



Enhancement Of Clove's Pharmacological Activity Research

Ms. Roshanee. D. Agrawal¹, Assistant Professor¹ Department Of Pharmacognosy¹

Ms. Sonali Jagdhane² Ms. Rutuja Nagmoti³, Ms. Sanjivani P. Patil⁴ Mr. Ujjwal D. Agrawal⁵

Aditya Institute of Pharmacy Chalisgaon, India

Abstract:

Clove oil and its primary constituent, eugenol, have the potential to be significant antiseptics in the food business. They also have positive effects on safety, aromaticity, and antibacterial and antifungal activity. Studies reveal that eugenol and clove oil both exhibit strong inhibitory effects on a wide range of food source microorganisms. These effects are linked to decreased adhesion and migration as well as inhibition of the synthesis of biofilm and other virulence factors. In vivo research using clove oil and eugenol are generally considered safe. In vitro, they might, nevertheless, exhibit some cytotoxicity toward fibroblasts and other cells. To enhance the antiseptic properties of clove oil and eugenol in the food antiseptic sector, studies on their additive standards and quality should be reinforced.

Keywords: Clove oil, eugenol, mechanism, antidiabetic, and antifungal effects

Introduction:

The fragrant blossom buds of the *Syzygium aromaticum* tree, a member of the Myrtaceae family, are known as cloves. They are a common addition to cuisines. Native to South America and Asia, clove is a blooming plant. Cloves are available year-round since different countries have distinct harvest seasons. Drugs are made from oils, dried flower buds, leaves, and stems. Most often, cloves are applied directly to the gums to treat toothaches, dental work-related pain, and other dental issues. But the scientific data supporting these and other assertions is scant. Foods and drinks can be flavoured with cloves. Clove is utilized in the production of toothpaste, soaps, perfumes, cosmetics, and cigarettes. another name for clove cigarettes, usually include 20–40% ground cloves and 60–80%



Fig. Clove

Synonyms-

Clovos, Caryophyllus, Lavang, Laung, Grambu, Grampus, Krambu.

Biological source-

It consists of a dried flower bud of *Eugenia caryophyllus*.

Botanical Classification-

Kingdom- Plantae

Sub Kingdom- Tracheobionta

Super Division- Spermatophyta

Division-Magnoliophyta

Class- Magnoliopsida

Subclass- Rosidae

Order-Myrtales

Family- Myrtaceae

Genus- *Syzygium*

Species- *aromaticum*

Materials &Methods

Materials

For Chinese herbs, clove (*E. caryophyllata* Thunb.) buds were purchased from a Tianjin factory. The samples were kept in plastic bags at room temperature and shielded from light after being dried at 30 °C in a ventilated drying oven.

Methods

Extraction of CO₂ supercritically:-

Using an instrument called the Speed SFE (Applied Separations Inc., Allenton, PA, USA), the experimental extraction of essential oil from clove buds was determined. An extraction column was charged with liquid CO₂ at the appropriate pressure after it had been pressurized using a high-pressure pump. The 32 ml extraction column had an inner diameter of 14.40 mm and a length of 195 mm. It was filled with glass beads and powdered raw materials.

An oven was used to heat the extraction column, and a thermocouple was used to monitor and regulate the temperature within ± 1 °C. Once through a heated micrometer valve, the supercritical CO₂ with dissolved compounds was expanded to ambient pressure. In a collect vial with room temperature and pressure, the extract precipitated. An accurately calibrated wet-test meter operating at a known temperature and pressure determined the total CO₂ content.

An approximate of 15 g of powdered clove bud was added to the extractor for every extraction experiment. A range of 2 l/min CO₂ flow rates was employed. Until the powdered clove bud contained no more oil, the oil weight was determined using a precision balance.

Hydro and steam distillation:-

For four to six hours, hydro distillation and steam distillation were applied to the plant (100 g of dried and ground clove buds) in a 500 ml flask.

Up until there was no more oil leakage, the volatile distillate was collected.

After adding some ether, sodium chloride was saturated into the distillate. Subsequently, a funnel was used to separate the hydro and ether layers. The ether layer was dehydrated using anhydrous sodium sulfate and then heated to 60°C in a water bath to recover the ether and concentrate the oil. Before analysis, the oil was weighed and refrigerated.

Solvent extraction:-

After weighing and quantitatively transferring the 30 g of ground clove bud samples into an extraction thimble made of filter paper and placing it in a 500 ml reflux flask, the samples were extracted using 250 ml of absolute ethanol in a Soxhlet apparatus for roughly 6 hours. Following Soxhlet extraction, the extracts were concentrated at 50°C in a rotary vacuum evaporator.

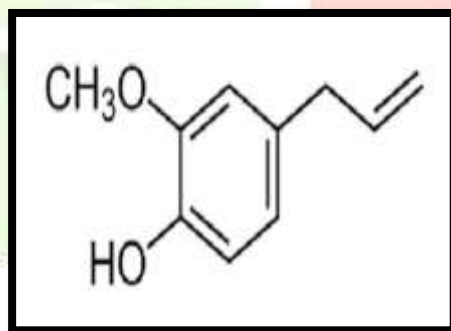
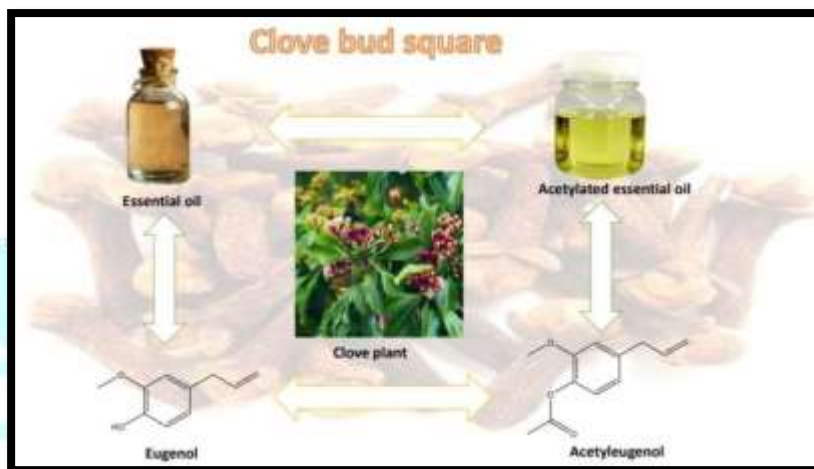
GC and GC/MS analysis:-

A Shimadzu GC-2010 gas chromatograph with a FID and a DB-5 fused-silica column (30 m · 0.25 mm i.d., film thickness 0.25 μ m, Agilent) was used to perform the GC analyses. After two minutes at 80 degrees Celsius, the oven was set to heat up to 230 degrees Celsius at a rate of 6 degrees Celsius per minute for another two minutes. The temperatures of the injector and detector were 230°C. Nitrogen, the carrier gas, was adjusted to a linear velocity of 24 milliliters per minute. The samples, which contained 0.1% of absolute ethanol, were split mode injected into the GC with a split ratio of 1/20. The internal standard utilized was methyl salicylate.

Chemical Composition:

Eugenol makes up 82–88% of its composition, with eugenyl acetate and other trace amounts. *Eugenia caryophyllus* twigs are the source of stem oils. Ninety to ninety-five percent of it is eugenol, with a few other trace amounts. Eugenol is a substance that contributes significantly to the taste of cloves.

Eugenol makes up 82–88% of its composition, with eugenyl acetate and other trace amounts. *Eugenia caryophyllus* twigs are the source of stem oils. Ninety to ninety-five percent of it is eugenol, with a few other trace amounts. Eugenol is a substance that contributes significantly to the taste of cloves.



Biological Activities:

Because of its many pharmacological benefits, which have been documented in literature and cemented from centuries of traditional use, clove is a significant medicinal plant.

Pharmacological Activities of Clove-

1. Anti-Diabetic Activity:

Cloves are known to increase insulin production and lower blood sugar levels, which helps manage diabetes. Studies indicate that the chemicals in cloves may help regulate blood sugar. Benefits can be obtained with as little as one teaspoon of the super-star spice.

2. Anti Cancer Activity-

Eat more cloves to keep cancer-free since they contain eugenol, which has potent ant carcinogenic qualities and helps prevent lung, breast, and ovarian cancers in their early stages. Additionally, clove inhibited the proliferation of pre-malignant cells by more than 85% and decreased the aberrant crowding of cells in specific lung tissue locations. Researchers discovered that clove oil inhibited the growth of multiple cancer cell lines, including but not limited to breast, cervical, and colon cancer, in another in vitro study. In a colon cancer cell line, clove extract also accelerated cell death and interfered with cell division.

3. Anti-Viral Activity-

Eugenin, a substance derived from *S. aromaticum* and *Geum japonicum*, demonstrated efficacy against strains of the herpes virus at 5 µg/mL. Based on this, it was inferred that eugenin primarily targets the synthesis of viral DNA by inhibiting the viral DNA polymerase. At the concentrations examined, eugenol was virucidal and exhibited no cytotoxicity.

4. Anti Fungal Activity-

Antifungal activity: According to this study, eugenol and clove oil exhibit strong antifungal activity against clinically significant fungi, including strains of the fungus that are resistant to fluconazole. These findings warrant additional research for potential clinical use in the management of fungus infections. Research have demonstrated that the essential oil of cloves kills fungi quickly and efficiently.

Advantages of Clove-

- Hydrates Parched Skin and Aids in Other Skin Issues.
- One excellent natural remedy for dry skin is clove oil.
- It also reduces some types of pain. Many people are aware of clove oil's ability to relieve toothaches and other dental pains.
- Calms Sickness and Enhances Blood Movement.



Rick and the Side Effects

Clove oil should normally not be consumed in large quantities as it can burn the mouth if swallowed. It is advised to use it as a wash or to apply it to the skin

1. Make bleeding worse.
2. Reduces blood sugar levels.
3. The toxicity.
4. Requires an Allergic Response.
5. Leads to convulsions.
6. Increases skin sensitivity.
7. Leads to sensitivity in the mouth.
8. Give rise to respiratory issues.
9. Sensation loss.
10. Issues with ejaculation and erection.
11. Rash and itching.
12. Gum pain and mouth irritation.

Conclusion-

Clove is an intriguing plant with great potential for use as a food preservative and as a rich source of antioxidant compounds, according to the information provided. At the flowering stage, the highest refractive index, eugenol content, and yield were found in clove flower buds. The primary constituents of clove essential oils were eugenol, eugenol acetate, and caryophyllene. There are still more crucial phases, like creating a better distillation process to enhance oil quality and using clove essential oil as a natural antioxidant. Many significant advantages over the other three traditional methods, such as a higher extraction yield, a clove that is extracted with the highest percentage of active antioxidant ingredients (eugenol plus eugenol acetate), a shorter extraction time, and so forth. For this reason, SFE is regarded as the best method for producing high-quality clove oil.

Reference

1. Milind P. and Deepa K., Int J. of Res Ayu & Pharm, 2011, 2(1) 47-54.
2. Hussain S., Rahman R., Mushtaq A., et al.: Clove: An Overview of a Precious with Several Applications, International Journal of Chemistry & Biosciences, 2017.
3. Cock, I. E. & Cheesman, M. (2018). Phytochemistry, ethnobotany, and medicinal properties of plants in the genus *Syzygium* (Myrtaceae). Bioactive components of medicinal plants. Apple Academic Press, USA, Ed Goyal MR, Ayeleso A.
4. Hu Q., Zhou M., & Wei S.: Advances in the study of clove oil and eugenol's antimicrobial activity in the field of food antisepsis: Journal of Food Science, Vol. 83, Iss. 6, 2018.
5. *Syzygium aromaticum*, Merr. (L) & Perr. Myrtaceae, Agroforestry Database 4.0 (Orwa et al.
6. *Syzygium Aromaticum* (clove): A Review On Various phytochemicals and pharmacological activities in medicinal plant, Yadav S., Gupta S. K., Bharti D., & Yogi B. World J. Of Pharmaceutical Research, 9(11), 2020.
7. Agrawal M., agrawal s., [...]: A review on uses of clove in oral and general health: IJRPB 2(4), 2014.
8. <https://en.wikipedia.org/w/index.php?title=Clove&oldid=99768494> 7. Agrawal M., agrawal s., [...]: A review on uses of clove in oral and general health: IJRPB 2(4), 2014.
9. Pulikottil SJ, Nath S.: *Syzygium aromaticum* clove's potential as a therapeutic agent for periodontal disease development. SADJ 2015, Vol. 70, p. 108–115, review.
10. Mittal m., Gupta N., [...]: *Syzygium aromaticum*'s phytochemical evaluation and pharmacological activity: A thorough review: Int J Pharm Pharm sci, 6(8).

11. Wong C.: Essential oils and aromatherapy for holistic health; The health advantages of cloves.
12. "Eugenol" November 2, 2019, US National Library of Medicine, PubChem. retrieved November 10, 2019.
13. Rovio, S.; Riekkola, M.-L.; Hiltunen, R.; Holm, Y.; Hartonen, K. (7 February 2000). "Extraction of clove using pressurized hot water" . *Journal of Flavor and Fragrance*, 14(6), 399–404. In 199911/12,
14. Zika, L., Vladimir, Z., Biljana, D., & Aleksandar, T. (2005). Supercritical CO₂ extraction of fennel (*Foeniculum vulgare* Mill.) seeds: A comparison with hydrodistillation. 143–149 in *Food Chemistry*, 92.
15. J. Briozzo (1989). clove oil's antibacterial properties when distributed in a concentrated sugar solution. 66, 69–75 in *Journal of Applied Bacteriology*.
16. Ministry of Public Health, Bureau of Drug Administration, People's Republic of China (1989). *Material handbook for Chinese traditional medicine*. People's Medical Press, Beijing.
17. Fu Y, Zu Y, Chen L, Shi X, Wang Z, Sun S, et al. Antimicrobial activity of clove and rosemary essential oils alone and in combination. *Phytother Res* 2007; 21(10): 989-994.
18. Chami F, Chami N, Bennis S, Trouillas J, Remmal A. Evaluation of carvacrol and eugenol as prophylaxis and treatment of vaginal candidiasis in an immunosuppressed rat model. *Antimicrob Chemother* 2004; 54(5): 909-914.
19. Ali SM, Khan AA, Ahmed I, Musaddiq M, Ahmed KS, Polasa H, et al. Antimicrobial activities of eugenol and cinnamaldehyde against the human gastric pathogen *Helicobacter pylori*. *Ann Clin Microbiol Antimicrob* 2005; 4: 20.
20. Zhou, L., Zheng, H., Tang, Y., Yu, W., & Gong, Q., (2013). Eugenol inhibits quorum sensing at sub-inhibitory concentrations. *Biotechnology Letters*, 35, 631–637. <https://doi.org/10.1007/s10529-012-1126-x>