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Review Article

Syzygiumaromaticum Antioxidant, Anticancer, and Antibacterial Activities of Clove: Review Article

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Abstract: Because of its curative properties, Syzygiumaromaticum has long been used in conventional, holistic medicine. It has anti-inflammatory, antibacterial, antioxidant, and cancer-fighting properties. Clove oil, also known as the essential oil of the Syzygiumaromaticum tree, contains a wide variety of compounds, including the methyl salicylate, tannins like bicorningallotannic acid, acetyl eugenol, beta-caryophyllene, vanillin, catholic acid, and the flavonoids eugenin and hesperetin., kaempferol, and rhamnetin are some of the bioactive compounds found in eucalyptus., and eugenic Using the MTT assay, we were able to determine the cytotoxicity of the stable oil and found that it inhibited the growth of cancer cells, suggesting that this formulation may be helpful as a complementary therapy for cancer. Also tested was the oil's efficacy against Staphylococcus aureus bacteria. According to membrane permeability studies, it is highly effective in passing through cell membranes and themes, increasing the leakage of cytoplasmic contents.

Keywords: Clove oil, Syzygiumaromaticum, acetyl eugenol MTT assay.

INTRODUCTION

An evergreen tree native to Cloves, also known as Syzygiumaromaticum, is the dried, fragrant florets of a flower that has not yet opened. They are native to India, Indonesia, Zanzibar, Mauritius, and Ceylon [1]. In addition to their widespread popularity as seasonings, they are also a popular ingredient in betel chew and a component of scented candles and tobacco chew—cinnamon and anti-fungal [2]. Consumption of natural antioxidants has been linked to a lower risk of cancer and cardiovascular disease, which has resulted in an increase in the antioxidant content of fruits and vegetables.

Medicinal plants have been the focus of a great deal of study over the past few decades due to their potential to help fight against a wide range of illnesses. As a result of the correlation between consuming natural antioxidants and a lower risk of cancer and cardiovascular disease, more and more attention is being paid to the antioxidant content of fruits and vegetables [3]. Like many other foods, fruit is an excellent way to get both carbs and protein and the vitamins A and C that your body needs. Consumption of these plant sources of antioxidants significantly correlated with lower death rates from the above causes [4]. Because natural antioxidants contain free radicals, which may cause chronic degenerative disorders, more research is needed. Studying the antioxidant activity of phenolic compounds in Cloves at various stages of development was the focus of this investigation (Syzygiumaromaticum).

History

As early as 200 BCE, envoys from Java delivered cloves to the Chinese court of the Han dynasty. During audiences with the emperor, it was customary for the attendants to carry these cloves in their mouths to perfume their breath. During this time period, cloves were commonly used in Europe.

Throughout the later Middle Ages to flavor, preserve, and adorn food. At the beginning of the 17th century, the Dutch eradicated cloves from all islands with the exception of Amboina and Ternate. This was done to create a scarcity of cloves and keep prices high. The cultivation of cloves was almost entirely confined

to the island nation of Indonesia. The French were able to break the Dutch monopoly on cloves by smuggling them from the East Indies to the New World and the islands in the Indian Ocean.

Clove (Syzygiumaromaticum) (Syzygiumaromaticum)

The height of the clove tree, an evergreen, ranges from 8 to 12 meters (25 to 40 feet). Its leaves are tiny, simple, opposite, and gland-adorned. The seeds are typically planted in damp, shady areas where the trees eventually thrive. Once a tree begins flowering, usually around the fifth year, it can yield as much as 34 kg (75 pounds) of dry buds annually. The flowering tops are harvested twice year, once in the late summer and once in the winter, and then dried in the sun. The length of a clove can range anywhere from about 13 mm to about 19 mm on average (0.5 to 0.75 inch).

The fragrant oil eugenol is the main constituent of the 14–20% essential oil that the buds contain. The potent and savory flavor of cloves is due to a compound called eugenol, which can be produced by distilling cloves in order to make oil of cloves. This oil serves as a local anesthetic for toothaches and is also utilized in the process of preparing microscopic slides for examination. In addition to being employed as a sweetener or intensifier, eugenol is used to manufacture vanillin, mouthwashes, fragrances, and antiseptics [3, 4].

In Asian, African, Mediterranean, Near, and Middle Eastern cuisine, cloves are used to flavor fruit, meats (such as baked ham), curries, and marinades (such as apples, pears, and rhubarb). Spices like cloves can be added to hot drinks to give them aroma and flavor. They are frequently paired with additional ingredients like sugar and lemon. They are typical in spice mixtures, such as speculaas and pumpkin pie spice. Cloves, known in Mexican cooking as clavos de olor, are frequently used in combination with cumin. The molecule eugenol contributes significantly to clove flavor, and only a tiny amount of the spice is typically needed. It goes nicely with peppercorns, basil, onion, citrus peel, star anise, vanilla, cinnamon, allspice, and red wine [4].

Phytochemicals

The chemical primarily responsible for the clove aroma is eugenol, which makes up between 70 and 90 percent of the essential oil produced from cloves [5]. In pressured water at 125 °C (257 °F), the extraction process is finished after 80 minutes. Microwave- and ultrasound-assisted extraction techniques offer faster extraction rates with less expensive energy [6].

Beyond these chemical substances, Clove oil contains acetyl eugenol, beta-caryophyllene, vanillin, and catholic acid, as well as tannins like bicorningallotannic acid and methyl salicylate, flavonoids like eugenin, kaempferol, rhamnetin, and eugenitin, triterpenoids like oleanolic acid, stigmasterol, and campesterol, and terpene The potential toxicity of eugenol cannot be determined with any certainty because so little is known about it. However, at 50, 75, and 100 mg per liter, it was found to be hazardous to test organisms [7].

Antioxidant Function

Antioxidant capacity is a commonly used criterion to describe the nutritional value of foods or plants as well as their bioactive constituents. The search for natural antioxidants to replace synthetic ones that were banned due to undesirable side effects like carcinogenesis has gained much traction as of late. Clove stem and fruit antioxidant properties, as well as stem and fruit acetone extracts, were tested in vitro., and were assessed using two distinct and complementary assays: the DPPH• (2,2-di-phenyl-1-picrilhydrazyl) free radical scavenging and the FRAP (Ferric Reducing Antioxidant Power). DPPH and FRAP assays show that cinnamon [3] antioxidant function.

Antioxidant capacity is a commonly used criterion to describe the nutritional value of foods or plants as well as their bioactive constituents. An increasing focus has recently been placed on the search for natural antioxidants to replace synthetic ones that were banned due to their harmful side effects, including carcinogenesis [8]. Clove stem and fruit antioxidant properties, as well as stem and fruit acetone extracts, were tested in vitro., and were assessed using two distinct and complementary assays: the DPPH• (2,2-di-phenyl-1-picrilhydrazyl) free radical scavenging and the FRAP (Ferric Reducing Antioxidant Power). DPPH and FRAP assays show that cinnamon [3]. They are also used in various Peruvian cuisines, including carapulcra and arroz with leche.

Anticancer Properties

The MTT assay was performed to determine how effective the improved clove bud nanoscale emulsion system was at inhibiting cell proliferation (CB-4). The MTT assay showed that the formulation was cytotoxic to (HTh-7) thyroid cancer cell lines. Both the non-cancerous Hek-293 cell line and the thyroid malignant HTh-7 cell line were tested for the cytotoxic activity of the oil-based emulsion system (CB-4), as illustrated in Figures 1(A and B). Cancer cells were shown to be sensitive to the cytotoxic effects of CB-4, while normal cells were found to be resistant in the HTh-7 case, n fruits are produced.

Moreover, after 48-hour treatment with a concentration of 0.7 L/mL of the improved formulation, less than 55% of the cell death was, on average, seen (CB-4). Because of this, the improved system's IC50 value for the thyroid cancer cell line was discovered to be 0.7 L/mL, as shown in Figure 2. Additionally, while a surfactant and water combination was tested as a

vehicle control, it was found that they had no effect on cytotoxicity [9].

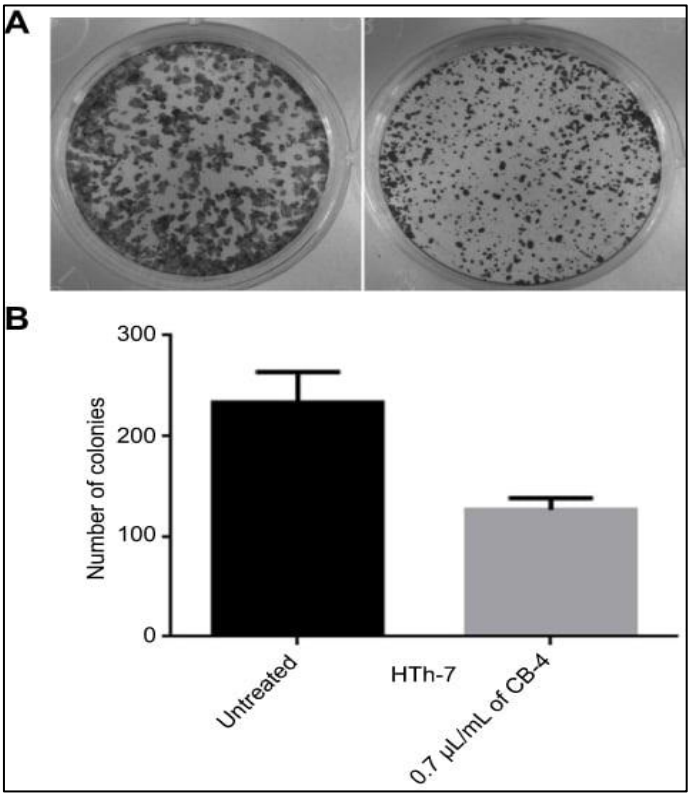

Figure 1: (A and B) shows that microemulsion CB-4 (clove bud oil: Tween 20 ratio of 1:4) has an antiproliferative impact by significantly decreasing the frequency of HTh-7Colony formation assays in cells compared to the untreated control (left). (*P 0.05 against the corresponding command) [9]

Bacterial Resistance

The CB-4 formulation of increased clove bud oil and its emulsion were shown to be efficient against S. aureus in an agar well diffusion assay. It can be shown in Figure 2 that the average inhibitory zone diameter for clove bud oil was 15.45 0.05 mm, while for its emulsion, it was 21.83 0.05 mm. A membrane permeability analysis confirmed these results, showing a significant amount of cytoplasmic leakage [10, 11].

Figure 2: Staphylococcus aureus treated with clove bud emulsion (top) and clove bud oil in a good diffusion experiment (bottom) [9]

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