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ESSENTIAL OIL AND CHEMICAL CONSTITUENT HERBAL DRUG TREATMENT FOR ANTICANCER

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ABSTRACT :

Cancer is a major life-threatening disease that presents significant challenges in both developed and developing countries. The global mortality rate from cancer continues to rise steadily. Various types of cancer, including lung, skin, breast, rectal, stomach, liver, prostate, and esophageal cancers, are of particular concern. The causes of cancer can be attributed to external factors such as population growth, dietary habits, and industrialization, as well as internal factors including hormonal imbalances, genetic predispositions, and a weakened immune system.

Plant-derived compounds play a crucial role in cancer treatment. This review explores several medicinal plants with anticancer and therapeutic properties, primarily due to their natural antioxidants, free radical scavengers, and singlet oxygen quenchers.

Highlighting these plants could enhance our understanding of their medicinal value and contribute to the discovery of new drugs.

Keywords: Essential oil, chemical constituents, anticancer

INDRODUCTION

What is Cancer?

Cancer refers to any one of a large number of diseases characterized by the development of abnormal cells that divide uncontrollably and have the ability to infiltrate and destroy normal body tissue. Cancer often has the ability to spread throughout your body. Cancer is the second-leading cause of death in the world As a result, contact inhibition becomes a powerful anti-cancer mechanism, but it is lost in cancer cells. Hence, most types of cancer have tumors (except for cancers of blood).

Rational of work

Cancer is the most prevalent disease worldwide. While standard treatments such as surgery, radiation, and chemotherapy are commonly used, they often result in significant toxicity, resistance, and relapse. Therefore, exploring novel therapies is essential to address these challenges.

In 2023, breast cancer affected 2.3 million women globally and led to 685,000 deaths. Preventing cancer involves navigating a complex mix of genetic, environmental, and lifestyle factors.

Essential oils and their chemical constituents, known for their antimicrobial, antiviral, antifungal, antiphrastic, and insecticidal properties, are increasingly being explored for their potential anticancer effects. Although most research to date has focused on their ability to improve quality of life, manage anxiety, and alleviate treatment side effects, there is a growing interest in their potential role in cancer prevention and treatment. This shift reflects a broader trend toward investigating natural remedies and alternative health approache

Aim

The use of essential oils and chemical constituent for cancer prevention is based on the idea that certain properties of these oils might help mitigate risk factors linked to the development and progression of the disease. While research is still ongoing and scientific evidence remains inconclusive, advocates propose several potential benefits of incorporating essential oils into breast cancer prevention strategies.

1) Anti-oxidant protection

Essential oils and photochemical constituent are often rich in antioxidants,which can neutralize free radical in the body, free radical are unstable molecules that can cause cellular damage and contribute in the development of cancer. By providing antioxidant protection, essential oils and chemical constituent may help reduce oxidative stress and the associated risk cancer.

2) Anti-Inflammatory Effects:

Chronic inflammation is known to contribute to the development of various diseases, including cancer. Essential oils with anti-inflammatory properties may help regulate the body's inflammatory response, potentially reducing the risk of cancer initiation and progression.
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OBJECTIVE

Exploring Natural Compounds:

Essential oil and chemical constituent contain various natural compounds that have demonstrated antioxidant and anti –inflammatory properties and preventing anticancer
Complementary Approach:

Individuals might consider essential oils as a part of complementary or integrative approach to overall health. This could involve incorporating essential oils into a broader wellness plan that includes a healthy diet, regular exercise, and other lifestyle factors
Reducing oxidative stress:

Some essential oils chemical constituents are believed to have antioxidant effects, potentially reducing oxidative stress in the body. Oxidative stress is linked to various diseases, including cancer, and mitigation it theoretically contributes to cancer prevention.
Collection and authentication of plant and the plant part Extraction of plant material with polar solvent (water) and solvent and non- polar solvent (methanol) Qualitative analysis of primary and secondary metabolite Anticancer activity of medicinal plant

LITERATURE REVIEW:

Kaushik S, Mohanty D, Surolia A. (2011):

Proteins are known for their diverse functions within and around cells. They drive, effect, and modulate cellular processes. The versatility of proteins is enhanced by co- and post-translational modifications, with glycosylation being the most complex and widespread. Glycosylation adds structural complexity and a range of physicochemical properties to proteins, with sugar moieties varying from small mono-saccharides to large branched polysaccharides. Glycosylation is broadly categorized into N-linked (to the nitrogen of asparagines or arginine) and O-linked (to the hydroxyl oxygen of serine, heroine, tyrosine, hydroxyl sine, or hydroxyproline). Among these, N-linked glycosylation, which attaches to asparagine's, is the most common form in eukaryotes. Recent discoveries have shown that glycosylation also occurs in prokaryotes and shares several similarities with eukaryotic glycosylation.
Rosty C, Aubriot M-H, Cappellen D, et al. (2005):

The objective of this study was to expand upon our previous research by screening a total of 75 patients for FGFR3 mutations and identifying any clinical or pathological features associated with these mutations. We also investigated whether FGFR3 mutations occur at various stages of cervical tumor progression, similar to their occurrence in bladder tumors, where the highest mutation rate is observed in low-stage non-invasive pTa tumors. To address this, we analyzed 80 squamous intraepithelial lesions, including 40 with low-grade squamous intraepithelial lesions (LSIL) and 40 with high-grade squamous intraepithelial lesions (HSIL).
Gautam N, Mantha AK, Mittal S. 2014:
The exploration of natural plant products for discovering new anticancer agents is rapidly growing. In recent years, essential oils (EOs) have gained attention for their potential in cancer therapy. This review aims to compile and document the existing research on EOs and their constituents as anticancer agents. It covers nearly 130 studies on EOs from various plant species, classifying them into in vitro and in vivo research categories. The review also provides an in-depth analysis of the mechanisms through which different EOs and their constituents exert their anticancer effects, detailing their roles in the treatment of various types of cancer.
Sulaiman A, Yao Z, Wang L. 2018: Epithelial-mesenchymal transition (EMT) and mesenchymal-epithelial transition (MET) play crucial roles in both embryonic development and cancer progression. In a typical model, epithelial-like cancer cells undergo EMT, transforming into mesenchymal-like cells with increased motility. These mesenchymal-like cells then migrate through the bloodstream to a new location. Once they reach a suitable site, they revert to an epithelial-like phenotype through MET, allowing for tumor regeneration at the new location.

Summary and conclusion

Essential oil:

Essential oils are highly concentrated liquids extracted from natural plant sources, typically through steam distillation. These oils are commonly used in the treatment of breast cancer and have broad applications in the pharmaceutical industry due to their antimicrobial, antiviral, antifungal, antiparasitic, and insecticidal properties. Recently, there has been growing interest in their anticancer potential. The natural constituents of essential oils play a significant role in cancer prevention and treatment, making them a valuable area of research in oncology.

Phytochemical constituent:

Phytochemistry is the branch of chemistry focused on the relationship between natural products and organic chemistry. This field is crucial because it enhances our understanding of plant constituents and their pharmacological activities. The term "Phyto" comes from the Greek word for plant, and phytochemicals are primarily associated with plant pigments. These protective compounds are produced by plants to defend themselves and are not essential nutrients for human life.

Phytochemicals, such as flavonoids, saponins, tannins, and glycosides, possess protective or disease-preventive properties. While they are not required for sustaining life, they offer significant health benefits. Many phytochemicals have antioxidant properties that help protect cells from oxidative damage and may reduce the risk of various cancers. For example, flavonoids have been linked to cancer prevention.

Research indicates that phytochemicals, in combination with nutrients from fruits, vegetables, and nuts, can help slow the aging process and lower the risk of diseases such as cancer, heart disease, stroke, high blood pressure, osteoporosis, and urinary tract infections.

Collection and authentication of plant and the plant part:

Extraction of plant material with polar solvent (water) and solvent and non-polar solvent (methanol)

Qualitative analysis of primary and secondary metabolites:

Anticancer activity of medicinal plant (vincristine, vinblastine, Myricetin, betulin, kaempferol, proanthocyanidins-B_1-B_2-B_3-B_7, betulinic acid, quercetin, vanillic acid, flavan-3- ols, gallic acid, gentisic acid, catechins, procyanidins, galloylquinic acid, gallotannin, α- linolenic, linoleic, oleic acids, α-β-γ-δ-tocopherols, lupeol and β-sitosterol.)

antioxidant properties Oxidative stress, a condition where there is an imbalance between free radicals and antioxidants in the body, is a significant factor in cancer development, including breast cancer. Essential oils, which are abundant in antioxidants, could potentially mitigate

Grapes

Fig No 3 Grapes

Synonym:Vitis vinifera, angoor, berry, vine fruit

Biological Source: It is fresh Fruit Obtained from the Vitis vinifera

Family name: Vitaceae

Chemical constituent: proanthocyanidins (gaps) fruit contain abundant carbohydrates (glucose) and organic acids (tartaric malic succinic, citric and oxalic acids). Seed contain 15-205unsaturated fatty acids (phenyl acrylic and derivative)

Use: the fruit are vitamin c, tonic, anti-anticancer and hepato protective, promote hair growth and prevent ischemic processes. The seed oil: hypolipidemic, prevent the increase of vascular permeability.

Dragon Fruit:

Synonym: Yellow Dragon, Pitahaya, or pitaya fruit

Fig No:5 Dragon Fruit

Biological source: It is considered as fruit of certain stain belonging to Family: cactus
Scientific Name: Seleniferous updates
Chemical constituent: phenolic compound, vitaminC, protein, Fiber, Magnesium,Betalains ,carotenoids,
Other chemical constituent: betacynin, Lycppene, Flavonoids, Amino Acids, Sugars, And Organic Acid, balatains, Carotenoids,
Uses: Cancer, heart disease, High cholesterol Obesity wound a healing
Pomegranate fruit Extract and its anticancer potential:

Previous studies have shown that the peel is rich in tannins, flavonoids, alkaloids, and

Organic acids. Tannins, high-molecular-weight polyphenols, are organically and chemically divided into three divergent groups: condensed tannins (also called proanthocyanidins), hydrolyzable tannins or ellagitannins (ETs), and gallotannins (GTs). Pomegranate peel is found to be rich in hydrolyzable tannins, such as punicalin, punicalagin, and other tannins like pedunculagin, gallic acid, and casuarinin are predominantly present. Hence, it possesses superior antioxidative property. Isolariciresinol (10.5 mg/kg) is one of the predominant these polyphenolics has rendered the peel with the property of anticarcinogenic activity.
The compound have been reported to be present in the peel through various studies using

High-Performance Liquid Chromatography (HPLC) and Gas Chromatography–Mass Spectrometry
(GC–MS) methods

Pomegranate

Fruit Fig No:6 Pomegranate

Scientific name: Punica granatum
Commonname: Granada (Spanish) grenade (French) Anar (hind) Family: lythrace
Origin: Itran (perisia) Fruit type: balaus
Nature of crop: subtropicalnonclimagtenic

Wikld pomegranate (p.protopunicaconsider as super food) Chemical constituent:

Polyphenol	Gallotanin	Flavonoids	Alkaloid	Tocopherol
Caffeic acid	Digalloyl hexoside/ glucogallin	Cynanidin(athocynidin)	Pelletrine	Alpha tochopherol
Vallinic acid	Monogalloyl hexoside/ glucogallin	Delphinidin(anthocynidin)	-	Vitamine E
		Pelagonidin-3-O- Glucoside (anthocyanins)	-	Heptadecane
Cinnamic Acid	punicalagin	Catechin	Ellagic acid	-

Table No 2

Uses: pomegranate Peel Against BreastCancer, colorectal Cancer, Postate cancer, SkinCancer, Thyroidcancer, Osteosarcoma.
Beet droot is native to Canada, eastern North America, and Nova Scotia. Externally, it has been used as a home remedy for skin cancer and is possibly the most wellknown anti-cancer herb around. There have been several publications showing that bloodroot has the potential to be a powerful anticancer agent. Bloodroot has been shown in several studies to have consistent anti-neoplastic activity; it can shrink tumors, and has shown it self to be useful when dealing with sarcomas. The sap is toxic if consumed in anything more than minute amounts but all parts of the plant can be used externally.
It's often used in naturopathic treatments for skin cancer

METHOD OF EXTRACTION

Steam distillation Apparatus
Fig No: 14

1) Steam distillation: The plant material is placed in a still, and steam is introduced. The steam carries the volatile compounds, which then condense into a liquid, separating the essential oil from the water.

Advantages: It is Suitable for a wide range of plant materials and is one of the oldest and most common method.

2) Cold Pressing method: This method involves mechanical pressure is applied to the plant material, releasing the oil. The oil and the water content are separated.

Advantages: Preserves the oil's natural aroma, commonly used for citrus fruit. 3) Solvent Extraction: Solvents like ethanol, methanol, etc. Dissolve the essential oil from the plant material. The resulting solution undergoes evaporation, leaving behind the oil.

Advantage: Efficient for extracting oils from delicate material.

3) Hydro distillation: Water is used as a distillation medium, and steam carries the essential oil. The oil is separated from the condensed steam.

Advantage: Suitable for plants with water-insoluble essential oil components.

4) Maceration: Plant material is soaked in a carrier oil to absorb the essential oil. Overtime, the oil absorbs the aromatic compounds from the plant material. The oil is then separated from the plant material

Maceration Fig No: 15

Advantages: It is suitable for heat-sensitive plants, Ideal for extracting essential oils from plants that are sensitive to heat

MATERIAL AND METHODS

The drug was extracted by the Hydro distillation of 200g of fresh rhizomes using a Clevenger apparatus. The rhizomes were washed in running water, and dried. Placed in
1000 ml round bottom flask with 500ml of distilled water and then extracted for 2hr after boiling. The oil was collected, and the remaining water after the extractions was removed by adding anhydrous sodium sulphate. The oil was stored at 4 degree C and protected from light prior to chemical analysis and use

MECHANISM:

The potential mechanisms proposed for the anticancer effects of some essential oils include:

1. Antioxidant properties: Some essential oils are rich in compounds with oxidant properties, which may help neutralize free radicals. Free radicals can damage cells and are linked to cancer development.
2. Anti-Inflammatory Effects: Compounds in certain essential oils may have anti- inflammatory effects, potentially reducing chronic inflammation linked to cancer development
3. Apoptosis Induction: Apoptosis is a natural process of programmed cell death. Some essential oils may stimulate programmed cell death in cancer cells, inhibiting their uncontrolled growth
4. Anti-angina properties: Angiogenesis is the formation of new blood vessels, a process crucial for tumor growth. Certain essential oils may have anti-antigenic effects, potentially inhibiting the blood supply to tumors.

DETERMINATION OF ACTIVITY OF CANCER:

1) Imaging Studies:

2) Mammography: X-ray examination of the breast tissue to detect Abnormalities or masses. Ultrasound: Uses sound waves to create images, helpful in characterizing the nature of a mass. MRI (Magnetic Resonance Imaging): Provides detailed images and is particularly useful for evaluating the extent of of the tumor

3) Biopsy: Fine Needle Aspiration (FNA) or Core Needle Biopsy: Extracts a small sample of tissue for examination. Surgical Biopsy: Removes a larger sample for more comprehensive analysis. 3) Pathological Analysis: Examination of tissue sample by a pathologist to determine the type, grade, and stage of the cancer

4) Molecular testing: Hormone Receptor Status: Determines if the cancer cells have receptors for hormone like estrogen or progesterone. HER2 Status: Identifies the presence of the HER2 protein, which can influence treatment decisions. Genomic profiling: analyzing the genetic makeup of the tumor to guide targeted therapy.

5) Staging: Determines the extent of cancer spread, ranging from stage 0(non- invasive) to stage 4(advanced). 6) Risk Assessment: Tools like the Oncotype DX or Mamma Print may be used to assess the risk of recurrence and guide treatment decisions.

6) Multidisciplinary Team Approach:
A team of healthcare professionals, including, Oncologists, Radiologists, Surgeons and Pathologists, collaborates to tailor a treatment plan based on the specific characteristics of the cancer. It is crucial to note that the determination of the breast cancer activity is a complex process, and individual cases may require different approaches based on various factors. Consultation with a healthcare team is essential for accurate diagnosis and treatment planning.

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CONCLUSION:

Individuals interested in incorporating essential oils into their health routine should approach it with caution, considering potential allergic reactions, interactions with medications, and the need for personalized advice. It is crucial to consult with healthcare professionals who can provide guidance based on the most up-to-date and reliable information, as well as considering evidence –based approaches for breast cancer prevention. Research in this field is dynamic, with ongoing investigations into the specific mechanisms of essential oils and their potential roles in cancer prevention. Safety consideration: Essential oils are potent substances, and their safety can very among individuals. Allergic reactions, Skin sensitivities, or adverse interaction with medication are potential concerns. Dilution and proper applications are crucial to minimize risks.,

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