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A REVIEW ON: CLOVE ESSENTIAL OIL (SYZYGIUM AROMATICUM L. MYRTACEAE)

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Abstract

The aromatic plant known as clove (Syzygium aromaticum L. Myrtaceae) is cultivated extensively in tropical and subtropical regions and is high in antioxidants and volatile chemicals including eugenol, -caryophyllene, and -humulene. Due to its extensive use in the fragrance, cosmetic, health, and food industries, clove essential oil has drawn a lot of attention. The biological properties of clove essential oil include insecticidal, antibacterial, and anti-oxidant activity that are pertinent to human health. The effects of various extraction techniques on the concentration of the primary volatile compounds in clove essential oil and organic clove extracts are shown, including hydrodistillation, steam distillation, ultrasound-assisted extraction, microwave-assisted extraction, cold pressing, and supercritical fluid extraction. At least 50% of the chemical is eugenol, which is the main one. Eugenyl acetate, -caryophyllene, and -humulene make up the final 10–40%.

Keywords

Clove Essential Oil, Antimicrobial Properties, Antioxidant Properties, Food Industry.

Introduction

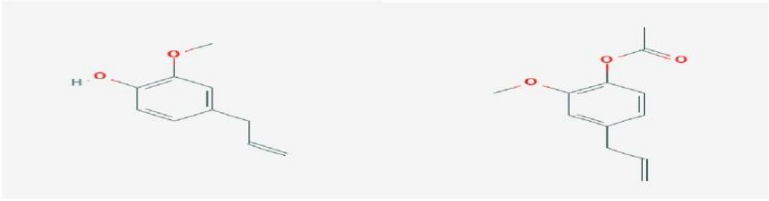
The European Pharmacopoeia defines an essential oil as an odoriferous substance, typically with a complex composition, produced by hydrodistillation, steam distillation, or a suitable mechanical technique from a botanically defined raw vegetable material [1]Due to their biological characteristics, such as their antibacterial, antifungal, and antioxidant activities, certain plant essential oils have also been researched [2] [3] [4] In the United State, these oils are categorised as usually regarded as safe food additives [5]. They have mostly been used as flavourings in soft drinks and confectionery, and more recently as preservatives, in foods. One of the hottest themes in the food functionalization branch is the introduction of essential oils into foods, naturally in cheese, to extend their shelf life and improve their functionality [6] [7] [8] . The recommended daily intake of

CEO for people has been set by the World Health Organization (WHO) Expert Committee on Food Additives as 2.5 mg/Kg body weight [9].The secondary metabolites of aromatic plants are combined in complicated ways to create essential oils (Eos) . In general, Eos are less dense than water, such as citronella oil, lime oil, or orange oil, but there are some heavier than water, such as allspice oil, cinnamon oil, clove oil, or garlic oil. Eos are liquid, soluble in organic solvents, and soluble in lipids; some of them are colourless, and others range from a light yellow to a reddish-orange. Only 10% of the 3000 Eos that are now recognised are reportedly employed commercially. Eos are known for their medicinal and aromatic qualities, as well as a number of biological activity (bactericidal, antiviral, and fungicidal). They are thought to be appropriate materials to replace chemical additives among their many other uses[10, 11].

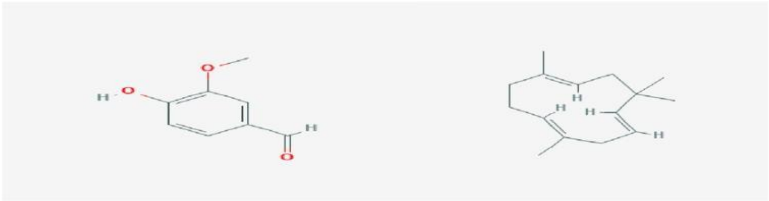
Clove Essential Oil

The Myrtaceae family, which includes the myrtle, eucalyptus, clove, and guava families, and more than 3000 species and 130–150 genera, includes Syzygium aromaticum L. Madagascar, Sri Lanka, Indonesia, and China all grow the fragrant flower known as clove [12,13,14]. According to a number of reports, S. aromaticum L. contains between 15 and 20% weight of EO. CEO has a significant concentration of phenolic compounds that have pharmacological effects including antioxidant, insecticidal, antibacterial, and antifungal characteristics [15,12,13,14,16]. CEO is used in foods, medications, sanitary goods, cosmetics, and fragrances because it is generally regarded as safe (GRAS) by the FDA [17,14].

(a) Image of clove



(b) 1. Eugenol **2.** Eugenyl acetate



3. Vanillin **4.** Humulene

(a) Image of clove, (b) The chemical structure of compounds presents in the essential oil of the clove

Antimicrobial Properties of Clove Oil

Antibacterial Activity

Clove oil and other natural extracts have been shown to prevent the growth of certain bacteria, according to numerous research [18,19,20]. This property is now Attributable to the high concentrations of eugenol andPhenolic substances that cause protein to become inactiveReacts to change the permeability of the cell membraneThe phospholipid in the cell membrane, and consequentlyHinders the growth of plants [21]. A recent studyRevealed that Listeria monocytogenes' growth rateStresses significantly decreased with 1% and 2%Treatment with clove oil at 15°C and 5°C, respectively [22]. Additionally, four bacteria were subjected to a clove oil sensitivity test, and the zone of inhibition or halo that resulted from this observation demonstrated that The biggest zone of inhibition was found in Bacillus subtilis.By Staphylococcus aureus, S. indicum, and Eccherichia coli [23]. So that it could Based on the findings of earlier research, it was determined that Oil seems to work against both gramme positive and negative bacteria. And gram-negative bacteria.

Antioxidant Properties of Clove Oil

clove oil's main ingredient, eugenol, has antioxidant properties. These phenolic substances have significant Reducing agent, metal chelator, and other Oxygen quenchers for singlets. Its anti-oxidant capability Expected to be more effective than synthetic An anti-oxidant like BHT (butylated hydroxytoluene) Also BHA (Butylated hydroxyanisole)[24]

Application of Clove Oil in Food Industry

Its use as an antioxidant is found in bakery items where it slows down oxidation and reduces the amount of oxidation products that are produced. Contrasting with artificial antioxidants. At 0.2%, clove powder was followed by Mixed into an emulsion of raw chicken meat That it continued to have the lowest TBA value until the Compared to ginger and garlic towards the end of storage [25]. Paneer in LDPE packaging displayed a shelf. Whereas the clove-treated sample displayed a half-life of 5 days 10 day shelf life in LDPE at 7-9 °C [26]. Because paneer is so highly suggested for use,Limited shelf life; highly perishable.

Uses

Cloves are used in a variety of applications, from cooking to medical. An excellent culinary spice, clove can be used to soups, salads, herbal teas, tomatoes, onions, and other foods. Additionally, it is utilised to flavour meat items, sweets, chewing gum, pickles, cookies, chocolates, puddings, pastries, sandwiches, and spiced fruit. The essence of fragrances, soaps, toothpastes, and medications is added using volatile oil. In Indonesia, a unique cigarette known as "Kretek" is made by mixing tobacco and cloves in a 1:2 ratio. Clove has antibacterial properties and is used to fight microorganisms in a range of mouthwashes, dental creams, throat sprays, and tooth pastes. Additionally, it helps relieve aching gums. Mixture of zinc oxide and eugenol, a key bioactive component of clove[27] Due to the presence of flavonoids, clove oil has anti-inflammatory properties. Aromatherapy for rheumatism and arthritis uses pure clove oil. To treat skin disorders, a paste made of clove powder and honey is utilised. Bite and cut healing is accelerated by a paste made with water and clove powder. Numerous digestive issues, including as loose stools, gas, nausea, and dyspepsia, are treated with clove. Improved body defences and assistance in the fight against invasive germs are provided by clove oil. Additionally, it is used to treat athlete's foot and onychomycosis. Clove essential oil can be inhaled to treat a number of respiratory disorders, including bronchitis, sinusitis, coughing, asthma, and colds. Cloves are used to treat skin and lung cancer and may have anticancer properties. Patients with diabetes benefit from clove because it manages[28]

Conclusion

According to the facts provided, it is possible to draw the conclusion that clove is a very intriguing plant with great potential as a food preservative and a rich source of antioxidant chemicals. It has been demonstrated that

biological processes point to the development of medications for use by both humans and animals and support the long-standing use of this plant

Reference

1.European Directorate for the Quality of Medicines & HealthCare of the Council of Europe. European Pharmacopoeia, 10th ed.; Council of Europe: Strasbourg, France, 2019; Volume I, ISBN 978-92-871-8912-7. [Google Scholar]

2.Holley, R.A. and Patel, D. (2005) Improvement in Shelf-Life and Safety of Perishable Foods by Plant Essential Oils and Smoke Antimicrobials. Food Microbiology, 22, 273-292.

3.Bakkali, F., Averbeck, S., Averbeck, D. and Idaomar, M. (2008) Biological Effects of Essential Oils—A Review. Food and Chemical Toxicology, 46, 446-475.

4.Ghasemnezhad, M., Sherafati, M. and Payvast, G.A. (2011) Variation in Phenolic Compounds, Ascorbic Acid and Antioxidant Activity of Five Coloured Bell Pepper (Capsicum annum) Fruits at Two Different Harvest Times. Journal of Functional Foods, 3, 44-49.

5. Kim, J., Marshall, M.R. and Wei, C.I. (1995) Antibacterial Activity of Some Essential Oil Components against Five Foodborne Pathogens. Journal of Agricultural and Food Chemistry, 43, 2839-2845. https://doi.org/10.1021/jf00059a013

6.Artiga-Artigas, M., Acevedo-Fani, A. and Martín-Belloso, O. (2017) Improving the Shelf Life of Low-Fat Cut Cheese Using Nanoemulsion-Based Edible Coatings Containing Oregano Essential Oil and Mandarin Fiber. Food Control, 76, 1-12. https://doi.org/10.1016/j.foodcont.2017.01.001

7.Can Seydim, A., Sarakus-Tutal, G. and Sogut, E. (2020) Effect of Whey Protein Edible Films Containing Plant Essential Oils on Microbial Inactivation of Sliced Kasar Cheese. Food Packaging and Shelf Life, 26, Article ID: 100567.

8.Fancello, F., Petretto, G.L., Marceddu, S. and Severino Zara. T.V. (2020) Antimicrobial Activity of Gaseous Citrus limon var pompia Leaf Essential Oil against Listeria monocytogenes on Ricotta Salata Cheese. Food Microbiology, 87, Article ID: 103386. https://doi.org/10.1016/j.fm.2019.103386

9.Gulcin, İ., Elmastaş, M. and Aboul-Enein, H.Y. (2012) Antioxydant Activity of Clove Oil—A Powerful Antioxidant Source. Arabian Journal of Chemistry, 5, 489-499.

10.Bakkali, F.; Averbeck, S.; Averbeck, D.; Idaomar, M. Biological effects of essential oils—A review. Food Chem. Toxicol. 2008, 46, 446–475. [Google Scholar] [CrossRef] [PubMed]

11.Bakry, A.M.; Abbas, S.; Ali, B.; Majeed, H.; Abouelwafa, M.Y.; Mousa, A.; Liang, L. Microencapsulation of oils: A comprehensive review of benefits, techniques, and applications. Compr. Rev. Food Sci. Food Saf. 2016, 15, 143–182. [Google Scholar] [CrossRef]

12.Tunç, M.T.; Koca, İ. Ohmic heating assisted hydrodistillation of clove essential oil. Ind. Crop. Prod. 2019, 141, 111763. [Google Scholar] [CrossRef]

13.Guan, W.; Li, S.; Yan, R.; Tang, S.; Quan, C. Comparison of essential oils of clove buds extracted with supercritical carbon dioxide and other three traditional extraction methods. Food Chem. 2007, 101, 1558–1564. [Google Scholar] [CrossRef]

14.Golmakani, M.-T.; Zare, M.; Razzaghi, S. Eugenol enrichment of clove bud essential oil using different microwave-assisted distillation methods. Food Sci. Technol. Res. 2017, 23, 385–394. [Google Scholar] [CrossRef][Green Version]

15.El-Saber Batiha, G.; Alkazmi, L.M.; Wasef, L.G.; Beshbishy, A.M.; Nadwa, E.H.; Rashwan, E.K. Syzygium aromaticum L. (Myrtaceae): Traditional Uses, Bioactive Chemical Constituents, Pharmacological and Toxicological Activities. Biomolecules 2020, 10, 202. [Google Scholar] [CrossRef][Green Version]

16.Hatami, T.; Johner, J.C.F.; Zabot, G.L.; Meireles, M.A.A. Supercritical fluid extraction assisted by cold pressing from clove buds: Extraction performance, volatile oil composition, and economic evaluation. J. Supercrit. Fluids 2019, 144, 39–47. [Google Scholar] [CrossRef]

17.Wei, M.-C.; Xiao, J.; Yang, Y.-C. Extraction of α-Humulene enriched oil from clove using ultrasound-assisted supercritical carbon dioxide extraction and studies of its fictitious solubility. Food Chem. 2016, 210, 172–181. [Google Scholar] [CrossRef]

18.Asha K, Sunil B, George G and Prejit (2014). Effect of clove On the bacterial quality and shelf life of chicken meat. Journal of Meat Science and Technology, 02(2): 37-39

19.Mane BG, Choudhary S, Lakhanpal P and Khurana SK (2017). Effect of aqueous and alcoholic extract of plant Materials on food isolated Listeria Monocytogenes. Journal of Meat Science and Technology, 05(2): 33-36.

20.Chaodhary S, Khurana SK and Mane BG (2017). Antimicrobial effect of aqueous and methanolic extracts Of plant origin against E. coli. Journal of Foodborne And Zoonotic Diseases, 05(3): 50-53.

21.Sánchez-González L, Vargas M, González-Martínez C, Chiralt A and Chafer M (2011). Use of essential oils in Bioactive edible coatings: a review. Food Engineering Reviews, 3(1), 1-16.

22.Mytle N, Anderson GL, Doyle MP and Smith MA (2006). Antimicrobial activity of clove (Syzgium aromaticum) Oil in inhibiting Listeria monocytogenes on chicken Frankfurters. Food Control, 17: 102-107

23.Sharma S, Singh S, Bond J, Singh A and Rustagi A (2014). Evaluation of antibacterial properties of essential oils From clove and eucalyptus. Evaluation, 7(5)

24.Ogata M, Hoshi M, Urano S and Endo T (2000). Antioxidant Activity of eugenol and related monomeric and dimeric Compounds. Chemical and Pharmaceutical Bulletin, 48: 1467-1469

25.Singh P, Sahoo J, Chatli MK and Biswas AK (2014). Shelf Life evaluation of raw chicken meat emulsion Incorporated with clove powder, ginger and garlic paste As natural preservatives at refrigerated storage (4±1°C). International Food Research Journal, 21: 1363-1373.

26.Khatkar AB, Ray A and Kaur A (2017). Effect of addition of Clove essential oil on the storage stability of paneer. The Pharma Innovation, 6(9, Part A): 39.

27.L. Cai, C.D. Wu. (1996). Compounds from Syzygium aromaticum possessing growth inhibitory activity against oral pathogens. Journal of natural products. 59(10): 987-990.

28.Y. Trongtokit, Y. Rongsriyam, N. Komalamisra, C. Apiwathnasorn. (2005). Comparative repellency of 38 essential oils against mosquito bites. Phytotherapy Research: An International Journal Devoted to Pharmacological and Toxicological Evaluation of Natural Product Derivatives. 19(4): 303-309