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A REVIEW ON PHARMACOLOGICAL PROFILE AND EFFECTIVENESS OF CLOVE OIL: AS SANJEEVANI MEDICINE

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ABSTRACT

- Clove (syzygium aromaticum) is one of the most valuable species that has been used for centuries as food preservative and for many medicinal purpose.
- It may be looked upon as a champion of all antioxidants known till date, because to determine antioxidant property US department of agriculture developed a test scale called Oxygen Radical Absorption Capacity (ORAC), and the ORAC score of cloves are over 10 million, a drop of clove oil is 400 times more powerful an antioxidant than wolf berries and blue berries.
- It also represents one of the richest sources of phenolic compounds such as Eugenol, Eugenol Acetate, Gallic Acid and possess great potential for pharmaceuticals, cosmetics, food and agriculture applications.
- The commercial use of clove is for the production of clove oil that contains active constituents which possess Anti-oxidants, Anti-microbial, Anti-diabetic, Anti-inflammatory, Antithrombotic, Anesthetic and insect repellent.
- A new application of clove as larvicidal agent is an interesting strategy to combat dengue which is serious problem in tropical countries.

KEYWORDS: Clove, Syzygium aromaticum, Anti-Oxidants, Dengue fever, Larvicidal agent.

INTRODUCTION

- Clove is a precious and valuable species of the world. It is an unopened flower bud growing on

a tree belonging to the family Myrtaceae.

- cloves (Syzygium Aromaticum or Eugenia Caryophyllus) are the aromaticum dried flower buds. It is commonly used as spice in food preparation and commonly found in spice racks in Indian homes and also at worldwide level.
- It possess (clove bud) intense fragrance, burning taste as pungent, slightly sweet and slightly astringent.
- In India, it is widely used in species rich dishes.

Common Names

Cloves, Carophyllus, clovos, Caryophyllus.

Indian Names

Sanskrit Names- Bhadrasriya, Devapuspa, Devkusuma, Haricandana, Lavanga. Hindi Names – Laung, Lavang.

Malayalam Names- Grampu, Karayampu. Kannada Names- Lavanga, Karambu.

Tamil Names- Kirampu, Kirambu, Grambu.

Telugu Names- Devakusumamu, Lavangamu, Kaaravallu.

International Names

Arabic Names -Kabsh, Qarunfil, Kabshqaranfil. Chinese Names - Ding Xiyang

French Names - Cloude Girofle, Giroflier. German Names - Nelke.

Greek Names - Garifalo.

Russian Names - Gvosdika, Sambala. Spanish Names - Clavo, Clavo de o lor.

Biological Source

It is obtained from dried flower buds of Eugenia Caryophyllus.

Family

Myrtaceae

Geographical Sources

- Indigenous to Amboyna C Molucca islands.
- Cultivated Zanzibar, Pemba, Penang, Caribbean islands, Srilanka, India.
- In India, cloves are grown in Nilgiri, Tenkashi-Hills and in Kanyakumari district of Tamil Naidu state. It also cultivated in Kottayam and Quilon district of Kerala.

History

By the 4th century, cloves had gained significant recognition in the Mediterranean region, and by the 8th century, their presence was established across Europe. In the 16th century, the Portuguese identified the Maluku Island as the native habitat of the clove plant. It is believed that cloves were introduced to India around 1800 BC by the East India Company.

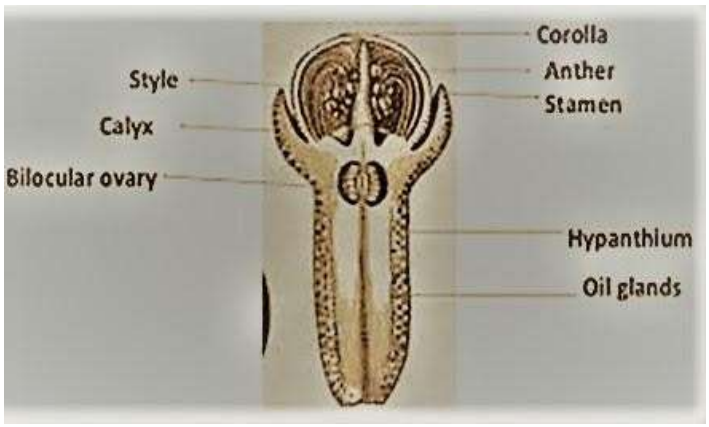
Maluku Island

The Maluku Island, located in Indonesia, are the indigenous home of the clove tree, which has thrived naturally for millennia without the necessity of cultivation. The initial planting of clove trees occurred during the 16th to 17th centuries, a period marked by the spice trade conflicts, when the Dutch East India Company sought to establish a monopoly on the clove trade.

Macroscopy

Colour- Crimson to dark brown. Odor- Slightly aromatic.

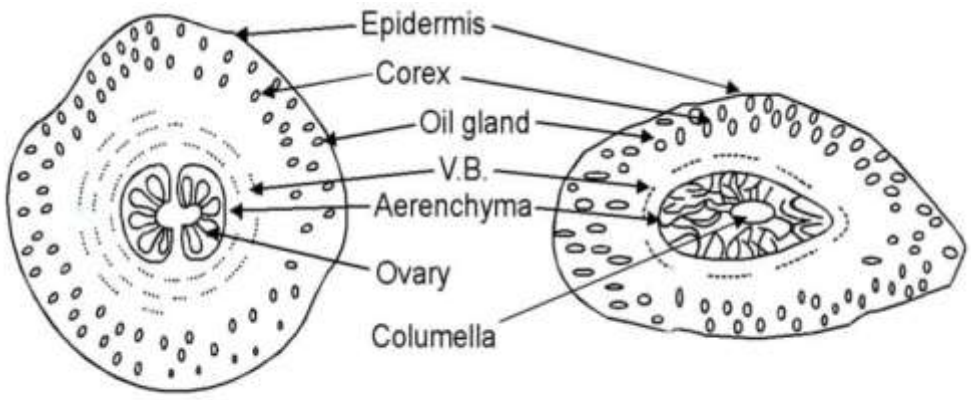
Taste- Pungent C Aromatic followed by numbness of the tongue. Shape- Sub-cylindrical and slightly flattened.



MICROSCOPY

T.S. of clove through hypanthium shows;

1) Epidermis: The structure is composed of robust cuticularized epidermal cells formed by small, straight-walled tubular cells. Numerous amniocytic stomata are interspersed among the epidermal cells.



T.S of clove passing through ovary **T.S of clove passing through columella**

2) **Cortex:** It is composed of three distinct zones

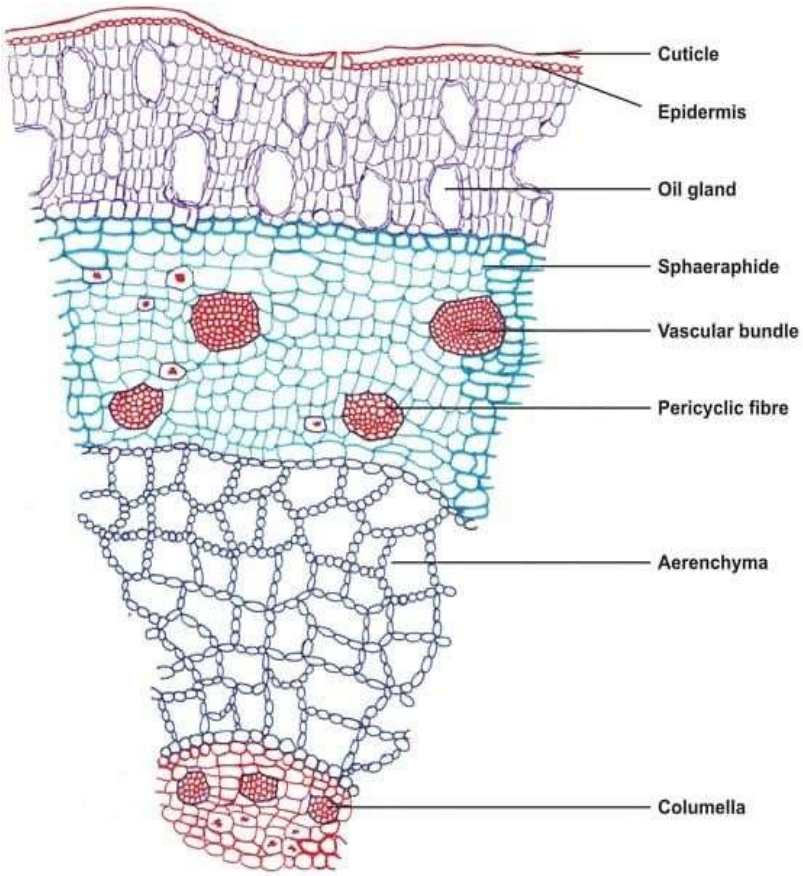
a) The outermost zone features parenchymatous cells arranged radially, consisting of two to three layers of large ellipsoidal oil glands formed through schizolysigenous processes. These parenchymatous cells contain tannins, which impart a dark coloration when treated with ferric chloride.

b) The middle layer is characterized by cells with thickened walls that encase a ring of bicollateral vascular bundles. Associated with these vascular bundles are a few thick- walled lignified pericyclic fibers. The xylem is made up of 3-5 lignified spiral vessels, and there are approximately 15 vascular bundles arranged in the ring.

c) Inside the ring of vascular bundles lies a parenchyma zone, which contains oil spaces divided by one –cell-thick lamellae, providing support to the central columella.

3) **Columella:** The columella is formed from parenchymatous tissue. Its outer region contains a ring of about 25 to 30 small vascular bundles. Throughout the tissue, clusters of calcium oxalate crystals are present, while starch grains, trichomes, and stone cells are notably absent.

When a transverse section of clove is examined through its ovary, it reveals the epidermis, zones of oil gland, and bicollateral vascular bundles. Instead of parenchymal tissue, a zone of the ovary present, consisting of cells with significantly thickened cellulose walls, bordered on the inner side by an inner epidermis that lines the ovary wall. The dissepiment is parenchymatous, and the placenta contains numerous clusters of calcium oxalate crystals. The central columella features a series of small vascular bundles arranged in a ring formation.



T. S. of Clove flower bud

Chemical Constituents

Clove possess volatile as well as non-volatile constituents.

a) Volatile Constituents: Clove yields different types of volatile oil.

- Oil extracted from

i) Leaves

ii) Stem

iii) Bud

iv) Fruit

- The chief component of all the type of oil is eugenol.

i) Clove leaves oil

- Clove contains following key chemical constituents. It possess 3-4.8% essential oil.

Δ Eugenol- It is main component known for its analgesic and antiseptic properties.

Δ Benzyl Benzoate- Provides fragrance and may have antifungal property.

Δ β caryophyllene- A sesquiterpene with potential anti-inflammatory effects.

Δ α Humulin- Another sesquiterpene that may have anti-inflammatory and anti-microbial

properties.

Δ Eugenyl Acetate- An ester that contributes to the oil's aroma.

ii) Clove stem oil

- It possess 6% of volatile oil.
- It contains 80.2% eugenol and 6.6% β caryophyllene, besides several minor constituents.

iii) Clove bud oil

- Good quality clove bud contains 15%-20% essential oil.
- It possess eugenol 70-80%), eugenyl acetate (15%), β-caryophyllene (5-12%).
- The minor constituents like methylamylketone, methylsalycylate etc, are responsible for the characteristic pleasant odor of cloves. Iv) Fruit oil:
- Ripe fruits possess 2% of oil in which 50-55% eugenol is present.

b) Non-volatile constituents

i) Tannins

- These contributes to the astringency and may have anti-oxidant properties.

ii) Flavonoids

- Provides various health benefits and contribute to color and flavor.

iii) Phenolic acid

- such as gallic acid C ellagic acid, known for their anti-oxidant effects.

iv) Ash and minerals

- Cloves contain essential minerals like calcium, potassium C magnesium.

Medicinal uses

- Clove is recognized for its antibacterial properties and is incorporated into a variety of dental products, including creams, toothpaste, mouthwashes, and throat sprays, to eliminate bacteria. Additionally, it serves to alleviate discomfort from sore gums and enhances overall oral health.
- Cloves are also considered aphrodisiacs, stimulating or enhancing sexual desire and potency. Their anti-inflammatory effects are attributed to a high concentration of flavonoids, leading aroma therapists to employ pure clove oil for alleviating symptoms associated with rheumatism and arthritis.
- Cloves also function as a carminative, promoting the secretion of hydrochloric acid in the stomach and facilitating peristalsis. A paste made from clove powder and honey can be applied to treat acne, while a mixture of clove powder and water aids in the expedited healing

of cuts and bites.

- Cloves are effective in addressing various digestive issue, possessing medicinal properties that can alleviate flatulence, diarrhea, indigestion, and nausea. They are beneficial in relieving symptoms of diarrhea, gastric irritability, and vomiting.
- Clove and clove oil enhances the immune system by purifying the blood and aiding in the combat against various illnesses. Clove oil is particularly effective in treating Athlete's foot and nail fungus. Inhalation of aromatic clove oil can alleviate certain respiratory ailments such as colds, coughs, asthma, bronchitis, and sinusitis, while also assisting in the clearance of the nasal passages.
- Chewing on a clove bud can diminish the craving for alcohol. The application of clove oil as poultice on affected areas can often relieve muscular cramps. Studies indicate that inhaling the spicy scent of cloves can alleviate drowsiness, irritability, and headaches.
- Clove is regarded as a leading antioxidant, with an Oxygen Radicle Absorption Capacity (ORAC) score exceeding 10 million, as established by the U.S. Department of Agriculture. Notably, a drop of clove oil is 400 times more potent as an antioxidant.

Veterinary application

Cloves are incorporated into a broader herbal formulation to assist bitches experiencing pup retention. Clove oil has been utilized for addressing foreign substances in the ears of dogs and cats, as well as serving as an analgesic for dental discomfort. A mixture of peppermint tea, enhanced with cloves and ginger, has been employed to alleviate vomiting in dogs, with a dosage of 1 tablespoon or more depending on the animal's size, administered three times daily.

Culinary application

Dried cloves serve as a fundamental component in Indian masala tea. Cloves are frequently utilized to enhance the flavor of various meat products, baked goods, confections, chewing gum, spiced fruits, hot beverages, chocolate drinks, wines, sandwiches, cakes and pickles.

Additional Application

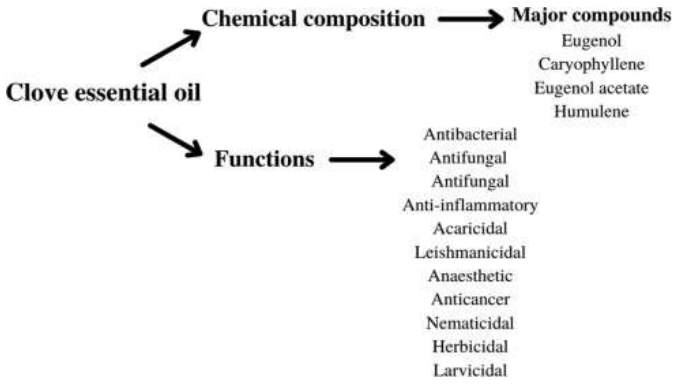
Cloves are employed to impart flavor to pharmaceutical.

Clove oil is also used to flavor toothpaste.

The oil extracted from the leaves is utilized to add fragrance to perfumes and soaps.

In Indonesia, cloves are blended with tobacco in a 1:2 ratio to create a cigarette known as Kretek.

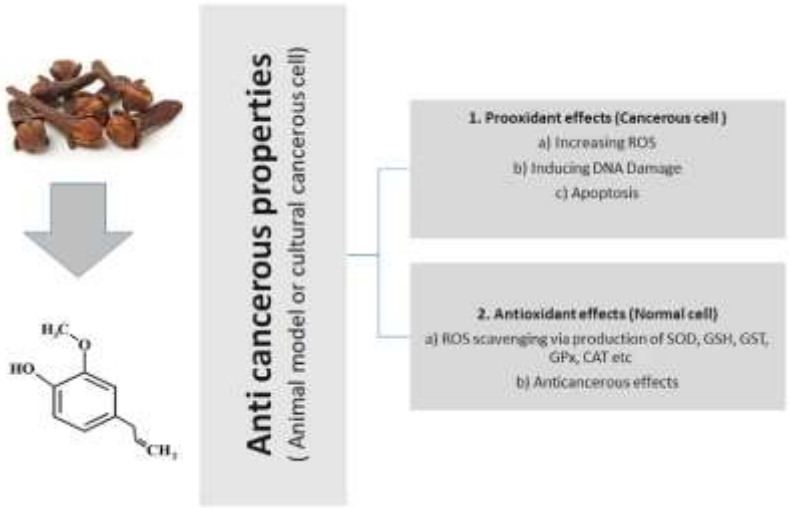
Clove Oil Used As Treatment In Various Disease



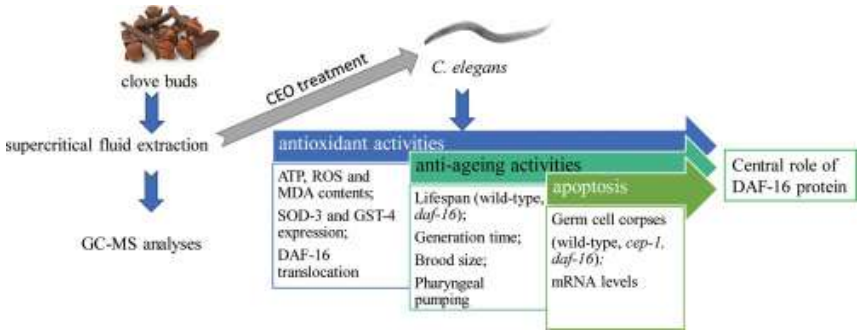
Antimicrobial: Clove oil has demonstrated significant efficacy against Staphylococcus species and is included in Dr. Huda Clark's protocol for the elimination of parasites from the digestive system. Research indicates that it is more effective than sodium propionate against certain food borne microbes. Additionally, a 0.05% solution of eugenol has been shown to effectively eradicate Bacillus tuberculosis. Among fungi, Aspergillus Niger has been identified as particularly sensitive to clove oil. Both clove oil and its primary components, eugenol, exhibit notable antifungal properties against Candida, Aspergillus, and dermatophyte species.

Hepatoprotective: The ethanolic extract of clove demonstrated hepatoprotective effects against liver injury induced by paracetamol, as it effectively restored the serum levels of the enzymes AST, ALT and ALP to their normal values.

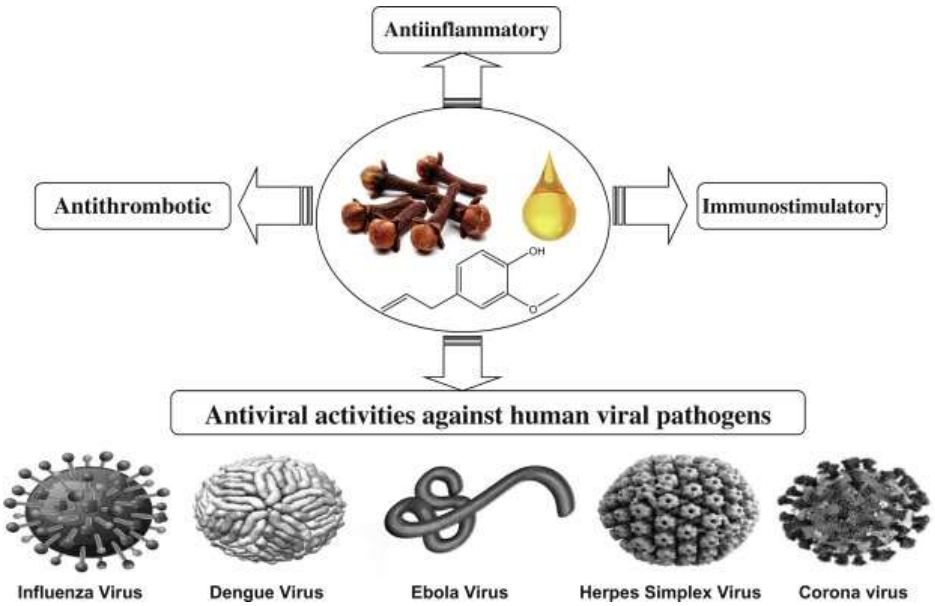
Anti-Cancer activity: Clove exhibited cytotoxic properties with antimutagenic effects against cancer cell lines. Additionally, clove oil extract revealed cytotoxic activity against cervical cancer and promoted increased cell death in colon cancer.



Anti-Oxidant activity: Clove and eugenol exhibit significant anti-oxidant properties. Clove demonstrates the highest ability to release hydrogen and mitigate peroxidation. Additionally, clove has shown a notable inhibitory effect on hydroxyl radicals and functions as an iron chelator. It also displays the highest activity against Di-p-picryl hydrazyl (DPPH) radicals and the greatest ferric reducing antioxidant power (FRAP). The antioxidant capacity of clove is likely attributed to its high levels of phenolic compound, including eugenol (71.56%), eugenol acetate (8.99%) and thymol. The antioxidant capacity of clove extract is comparable to that of natural antioxidants such as α Tocopherol (vitamin E) and butylated hydroxytoluene (BHT). The effects of eugenol are concentration dependent; at low concentration, it functions as an antioxidant and anti – inflammatory agent, while at high concentration, it may act as a pro-oxidant, potentially leading to tissue damage due to increased free radical generation.



Anti-viral activity: clove possess significant antiviral properties. Eugenie, extracted from clove buds, demonstrated antiviral efficacy against the herpes simplex virus at a concentration of 10 μ mg/ml.



Anti-platelet activity; Research indicates that both eugenol and acetyl eugenol exhibited greater potency than aspirin in suppressing platelet aggregation triggered by arachidonate, adrenaline and collagen. Additionally, clove oil demonstrated superior efficacy as an inhibitor of aggregation induced by arachidonic acid (AA) and platelet- activating factor (PAF) compared to collagen.

Analgesic activity: For numerous centuries, eugenol has served as natural remedy, particularly for alleviating dental pain, a practice that continues to be embraced in contemporary dental care. Research has demonstrated that eugenol possess analgesic properties in various experimental pain models involving mice.

Kurian and colleagues investigated the anti-nociceptive effects of eugenol (100mg/kg) across several mouse models, revealing that its efficacy was significantly greater during the inflammatory phase compared to neurogenic phase.

Anesthetic activity: Clove serves as an inexpensive and readily accessible topical anesthetic. It is quickly metabolized and eliminated from the body. When channel catfish (Ictalurus punctatus) were exposed to clove oil at a concentration of 100mg/lit, anesthesia was induced within 1 minute.

Aphrodisiac: The ethanolic extract of clove at a concentration of 0.5% has been shown to significantly and consistently enhance the sexual activity of normal male rats, without causing any noticeable gastric ulceration or adverse effects.

Mosquito repellent: Clove oil demonstrated the most extended period of complete repellency, lasting between 2 to 4 hours, against three mosquito species i.e. Aedes aegypti, Culex quinquefasciatus, and anopheles' virus, when tested under laboratory condition with human subjects.

Toxicity: Clove oil is regarded as safe for consumption at doses below 1.5g/kg. The World Health Organization has established an acceptable daily intake of clove at 2.5 mg/kg for humans. However, the National Center for Biotechnology Information indicates that clove oil is associated with several hazards, including irritation to the eyes, skin, and respiratory system, as well as potential allergic reactions on the skin. Additionally, clove oil may elevate the risk of bleeding.

CONCLUSION

The study, that are review in discuss pharmacologically activity of all phytochemical constituents from the syzygium aromaticum. It contain main chemical constituents of eugenol

are called essential oil, light yellowish color, slightly aromatic odour. Mainly Indian spices and are used in as ayurvedic medicine. Cloves are shows such as the pharmacologically activity as anti-oxidant, anti-cancer, anti-microbial, anti-inflammatory, anti-pyretic, anti-viral, anti-diabetic, anesthetic, analgesic, anti-carcinogenic, antibacterial, antifungal, anti-biotic. Some other activities are shows masquito repellant and insecticidal. All the major activities of clove oil are explained in result have been reported regarding the various activities discussed in the review.

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