



Clove :The Versatile Medicinal Herb

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Abstract: Clove (*Syzygium aromaticum*) is a spice and medicinal plant that is native to the Maluku Islands in Indonesia. It has been used for centuries for culinary, medicinal, and cultural purposes and is now cultivated in many tropical regions around the world, including India, Sri Lanka, and the Philippines. This spice originates from the dried flower buds of an evergreen tree natively found in Indonesia's Spice Islands, where they are native, and have been used in the culinary as well as the medical field since its discovery with potent flavoring characteristics and innumerable medicinal virtues. Clove is one of the important ingredients in various cuisines and spice blends, especially in Southeast Asia, the Middle East, and Europe. It has a distinctive, pungent aroma and a slightly sweet, bitter taste.

Clove's diverse applications, ranging from culinary uses to therapeutic benefits, underscore its significance not only in modern health and wellness but also in the cultural traditions that have been handed down through generations. As the interest in natural and plant-based remedies continues to rise, clove's reputation as a medicinal plant is increasingly gaining recognition

Keywords: Spice, Eugenol, antioxidant, Anticancer

Introduction: Clove (*Syzygium aromaticum*) is a fragrant spice and medicinal plant, well-known for its distinctive flavor and numerous health benefits. Originating from the Maluku Islands of Indonesia, clove has a rich history as a prized commodity in ancient trade routes and has played a significant role in the global spice trade. Today, it is grown in tropical regions worldwide and is utilized in both cooking and traditional medicine.

Cloves range in length from approximately 1/2 to 3/4 inch and contain 14-20% essential oil. Their strong pungency is attributed to the high levels of eugenol, which can be extracted through distillation to produce the essential oil. Clove buds are considered safe for oral medicinal use. For over two thousand years, cloves have been utilized by humans (1)

The primary form of the plant, the dried flower bud, has been celebrated for its strong medicinal properties, mainly due to the bioactive compound eugenol. This compound is recognized for its analgesic, anti-inflammatory, antimicrobial, and antioxidant effects, making clove a valuable addition to various health practices. It is commonly used for pain relief, digestive health, oral care, and as a general immune booster.

This article will delve into the different aspects of clove, including its botanical features, medicinal applications, active compounds, and cultural importance, with a focus on its expanding role in current health and wellness trends.

History: A Chinese physician noted that visitors to the court had to hold cloves in their mouths to mask any bad breath before meeting the Emperor. Cloves were first traded to Europe by Arab merchants in the 4th century A.D. The true origin of cloves remained a mystery until the Portuguese discovered the islands of Indonesia, also known as the Moluccas, in the 16th century. By the 17th century A.D., cloves made their way to Sri Lanka, and in the 18th century A.D., they were introduced to India by the East India Company. In many European countries,

there is a tradition of creating "Pomanders" by studding oranges with clove buds and hanging them around homes during Christmas for decoration and to spread a pleasant fragrance. (2)

Botanical Description:

Kingdom- Plantae

Sub Kingdom- Tracheobionta

Super Division- Spermatophyta

Division-Magnoliophyta

Class- Magnoliopsida

Subclass- Rosidae

Order-Myrtales

Family- Myrtaceae

Genus- Syzgium

Species- aromaticum



Figure 1 Clove

Chemical Composition: Clove is a significant plant source of phenolic compounds, including flavonoids, hydroxybenzoic acids, hydroxycinnamic acids, and hydroxyphenyl propens. (3)

The standard physicochemical properties of clove oil are derived from the parameters of cultivated clove oil rather than those of wild cloves. These properties include aspects such as color, specific gravity, refractive index, optical rotation, solubility in ethanol, eugenol content, and β -caryophyllene levels. (4)

A single clove bud has about 14-20% essential oil content. Eugenol, a key bioactive compound, is abundant in clove oil. The therapeutic benefits of clove are largely attributed to eugenol, which includes properties such as analgesic, anti-spasmodic, antioxidant, anti-inflammatory, anti-thrombotic, neuroprotective, anti-convulsant, anti-carcinogenic, anti-diabetic, anti-bacterial, and antifungal effects. (5)

The plant produces dried flower buds (cloves), essential oil (EO), and oleoresin, which are rich in eugenol, a bioactive compound recognized for its antioxidant and anti-inflammatory benefits. Clove's potential in cancer treatment stems from its wide array of bioactive compounds that show various therapeutic effects. Notably, it has well-established analgesic and anti-inflammatory properties, making it a useful natural remedy for alleviating pain and managing inflammation. Furthermore, cloves have shown antimicrobial and antifungal properties. (6)

The chemical structure of eugenol is similar to that of phenol. It acts as an antioxidant and can help prevent diseases linked to free radical activity, including cancer, cardiovascular disease, neurodegenerative disorders, and more (7)

Clove oil can be extracted from various parts of the plant, including the leaves (1-4%), stems (5-10%), and flowers (10-20%). Previous studies have focused on the antibacterial properties of clove oil against *Streptococcus mutans* and *Streptococcus pyogenes*. (8)

The anti-aging properties are closely linked to the presence of active secondary metabolites found in clove leaves. These secondary metabolites are produced not only by the plants themselves but also by endophytic bacteria that reside within the plant tissues. (9)

Pharmacological Activities of Clove:

- 1) **Anti Cancer Activity-** The A549 cells were trypsinized and then centrifuged at 300 rpm before being transferred to a 96-well microplate. The cell count was adjusted as needed. The plate was subsequently placed in a CO₂ incubator set to 5% CO₂. After this, the medium was removed, and 200 µl of medium containing 10% MTT reagent was added to each well, achieving a final concentration of 0.5 mg/ml. The plate was incubated for 3 hours in the CO₂ incubator with 5% CO₂. The medium was completely removed afterward. Finally, the absorbance was measured at 570 nm and 630 nm. The results were analyzed to calculate the IC₅₀ value, which indicates the concentration at which cell growth is inhibited by 50%. (10)
- 2) **Analgesic activity:** The present study suggests that, in addition to eugenol, there may be other polar compounds in clove buds that possess analgesic properties, warranting further investigation. It is also concluded that the aqueous extract of clove has analgesic effects, which may be partially attributed to the opioid system. However, the precise mechanisms involved require further exploration (11)
Clove oil is widely recognized for its analgesic and anti-inflammatory properties. The main bioactive component, eugenol (which makes up about 80%), along with other compounds such as α -caryophyllene, acetoeugenol, and humulene, exhibits strong antimicrobial, antioxidant, anti-inflammatory, and antipyretic effects. (12)
- 3) **Anti fungal activity:** Sa-AgNPs have proven to be effective against a range of fungi, such as *C. albicans*, *A. fumigatus*, and *T. rubrum*. They can eliminate fungi by causing damage to their cell walls, which ultimately results in cell death. (13)
Clove oil emerged as the most effective and broad-spectrum antifungal agent against various fungal species found in the environment. These findings are preliminary and require further validation, especially regarding their practical application. A key outcome from a methodological standpoint was the notable variation in several of the products over time when examined using the disc diffusion assay. (14)
- 4) **Anti viral activity:** Antiviral agents are compounds that directly block the viral replication process within host cells and/or stop viruses from being released into the surrounding space. To address the growing issue of resistance, there is significant global interest in developing antiviral substances that utilize new mechanisms of action. (15)

Uses:

1. Antioxidants: Clove oil's high antioxidant content can help prevent cellular aging. The use of clove oil in cancer research is under consideration. (16)
2. Dairy products: Recent scientific advancements in food science and technology have broadened the range of unique ingredients available to enhance the value, quality, natural preservation, shelf life, and novelty of traditional Indian dairy products. (17)

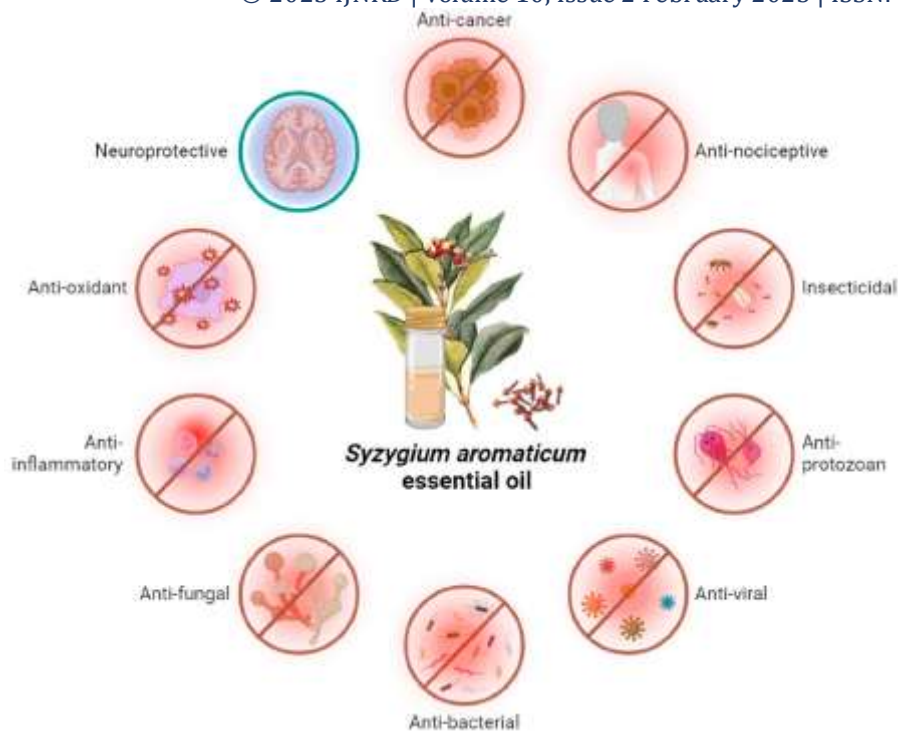


Figure 2 Syzygium Aromaticum Essential Oil (18)

Side Effects & Rick:

It is generally advised to avoid ingesting large amounts of clove oil. If swallowed, clove can lead to a burning sensation. Instead, it's better to apply it to the skin or use it as a wash. (19)

- 1) **Oral Irritation:** Clove oil is strong and may cause irritation or burning in the mouth if used excessively or in concentrated amounts.
- 2) **Respiratory Issues:** Breathing in clove oil vapors in large amounts may irritate the respiratory system.
- 3) **Allergic Reactions:** Some people may have an allergic reaction to cloves, leading to symptoms like skin rashes, itching, or swelling.
- 4) **Gastrointestinal Issues:** Excessive consumption of clove or clove oil may cause nausea, vomiting, or gastrointestinal irritation.

Conclusion: Clove is a valuable herbal remedy when used in moderation. It can effectively help with pain relief, digestive problems, and oral health, while also providing a strong dose of antioxidants and anti-inflammatory benefits. However, it's crucial to use clove responsibly, especially in concentrated forms like clove oil, as overuse can lead to side effects. As with any herbal treatment, it's wise to consult a healthcare professional before using clove for medicinal purposes, particularly if you have existing health issues or are taking other medications.

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