

From Scared Herb to Modern Marvel: *Ocimum Basilicum*

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ABSTRACT

Basil, a member of the *Ocimum* genus, boasts a rich history dating back to ancient medicinal practices, including mentions in Dioscorides' *De Materia Medica*. Known by various names across cultures, basil holds significance beyond its culinary uses, with beliefs ranging from protection against evil spirits to its association with religious rituals. Its chemical constituents, including essential oils and phytochemicals, contribute to its wide array of medicinal properties, ranging from anti-inflammatory and antimicrobial to anticancer and immunomodulatory effects. Traditional medicinal practices in regions like India and Iran have long utilized basil for its therapeutic benefits, while modern research continues to unveil its pharmacological potential. From its antioxidant activity to its ability to modulate immune responses and protect against thrombosis, basil emerges as a versatile herbal remedy with promising applications in both traditional and modern medicine. This mini-review explores the multifaceted nature of basil, shedding light on its chemical composition, historical significance, traditional uses, and emerging roles in contemporary healthcare practices.

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INTRODUCTION

Ocimum is a genus of more than 30 species of herbs and shrubs. The genus is found in Asia, Central and South America, and Africa. *Ocimum* is also known as "the herb of kings" in ancient Greeks. "Basil" is an English name for *Ocimum* "*Basilicum*" L., "*Basilic*," "*Basilikum*," "*Albahaca*," "*Basilica*" in French, German, and Spanish, and "*Reihan*" and "*Rehan*" in Persian and Arabic. The most important members of the genus *Ocimum* are *Ocimum Americanum*, "*Basilicum*," "*Basilicum*," "*Hepidulum Schum*," "*Tenuiflorum*," "*Sacramentum*," "*Ratissimum*," and "*Ocimum* (1-3).

Typically, *ocimum basilicum* is called sweet basil, whereas *O.americanum* is called Hoary basil, Hairy basil, American basil, Lemon basil, and Spice basil. *O.gratissimum* is commonly known as African basil, Tree basil, and Shrubby basil, while *O.campechianum* is known as Least basil, Peruvian basil, and Spice

basil. *O.xcitriodorum* is known as Lemon basil and *O.kilimandscharicum* as Camphor basil. Linalool, Methyl chavicol, Eugenol, Bergamotene, and Methyl cinnamate are the most dominant volatile components of basil. (4-6)

Chemical components, essential oil levels, and growing conditions vary between species and cultivars of basil. It is also used in Iranian, Italian, Chinese, and Indian cuisines. Biochemical components of medicinal plants may be affected by various factors, including genotype, cropping season, and geographic location. *Ocimum basilicum* plant contains a variety of bioactive phytochemicals that provide various therapeutic effects as well. (7-16)

This mini-review article aimed to know the important chemical constituents and medicinal uses of basil in traditional medicine and modern medicine. And the pharmacological effects of sweet basil.

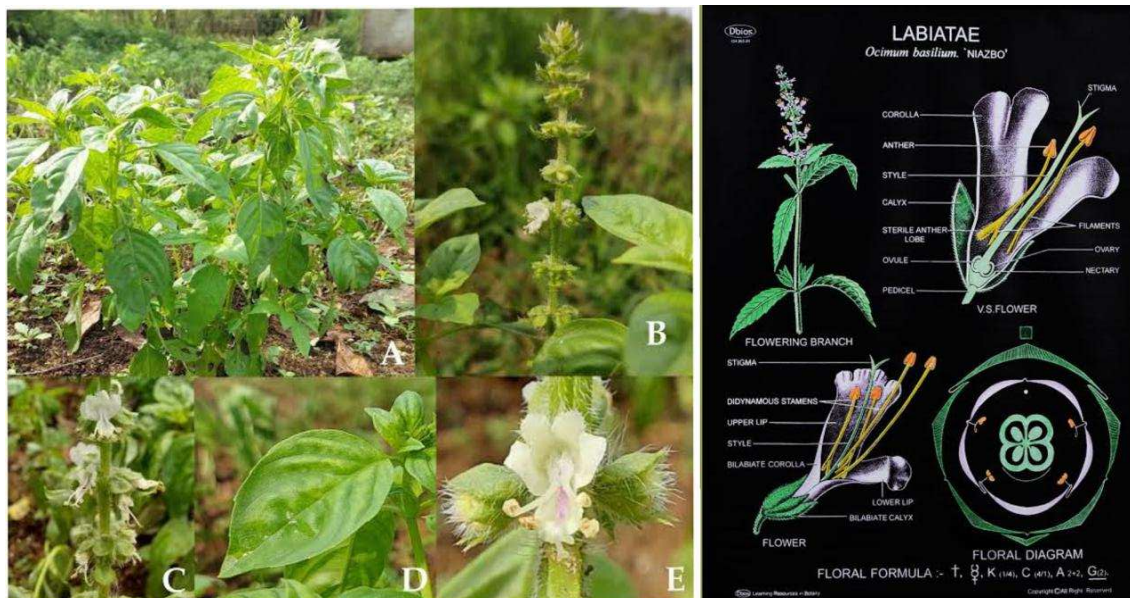


Fig.1: Ocimum Basilicum

History

The use of Basil as a medicine can be traced back to Dioscorides, who wrote about it in one of the earliest books on medicinal plants, De Materia medica. He mentioned its effectiveness as a potent antidote for scorpion stings. Historical use of Basil has several interesting beliefs attached to it. Europeans believed it to be associated with funerals and considered dreaming about it to be unlucky. Conversely, in Italy, women wear it in their hair and young people stick a spring of it above their ear when they go courting. In India, Hindus believed that a leaf of Basil buried with them would serve as their passport to heaven. In the early 1600s, the English used it in their food and in doorways to ward off uninvited pests, such as flies and evil spirits. In the early 1600, the English used it in their food and in doorways to ward off uninvited pests, such as flies as well as evil spirits (17)

Chemical constituents

Ocimum basilicum, commonly known as sweet basil, has traditionally been used as a remedy against various ailments. Its fruit was used to treat inflammation, diarrhea, worm infestation, and eye-related diseases (18). Its leaves and flowers were used as a tonic and vermifuge, and as a tea to treat nausea, flatulence, and dysentery. The essential oils obtained from *O. basilicum* are commonly used to treat colds, seizures, wasp stings, and snakebites (19). In China, the polysaccharide component of *O. basilicum* was traditionally used in cancer treatment, while in South Europe, it is used as an ingredient in Mediterranean cuisine, such as Italian and Greek cuisines (20-22).

O. basilicum is packed with essential nutrients such as calcium, phosphorus, vitamin A, vitamin C, and beta-carotene, which are beneficial for health (23). It

also contains various phytochemicals such as alkaloids, flavonoids, phenols, saponins, tannins, terpenoids, carbohydrates, cardiac glycosides, cholesterol, glycosides, and phlorotannins, which give it its anti-inflammatory, antimicrobial, antiviral, anticancer, antifungal, antidiabetic, anti-allergic, analgesic, cardioprotective, and immunomodulatory properties (24-28). Additionally, the flavonoids and phenolic compounds present in *O. basilicum* exhibit antioxidant activity (29,30).

Medicinal uses in traditional medicine

As a traditional medicine in India (31), basil is considered the goddess tulsi in some parts of Asia (32), and is used for both medicinal as well as religious purposes in orthodox Christian rituals (33). This herb is widely cultivated in Iran, where people use it both as a vegetable and a medicinal tincture. (34) It is also used as a flavoring agent, in food products and dental and oral care products. (35) As a source of dietary fiber in Asian beverages and desserts, its seeds are used in traditional medicine (36). The seeds are also used to treat coughs, headaches, worms, diarrhea, and skin infections. (37) The polysaccharides in basil are also used in traditional Chinese medicine for cancer treatment, (38) they are used in Italian and Greek cuisines and also the Mediterranean diets, especially in the south of Europe (39)

Medicinal Uses in Modern Medicine Industry

It is used to lower blood glucose, [40] with anti-spasmodic and anti-diabetic properties. [41,42] It has been used to treat a variety of illnesses, including anxiety, pyrexia, infections, stomach aches, coughs, headaches, and constipation. [43,44] It has also been shown in previous studies to have anti-bacterial, anti-fungal, and antioxidant properties. [45,46] Eugenol's

anti-fungal, nematocide, and antibacterial properties against food-borne pathogenic microorganisms are its most significant therapeutic qualities. [47,48] In diabetic rats, ethanol extracted from basil leaves can lower blood glucose and advanced glycation end products. [49] In traditional medicine, basil leaves are used as a stomachic, carminative, and antispasmodic. [50] The content of essential oil compounds in basil leaves are alkaloids, tannins, flavonoids, and saponins. [51–56] Basil essential oil components have anti-oxidative, anti-inflammatory, and anti-microbial activities. [57–75] Basil seed have diuretic, antipyretic, antispasmodic and stomachic properties. [76,77] Basil seed mucilage has many benefits such as hydrophilicity, biocompatibility, low production cost, appropriate film forming, edibility, and viscoelastic properties. [78–82] Basil polysaccharides have antitumor, anti-oxidant, anti-aging activity with antibacterial effects, anti-atherosclerotic effects, immunity enhancement effect, and are useful in the treatment of diabetes mellitus. [83] BSG is an anionic polysaccharide with a high molecular weight (2320 kDa) and contains two fractions, PER-BSG (6000 kDa) and SUPER-BSG (1045 kDa). [84] BSG is mainly composed of glucomannan (43%), (1-4)-linked xylan (24.3%), a minor fraction of highly branched arabinogalactan along with glucan (2.31%), with a small fraction of protein (1.32% wt/wt) and a typical uronic acid content between 12.1 and 19.5% which provide the polyelectrolyte behavior to extract. [85,86] It has been used to modify the structure of processed cheese, ice cream, and bread. [87–89] The BSG consists of glucose, galacturonic acid, rhamnose, mannose, arabinose, glucuronic acid, and galactose. BSG has a random coil conformation which has high chain flexibility. It is subjected to SUPER-BSG fraction. [90–92]

Pharmacological Activity :

Anti-bacterial activity

When standard antibiotics and *O. basilicum* essential oil are combined then the pharmacological effects are produced on bacterial strains *Staphylococcus aureus* and *Pseudomonas aeruginosa* was determined. *Ocimum basilicum* essential oil links with existing standard antibiotics due to which their antibacterial activity increases, resulting in synergistic activity against bacterial strains of clinical importance. The antibacterial activity of *O. basilicum* essential oil can be linked with linalool [93]. The effect of the action of chitosan towards various concentrations upon sweet basil before seeding and transplanting was examined in aspects of the amount of phenolic and terpenic compounds, antioxidant activity, and growth of the basil, and also the phenylalanine ammonia-

lyase (PAL) activity. It indicates that an extract such as chitosan can productively induce phytochemicals in plants, which might be another alternative and effective means instead of genet. [94]

Antioxidant activity

Various studies have been conducted to investigate the antioxidant properties of extracts from different species of basil and oregano. The antioxidant activity of these extracts varies and is partly dependent on the levels of phenolics and flavonoids present in them. (95) In one study, the effect of nutrient availability, particularly nitrogen fertilization, on the production of polyphenolic compounds in three cultivars of basil was examined. It was found that the type of basil cultivar significantly affects the total phenolic levels, rosmarinic and caffeic acid concentrations, and antioxidant activities. (96) Another study evaluated the effect of methyl jasmonate (MeJA) on sweet basil. The results showed that when MeJA was sprayed on healthy basil plants, the total phenolic content of the sweet basil significantly increased following 0.1 and 0.5 mM MeJA treatments compared to the control group. (97) Furthermore, the antioxidant activity of a methanolic extract of sweet basil was tested using various in vitro assay models. The study found that one rosmarinic acid molecule can capture 1.52 radicals and that a synergistic effect between alpha-tocopherol and rosmarinic acid exists. (98)

Cytotoxicity

Methanolic extracts of *Ocimum basilicum* L. (OB) and *Mentha longifolia* L. (ML), which are grown in the western part of Saudi Arabia's Madina province, were tested for their antioxidative and anticancer properties. It was determined that OB and ML extracts were cytotoxic to the MCF-7 cell line and could function as strong antioxidants and shield DNA damage [99].

Synergistic effect

Basilic essential oils (EFOs) obtained from five different variegated plants (*O. basilicum* L.) were analyzed for antimicrobial worryness against a broad spectrum of Gram-positive, Gram-negative, and -negative foodborne bacteria (yeasts) and microorganisms (molds) by agar well waste. (101) The results of this study suggest the need for more in-depth investigations to determine the antimicrobial properties of basil oils when combined with other feed additives and preservation parameters (102).

Anti Inflammatory effect

An extract obtained from the aerial parts of *Ocimum basilicum*, extracted in a solvent, exhibits potent anti-inflammatory activity against macrophages (RAW264.7), human chondrosarcoma cells (SW1333), and human primary chondrocytes. (102)

Acute inflammation caused by turpentine oil was studied in Wistar male rats using *Ocimum basilicum* L. tincture. Tincture of *Ocimum basilicum* significantly reduced total leukocyte counts and monocyte percentages, but inhibited synthesis slightly. There was a lesser inhibitory effect of *Ocimum basilicum* tincture on all parameters tested as compared to diclofenac (103)

Anti-hepatotoxicity effects

It was determined whether a methanolic leaf extract of *Ocimum basilicum* L. protected Swiss albino mice from benzene-induced hematotoxicity. It shows the methanolic leaf extract of *O. basilicum* L. secondary metabolites, which include the primary constituents of the essential oil monoterpene citral and its oxidized form geranial, have modulatory effects on the benzene-induced hematological abnormalities and cell cycle dysregulation in mice [104]. A dichloromethane extract of hairy root cultures of *Ocimum basilicum* L. (Lamiaceae) was shown to contain six triterpene acids: betulinic, oleanolic, ursolic, 3-epimaslinic, alphitolic, and euscaphic. All investigated compounds exhibited hepatoprotective efficacy comparable to oleanolic and ursolic acids [105].

Thrombotic effect

The study of *ocimum basilicum* L extract on platelet aggregation and experimental thrombus. OBL inhibits platelet aggregation induced by ADP and thrombin in a dose-dependent manner, resulting in anti-thrombotic activity, in vivo, it develops slowly over 7 days, then disappears within 3-7 days. Thrombus weight in an arteriovenous thrombosis (AVT) model was examined after 2 weeks of treatment with 15, 75, and 375 mg/kg OBL orally compared to 8.8 mg/kg aspirin. Aqueous extracts of *O.basilicum* induced aggregation to 33%, 22%, and 21%. Identification of the active ingredient is needed now. (106)

Immunomodulatory Activity

Extracts from the plant *Ocimum basilicum* exhibit immunomodulatory activity at the cellular level, including the ability to reduce platelet aggregation and inhibit HIV-1 reverse transcription. (107,108) *Ocimum basilicum* is viewed as an anti-atherogenic and hypolipidemic plant with unknown mechanisms of action. (109) The effect of *O.basilicum* was assessed in wister albino rats in low and high doses. The SRBC titer method was used to determine antibody titer. RBC, WBC, and Haemoglobin count (as well as the antibody titer value) were raised. *O.basilicum* showed increased body weight compared to control animals for immunomodulatory effects. (110)

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