ACADEMICIA: An International Multidisciplinary Research Journal
ISSN: 2249-7137 Vol. 11, Issue 11, November 2021 SJIF 2021 = 7.492
A peer reviewed journal

ESSENTIAL OILS ANTICANCER PROPERTIES: A REVIEW

Namrata Arya*; Dr. Arminder Kaur**

*SBAS, Sanskriti University,
Mathura, Uttar Pradesh, INDIA
Email Id- namrata.sobas@sanskriti.edu.in,

*SBAS, Sanskriti University,
Mathura, Uttar Pradesh, INDIA
Email id: arminder.smas@sanskriti.edu.in

DOI: 10.5958/2249-7137.2021.02591.X

ABSTRACT

Essential oil components have an important role in disease development and treatment. Monoterpenes, sesquiterpenes, phenolic, oxygenated sesquiterpenes, oxygenated monoterpenes, as well as other volatile oils components from aromatic herbs as well as nutritional plants include sesquiterpenes, Mon oterpenes, oxygenated sesquiterpenes, phenolic, as well as other volatile oils components. Anti-oxidant, anti-mutagenic, anti-proliferative, immunological function and surveillance improvement, enzyme activation as well as increased detoxification, regulation of multi-drug resistance, as well as synergistic processes of volatile ingredients are all responsible for their cytoprotective qualities. Based on the most recent research, this article describes structural groups as well as molecular anti-cancer mechanisms of components from aromatics herbs as well as food plants.

KEYWORDS:*Anticancer Mechanisms; Essential Oils; Synergism; Terpenes.*

INTRODUCTION

Cancer is the second greatest cause of mortality after heart disease, and it is becoming a global health issue. Upwards of 10 million cancer cases are diagnosed each year across the globe, including greater than a hundred illnesses like cancer of the lung, stomach, breast, liver, colon, and others organs. Interfering with modulation stages and related signal transduction pathways is the most logical approach to influence carcinogenesis. UV as well as ionizing asbestos radiations, as well as cigarette smokers, bacterial, viral, as well as parasitic diseases, and mycotoxins foodborne illness are only a few examples of physiological and biochemical carcinogens. Overproduction of oxygen-centered allowed radicals as well as others sensitive oxygen species may cause oxidatives damage to bio molecules, which is why certain cancers are caused by them (1). There is currently no very effective medication on the market to treat the majority of malignancies. New medicines that are extremely effective, have minimal toxicity, and have a small environmental impact are in great demand. Natural compounds that are novel provide possibilities for drug development innovation. Natural ingredients, in fact, play a significant roles in cancer preventions as well as therapy.

Natural antitumor agents make up a significant portion of the anticancer drugs presently in use in clinics. Natural products or their derivatives, for example, accounted for more than half among all anticancer prescription medicines authorized globally between the 1940s and 2006. Since then, natural chemicals derived from medicinal plants have piqued attention as promising sources of new anticancer medicines. Significant proof from population as well as explanatory studies has discovered an inverse connection among adequate fruit and vegetable consumption and also the take the chance of exact cancer, indicating that a nutritional supplementation consumption of the fruits as well as whole grains, as well as vegetables, is powerfully linked to a lower cancer risk (2). There are many clinical studies involving the uses of nutritional additions as well as changed diets to stop cancer. These dietary substances are thought to protect against cancer by inducing cellular defense mechanisms likes detoxifying as well as antioxidant enzymes, and inhibiting anti-inflammatory as well as anti-cell development signaling path ways, resulting in cells cycle arrest as well as cell death. Essential oil components, which have a broad range of bioactivities, have piqued curiosity and received the most attention among phytochemicals due to their structural diversity (3).

Essential Oils Have Anticancer Properties

Since oxidations damages numerous biological substances as well as reasons numerous diseases, including Alzheimer's disease, liver disease, atherosclerosis, cancer, aging, inflammation, arthritis, diabetes, Parkinson's disease, as well as AIDS, antioxidant action is one of the greatest intensively studied subjects in significant oils research. As a consequence, antioxidants have been used to treat a variety of illnesses in order to avoid oxidative damage. Many researchers have recently started looking into the antioxidant activities of various vital oils in attempt to find nontoxic natural anti-oxidants. As a result, many studies have exposed that important oils are excellent natural antioxidant sources. Superoxide anions and hydrogen-peroxide generate in eukaryotes, which are extremely destructive to mitochondrial DNA. Damaged mitochondrial DNA prevents electron transport protein production, resulting in the buildup of reactive species of oxygen. When free radicals from a injured mitochondrial membrane interact with essential oils, they form reactive phenoxy radicals that association with ROS to stop further injury (4). Among twenty five essential oils evaluated in one research, thyme essential oil had the strongest antioxidant impact, following by basil, clover leaf, cinnamon leaf, eucalyptus, and chamomile.

Antimutagen

Essential oils' anti-mutagenic properties are attributed to a number of mechanisms, including mutagen inhibition, direct scavenging of mutagens, antioxidant captures of mutagen-produced radicals, inhibition of metabolic conversion of promutagens into mutagens by P450, activation of cell antioxidant enzymes, and activation of enzymatic detoxification(5). 50 antimutagenic drugs function by either promoting or inhibiting error-free or error-prone DNA repair. In the yeast, essential oils have been found to reduce mitochondrial harm as well as apoptosis and necrosis. Saccharomyces cerevisiae is a kind of yeast.

Anti-proliferation

Lavandula officinalis, Satureja hortensis, Salvia officinalis, Satureja montana, Thymus vulgaris, Foeniculum vulgare, Calamintha origanifolia, as well as Mentha arvensison have anti-proliferative effects in human erythroleukemic K562 cells. Lime volatile oils induced DNA

fragmentations as well as caspase-3 activation by up to 1.80 as well as two-folds after twenty four as well as fourty hours, indicating that apoptosis is involved. Apoptosis-related protein expression investigations corroborated the inductions of apoptosis by lime volatile oil, suggesting that lime volatile oil may have potential advantages in colon cancer prevention. Carvacrol, a phenolic monoterpene, is found in Thymus vulgaris, Carum copticum, origanum, and oregano, among other plants. Carvacrol's anti-proliferative effects in metastatic breast cancer cells were attributed to the stimulation of the traditional apoptosis response, that included a decrease in mitochondrial membrane and an increase in cytosolic released from mitochondria, a decrease in the Bcl-two /Bax ratios, an increase in caspase activities, proteolytic processing of polypeptide, and DNA fragmentation.

Enhancement Of Immune Functions And Surveillance

Whenever these variables are taken into account, including such supporting healthy gut flora, stress reduction, as well as encouraging improved blood and lymph quality, mechanism that help strengthen the immune systems are successful. Aromatherapy has shown to be a very effective approach. Aromatherapy is the uses of vital oils to improve immune function via different media(6). It has a critical role in improving immune function. Controlling the hormones produced by the adrenal glands, likely to result in stress relief, inspiring the immune reaction by assisting the lymphatic system in removing toxins as well as stimulating the productions of immune improvement cells, as well as destroying damaging microorganisms are just a few of the ways it works. Citrus limonum and Lavendula angustifolia were used in one study to see how aromatherapy affected human immune function. Inhaling lemon essential oil improved mood and increased norepinephrine production, although neither essential oil was beneficial in other immunological tests. Inflammation is a crucial component of many illnesses, particularly multiple sclerosis, inflammatory bowel disease, arthritis, asthma, as well as atherosclerosis, and it is a reaction to harm produced by unpleasant physical or chemical stimuli.

Enhancing Detoxification And Inducing Enzymes

Consumptions of the Allium species have linked to a lower risk of cancer incidence in epidemiological studies. Organosulfur compounds produced from these plants are thought to be responsible for Allium's anticarcinogenic effects. Sulfur-containing substances have been found to prevent chemically induced carcinogenesis in a variety of organs in animal models. Sulfur-containing compounds suppress carcinogenesis and modify procarcinogen metabolism. By raising the amounts of phase two enzymes likse UDP-glucuronyl transferase,glutathione S-transferase, or lowering the levels of phase one enzymes such cytochromes P450, quinone reductase, these drugs may boost detoxification (7).

Multidrug Resistance

Due to increased efflux pumps such as through energy-dependent drug transporters related to the ABC family of proteins, multidrug resistant phenotypes have been described in several of malignancies, with decreased intracellular drug concentration as well as damage of one or more phases of the apoptotic signaling flows. Thymo quinone, the active component in thyme and black seed essential oils, has antioxidant and anti-neoplastic characteristics that may affect doxorubicin's multidrug resistance. In vitro, tea tree oil was tested against human melanoma M

sixteen wild type cells and their drug-resistant counterparts, M fourteen Adriamycin-resistant cells, which were chosen following protracted doxorubicin therapy.

Compounds from Plants That Have Anticancer Characteristics

Medicinal plants have been utilized in traditional medicine in Asian and African communities for thousands of years, and many plants are taken for their health advantages in industrialized countries. According to the World Health, many nations continue to rely on plant-based medicine as their primary supply of medications, while emerging economies are increasingly turning to organically manufactured chemicals for their medical advantages. Polyphenols, brassinosteroids, including taxols have all been discovered and isolated from terrestrial plants as anticancer compounds.

Poly Phenols

Polyphenolic compounds such as flavonoids, curcumin, resveratrol, tannins, as well as gallacatechins are careful to be anti-cancer. Resveratrol may be present in a variety of foods, such as peanuts, grapes, and red wine. Green tea contains gallacatechins, which are antioxidants. Polyphenols, which are natural antioxidants, are believed to enhance health and decrease cancer risk when included in a person's diet. Poly phenols have been demonstrated to have cytotoxicity and antioxidant properties against a range of cancer cells. Polyphenols are considered to induce apoptosis, and so may have anticancer characteristics. Polyphenols are considered to cause apoptosis by controlling the mobilization of copper ions linked to chromatin, which causes DNA destruction.

Flavonoids

Flavonoids are polyphenolic chemicals with over 10,000 identified structures that make up a wide family of secondary metabolites found in plants. They are physiologically active compounds generated from plants that are attracting scientific attention due to their possible health advantages. Various plants, including fern species including plants used in traditional Chinese medicine, such as the litchi leaf, have been studied for their flavonoid content and how these chemicals effect cancer cells. Only one component of the plant, the seed, has large amounts of anthocyanins, flavones, flavonols, chalcones, as well as other flavonoid chemicals. Flavonoids have been shown to have both cytotoxicity and significant free radical scavenging properties in cancer cells.

Brassino Steroids

Brassino steroids are naturally occurring compounds present in plants that regulate cell growth and differentiation, as well as stem and root cell elongation and other activities including disease and stress resistance. Plant senescence is also controlled by BRs. They are necessary for the growth and development of plants. BRs are another naturally occurring chemical with therapeutic potential in the battle against cancer.

Plant-Based Anticancer Medicines

Plant-based anticancer treatments are favoured since they are natural and easy to get. Patients may simply take them orally as part of their usual diet. Because they are produced from plants, they are usually more tolerant and non-toxic to normal human cells. Lignans, cyanogenetic glycosides, lectins, saponins, lectins, as well as several taxanes are exceptions. Plant-derived

drugs may be advanced into clinical trials for further therapeutic development if they exhibit selectivity in research, are non-toxic to normal cell lines, and show cytotoxicity in cancer cell lines.

Improving The Administration Of Drugs

New methods for the application and dosing of these anticancer substances are developing as a result of advances and discoveries in naturally produced medicines. In order for a substance to be a viable alternative to conventional therapies like chemotherapy, it must be administered effectively. Any use of nanoparticles as a delivery method for pharmaceuticals to reach specified regions is becoming more common in nanotechnology. Due to the requirement for large doses, certain drugs with anticancer activity may be restricted in their clinical development.

The Medicinal Plant

Plant-based medications have shown to be effective in clinical trials, making them a preferred alternative for clinical research. They are in great demand due to their non-toxic effects on immunological tissues and cytotoxic effects on cancer cells. Many of the species studied are from poor African and Asian nations, where herbal cures are common because medicinal plants are used as first-line treatments. In rising nations, there is a significant demand for therapeutic herbs, placing strain on plant populations. Several medicinal herbs are cultivated for informal commerce from wild populations, but this cultivation also isn't controlled. The preservation of medicinal plants is becoming an issue as a result of fast population expansion, deforestation, and urbanization. High-value medicinal plants may go extinct if over-exploitation persists as a consequence of growing demand. At all costs, these plants must be safeguarded. Only some portions of wild medicinal plants are utilized in therapy, such as the bark of a tree or the bulbs as well as tubers of bulbous and tuberous plants. Taking just a little portion of a plant might be damaging to it and limit its chances of survival. To ensure the long-term viability of medicinal plants in poor nations, all plant components, including some of the stem, leaf, root, as well as bark, should be included in the therapy. Germplasm preservation, viable seed conservation, cryopreservation, keeping biological material in liquid nitrogen, and notably tissue culture, which propagates plant in sterile conditions and may swiftly generate growing plant clones of rare species, are all conservation methods. In developed areas, these preservation processes will also enable for industrial use.

LITERATURE REVIEW

Aromatic herbs have a longer as well as important history in modern medicine in many nations, according to Aglaia Pappa. There is a growing interest in examining the biological features of aromatic plant extracts due to their diversity, broad availability, and low toxicity. The country's geographic position, landscape form, and various hilly and insular areas are all factors in the profusion of aromatic plants. A variety of aromatic plant extracts from Greece have been researched for their bioactivities, notably their anti-proliferative potential against various forms of cancer, during the last fifteen years. Despite the fact that particular Greek species' pharmacological characteristics have been studied in the past, no data on specific Greek species has been created. We summarize existing data, mainly on the anti-proliferative activity of extracts isolated from Greek lamiaceae family, and begin debating their small molecule mechanism of action, where available, in order to identify hopeful extracts for scientific

experimentation and link chemical constituents held to account for their own activity, in this review. We conclude that although essential oils are the most well-studied plant compounds, with a wide range of composition and antitumor potential, other cancer chemoprevention excerpts are also worth investigating(8).

Arnica Montana L. is a medicinal herb with a wide range of biological activity that is widely used in pharmacy and cosmetics, according to Danuta Sugier et al. The chemical composition as well as the concentration of essential oils define the qualities of A. montana. The goal of this study was to characterize the chemicals compositions of EOs derived from A. Montana rhizomes as well as roots while taking into account the maturity level of the plants, as well as to examine the impact of EO analysis on apoptosis, necrosis, as well as autophagy in human glioblastoma T98G and anaplastic astrocytoma MOGGCCM cell lines. The rhizomes and roots of mountain arnica were gathered at the conclusion of the third and fourth vegetative cycles, respectively. The composition of essential oils and, as a result, their biological activity, may be influenced by plant component and age. Essential oils extracted from A. Montana rhizomes as well as roots have never been studied for their anticancer properties(9).

The phytochemical components of methanolic extracts of the therapeutic plants Aloe castellorum and Aloe pseudorubroviolacea were investigated by Anis Ahamed et al. The cytotoxic efficiency of leaf extracts from Aloe castellorum and Aloe pseudorubroviolacea against a human colon cancer cell line was also studied. The two medicinal plant extracts have high cytotoxic activity, with Aloe castellorum's methanolic extract having stronger cytotoxic activity than Aloe pseudorubroviolacea's extract. Against the cell line in question, Aloe castellorum is more efficient than the control. Gas chromatography and mass spectrometry were used to identify the chemical constituents of Aloe castellorum and Aloe pseudo rubroviolacea leaf extracts. Molecular docking experiments show that the impact is also damaging(10).

DISCUSSION

Cancer incidence and death are on the rise, necessitating the development of new preventive and treatment methods. Natural products have been utilized for their therapeutic qualities since ancient times, and interest in these characteristics has grown in recent years. Numerous research are now being conducted to determine their pharmacological potential, as well as their chemo preventive as well as chemotherapeutic belongings. Although few aromatic plants extracts from Greece have been researched for their anti-proliferative capabilities, existing evidence against a variety of cancer types is encouraging, prompting further study into the country's diverse flora. Clearly, further research into the molecular mechanisms of actions of the extracts as well as their components is needed, both in vitro and in vivo, to confirm and establish their usefulness in the fight against cancer.

CONCLUSION

Despite their direct impact on tumor cells, essential oils have been proven to have a chemical influence on the immune system. When essential oils are employed, white blood cells become more effective in removing foreign material and pathogens from the body. Other small molecules are expected to alter the action of the essential oil's major components. Cell penetration, lipophilic or hydrophilic attraction and adherence to cell walls and membranes, and cellular dispersion are all likely to be influenced by a variety of factors. However, since the idea of

synergism seems to be more relevant, it is more necessary to examine a complete essential oil rather than certain of its components for biological reasons. As a result, essential oils, like many other plant medicines, operate in a variety of ways to treat a variety of illnesses, including cancer. It is also hoped to test the anticancer effects of certain new essential oils and undiscovered compounds. Furthermore, specific molecules must be synthesized to improve their activity.

REFERENCES

1. RESHMA A, PRIYADARISINI VB, AMUTHA K. Sustainable Antimicrobial Finishing of Fabrics Using Natural Bioactive Agents - a Review. Int J Life Sci Pharma Res. 2018;8(4):10–20.

2. Blowman K, Magalhães M, Lemos MFL, Cabral C, Pires IM. Anticancer Properties of Essential Oils and Other Natural Products. Evidence-based Complementary and Alternative Medicine. 2018.

3. Andrade MA, Braga MA, Cesar PHS, Trento MVC, Espósito MA, Silva LF, et al. Anticancer Properties of Essential Oils: An Overview. Curr Cancer Drug Targets. 2018;

4. Timsina B, Shukla M, Nadumane VK. A review of few essential oils and their anticancer property. International Journal of Shoulder Surgery. 2012.

5. Dahham SS, Tabana YM, Iqbal MA, Ahamed MBK, Ezzat MO, Majid ASA, et al. The anticancer, antioxidant and antimicrobial properties of the sesquiterpene β-caryophyllene from the essential oil of Aquilaria crassna. Molecules. 2015;

6. Fayed SA. Chemical composition, antioxidant, anticancer properties and toxicity evaluation of leaf essential oil of Cupressus sempervirens. Not Bot Horti Agrobot Cluj-Napoca. 2015;

7. Aziz ZAA, Ahmad A, Setapar SHM, Karakucuk A, Azim MM, Lokhat D, et al. Essential Oils: Extraction Techniques, Pharmaceutical And Therapeutic Potential - A Review. Curr Drug Metab. 2018;

8. Fitsiou E, Pappa A. Anticancer activity of essential oils and other extracts from aromatic plants grown in Greece. Antioxidants. 2019;8(8):1–20.

9. Sugier D, Sugier P, Jakubowicz-Gil J, Winiarczyk K, Kowalski R. Essential oil from Arnica Montana L. Achenes: Chemical characteristics and anticancer activity. Molecules. 2019;24(22):1–13.

10. Greenwell M, Rahman PKSM. Medicinal Plants: Their Use in Anticancer Treatment. Int J Pharm Sci Res. 2015;6(10):4103–12.