

Research

ESSENTIAL OILS USED IN TREATMENT AND MANAGEMENT OF DIFFERENT DISEASES

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Abstract:

Essential oils are one of the most used natural products available throughout the world derived from different parts of a plant like leaves, peels, barks, flowers, buds, seeds etc. A variety of other names are given to the essential oil. These include essence, fragrant oil, volatile oil, etheric oil, aetheroleum or aromatic oil. Essential oils consist of terpenes (diterpene, triterpene, tetraterpene, and terpenoid), alcohols, and phenolics, and oxygenated compounds. Diterpenes, triterpenes, tetraterpenes are bigger molecule than monoterpenes and sesquiterpenes. They seem to be less viscous than oil, despite the word “oil,” and have more of a watery appearance. Essential oils have been largely employed for their properties already observed in nature, i.e. for their antibacterial, antifungal and insecticidal activities. The efficacy of several essential oils has been studied extensively for oral hygiene. Spearmint oil is the most widely used essential oil in oral care treatments. Common Basil. Cancer is a growing health problem around the world and is the second leading cause of death after heart disease. that essential oils have potential therapeutic applications in the prevention of cancer. Medicinal plants have become an interesting source of anticancer compounds because they are safe, have fewer side effects, and are easily accessible.

Key words: Aromatic plants, natural extracts, dental diseases, chronic inflammation, cancer, antibacterial.

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Introduction:

The term “essential oil” was coined in the 16th century by Paracelsus von Hohenhein that named the effective component of a drug “Quinta essential” ⁽¹⁾.

Essential oils are one of the most used natural products available throughout the world derived from different parts of a plant like leaves, peels, barks, flowers, buds, seeds etc. They can be used in various aspect of ailments cure due to their broad biological properties and medicinal value. Essential oils are used in food flavours, cooking, therapeutic, perfumery, cosmetics, and food beverage. Moreover, it can also be used in curing several diseases of both

plants and humans, and most interestingly in application of aromatherapy on humans ⁽²⁾.

A variety of other names are given to the essential oil. These include essence, fragrant oil, volatile oil, etheric oil, aetheroleum or aromatic oil. The latter term “aromatic” is another term that generates a lot of confusion and contention. Although the term “aromatic” in modern usage describes the quality of giving off an aroma that is either pleasant or odious to the nose, an aromatic compound or moiety, in the language of chemistry, has a chemical arrangement that results in delocalisation of electrons, producing greater molecular stability ⁽³⁾.

They seem to be less viscous than oil, despite the word “oil,” and have more of a watery appearance. The presence of the essential oils varies from either colourless to further some colour of the spectrum, and most of the colour of the oil relates to its medicinal properties. For example, being blue, Chamomile Oil is generally useful for the aromatherapy massage undergoing “red hot” emotions since blue reflects its typical “cooling and

soothing” action and stimulates both physical and emotional feelings ⁽⁴⁾.

Essential oils are natural, complex, multi-component systems composed mainly of terpenes in addition to some other non-terpene components. Several techniques can be used to extract essential oils from different parts of the aromatic plant, including water or steam distillation, solvent extraction, expression under pressure, supercritical fluid and subcritical water extractions ⁽⁵⁾.



Fig (1): Different types of essential oils⁽⁶⁾

In addition to their widespread use as flavouring material (Attokaran 2011), essential oils represent a “green” alternative in the nutritional, pharmaceutical,

and agricultural fields due to reported antimicrobial, antiviral, nematocidal, antifungal, insecticidal, and antioxidant properties⁽⁷⁾.

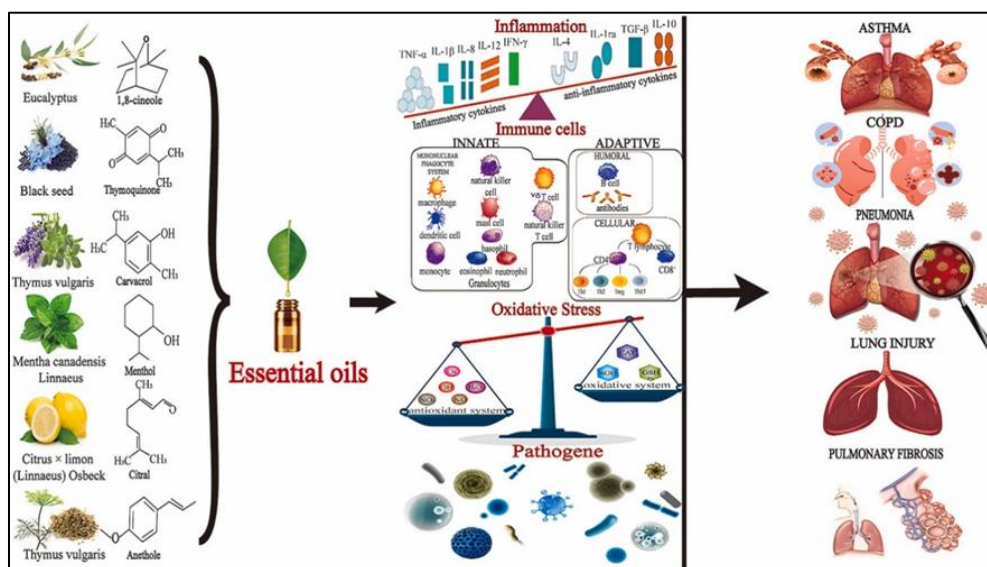


Fig (2): Essential oils used for different diseases⁸

The efficacy of several essential oils has been studied extensively for oral hygiene. Spearmint oil is the most widely used essential oil in oral care treatments. Lavender oil also contributes to oral diseases as preservative—Essential oils demonstrated greater inhibitory activity than extracts and methyl paraben against the measured microorganism strain. Essential oils are used to replace methyl paraben in cosmetic emulsions, often used as a preservative in different dental products, specifically in patients who are allergic to methyl paraben⁸.

Clove oil, also known as Eugenol in dentistry, is an aromatic oil extracted from cloves that have been proven to be very useful in root canal treatments in the past decade. However, many more EOs are now being studied for their therapeutic use, such as Tea tree oil, Thyme oil, Cinnamon oil, Citrus oil, Bergamot oil, Lavender oil, and Peppermint oil. In dentistry, the most common pathologies are bacterial and fungal, with pathogens such as *Streptococcus mutans* (*S. mutans*), *Streptococcus salivarius* (*S. salivarius*), *Streptococcus sanguis* (*S. sanguis*), *Streptococcus sobrinus* (*S. sobrinus*), *Porphyromonas gingivalis* (*P. gingivalis*), *Prevotella intermedia* (*P. intermedia*), *Enterococcus faecalis* (*E. faecalis*), *Candida albicans* (*C. albicans*), and *Actinobacillus actinomycetemcomitans* (*A. actinomycetemcomitans*) often modifying the oral microbiome and resisting other known therapies⁹.

The oral cavity is a habitat for many microorganisms that form a complex structure, the biofilm, that adheres to teeth and oral epithelium. Oral diseases occur when there is an imbalance between the oral ecosystem and the biofilm; thus, the absence of microorganisms is preferred to maintain oral health.¹⁰ In recent years, increased interest has been focused on studying the biological properties of aromatic plant extracts mostly due to their high availability and few side-effects. Among their reported properties is their ability to affect proliferation of cancer cells and induce apoptosis, one of the most important features of cancer chemoprevention. In Greece, cancer is the second leading cause of death after cardiovascular diseases. With a population of

approximately 11,000,000, there was an expected number of 67,400 new cancer cases and 33,200 deaths in 2018.

Preservatives

EOs were more effective in inhibiting certain microorganism strains than extracts and methylparaben. Therefore, they could be used as a substitute for methylparaben in cosmetic emulsions and as a preservative in dental products for patients allergic to methylparaben. However, more clinical trials are needed to determine the safety and efficacy of using EOs as a preservative in products injected into the human body, as studies are not sufficient yet.¹¹

Toxicity

Marketable EOs may result in toxicity due to factors such as improper product management, specific ingredients, overuse, improper use, the potential for sensitization or anaphylaxis, and lack of scientific evidence. Therefore, it is crucial to be aware of the potential adverse effects in addition to the intended use. Some studies have reported additional side effects, such as skin irritation and allergic reactions when using EOs. They are seen as “harmless” because of their natural provenance¹².

Chemical constituents of essential oils

Essential oils consist of terpenes (diterpene, triterpene, tetraterpene, and terpenoid), alcohols, and phenolics, and oxygenated compounds. Diterpenes, triterpenes, tetraterpenes are bigger molecule than monoterpenes and sesquiterpenes, but are present at very low concentrations. These compounds are the combination of C, H, and O i.e. organic in nature.

Essential oil extraction

The dried plant materials were separately pulverized to obtain a homogenous fine grade powder. A sample of 50 grams of powdered material was extracted by using hydro distillation technique during 3 hours in an all-glass Clevenger type apparatus. The extracted crude essential oil was dried over anhydrous sodium sulphate, stored in sealed glass vials and kept under refrigeration at 4°C until analysis. Extraction was carried out in triplicate and essential oil content was expressed as v/w based on dry weight¹³.

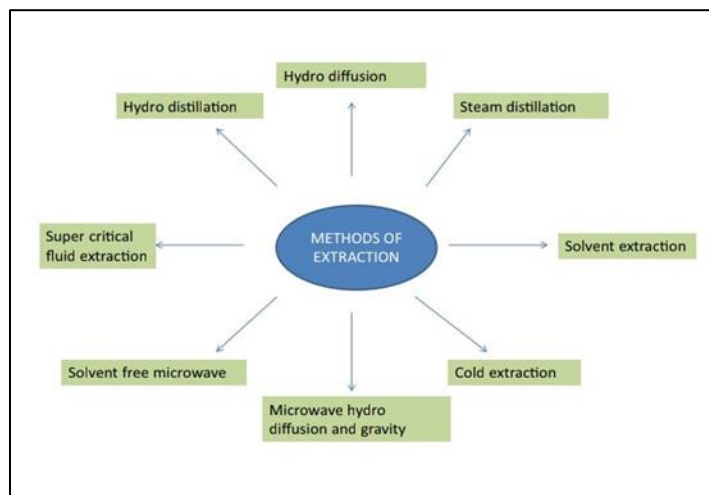


Fig (4): Different methods of extraction of EOs ¹³

Plant material

Plant materials of *E sideroxyylon* Cunn. ex Woolls and *E torquata* Luehm. were collected from the trees cultivated in El-Kobba palace, El-kobba, Cairo, Egypt. Samples were identified by the Herbarium of the Royal Botanic Gardens, Kew, Richmond, Surrey. The materials were collected in the flowering stage of both *Eucalyptus* species .

Essential oils used in treatment of dental diseases

The efficacy of several essential oils has been studied extensively for oral hygiene. Halitosis is a general term used to define an unpleasant or offensive Odor emanating from the mouth, which originates from

oral or non-oral sources. Among the methods for treatment of halitosis are products that (i) chemically and mechanically reduce the number of microorganisms, (ii) mask the Odor, and (iii) chemically neutralize VSCs.

Mentha oil, Myrtus communis oil, Thymus oil, Melaleuca alternifolia oil, Eucalyptus globulus oil, lemongrass oil, cinnamon oil, Clove oil. These include anti-inflammatory and antioxidant properties as well as the potential impact on relevant clinical parameters linked to mouth health status and gingival inflammation: plaque index (PI) and gingival index (GI).

Essential Oils for Oral Care*

Fluoride-Free

<p>Spearmint/Peppermint</p> <ul style="list-style-type: none"> • mouthwash • pain • toothpaste 	<p>Lemon</p> <ul style="list-style-type: none"> • antiseptic • strengthens gums • whitens teeth
<p>Clove Bud</p> <ul style="list-style-type: none"> • fights germs • numbs pain • fights bad breath 	<p>Cinnamon</p> <ul style="list-style-type: none"> • antifungal • antibacterial • fights bad breath • numbs pain
<p>Myrrh</p> <ul style="list-style-type: none"> • antiseptic • antibacterial • strengthens gums 	

Fig (5): Essential oils used for oral care ¹⁴

Traditionally, in a conservative periodontal treatment, scaling and root planning is often performed over the course of 2–3 months (one quadrant or sextant at a time with a 1–2-week interval between clinical appointments). However, although this method has a well-documented success rate (Badersten et al. 1981, Hammerle et al. 1991), this standard strategy seems to allow for rapid recolonization and intra-oral

bacterial translocation from untreated sites to recently disinfected sites. As such, periodontal therapy aims to reduce periodontal pathogens and increase the presence of beneficial bacterial species.

Participants with mild periodontitis were randomly allocated to receive either one-stage full-mouth disinfection plus essential oils.

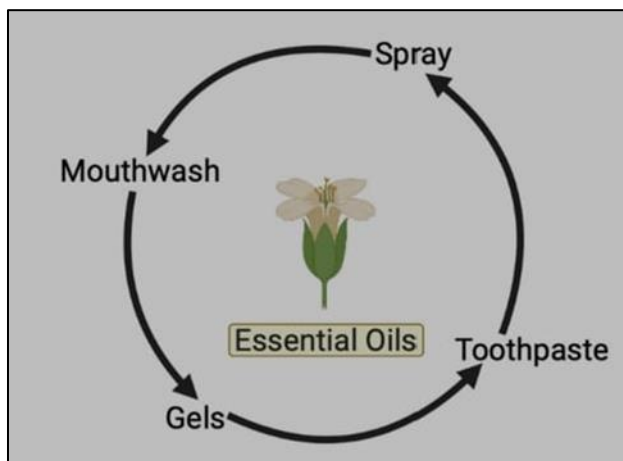


Fig (6): EOs found in dental products¹⁵

The antibacterial agents that are currently used for treatment of oral health problems are reported to cause several side effects such as diarrhoea, vomiting, etc.,. Increasing bacterial resistance to the drugs is also a major concern. Because of the adverse effects, increasing bacterial resistance, and high cost associated with the standard therapeutic procedure, there is a need to explore new therapeutic agents and conduct further clinical research on traditional medicines obtained from various plant sources.

Many traditionally used medicines for treating infections have been studied again, and clinical trials are being done to establish their efficacy and possible side effects. One of these natural medicines is essential oils (EOs). In the recent years, there has been an increased interest toward EOs¹⁶.

Essential oils used in treatment of chronic inflammation

Inflammation is a defence mechanism against infection and tissue damage. Inflammation and proinflammatory cytokines, reactive oxygen species (ROS), lipid extraction medium: arachidonic acid (AA), hydrolases, transcription factors, etc., are

closely related. Anti-Inflammatory Effects of Traditional Chinese Medicine Essential Oils In Vivo. For in vivo tests of essential oils of traditional Chinese medicine with respect to anti-inflammatory diseases, most articles reported the use of chemical reagents to induce inflammation. Essential oils of Chinese medicine have inhibitory effects on inflammation induced by chemical agents. They play inhibitory roles in inflammatory diseases such as skin inflammation and intestinal inflammation, 12-O-tetradecanoylphorbol-13-acetate (TPA) can be used to induce skin inflammation¹⁷.

The triggers of the inflammatory response involve cellular stimulation with the release of mediators, such as pro-inflammatory cytokines (i.e., TNF- α , IL-1 β , IL-6, and IL-8), which promote the activation of macrophages and mast cells, that potentiate this effect by activating endothelial cells, increasing vascular permeability, leakage of fluids, proteins, and influx of immune cells (polymorphonuclear) from the circulation to the inflamed site¹⁸.

Many medications are available to prevent or minimize the progression of inflammation, including

non-steroidal anti-inflammatory drugs (NSAIDs) and corticosteroids. The biological activities of many plants have been long known in ethnomedicine to treat inflammatory diseases. These biological properties are often due to essential oils contained in plants which are used as herbal remedy in traditional medicine.

It has been found that these essential oils possess different activities such anti-inflammatory and antiradical properties. For this reason, we did a review of the last five years and in this period, we found that several essential oils with anti-inflammatory activity were isolated from 43 plants.

Essential oils used in treatment of cancer

Cancer is a growing health problem around the world and is the second leading cause of death after heart disease. According to a recent report by the International Agency for Research on Cancer (IARC), in 2008 there were 12.7 million new cancer cases throughout the world. There are now more than 10 million cases of cancer per year worldwide, including a group of more than 100 diseases such as cancer of the liver, lung, stomach, colon, breast, and so forth. Many volatile constituents have been reported to possess potent antioxidant activity and to have anticancer or anticarcinogenic /antimutagenic /antiproliferation effects. Together these data strongly support the view that essential oils have potential therapeutic applications in the prevention of cancer¹⁹.

Besides the well-described pharmacological and clinical researches investigating terpenoids' cardiovascular or neuronal effects, it could be of particular interest to highlight the important amounts of significant studies exhibiting the properties of terpenoids or more generally EOs in the field of cancer research. EOs-mediated therapy cannot be a substitute to the standard chemotherapy and radiotherapy but can be used in combination with cancer therapy to decrease the side effects of the drugs. Hence, EOs can be used for improving the health of the cancer patients and as a source of novel anticancer compounds.

In the last two decades, a number of researches are exploring anticancer potential of EOs and their components *in vitro* and *in vivo* models. Recently, Bhalla et al. reviewed EOs as anticancer agents

limiting to the recent literature and a short mechanism(s) of action²⁰.

Antibacterial activity of essential oils

The antibacterial properties of the essential oils have been well recognized for many years, and as naturally occurring antibacterial agents, they have been applied to pharmacology, pharmaceutical botany, phytopathology, medical and clinical microbiology, and food preservation. Furthermore, the essential oils of some *Salvia* species have recently been investigated, showing strong antibacterial activity.

The antibacterial activity of five major components of the oil, included 1, 8-cineole, α -pinene, β -pinene, β -caryophyllene and carvacrol. Among of these components, the antimicrobial activity of carvacrol was superior compared to the other components.

Factors influencing the antimicrobial activity of essential oils *in vitro* and the mechanisms of essential oils action on bacteria are reported²¹.

Plants produce an enormous array of functional relevant secondary metabolites (phytochemicals) that exhibit a diversity of medicinal properties. The majority of these compounds are used by plants as a defence mechanism against other microorganisms, herbivores, and competitors. The principal phytochemicals present in plants are essential oils (EOs), phenolic compounds, alkaloids, lectins/polypeptides, and polyacetylenes²².

EOs are a complex mixture of natural, volatile, and aromatic compounds synthesized by aromatic plants that have been often used in traditional medicine²³.

Infections due to bacterial species also remain a serious clinical problem. Emerging resistance of bacterial species is seriously decreasing the number of effective antimicrobials. Because of increasing pressure of consumers and legal authorities, the food industry has tended to reduce the use of chemical preservatives in their products to either completely nil or to adopt more natural alternatives for the maintenance or extension of product shelf life²⁴.

Essential oils used as antibiotics

Antibiotics are probably the drug most used in human medicine, and over the last few years, abuse in the use of these drugs has created multidrug resistance (MDR), which puts at serious risk the effective treatment of a growing number of infections caused by pathogenic microorganisms.

MDR is the result of a number of convergent factors, among which are the inappropriate use of antibiotics caused by suspension of treatment, use of inadequate doses, and genetic improvement of microorganisms, among others.

Currently, bacterial infections represent a serious risk around the world, especially bacterial infections that are resistant to drugs and affect a large number of patients; these diseases are usually more severe compared with the same infections caused by microorganism and thus are more difficult to be treated and eventually be cured²⁵.

Anxiolytic potentials of essential oils

Anxiety is a state of psychological and physiological disturbances manifested by cognitive, emotional, behavioural and somatic elements. All together, these factors provoke an unpleasant sensation coupled with

Conclusion

EOs also possess neuroprotective, anti-aging potentials and are effective in dementia, epilepsy, anxiety and other neurological disorders. Regarding AD, it is important that EOs which are effective on multiple targets (multi-potent agents) must be screened to find more effective drugs in comparison to the currently available drugs which have limited efficacy and are useful for symptomatic relief only. Anti-aging EOs will be more effective in the prevention of these neurological disorders. A number of EOs and

apprehension, fret, disquiet and restlessness. The onset of anxiety is sudden and unexpected without any triggering stimulus and thus is a serious medical state. In order to cope the unusual panic situation, the body is liable to some symptoms, like tension, sweating, palpitations, chest pain, papillary dilatation and shortness of breath.

Pharmacologically effective aromatherapy can be a better choice to relieve anxiety in patients petrified of surgical interventions or dental procedures. In a study, relative efficacy of lavender EO and standard drugs were tested in pre-operative anxiety patients.

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several of their individual components exhibit antibacterial activity against food borne pathogens in vitro and, to a lesser extent, in foods. Thanks to their numerous biological activities, essential oils have to be valorized via several domains, mainly human health, green chemistry, and sustainable agriculture. However, numerous investigations should be carried out on their mode of action and their probable toxicological effects in order to optimize their potential uses.

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