antithyroid	Leaves	Leaf extract	Male mouse	[29],[1]
Anthelmintic	Leaves	Essential oil	Caenorhabditis elegans model	[50],[1],[26]
Antiamnesic and nootropic	Whole plant	Extract	Mice	[34]
Antihyperlipidaemic	Seed oil	-	Rabbit	[43]
Antitoxic	-	Extract	Swiss albino mice	[83],[1]
Woundhealing	Leaves	Aqueous and Ethanol extract	Rat	[84],[85],[26],[1]
Lensaldose reductase inhibiting	-	Aqueous extract	Rat	[86]
Hypotensive	-	Fixed oil	Anaesthetized dog	[74]
Hypoglycemic	Leaves	Leaf powder	Diabetic rat	[87]
Effect on gene transcription	-	Polyphenolic extracts	-	[88],[1]
Vomiting	Leaves	-	-	[88]

## DISCUSSION AND CONCLUSION

This ethnomedicobotanical study on the plant *O. sanctum* has revealed the enormous diversity of its medicinal uses and popular use of the plant *O. sanctum* for a wide range of common ailments like fever, colic pain, sore throat, bronchitis, asthma, hepatic diseases, and malaria fever. Either the whole plant or a plant part used singly or mixed with other plant materials to enhance the efficacy.

Nature has been used as a source of medicinal agents for thousands of years and an impressive number of modern drugs have been isolated from natural resources. Traditional medicine is an important source of potential modern drugs all over the world. [51] The important advantages of medicinal plants in various treatments are their safety besides being less expensive, efficacy and availability throughout the world. [53],[10] Hence, the last decade witnessed an increase in the investigations on plants as a source of human disease management. [89] Therefore, it is of great interest to carry out a screening of traditional medicinal plants in order to validate their use in folk medicine and to reveal the active principle by isolation and characterization of their potential constituents.

In recent years, there has been a resurgence of interest in investing the traditional health promoting uses of Tulsi. The modern pharmacological studies confirm the therapeutic importance of *O. sanctum* i.e. antimicrobial, adaptogenic, antidiabetic, hepatoprotective, antiinflammatory, anticarcinogenic, radioprotective, immunomodulatory, neuroprotective, cardioprotective etc.

In the present day, traditional knowledge system in our country is fast eroding and there is an urgent need to inventoried, record all ethnobotanical and cultural information among the diverse ethnic communities before the traditional cultures are completely lost. Therefore, documentation of information on ethnomedicinal uses will help in conserving the knowledge. A comprehensive database of the plants used for various purposes could be saved for the forthcoming generations.

## CONFLICT OF INTEREST

The authors have no conflict of interest.

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