



# REVIEW ARTICLE ON SYZYGIUM AROMATICUM (CLOVE)

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## ABSTRACT

Clove may be as a champion of all the antioxidants at till date. The Oxygen Radical Absorption Capacity (ORAC) test is a scale developed by U.S. Department of Agriculture for comparing anti-oxidant exertion. The ORAC score, of clove is over a million. A drop of clove oil painting is many times more important as an anti-oxidant than Wolf berries or blueberries. It's salutary As a home remedy in curing several infections conditions. The clove buds have an Abundance of medicinal and recreational uses. The major part of the public's consumption of the clove spice is in the Home and hotel. Clove oil that contain active Ingredients, which retain antioxidant, anti-fungal, anti-viral, anti-microbial, anti-diabetic, anti-inflammatory, Antithrombotic, anesthetic, pain reliving and insect repellent plots. Eugenol is the main element responsible For the medicinal properties of the clove Buds. In the light of over, we allowed it worthwhile to collect an over- to- date Review composition on clove covering its, antonyms, chemical ingredients, phytopharmacology and medicinal uses.

## KEY WORDS

Cloves, Syzygium aromaticum, Lavang Spice, Aromatic plant, Volatile, Antioxidant, Dengue fever.

## INTRODUCTION

spices as clove, oregano, mint, thyme and cinnamon, Have been employed for centuries as food preservatives And as medicinal shops substantially due to its antioxidant and Antimicrobial conditioning. currently, numerous reports confirm The antibacterial, antifungal, antiviral and anticarcinogenic parcels of spice shops. Clove in particular has attracted The attention due to the potent antioxidant and antimicrobial Conditioning standing out among the other spices. Syzygium aromaticum (S. aromaticum) (reverse Eugenia Cariophyllata) generally known as clove, is an median size Tree (8- 12 m) from the Mirtaceae family native from the Maluku islets in east Indonesia. For centuries the trade of Clove and the hunt of this precious spice stimulated the profitable development of this Asiatic region. The clove tree is constantly cultivated in littoral areas At outside mound of

200 m above the ocean position. The product of flower kids, which is the capitalized part of this tree, starts after 4 times of colony. Flower kids are collected in the development phase before unfolding. The collection could be done manually or chemically- intermediated using a natural phytohormone which liberates ethylene in the vegetal towel, producing unseasonable development. currently, the larger patron countries of clove are Indonesia, India, Malaysia, Sri Lanka, Madagascar and Tanzania especially the Zanzibar islet. In Brazil, clove is dressed in the northeast region, in the state of Bahia in the regions of Valence, Ituberá, Taperoá, Camamu and NiloPeçanha, where roughly 8 000 hectares are cultivated, producing near 2 500 tons per time<sup>(1-7)</sup>

## COMMON NAMES

Names in Indian languages

Sanskrit: Bhadrasriya, Devakusuma,

Devapuspa, Hindi: Laung, Laung, Lavang.

Malayalam: Grampu, Karamu,

Karayampu. Marathi: Lavang

Kannada: Lavanga, Daevakusuma, Krambu Tamil: Kirampu, Ilavankam, Kiraambu, Kirambu, Grambu.

Telugu: Devakusumamu, Lavangamu, Lavangalu, Kaaravallu

Bengali: Lavanga.

Gujarati: Lavang

Punjabi: Laung

Oriya: Labanga



## REVIEW OF LITERATURE

**Parle Milind, and Khanna Deepa. Et.al. ( 2011)**

Clove is a champion of all the antioxidants known of at this date. The Oxygen Radical Absorption Capacity (ORAC) test is a scale developed by U.S. Department of Agriculture for comparing anti-oxidant activity. The ORAC score, of clove is over 10 million. A drop of clove oil painting is 400 times more important as anti-oxidant than Wolf berries or blueberries. **Seema Yadav. Et.al. ( 2020)**

*Syzygium aromaticum* is general name is clove. That's belonging to Family myrtaceae. Clove is notorious the Indian flavor used as spice and Medicinal properties are contained. They're substantially ayurvedic drug used in ayurveda. It a dark brown colour, taste pungent, Odour is slightly sweet. Clove- cub is excerpt attained from the Essential oil painting.

**Mukesh Yadav. Et.al. (2021)**

Clove are the sweet flower buds of a tree in the family Myrtaceae, *Syzygium aromaticum*. They're native To the Maluku islands( or Moluccas) in Indonesia and are generally used as a spice. Clove are available Throughout the time owing to different crop seasons in different countries. Clove is use in antioxidants, Help cover against cancer, it can also kill bacteria, helpful in liver health, regulate bloodsugar, and help in numerous further health problems.

**Shahid Hussain, Rafia Rahman and Ayesha Mushtaq. Et.al. ( 2017)**

Clove( *Syzygium aromaticum*) is one of the most precious spices that have been used traditionally as food preservative and for numerous remedial purposes. Clove is native of Indonesia but it has also been dressed in several corridor of the world including Pakistan. This factory represents one of the richest sources of

phenolic ingredients as eugenol, and eugenol acetate and possesses Great eventuality for medicinal, ornamental, food and farming operations. This composition includes main studies reporting the Phytochemical profile and pharmacological conditioning of clove and eugenol.

**Diego Francisco Cortés- Rojas. Et.al. (2014)**

Clove( *Syzygium aromaticum*) is one of the most precious spices that has been used for centuries As food preservative and for numerous medicinal purposes. Clove is native of Indonesia but currently Is dressed in several corridor of the world including Brazil in the state of Bahia. This factory Represents one of the richest source of phenolic composites similar as eugenol, eugenol acetate And gallic acid and trains great implicit for medicinal, ornamental, food and agrarian operations. This review includes the main studies reporting the natural conditioning of clove and Eugenol.

**Paramita Jaya Ratri. Et.al Published( 2020)**

As a tropical country which has abundant of spices, Indonesia is challenged to increase the profitable values of spices commodity in raw material form( wet or dry). One way to raise The profitable values of these goods is by modifying into its derivations. Clove is one Of spices commodity which can be reused likewise into an essential oil painting. By Transforming clove from raw material to essential oil painting, the profitable value increases from 2 To 20 times per kilogram. In this present exploration, the extraction time of clove oil painting using Steam hydro distillation is reported.

**METHODOLOGY MATERIALS CHEMICALS**

The raw material of clove buds (*Syzygium aromaticum*) which is used in this Research was a species from Central Java, Indonesia. Chemicals including solvents Were used in extraction of essential oil process, Production of eco-friendly packaging candidate, Or during characterization. N-hexane technical Grade 96%, acetic acid glacial p.a. 100%, Ethanol p.a. 99.0% were Purchased from Merck Chemicals. Chitosan Which was used for pulp production was Industrial grade with 30 to 80 mesh of particle Size from CV. ChiMultiguna. The used paper Was added so that mechanical propertiesImprovement. The type of used papers in the Experiment is an HVS 80 gr.

**INSTRUMENTATIONS**

Instrumentations such as Gas Chromatography Mass Spectrometer (GC-MS), Fourier Transform Infrared (FTIR), Universal Testing Machine (UTM), and Thermogravimetric Analysis (TGA) were used for characterization And testing. The essential oil contents were Detected by Thermo Trace 1310 GC with Mass Spectrometer Thermo ISQ Single Quad Detector And FTIR Spectrometer System Nicolet is' 5 in Attenuated Total Reflectance (ATR) mode. Mechanical properties of ecofriendly paper Candidate were conducted by Material Strength Testing, Zwick Roell Z100. Thermal degradation Ofeco-friendly paper applicant was measured by Discovery- 650 SDT( Simultaneous DSC- TGA).

## METHODS EXTRACTION OF CLOVE OIL

Steam hydro distillation is selected as a Method to isolate clove oil. A twenty-five gram (25 g) of dried clove buds was put in steam flask as The steam distillation was conducted in several times such as 3, 4, 5, and 6 h. The time started to be counted when first drop of Distillate comes out. Then the all collected distillate Was extracted and furthermore with n-hexane as Solvent use separatory funnel. Clove oil was Obtained by evaporating the n-hexane.<sup>(19-21)</sup>

## BOTANICAL CLASSIFICATION

Kingdom- Plantae

Sub Kingdom- Tracheobiont

Super Division- Spermatophyta Division

Class- Magnoliopsida

Subclass- Rosidae

Order-Myrtales

Family- Myrtaceae Genus- Syzgium

## POST-HARVEST TECHNOLOGY

Clove trees begin to flower in four times and the Full bearing stage is achieved only in 15 times. Unfolding Period varies from September- October to December- January Depending on tree position. Clove buds are formed on youthful Branches and take 4- 6 months to come ready for harvest. Buds should be gathered when color of petals changes to unheroic pink from green. Harvesting can be done by hand or By using stepladder. Harvesting should be done precisely to help breakage of branches. An average 15 to 20 time old Tree yields 3 to 4 kg of dried clove buds. Optimum time for Harvesting clove seeds is 75- 90 days after fruit set. After Harvesting, clove buds are separated from their stalks by Hand and spread on mats for drying. Drying may take 4 to 5 Days. Well dried buds are hard, crisp and dark brown, Having humidity content (< 12), which can be stored for 1 To 2 times in gunny bags. Roughly, 15- 20 unpredictable oil painting can be produced from dried buds(°).

## USED

Cloves have numerous uses ranging from culinary to Medicine. Clove is a precious kitchen spice which can be Used for splotching onions, tomatoes, salads, herbal teas, and mists. It's also used to flavor meat products, eyefuls, Biting epoxies, spiced fruits, pickles, chocolates, soft drinks, Puddings, sandwiches, afters , and delicacies. Unpredictable oil painting is Used to conduct substance to scents detergents, toothpastes, and Pharmaceuticals. In Indonesia, admixture of clove and tobacco In a rate of 12 is used to make a special cigarette — Kretek I. Clove possesses antibacterial implicit and is used in a Variety of mouth wetlands, dental creams, throat sprays, and Tooth pastes to kill pathogens. It's also used to relive sore Epoxies. Admixture of eugenol( major bioactive element of Clove) and zinc oxide is used for short- term stuffing of dental depressions. Clove oil painting has anti-inflammatory parcels due To the presence of flavonoids. Pure clove oil painting is used in Aromatherapy of arthritis and rheumatism. Paste of clove Greasepaint and honey is used to cure skin conditions. Paste of Water and clove greasepaint boosts mending process of mouthfuls and cuts.

Clove is used to treat colorful digestive diseases Including loose stir, flatulence, nausea, and dyspepsia. Clove oil painting improves body defense system and help to fight Against overrunning microbes. It's also used to cure Onychomycosis and Athlete's bottom complaint. Inhalation of Clove essential oil painting soothes colorful respiratory conditions similar as asthma, cold wave, cough, sinusitis, and bronchitis. Cloves have anticancer implicit and are used

to cure skin And lung melanoma. Clove is good for diabetic cases as it Controls the blood position of glucose. Eugenol prevents the conformation of blood clots. Topical operation of clove oil painting Relieves muscular cramps. Cloves also help the Breakdown in eye's retina, which slows down muscles Degeneration and assists vision in the old age. Sniffing of Clove aroma reduces languor, restlessness, and headaches. Operation of one drop of clove oil painting can soothe headaches. Clove improves memory by relieving internal fog, Doziness, and depression. Clove oil painting is mosquito repellent. Antioxidant eventuality of clove is advanced than numerous Other medicinal shops. One drop of clove oil painting is 400 times More potent than blueberries. Cloves are used as part of Herbal phrasings to cure creatures. The clove oil painting has Implicit of curing observance infection in doggies and house cats. Peppermint tea with a sprinkle of cloves and ginger has been Used to treat vomiting in doggies; 1 tbsp or further, according to The size of the creature, being given 3 times daily.<sup>(7-8)</sup>



(A): Clove dried flower buds.



(B): clove bark



(C): clove flowering.



(D): clove fruits and seeds



(E): clove Tree

## CHEMICAL CONSTITUENTS

### Volatile Constituents

Clove yields different types of unpredictable oil painting( oil painting uprooted Frome. Leaves, ii. The stem, iii. The buds and iv. The fruit.) These canvases differ vastly in yield and quality. The Yield and composition of the oil painting attained are told By its origin, season, variety and quality of raw material, Maturity at crop, pre-andpost-distillation treatments And system of distillation. The principal element of all the Types of oil painting is eugenol.

### Bud Oil

Good- quality clove buds contain 15 – 20 essential oil painting,<sup>2</sup> The oil painting is dominated by Eugenol( 70 – 85), eugenyl Acetate and  $\beta$ - caryophyllen, which Together make up 99 of the oil painting. The ingredients of the oil painting also include methylamylketone, methyl salicylate,  $\alpha$ - And  $\beta$ - humulene, benzaldehyde,  $\beta$ - ylangene and chavicol. The minor ingredients like methylamylketone, Methylsalicylateetc., are responsible for the characteristic Pleasant odour of cloves. The clove bud and stem canvases From Madagascar were also dominated by eugenol, Eugenyl acetate and  $\beta$ - caryophyllene. The stem oil painting Contained a advanced position of eugenol, whereas the eugenyl Acetate content was advanced in the bud oil painting. The oil painting from Clove bud contained 73.5 – 79.7 eugenol and 4.5 – 10.7 Eugenyl acetate, while the stem oil painting contained 76.4 – 84.8 Eugenol and 1.5 – 8.0 eugenyl acetate. Both contained 7.3 – 12.4  $\beta$ - caryophyllene and 1.0 – 1.4  $\alpha$ - humulene<sup>3</sup> Pinoetal. Linked 36 composites from the unpredictable oil painting Of clove buds. Clove buds from India contained 12.9 – 18.5 oil painting, of which 44 – 55 was eugenol, whereas the Pedicels contained 3.0 – 7.7 oil painting with 60.0 – 72.4 Eugenol<sup>2</sup>

### Leaf Oil

Clove leaves yield 3.0–4.8% essential oil. The essential Oil content during the different stages of leaf growth Revealed that the eugenol content in the leaves increased From 38.3 to 95.2% with maturity, the content of

eugenic acetate is (51.2 to 1.5%) and a (6.3 to 0.2%) decreased 4. Clove bud oil and leaf oil contain a various of Classes of compounds, e.g. monoterpenes, sesquiterpenes, Aldehydes and ketones.

### Clove Stem Oil

Clove stem yields 6 unpredictable oil<sup>1</sup>. The oil painting is a pale to Light unheroic liquid containing 80.2 eugenol and 6.6  $\beta$ - Caryophyllene, besides several minor factors.

### Fruit Oil

Ripe fruits yield 2 of oil painting, which is comprised of 50 – 55 eugenol. Non- unpredictable ingredients A many non-volatiles have been insulated from clove, which Include tannins, sterols, triterpenes and flavonoids.

### Tannins

Cloves contain 10 – 13 tannins, which have the same Chemical composition as gallotannic acid. Eugenol and Ellagitannin<sup>5</sup> were insulated from cloves. Eugenol Glucoside gallate, a chromone C- glycoside, galloyl and Hexahydroxy diphenyl esters of 2, 4, 6- trihydroxy Acetophenone- 3- glucopyranoside were insulated from Clove leaves<sup>6</sup>. Further, two ellagitannins, namely, Syzyginin A (1, 2, 3-tri-O-galloyl – 4, 6-( S) – tergalloyl-  $\beta$ - D- glucoside) and syzyginin B, were also insulated from the Leaves.

### Triterpenes

Cloves contain about 2 of the triterpene, oleanolic acid. Narayanan and Natu( 1974) insulated maslinic acid from Clove buds<sup>7</sup>. From clove, 2 $\alpha$ - hydroxyoleanolic acid was Also isolated<sup>8</sup>

Sterols isolated from clove includes sitosterol, stigmasterol , campesterol<sup>8</sup>.

### Flavonoids

A chromone C-glycoside, isobiflorin (5, 7-dihydroxy-2-Methoxychromone-8-C- $\beta$ -D- glucopyranoside) and Biflorin were isolated from the ethanolic extract of Cloves<sup>9</sup>. From the ethanol extract of the seeds, apigenin 6-C- $\beta$ -D-xylopyranosyl-(1 $\rightarrow$ 2'')-  $\beta$ -D- Galactopyranoside]- 7-O- $\beta$ -D-glucopyranoside and Apigenin-6-C- $\beta$ -D-xylopyranosyl- (1 $\rightarrow$  2'')-  $\beta$ -D- Galactopyranoside]-7-O- $\beta$ -D-(6-O-p-Coumarylglucopyranoside) were isolated<sup>10 (9-13)</sup>

### Caution for Children

Clove oils can be poisonous to children. Store products that contain clove oil painting down and out of reach of children in your home.

**Precautions** There's inadequate safety data on cloves or clove oil painting in pregnant and suckling people. Thus, it's recommended to avoid supplementing with it. Clove oil painting shouldn't be used for children. Indeed small quantities of clove oil painting have been reported to beget severe side goods similar as seizures and liver damage. One case report detailed a child who ingested clove oil painting and endured circulated intravascular coagulation( DIC), a rare but serious blood clotting condition, and hepatocellular necrosis( death of hepatocytes, which are liver cells)

## SIDE EFFECTS OF CLOVES

Low dosages of clove oil painting appear to beget many side goods but can affect in original irritation, rare antipathetic responses, and contact dermatitis. Still, consuming large dosages can beget severe side goods, similar as liver and order damage, seizures, and coma.

## PHARMACEUTICAL ACTIVITIES OF CLOVE

### Antimicrobial exertion:

Eugenol exhibits antimicrobial exertion toward fungi, as well as an extensively range of gram- positive and gram-negative bacteria. Eugenol is naturally being essential oil painting i.e, hydroxyphenyl propene belonging to family myrtaceae Responsible for mortal infection conditions, Oral depression eugenol complaint, food-borne Pathogens eugenol demonstrates bioactive composites with broad range anti-microbial exertion against both plank- alcohol and sessile cells carrying foodborne micro-organisms And mortal conditions.

### Anti-Oxidant exertion:

Antioxidant exertion above essential oil painting separated significant Eugenol composites and its outgrowth are determineology using two the free revolutionary Scavenging assays in vitro- model involving, 2 – di- phenyl- 1-picryl hydrazyl( DDPH) and nitric oxides. The chance inhibition was measured and reported by hydroxyphenyl propene. Represented using ascorbic acid as normal in a term of IC<sub>50</sub> val – uses( attention When compared at which free revolutionaries is inhibition by 50 per cent)( KaurK. Et al, 2019). This exertion is estimated with DPPH. Radical scavenging activity is the truly common system to determine the exertion. Landing of free revolutionary by eugenol is expressed as IC<sub>50</sub>, Expresses the attention demanded to capture redicals as a medium of 50 per cent. As a Result it shows explosively decreases anti-oxidant exertion.

### Antidiabetic Activity:

There work is hypo- thesized to estimate the anti-hyperglycemic Capability are eugenol via defining exertion are enzymes the involved in streptozotocin( STZ)- convinced glucose metabolized in a diabetics rats. Increases in the exertion of major Carbo- hydrate metabolized enzymes similar as hexo- kinase, pyruvate- kinase, glucose-6-Phosphate-dehydrogenase, glucose- 6-phosphatase, fructose- 1, 6- bis- phosphatase, and Liver biomarkers( AST, ALT, and peak), creatine- kinase, and blood urea nitrogen's in Serum, and diabetes rat blood have appreciably returned to nearly normal rates via Eugenol administration. Eugenol dosing to ameliorate body weight for diabetic rats and Hepatic glycogen quality exemplify eugenol's anti- hyperglycemic capability in diabetic rats. Current findings indicate that eugenol in experimental diabetes may potentially boost Conditioning of enzyme of glucose metabolized, and the prudent are extend from a compass The eugenol used in a trial of palliate the adverse effect of diabetes( SrinivasanS. Et al, 2013). Lavang and insulin impact the exertion of diabetes- related

genes similar as a phosphoenol- Pyruvate carboxy- kinase( PEPCK) glucose 6- phosphate( G6Pase) gene, probing the Antidiabetic goods of free and set phenolic clove excerpts against carbo- hydrate- Hydrolyzing enzyme in a analogous manner. Result of both extracts a blocked dose-dependent Alpha- amylase.

### Anti-Inflammatory Activity:

Essential oil open breathing channels, serving as an Expectorant to treat numerous of the upper respiratory diseases including snap, eye shambles, Bronchitis, sinus diseases, S cough and asthma. In traditional clinical drug, clove Was used to relieve nasal interference and musculoskeletal discomfort that indicates its Anti-inflammatory function and the action is attributed to COX- 2 inhibition. When gobbled, the sweet oil painting could help to palliate similar breathing problems similar as cough, Colds, asthma, bronchitis, and sinusitis.

### Antiviral Activity:

Shrine reduction assays delved antiviral exertion and the anti – Viral medium of action was determined by administering the medicines to uninfected Cells, infected contagions or herpesvirus- infected cells. Phenylpropanoids inhibited about 60 – 80 HSV infection and 40 – 98 sesquiterpenes that averted herpes



contagion Infection. Anise essential oil painting displayed anti- HSV-1 exertion on all insulated composites By direct inactivation of free contagion patches. Tested medications bind with patches of The herpesvirus, inactivating viral infectivity. The antiviral potential of the  $\beta$ - Caryophyllene suggests that then in essential oils Phenylpropanoids and sesquiterpenes Contribute to their antiviral function as opposed to HSV **Anticancer Activity:**

Showed cytotoxic goods of antimutagenic exertion against cancer Cell lines. Clove oil painting excerpts demonstrated cytotoxic exertion against cervical cancer Hela cells, MCF- 7 cells and MDA- MB- 231 cells for bone adeno- melanoma, DU- 145 Cells for prostate- cancer, TE- 13 cells for oesophageal- cancer. Cytotoxicity of methanol Excerpt from clove kids was also reported against melanin conformation, and it was set up That waterless clove infusion had a promising function in limiting the carcinogenesis Process in 9, 10- dimethyl benz( a) anthracene- convinced skin melanoma. There were Also studies of anti-mutagenic conditioning of clove seeds.

### **Anti Bacterial Activity:**

This research was conducted against gram-positives and gram-Negatives bacteria, pathogenic fish bacteria isolated from Korea's cultivated olive Flounder. CEO includes 7 chemical compounds including 83.63 percent eugenol disc –Diffusion assay, micro, mbc test indicates that ceoeugenol inhibits growth gram Positive and gram negative bacteria (Pathirana H.N.K.S. et al, 2019).It shows synergic effect combined with rifampicin, isoniazid, ethambuton and pyrazinamide In m.tb includes multi drugs resistant with more precisely to bacillus than

macrophages. Eugenol derivatives are more active against m.tb than eugenol. It possess are the less Activities of against gram-positives and gram-negatives bacteria.

### **Antifungal Activity:**

Antifungal clove activity is increased if collected by isomerizing Double bond or adding nitro group on the aromatic ring. Based on the relationship Between fungicides, chemical structure and mechanism of action (MOA), activity for Commercial fungicide BC-1000 is highly documented. As a result, the compound shows Potential impact and can be used to design the natural compound's new and efficient Balance

### **Anaesthetic Activity:**

in study, methyl-Isoeugenol show effects and was only active When higher dose is given. Isoeugenol as compound to methylisoeugenol shows similar Activity and potency between eugenol and methyleugenol.eugenol is a allyl compound And is more active than propenyl isomer (isoeugenol) .<sup>(14-18)</sup>

## **CONCLUSION**

Grounded on the information presented, it could be Concluded that clove represents a veritably interesting factory With an enormous eventuality as food preservative and As a rich source of antioxidant compounds. It's proved Biological conditioning suggest the development of medicinal Products for natural and creatures uses and confirm why this Factory has been employed for centuries.

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