



An Overview of *Elettaria cardamomum* and It's Therapeutic Uses and Role as an Essence of Life

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Abstract

Elettaria cardamomum, occasionally referred to as green cardamom, is a rare spice that has major cultural and therapeutic significance. This fragrant plant, which is a member of the Zingiberaceae family, has been utilized widely in historical medical systems including Ayurveda, Unani, and Siddha because of its many health advantages. Packed by bioactive substances including flavonoids, terpenoids, and essential oils, cardamom has multiple pharmacological effects, such as gastroprotective, anti-inflammatory, antibacterial, and antioxidant properties. Numerous ailments, including as metabolic syndromes like diabetes, respiratory disorders, cardiovascular dysfunctions, and gastrointestinal disorders, have been treated with it. Recent research findings demonstrate its ability to prevent cancer and to enhance general wellbeing. Described as the "essence of life," cardamom is a key ingredient in both traditional and modern therapy settings because it represents energy and overall wellness. *Elettaria cardamomum*'s phytochemistry, medicinal uses, and beneficial properties are thoroughly covered in this review, highlighting its enduring value as a natural cure and functional food component.

Keywords: *Elettaria cardamomum*, green cardamom, Zingiberaceae family, Anti-inflammatory, Essence of life.

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Introduction

Natural resources have served as the main source of therapeutics from prehistoric times. Many secondary metabolites with distinctive structural diversity and unique biological abilities are abundant in plants and may be the basis of numerous significant medications. (Elendu *et al.*, 2024). *Elettaria cardamomum* Maton is unique among the many beneficial plants that have a wealth of volatile oils. It is commonly referred to as "Choti Elaichi" in Hindi and "Green Cardamom" in English and Cardamom, a member of the Zingiberaceae family, is mostly grown in Guatemala, Tanzania, Sri Lanka, and southern India. It is harvested from the seeds of *Elettaria cardamomum* Maton. In the realm of spices, cardamoms come in two different forms:

i. The little cardamom is also known as the real cardamom or known as Chhota Elaichi (*Elettaria cardamomum*) Its sweet, flowery, and a little spicy flavor make it one among the Most commonly spices in the world. Green cardamom also known as "Queen of Spices" is an essential ingredient in Middle Eastern and Indian cooking and in traditional medicine.

ii. The giant cardamom, also called Bada Elaichi (Aframomum and Amomum species) In addition to traditional medicine, it is commonly used in Southeast Asian, Indian, and Himalayan cuisines. (Vijayan *et al.*, 2024). In regards to flavor, scent, and culinary utilizes, black cardamom varies greatly from green cardamom (*Elettaria cardamomum*). This family's plants are useful in the food, cosmetics, perfumery, and pharmaceutical industries because of their unique chemical profile, including alkaloids, proteins, carbohydrates, phenolic acids, flavonoids, diarylheptanoids, and essential oils, as well as their color, taste, and odor. It is also known as the "Queen of Spices". One of the most expensive and essential commercial spices in the world, it is ranked as the most expensive spice after saffron and vanilla (Parthasarathy *et al.*, 2008).

The popular South Indian language, Tamil, has been proposed to be the source of the plant's botanical name. "Elettari" is a common Tamil word that refers to cardamom seed. While eight distinct species have been found in the Borneo region and Sarawak (Malaysia), these places are thought to be the primary diversification centers of the genus *Elettaria*. In addition to its well-established gastronomic quality and flavoring qualities, it is widely utilized as a spicy and flavorful component in curries and sweets. India and Saudi Arabia use the majority of the cardamom crop to flavor their coffee and tea. (KA *et al.*, 2024). The plant's rhizomes are used as a condiment and spice in various regions of India. Many people in Germany, Russia, and Scandinavia use *Elettaria cardamomum* to flavor cakes and other foods. In addition of being used as a remarkable spice in food, it is a medicinal plant with significant therapeutic significance since it contains a variety of

phytochemical elements, like proteins, anthocyanin's, alkaloids, steroids, terpenoids, phenols, glycosides, carbohydrates, tannins, and carbohydrates. Its volatile oils usually contained flavonoid and phenolic elements. (Katwara *et al.*, 2023). Nevertheless, the volatile oil's content also includes sterols, protein, waxes, and carbohydrates. The plant's seeds and fruits are mainly used for therapeutic purposes. *Elettaria cardamomum* was utilized by ancient Greek and Roman physicians, along with Indian Ayurvedic and Unani practitioners, to treat cardiovascular diseases, ulcers, gastrointestinal disorders, indigestion, bronchitis, asthma, constipation, anorexia, vomiting dyspepsia, epilepsy, hypertension, and vomiting. (Sundarasamy *et al.*, 2023). The pharmacological properties of the plant contain anti-inflammatory, anti-microbial, anti-cancer, immunostimulant, gastroprotective, anti-hypertensive, and antioxidant properties.

Table 1: Different name of black cardamom according to the Regions. (Nair



Fig. 1 cardamom seeds

et al., 2020)

Sanskrit	Bhadr, stulaila Bhadrai
Hindi	Bari elachi/bari illayaca
English	Black cardamom
Bengali	Baara aliach
Kannada	Dodda Yalakki, Nepdi Elakki
Urdu	Badi Elaichi, poorbi elaichi, Heel Kalan
Malayalam	Perelam, Valiya Elam
Marathi	Mothi Elayachi
Oriya	Bada aleicha, Aleicha
Punjabi	Budi Eleichi
Tamil	Periya Elam, Beraelam, Kattu Elam Telugu Pedda Elakulu
German	Kardamom Italian Cardamomo, Cardamone
Spanish	Cardamomo Burmese Phalazee
French	Cardamome

Indonesian	Kapulaga
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Family-Zingiberaceae	Gingerfamily
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Table 2: Taxonomical Classification

Taxon	Taxonomic Rank
Kingdom	Plantae
Division	Magnoliophyta
Class	Liliopsida
Order	Zingiberales
Family	Zingiberaceae
Genus	<i>Elettaria</i>
Species	<i>cardamomum</i>
Common Name	Choti Elaichi

Botanical Description of *Elettaria cardamomum*

This herbaceous perennial plant grows at a height of 2 to 5 meters and has dark green, lance-late, acuminate leaves that are 30-35 cm long and 7-10 cm broad. (Poulsen *et al*, 2024). Two to four panicles emerge from the enlarged base of tillers, and its inflorescences have a long, cane-like peduncle with internodes and nodes, its flowers are white with a pink streak across the center lip, it is bisexual, irregular, and has an oval labellum that is indistinctly three lobed, A tubular, approximately ¼-long, and short-toothed calyx surrounds a small, funnel-shaped chamber with cilia axial placentation, inferior, trilobular ovary, and multiple ovules in each carpel. The corolla is poorly three-lobed, with the larger one at the posterior side (Shehasen *et al*, 2024)

Table 3: Botanical classification

Kingdom-Plantae	Plant
Subkingdom- Tracheobionta	Vascular plant
Plant Division- Magnoliophyta	Flowering
Super-division- Spermatophyta	Seed
Subclass	Zingiberidae
Order	Zingiberales
Genus	<i>Elettaria</i> Maton
Plant Class- Liliopsida	Monocotyledons
Family- Zingiberaceae	Gingerfamily

There are mainly two types of cardamom: huge red and black cardamom and little green cardamom (*Elettaria cardamomum*). Over 85% of the world's cardamom (*Amomum subulatum*) is grown in India, with the biggest yearly output of 4000 MT being produced in Nepal (2500 MT) and Bhutan (1000 MT).

Type of Cardamom-

There are mainly two types of cardamom: small (green) and large (black), While black cardamom is mostly cultivated in India, green cardamom, that has a small biological source (*Elettaria cardamomum*), is the most typically farmed kind. (Azgomi *et al*, 2024). The nation of Gautemala in India is its largest producer of cardamom and difference between green cardamom and black given in (table no 4) and (table no 5) (Sakkaravarthy *et al*, 2024 and Souza *et al*, 2024)

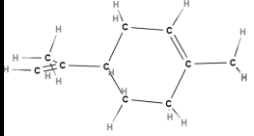
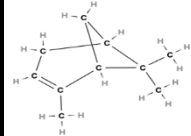
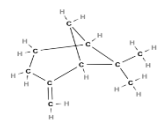
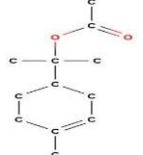
Table 4: difference between green cardamom and black cardamom

GREEN CARDAMOM	BLACK CARDAMOM
It has a strong scent and flavor.	It has a scent and flavor that is slightly camphor-like and smoky.
<i>Elettaria cardamomum</i> is the plant that produces the spice called green cardamom.	<i>Amomum subulatum</i> is the plant that produces the spice called black cardamom.
Pods and seeds are both used.	Only seeds are used

Table 5: Chemical Constituent

Chemical component	Green Cardamom	Black Cardamom
Limonene	0.30	3.60
α-pinene	1.58	2.78
β-pinene	0.19	3.34
α-terpinyl acetate	72.37	-
α-terpineol	0.79	3.30
1,8-cineole	10.16	65.50

Table 6: Chemical Constituent and its biological activity with their structure (Chaidech *et al*, 2024 and Taherzadeh *et al*, 2025).

Sr. N.	Chemical component	Biological activity	Chemical structure
1.	Limonene	<ul style="list-style-type: none"> ➤ Its chemical formula is (C₁₀H₁₆). ➤ Limonene is also known as cinene, cajaputene. ➤ Its molecular weight is (136.23). ➤ Its IUPAC name is (1-methyl-4-prop-1-en-2-ylcyclohexene). ➤ It is a colorless fluid with a sweet, citrusy flavor and a beneficial lemony smell. ➤ Its boiling point (176.00C). 	
2.	α-pinene	<ul style="list-style-type: none"> ➤ Its chemical formula is (C₁₀H₁₆). ➤ α-pinene also known as Acintene A, alpha.-Pinene. ➤ Its molecular weight is (136.23). ➤ Its IUPAC name is (2,6,6 trimethylbicyclo). ➤ Its Boiling point is (1550C). 	
3.	β-pinene	<ul style="list-style-type: none"> ➤ Its chemical formula is (C₁₀H₁₆). ➤ β-pinene is also known as No pinene, 2(10)-Pinene. ➤ Its molecular weight is (136.23). ➤ it is colorless and transparent liquid. ➤ It has strong turpentine-like flavor, dry woody or resinous scent, and turpentine-like and piney in taste. ➤ Its boiling point is (166.00C). 	
4.	α-terpinyl Acetate	<ul style="list-style-type: none"> ➤ Its chemical formula is (C₁₂H₂₀O₂) ➤ Its IUPAC name is (2-(4 methylcyclohex-3-en-1-yl) propan-2-yl acetate). ➤ α-terpinyl acetate is also known as terpineol acetate. ➤ Its boiling point is (115.0°C). 	

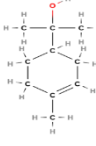
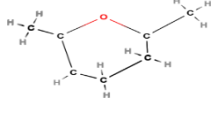
5.	α -terpineol	<ul style="list-style-type: none"> ➤ Its chemical formula is (C₁₀H₁₈O). ➤ It is also known as (2-4-methylcyclohex-3-en-1-yl). ➤ Its Molecular weight is (154.25). ➤ Its IUPAC name is -2-(4-methylcyclohex-3-en-1-yl)propan-2-ol. ➤ Its boiling point is 219°C 	
6.	1,8-cineole	<ul style="list-style-type: none"> ➤ Its chemical formula is (C₁₀H₁₈O). ➤ It is also known as Eucalyptol. ➤ Its molecular weight is (154.25). ➤ Its IUPAC name is (1,3,3-trimethyl-2-oxabicyclo[2.2.2]octane). 	

Table 7: Phytochemical Extraction Methods

SR	Methods	About methods.	Procedure	Advantages
1	Steam Distillation.	It is a Purpose of extraction of volatile essential oils ex- cineole, terpinyl acetate.	First, get a Crush apart cardamom pods to reveal stores of essential oils, and then Place the crushed pods in a distillation device. Then, use a separatory funnel or	Highly volatile substances that are heat- stable. Useful for extensive
2	Supercritical Fluid Extraction.	Extraction of lipophilic substances, such as terpenes and essential oils.	First, get a Crush apart cardamom pods to reveal stores of essential oils, and then Place the crushed pods in a distillation device. Then, use a separatory funnel or	Highly volatile substances that are heat- stable
3	Ultrasound-Assisted Extraction	Enhances the extraction of essential oils, phenolics, and flavonoids.	First, we to obtain the extract, mix ground cardamom with a solvent (such as ethanol, methanol, or water) and either place the mixture in an ultrasonic bath or use an ultrasonic probe to apply ultrasonic waves which dissolve cell walls and release phytochemicals. After filtration the solution to get rid of any residues, evaporate the solvent	Decreases the time needed for extraction. Utilizes less solvent than extraction. Utilizes less solvent than traditional techniques.
4	Soxhlet Extraction.	Extraction of substances that aren't volatile, like phenolics, alkaloids, and flavonoids.	Cardamom seeds or pods should first be dried and ground into a fine powder. Place the powder into the Soxhlet extractor in a thimble or Depending on the target elements, use solvents like ethanol, methanol, or hexane. Then, heat the solvent until it refluxes, enabling the target compounds to dissolve again. Finally, evaporate the solvent to get the concentrated extract.	➤ It is effective for producing large amounts of polar and non- polar molecules. It is easy and repeatable.
5.	Microwave-Assisted Extraction.	Extraction of alkaloids, essential oils, and phenolics.	First, combine powdered cardamom with a suitable solvent. Then, heat the mixture in a microwave extractor, adjusting the intensity and time for best extraction. Lastly, filter the extract and use evaporation to remove the solvent.	Quick and effective. Minimizes the use of solvents.

Therapeutic Uses of *Elettaria cardamomum*

Elettaria cardamomum, frequently referred to as green cardamom, is well known for its therapeutic properties due to its diverse phytochemical profile, which includes phenolic compounds, flavonoids, terpenes, and essential oils.

Its widespread application in traditional medical systems such as Chinese, Ayurvedic, and Unani medicine is a result of these bioactive ingredients. (Banerjee et al, 2024 and Gupta et al, 2023)

Table 8: Various Therapeutic Uses of *Elettaria cardamomum*

Digestive Health	Respiratory Health	Oral and Dental Health
Cardiovascular Health	Anti-inflammatory and Antioxidant Effects	Potential Anti-Cancer Properties
Skin and Hair Health	Potential Anti-Cancer Properties	Anti-arthritis Benefits
Immune System Support	Metabolic and Weight Management	Antimicrobial Properties
Detoxification	Antidiabetic Effects	Stress and Mental Health

Applications for Traditional Medicine

Ayurveda	Unani Medicine	Traditional Chinese Medicine
It is a part in formulations for detoxification and rejuvenation as well as decoctions used to treat colds, coughs, and digestive issues	Prescribed to treat digestive problems, sexual health issues, and respiratory ailments	This used to treat respiratory infections and promote digestion.
A useful medicinal spice, cardamom has an array of therapeutic uses. Modern research in science has confirmed its long-standing use in traditional medicine, making it an effective addition to natural health practices. (Mohammed et al, 2024)		

Role of Cardamom as an Essence of Life

It also Known as the "Queen of Spices," *Elettaria cardamomum* is more than just a delicious food. It represents health, vigor, and harmony and is an essential part of human existence due to its rich phytochemical qualities, cultural importance, and medicinal effects. It Reduces bloating, indigestion, and nausea, acts as a bronchodilator and expectorant, facilitates easy breathing, controls blood pressure, enhances circulation, promotes

cardiovascular health, cleanses the body by supporting liver and kidney function, eliminates toxins, and fortifies the body's defenses with its antimicrobial and antioxidant qualities. Also, it uses as mental and Emotional Well-being, Culinary and Nutritional Enrichment, Anti-aging and Disease Prevention, Spiritual and Cultural Significance, Universal Appeal and Accessibility, Symbol of Holistic Harmony etc. It is truly the essence of life, offering a well-balanced combination of sensory pleasure, cultural

variety, and health benefits. It is essential to human health, as evidenced by its continued use in religion, traditional medicine, and international cuisine. Whether used as a spice, medications, or a warming symbol, cardamom is a timeless addition to the richness and energy of life (Kumar *et al.*, 2021).

Pharmacological activity of *Elettaria cardamomum*

Table 9. Uses

1.	Cardamom tea	As cardamom tea is high in antioxidants, vitamins, and essential oils, it is a pleasant and sweet beverage that has several health advantages... Cardamom tea is helpful to relieve digestive problems such as gas, bloating, and indigestion. It also encourages the release of digestive enzymes, which improves digestion and may lessen heartburn and symptoms associated with acid reflux, it supports kidney function, assists in flushing out toxins from the body, and may help prevent urinary tract infections due to its diuretic qualities. When taken regularly then the antioxidant and diuretic properties of cardamom may help reduce blood pressure.
2.	Cardamom as a spice	There are two primary types of cardamom, that is a fragrant and adaptable spice used in many different cuisines globally: Black cardamom is more smoky and strong than green cardamom, which has a pleasant, floral flavor, in besides being used in traditional sweets like Indian kheer (rice pudding) and gulab jamun, it gives flavor to Scandinavian delights like cardamom buns and enhances desserts like puddings, custards, and cakes.
3.	Antiseptic	Essential oils found in cardamom such as borneol, limonene, α -terpineol, and 1,8-cineole (eucalyptol). These chemicals cause microbial cell membranes to fall down, which inhibits pathogens from growing and surviving and it is a great natural antiseptic as it is known to function as a natural antiseptic and to be effective against many kinds of diseases, such as bacteria, fungi, and viruses. Cardamom is effective against a variety of pathogens, like bacteria, mold, and viruses. and its antibacterial qualities are further enhanced by its capacity to reduce inflammation, resulting in the healing of infected wounds. <i>Elettaria cardamomum</i> 's anti-inflammatory, anti-bacterial, and healing qualities make it an effective natural antiseptic. It is a useful supplement to both contemporary antiseptic pieces and conventional therapy. Its uses in the pharmaceutical and medical industries may increase with further investigation and clinical testing.
4.	Anti-inflammatory	<i>Elettaria cardamomum</i> is an effective remedy for healing illnesses caused by inflammation due to its well-known anti-inflammatory properties. Phytochemicals such 1,8-cineole (eucalyptol), terpinene, limonene, borneol, and flavonoids all rich in cardamom. These compounds prevent the production of cytokines as well as pro-inflammatory mediators and Cardamom's anti-inflammatory and antioxidant properties have been demonstrated to reduce joint pain and swelling, therefore mitigating the symptoms of arthritis and Oxidative stress can lead to chronic inflammation. Because of its potent antioxidant qualities, cardamom indirectly reduces inflammation by decreasing free radicals also Cardamom reduces the production of inflammatory mediators such as prostaglandins and leukotrienes by reducing enzymes like cyclooxygenase and lipoxygenase, a natural and adaptable therapy for a range of inflammatory conditions, cardamom's anti-inflammatory qualities are fueled by its bioactive constituents and antioxidant activity. Its use in topical therapies and diets provides a comprehensive strategy to minimize inflammation.
		(eucalyptol) causes cell death and These substances inhibit microbial development by interacting with their DNA synthesis and metabolic processes. In addition, cardamom oils and extracts change the pH of the surroundings, which reduces microbial growth also It increases its antimicrobial activity by reducing the growth of biofilms, which are protective structures made by microorganisms. A strong natural antimicrobial with broad-spectrum actions against viruses, fungi, and bacteria is <i>Elettaria cardamomum</i> . It can be used for everything from advanced medications and food preservation to ancient therapies. Cardamom could discover new applications and formulations in antibiotic therapy with more investigation and clinical trials.
5.	Antimicrobial	<i>Elettaria cardamomum</i> is efficient against a variety of bacteria, fungi, and viruses due to its strong antibacterial properties. The large number of bioactive phytochemicals and essential oils is mostly responsible for these characteristics. The breakdown of microbial cell membranes by essential components such as borneol, limonene, α -terpineol, and 1,8-cineole
6.	Anti-cancer	Preclinical research on <i>Elettaria cardamomum</i> has shown positive anti-cancer characteristics, indicating that it may be used as a supplemental medicine in the prevention and treatment of cancer, Cardamom is abundant in flavonoids and phenolic compounds which reduce oxidative stress, a major factor in the development of cancer, and neutralize free radicals. Additionally, its extracts provide cancer cells apoptosis, or programmed cell death, by activating pathways like the mitochondrial (intrinsic) apoptotic pathway, in addition to modulating important signaling pathways such as NF- κ B, MAPK, and PI3K/Akt, which are frequently dysregulated in cancer, cardamom inhibits angiogenesis, the process of new blood vessel development necessary for tumor growth and dissemination, one important risk factor for cancer is chronic inflammation. Due to its anti-inflammatory qualities, cardamom lowers the risk of cancer through decreasing the generation of pro-inflammatory cytokines. <i>Elettaria cardamomum</i> 's anti-inflammatory, anti-proliferative, and antioxidant qualities make it a promising natural anti-cancer agent. Preclinical research seems promising, but more human clinical trials are required to determine its security and efficacy in the prevention and treatment of cancer.
7.	Cost-effective Applications	Cardamom is a valuable spice in culinary traditions around the world, but it can also be used in cost-effective ways due to its several functional, medicinal, and aromatic qualities. For example, use small amounts of cardamom powder or pods to add robust flavor to dishes, reducing the need for multiple spices and to add luxury tastes to liquids like coffee or chai and raise their worth without breaking the bank, add cardamom, Traditional medicine uses cardamom extensively to treat a variety of illnesses. Make cardamom-infused drinks or powders to alleviate nausea, flatulence, and indigestion without the need for costly medicinal products. As a natural and reasonably priced substitute for store-bought breath fresheners and oral antiseptics, chew cardamom seeds. To boost mood and relieve anxiety, add cardamom essential oil to low-cost DIY aromatherapy compounds and it is an inexpensive component for personal care products because of its antibacterial and fragrant qualities: For anti-aging and anti-inflammatory properties, incorporate cardamom powder or oil into DIY projects face scrubs or masks. For reasonably priced, long-lasting natural smells, use cardamom essential oil with carrier oils. Avoid expensive salon treatments by adding cardamom to hair oils or rinses to support healthy scalps and lessen dandruff. <i>Elettaria cardamomum</i> has several economic uses in a variety of fields, such as commercial product development, sustainable farming methods, and culinary and medicinal uses.

Conclusion

In conclusion we know that *Elettaria cardamomum* is a gift from nature that represents energy, harmony, and overall well-being, it is much more than just a spice. Its adaptability in terms of gastronomy, health, and culture highlights its enduring significance in human existence. A mainstay of natural medicine, cardamom's medicinal properties have their roots in both ancient customs and contemporary research. Furthermore, its function in enhancing tastes and fostering emotional equilibrium supports its standing as the genuine essence of life. Alpha terpinyl acetate, the main chemical component of cardamom, is among a number of active medicinal compounds

Cardamom has several pharmacological and therapeutic properties like antiseptic, antispasmodic, phrodisiac, anthelmintic, cephalic, cardiogenic, expectorant, antibacterial, diuretic, sialagogue, emmenagogue and stomachic (Yahyazadeh *et al.*, 2021 and Kumar *et al.*, 2022).

it contains. Other constituents include 1,8-cineole, β -pinene, α -terpineol, limonene, α -terpinyl acetate, and α -pinene. Studies have shown that it also acts as a stimulant of the nervous system and an antidote for some venoms. In a world where holistic and sustainable health practices are becoming more and more popular, cardamom is an example of the resilience and generosity of nature. The long-lasting interaction between people and the natural world—one that promotes health, happiness, and harmony for future generations—is demonstrated by the incorporation of cardamom into daily life.

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