www.ijarp.com ISSN 2456-9992 Page: 01-14

International Journal Advanced Research Publications

Research Article

Volume: 02
Issue: 04

MEDICINAL USES OF CINNAMOMUM VERUM (CINNAMON BARK)

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Article Received: 07 March 2026, Article Revised: 27 March 2026, Published on: 17 April 2026

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DOI: https://doi-doi.org/101555/ijarp.3217

ABSTRACT

Cinnamomum verum is a widely recognized spice plant valued for its diverse medicinal and pharmacological properties. Its former botanical name, *Cinnamomum zeylanicum*, originates from the old name of Sri Lanka, Ceylon. Since ancient times, this plant has been extensively used as a therapeutic spice. It is indigenous to Sri Lanka and the southern regions of India. Belonging to the Lauraceae family, *Cinnamomum verum* is commonly obtained from the dried inner bark after removal of the outer cork and parenchymatous layers.

This plant is a well-known medicinal herb with broad applications in traditional and modern systems of medicine. It has long been used as a flavoring agent in food and as an active ingredient in pharmaceutical formulations for treating various disorders. In contemporary usage, it is incorporated into products such as confectioneries, chewing gums, mouthwashes, and toothpastes.

Cinnamomum verum is rich in volatile oils, mainly cinnamaldehyde, cinnamic acid, and cinnamate, along with eugenol, which serves as a major bioactive compound responsible for several biological activities. The plant exhibits a wide spectrum of pharmacological effects, including antimicrobial, wound healing, antidiabetic, anti-HIV, anxiolytic, and anti-Parkinson's activities.

Key phytoconstituents include eugenol, cinnamaldehyde, cinnamyl acetate, copaene, and camphor. Among these, cinnamaldehyde has been extensively studied for its therapeutic potential. This review aims to provide a comprehensive overview of the plant, covering its morphology, phytochemical composition, and pharmacological activities.

KEYWORDS: *Cinnamomum verum*, Dalchini, medicinal properties, volatile oils, antimicrobial, anti-HIV, antidiabetic.

INTRODUCTION

Cinnamomum verum (family Lauraceae) is cultivated in several Asian countries, particularly Sri Lanka and southern India. Cinnamon is a traditional herbal remedy widely used in countries such as China, Korea, and Russia. It has been utilized across different cultures for centuries due to its therapeutic and culinary significance.

There are two primary types of cinnamon: *Cinnamomum zeylanicum* (true cinnamon) and *Cinnamomum cassia*. Both are derived from the inner bark of evergreen trees belonging to the genus *Cinnamomum*. The medicinal material is prepared by removing the outer cork layer and underlying parenchyma from the shoots.

The bark is characterized by a longitudinally striated surface and a short, splintery fracture. It contains not less than 12 mL/kg of essential oil obtained through steam distillation. Cinnamon possesses a pleasant aromatic odor and a warm, spicy-sweet taste with slight mucilaginous characteristics.

The bark contains approximately 4% essential oil, primarily composed of cinnamaldehyde (60–75%), cinnamyl acetate (1–5%), eugenol (1–10%), β-caryophyllene (1–4%), linalool (1–3%), and 1,8-cineole (1–2%). Other constituents include oligomeric procyanidins, cinnamic acid, phenolic compounds, diterpenes such as cinnzeylanol and cinnzeylanine, as well as sugars like mannitol and various polysaccharides.

Numerous studies have demonstrated its pharmacological activities, including anti-inflammatory, antimicrobial, hypoglycemic, cardioprotective, cognitive-enhancing, and anticancer effects. In traditional Chinese medicine, cinnamon is regarded as a potent neuroprotective agent and is commonly used in the management of type 2 diabetes mellitus.

HISTORY

Cinnamon has been used for thousands of years in both culinary and medicinal applications. In Ayurvedic medicine, it has been valued for its therapeutic properties and used as an antiemetic, antidiarrheal, carminative, and stimulant.

Ancient Egyptians used cinnamon in embalming processes due to its preservative properties. During the 16th and 17th centuries, Portuguese traders introduced *Cinnamomum zeylanicum* from Sri Lanka to Europe, significantly expanding its global trade.

Later, during Dutch colonization, cinnamon cultivation was established in Java. The spice was widely distributed in Europe through the activities of the East India Company. As cinnamon cultivation declined in some regions, Sri Lanka emerged as the leading producer of

high-quality cinnamon oil, widely used in pharmaceutical and food industries. In addition, Chinese cinnamon oil continues to be utilized in medicinal preparations.

PHYTOCHEMICAL CONSTITUENTS OF *CINNAMOMUM ZEYLANICUM* (DALCHINI)

Cinnamomum zeylanicum is rich in a diverse range of phytochemicals, particularly resinous substances such as cinnamaldehyde, cinnamate, cinnamic acid, and various essential oils. The characteristic pungent taste and distinctive aroma of cinnamon are primarily attributed to the presence of cinnamaldehyde.

The essential oil fraction contains numerous bioactive compounds including trans-cinnamaldehyde, cinnamyl acetate, eugenol, L-borneol, caryophyllene oxide, β-caryophyllene, L-borneol acetate, E-nerolidol, α-cubebene, α-terpineol, terpinolene, and α-thujene. In addition, the plant comprises a wide spectrum of chemical classes such as aldehydes, alcohols, esters, phenolic compounds, organic acids, monoterpenes, diterpenes, sesquiterpenes, benzopyrones, hydrocarbons, and flavonoids.

The aldehydic constituents present in the bark essential oil include cinnamaldehyde, methoxycinnamaldehyde, hydrocinnamic aldehyde, benzaldehyde, vanillin, cuminaldehyde, benzenepropanal, 2-methyl-3-phenylpropanal, and citronellal. Alcoholic compounds identified in *C. zeylanicum* include cinnamyl alcohol, α-terpineol, linalool, and α-bisabolol. The ester components consist of cinnamyl acetate, cinnamaldehyde diethyl acetal, methyl cinnamate, hydrocinnamyl acetate, benzyl benzoate, and bornyl acetate.

Various parts of the plant also contain phenolic and organic acids such as cinnamic acid, ferulic acid, caffeic acid, gallic acid, protocatechuic acid, oleic acid, and p-hydroxybenzoic acid. The monoterpene fraction includes compounds like p-cymene, limonene, α-terpinene, α-pinene, camphene, camphor, 1,8-cineole, β-pinene, α-phellandrene, and 3-carene.

Due to the complexity and diversity of essential oil components, their isolation and purification can be time-consuming. Hydro-distillation is one of the most commonly employed extraction techniques because it is simple, rapid, and cost-effective. However, this method may lead to degradation or alteration of heat-sensitive compounds. To address these limitations, advanced techniques such as supercritical fluid extraction have been developed, which are particularly suitable for isolating thermolabile and chemically unstable constituents.

Different plant parts—including bark, leaves, fruits, buds, and stems—are utilized for phytochemical extraction. The leaf oil predominantly contains eugenol, along with α-

ylangene and methyl and ethyl cinnamate. Bark oil is known to contain benzyl benzoate, whereas root bark oil contains terpinene-4-ol.

A study conducted by Jayaprakasha and Jagan Mohan Rao identified 72 chemical constituents from different parts of *C. zeylanicum*, including leaf, stem bark, and root bark oils. Among these, 32 compounds were previously reported, while several new compounds were identified, including 11 monoterpenes, 4 sesquiterpenes, 2 aliphatic compounds, and 15 aromatic compounds. Furthermore, Isogai et al. reported two novel compounds, cinnzeylamine and cinnzeylanol, from the dried bark.

Analysis of leaf essential oil by Vermin et al. revealed significant amounts of p-cymene (21.35%) and eugenol (16.7%). Additionally, GC-MS analysis of essential oils from cinnamon leaves grown in India identified a total of 47 chemical constituents.

Figure 02 illustrates the chemical structures of some of the major bioactive compounds present in *C. zeylanicum*.

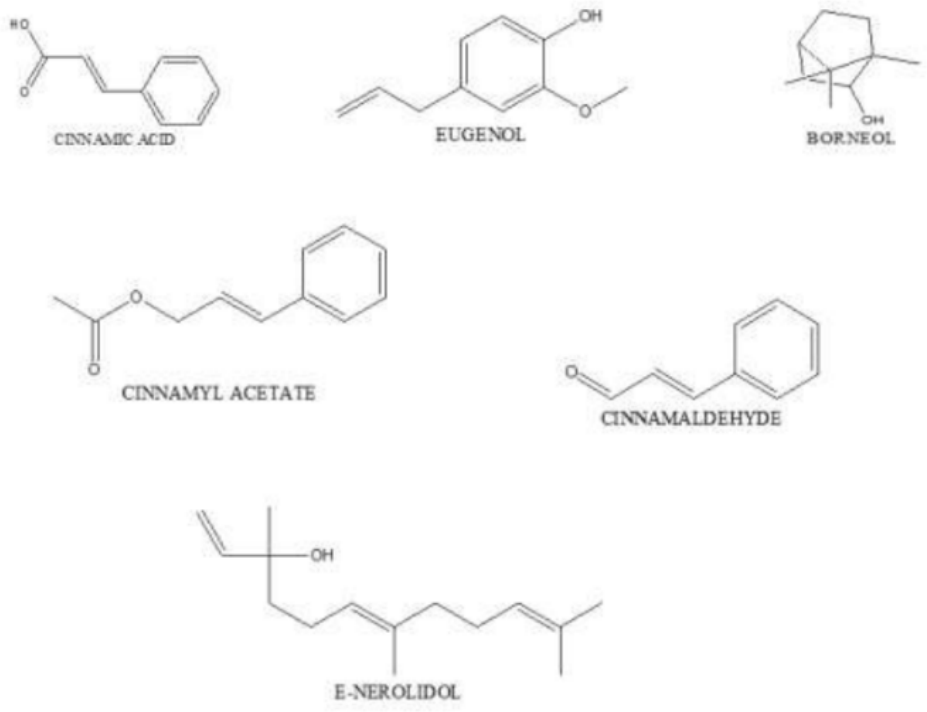

Figure 1: Some of the Important Elements in C. zeylanicum's Chemical Structure

BOTANICAL DESCRIPTION AND DISTRIBUTION OF *CINNAMOMUM ZEYLANICUM*

Cinnamomum zeylanicum (Dalchini) is a tropical evergreen tree characterized by its thick, smooth, and reddish-brown bark. It typically attains a height of about 6–8 meters under

favorable growing conditions. The plant is predominantly found in Sri Lanka and southern parts of India, and is also cultivated in several other tropical regions.

The leaves are arranged in an opposite or sub-opposite manner and are glabrous, simple, and leathery (coriaceous) in texture. They are generally ovate to lanceolate in shape, with a glossy green upper surface and a comparatively paler underside. Each leaf usually exhibits 3–5 prominent longitudinal veins. The petiole is short, flattened, and measures approximately 1–1.5 cm in length.

The flowers are small, greenish-white to yellowish, and are borne in axillary or sub-terminal inflorescences such as cymes or panicles. The fruit is a drupe, typically ovate to oblong in shape, measuring about 1.5–2 cm in length. It is slightly pointed at the apex (apiculate) and may be dry or somewhat fleshy when mature, turning dark purple in color.

Figure 2: *Cinnamomum Zeylanicum* (Dalchini)

Table 1: Vernacular names of Cinnamomum Zeylanicum.

Spanish	Canela
French	Cammelle
Urdu	Darchini
Gujarati	Taja
Hindi	Dalchini
English	Cinnamon
Punjabi	Dalchini, Darchin
Telugu	Lavanga Patta
Oriya	Dalechini, Guda twa
Malayalam	Karuvapatta, Ilavarngathely
Bengali	Daruchini
Tamil	Ilayangam

Table 2: Morphological Classification of Cinnamomum Zeylanicum.

Taxonomical	Taxon
Kingdom	Plantae
Phylum	Magnoliophyyta

Phylum	Magnoliopsida
Order	Laurales
Family	Lauraceae
Genus	Cinnamomum
Species	Zeylanicum

TRADITIONAL USES

The wood of *Cinnamomum* species is widely utilized for making ornamental items, furniture, cabinets, and plywood. *Cinnamomum javanicum* yields strong and durable timber, making it suitable for construction and housing purposes. Cinnamon is extensively used in the food and beverage industry for flavoring products such as chocolates, drinks, confectioneries, and alcoholic beverages.

True cinnamon, derived from the bark of *Cinnamomum verum*, is among the most commonly used spices worldwide. The bark of *C. politum* is traditionally added to hot beverages to enhance muscular strength and alleviate pain. A paste prepared from the crushed leaves and bark of *C. crassinervium* is applied for relieving headaches. The leaves of *C. rhynchophyllum* and *C. soegengii* are traditionally used to treat gastrointestinal disorders such as stomach ache and food poisoning.

The mucilage obtained from *C. iners* is used in the manufacture of mosquito repellents, incense sticks, and laminates such as formica. Cinnamon also exhibits several biological activities, including antifungal, antibacterial, antitermitic, larvicidal, nematicidal, and insecticidal effects.

In traditional Ayurvedic medicine, cinnamon is believed to balance the Vata and Pitta doshas. It is commonly used to relieve menstrual discomfort. Studies suggest that consumption of warm cinnamon-infused water may help reduce menstrual pain for a short duration.

Major Ayurvedic Uses of *Cinnamomum zeylanicum*:

- Provides relief from sore throat, influenza, common cold, and headaches
- Acts as an expectorant and shows antitubercular properties
- Used in the management of rheumatoid arthritis
- Helps in lowering cholesterol levels and strengthening cardiac muscles
- Alleviates menstrual pain and discomfort

MEDICINAL USES OF *CINNAMOMUM VERUM*

1. Antimicrobial Activity

Due to its hydrophobic nature, *Cinnamomum zeylanicum* exhibits strong antimicrobial properties. Various studies have demonstrated its effectiveness against a wide range of pathogenic microorganisms. Essential oils of cinnamon have shown significant antibacterial activity against organisms such as *Salmonella typhi*, *Escherichia coli*, *Staphylococcus aureus*, *Bacillus licheniformis*, and *Pseudomonas fluorescens*. Comparative studies indicate that cinnamon exhibits stronger antibacterial activity than several other medicinal plants.

Different solvent extracts have also demonstrated varying degrees of antibacterial effects. Ethyl acetate extracts show strong activity against *Staphylococcus aureus*, *E. coli*, and *Pseudomonas aeruginosa*, while petroleum ether extracts are particularly effective against *Bacillus subtilis*. Overall, cinnamon essential oil has been reported to possess superior antimicrobial activity compared to many other plant-derived oils.

2. Antioxidant Activity

The antioxidant potential of cinnamon has been evaluated using assays such as DPPH, phosphomolybdate, and ferric reducing antioxidant power (FRAP). Among different extracts, methanolic extracts of cinnamon exhibit the highest antioxidant activity. Studies have also shown that cinnamon essential oil demonstrates stronger antioxidant effects compared to lemon oil.

In experimental models, cinnamon powder has shown significant antioxidant effects in alloxan-induced diabetic rats. It enhances antioxidant enzyme levels such as glutathione, catalase, peroxidase, and superoxide dismutase, thereby reducing oxidative stress and lowering blood glucose levels.

3. Anti-inflammatory Activity

Methanolic and ethanolic extracts of *C. zeylanicum* have been shown to inhibit lipoxygenase (LOX) enzyme activity, contributing to their anti-inflammatory effects. In animal models of collagen-induced arthritis, these extracts significantly reduced the production of pro-inflammatory cytokines.

Additionally, cinnamic acid has demonstrated anti-inflammatory activity by decreasing levels of inflammatory mediators such as interleukin-6 (IL-6) and tumor necrosis factor-alpha (TNF-α) in vitro.

4. Anticancer Activity

The anticancer potential of cinnamon has been evaluated through in vitro studies. Water-soluble polysaccharides extracted from cinnamon have shown strong immunostimulatory

activity and inhibitory effects on cancer cell proliferation. Cinnamon aqueous extracts have also been reported to slow the progression of oral cancer.

5. Antidiabetic Activity

Cinnamon exhibits significant antidiabetic effects in experimental studies. Methanolic extracts of cinnamon, alone or in combination with green tea, have shown a reduction in blood glucose levels in streptozotocin-induced diabetic rats. The combination therapy demonstrated a synergistic effect.

Further studies indicate that cinnamon helps regulate blood glucose and insulin levels, suggesting its potential role in diabetes management.

6. Wound Healing Activity

Ethanolic extracts of cinnamon have demonstrated notable wound-healing properties in animal models. Higher concentrations (e.g., 3%) showed enhanced healing effects compared to lower concentrations.

7. Anti-HIV Activity

Cinnamomum zeylanicum has been reported to possess activity against HIV. Studies involving multiple medicinal plants have indicated its potential role in the management of HIV/AIDS.

8. Anti-anxiety and Antidepressant Activity

Cinnamon essential oil exhibits anxiolytic and antidepressant properties. Experimental models such as the forced swim test (FST) and tail suspension test (TST) demonstrated reduced immobility time, indicating antidepressant effects. Anti-anxiety activity was confirmed using elevated plus maze (EPM) and open field tests.

9. Anti-Parkinson Activity

Studies in MPTP-induced Parkinsonian mice have shown that cinnamon administration may help improve symptoms. The findings suggest its potential role in the management of Parkinson's disease.

10. Spasmolytic and Cardiovascular Activity

Cinnamaldehyde exhibits spasmolytic effects similar to papaverine, leading to smooth muscle relaxation and vasodilation. This contributes to its beneficial effects on both the cardiovascular and digestive systems.

11. Toxicity / Overdose

Excessive consumption of cinnamon bark oil or cinnamaldehyde (above 0.2 g/day, equivalent to approximately 15–20 g of crude drug) may cause irritation and adverse effects. Therefore, dosage regulation is essential.

CONCLUSION

Cinnamomum verum is a highly valued medicinal plant with extensive pharmacological applications. It is widely used across various traditional and modern systems of medicine. The plant exhibits a broad spectrum of biological activities, including antidiabetic, antimicrobial, antioxidant, anti-inflammatory, and anticancer effects, all of which contribute significantly to human health.

The major bioactive constituents of cinnamon include eugenol, cinnamaldehyde, cinnamyl acetate, copaene, and camphor, with cinnamaldehyde being the most extensively studied compound. This review highlights the comprehensive profile of *Cinnamomum verum*, encompassing its botanical features, phytochemical composition, and therapeutic potential.

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