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## The Uses of Oils in The Field of Dental Prosthetics

**Zaid Ezzet Abdul Majeed**

Department of Dental Technology, Middle Technical University Baghdad Iraq

**Sara Abdul Basit Turki**

Department of Dental Technology, Middle Technical University Baghdad Iraq

**Johari Abdullah**

Research Cluster, School of Dental Sciences, Universiti Sains Malaysia Health Campus, Iraq

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### Abstract

One of the fast-growing unconventional therapies is aromatherapy, which applies essential oils and volatile organic compounds for a pleasant smell, massage, or treatment. The efficacy and usefulness of essential oils have already been validated by several clinical trials. Essential oils may reduce oral microorganisms besides helping in the effectiveness of drugs or any other actives being applied for the treatment of periodontal disease, mucositis, or dental anxiety. This review would present briefly essential oils, including their medicinal properties that can be used. There exists strong evidence on the capability of EOs to be explored as preventive and therapeutic agents in different dental diseases that this review narrates. Although several other potentials use of EOs have been studied reported, and many claims of successful treatment have been adequately validated by both in vitro experiments as well as in vivo clinical studies, more research is still required to determine the safety and efficacy of these essential oils before introducing them into clinical practice. Used properly, they may be very useful in dental practice and also improve the quality of oral health care. Clinical studies conducted in vivo that validate the efficacy of EOs while simultaneously considering issues such as side effects and toxicity, or interaction with other drug substances would be extremely useful.

**Keywords:** Essential oils, such as terpenes and terpenoids, and acrylic resin

### Introduction

Dentistry was one of the medical specialties where bacterial and antifungal infections were common. This major element of preventive dentistry is good dental care which reduces the bacterial biofilm [1]. Fluorides, hyaluronic acid (HA), and chlorhexidine are some of the most commonly active ingredients for dental products or mouthwashes [2]. Though they are effective, chemical products can have some clinical disadvantages such as dental epithelial ulcers, mouth loss of moisture, the supragingival plaque buildup, tooth discolouration as

well as taste alterations [3]. The antibacterial properties of traditional medicinal substances attract many researchers among which essential oils (EOs) are included. Extracts and vital oils seem to exhibit strong antimicrobial or antibacterial effects [4]. Oral hygiene solutions based on botanical extracts are famous in the dentistry industry. The aim is, to an extent, of browsing through the diverse and interesting world of oils that are essential and their myriad conventional and unconventional uses. Because dental caries results in an enormous loss of natural teeth all over the world, it

describes a major global health issue which impacts children as well as the great majority of adolescents. Composites such as titanium implant dentistry are used to replace missing teeth since dental caries is caused by biofilm bacteria that protect the enamel of teeth eventually leading to tooth loss. For restorative restoration of a missing tooth, a titanium implant is surgically implanted into the jawbone however it can fail due to bacteria that reside on its surface. From time immemorial, essential oils have found broad applications. as natural treatments against a host of ailments including fungus, bacterial as well as viral infections. They are attractive natural products. Because essential oils have anti-fungal, antimicrobial, or antioxidant properties, there has been an increasing demand to use them. Since germs can thrive and propagate when antibiotics are used, antibiotic resistance has become a major health concern. As a result, the primary benefit of organic products like The fact that vital compounds do not help in the development of resistance to antibiotics as compared to long usage of synthesised medicines. Essential oils attack cytoplasmic membranes by breaking down the membranes of the cells; therefore applying these bacteria. Thus by targeting a barrier or their cytoplasm essential oils stop the formation of infections and in some cases totally alter the composition of pathogenic bacteria cell. They can be useful in dentistry because they are promising in biological medicine.

According to their use and intended goal, several essential oils may help. Potentially active compounds can be obtained from different plants [15]. Plant oils are being converted into essential oil-based products by manufacturers. Several of the most commonly used necessary Oils as follows: lavender peppermint tea tree

- lemon
- eucalyptus
- chamomile
- ylang-ylang

Other than their extensive applications as food flavors and fragrances in the entire commercial cosmetics industry, essential oils have recently become popular over the past years for quasi-medical uses through aromatherapy (see Figure 1) with strong exploration of them for the development of new pharmaceuticals because of their large diversity in chemical composition which allows interaction on different pharmacological targets (enzymes, ion channels, or receptors) [16-17]. Some essential oils, like peppermint oil, are already being applied medically for therapeutic use on inflammatory bowel disease and functional dyspepsia. Great antioxidants, antibacterial, anxiolytic, spasmolytic, and anti-inflammatory activities have been found by many in vitro and in vivo tests from several essential oils that might be interesting to human medicine.

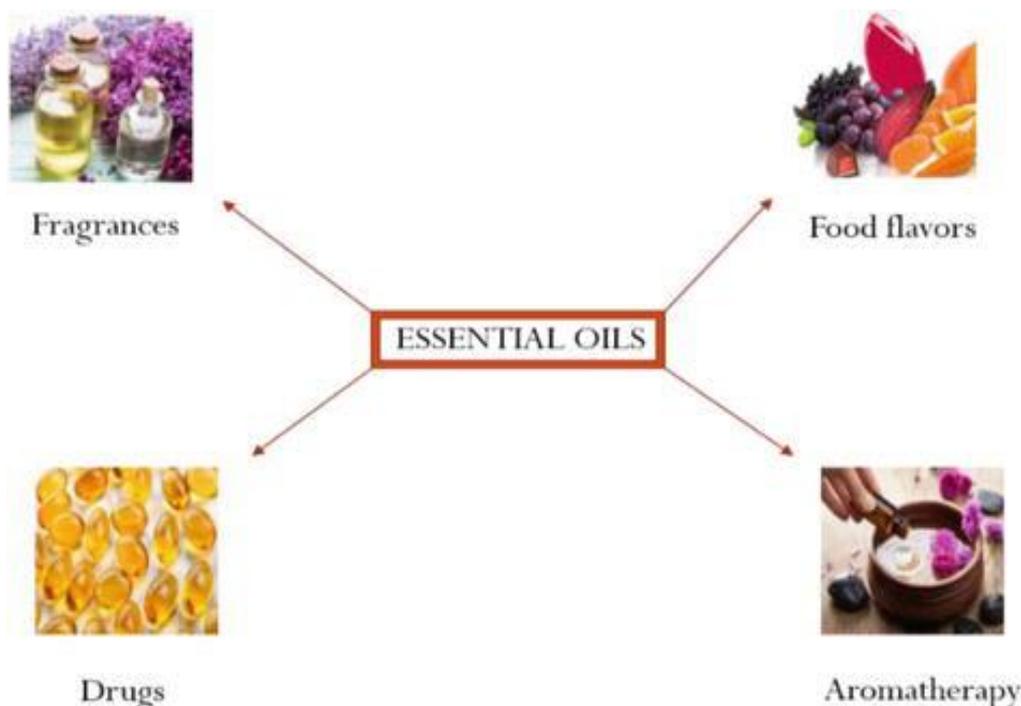
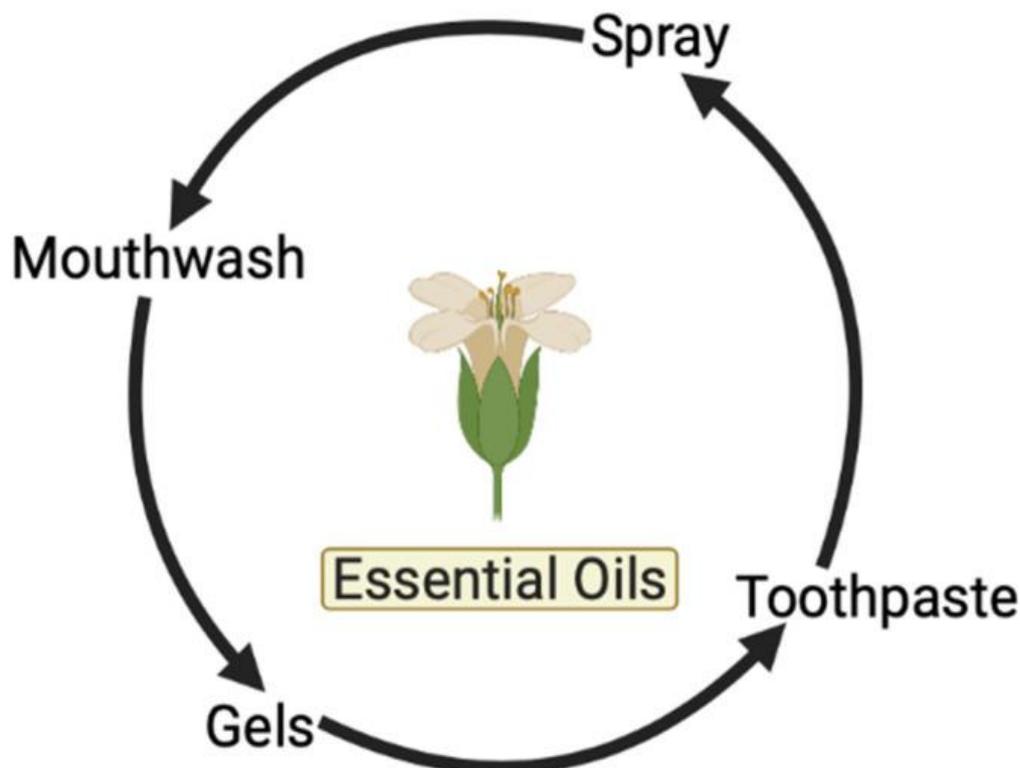


Figure 1 : primary uses of Essential oils

EOs are known to be harmless as well as piqued interest as a natural remedy for dental conditions. However, investigations of EOs' impending prospective use of dentistry are still not sufficiently acknowledged, considering the advancements in research which have been made so far[18]. EOs are included in a number of

dental products, as seen in Figure 2, as well as are particularly helpful in the following areas of dentistry: endodontics, periodontics, surgical procedures, as well as oral preventive. They have been shown to be effective as additives, dental implants, anxiolytics, wound care dressings, or adjuncts to dental hygiene.



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**Figure 2 : EOs present in dentistry goods**

### 1. History of oils in dentistry

According to the ancient books of Indian history, essential oils could be among the first forms of medicine. Despite being used as a flavouring agent to holistic treatment, its usage as a therapeutic method progressively changed. Essential oils' medicinal properties make their uses in dentistry well-thought-out[19-20]. It has several uses outside of the medical industry, including either a preservation or flavouring ingredient in a variety of foods, salad dressings, condiments, meat-based items, beverages (tea or soft drinks), detergents, cosmetics, and fragrances [21]. Among the many functions of essential oils include antibacterial, anti-inflammatory, pain relieving, sedative, central nervous system stimulation, antispasmodic, and more. Especially, essential oils are becoming more and more well-liked as forms of comprehensive medicine throughout other nations lately [22-23]. Given its

characteristics, essential oils are being extensively researched for their potential benefits in tooth; at this point, limited research has managed to incorporate them into normal dental practice.

### 2. Chemical composition of oils

The complex blends of volatile secondary compounds that make up essential oil are transmitted by nature. Numerous factors, including its constitution, might cause misunderstandings about its amazing pharmacological properties. In actuality, the initial chemotype of essential oils may be mischaracterized from after harvesting to the detection of the chemical by method of extraction [24]. Since ancient times, the oral tradition has been aware of essential oils' medicinal potential. Certain chemo types of these oils have shown efficacy against the top 10 deadly illnesses listed by the WHO in recent years. However, the absence of a reliable and

simple analytical method that can permit an assessment of the oils to be assessed is partly to blame for the abuse of these oils.

The principal elements found include 1,8-cineole, B-ocimene, linalool, linalyl acetate, B-ocimene, l-fenchone, terpinen-4-ol, camphor, as well as viridiflorol. Yet, each one of those elements has a distinct proportional position among distinct species. Linalool (3,7-dimethylocta-1,6-dien-3-ol), (3,7-dimethyl-1,6-octadien-3-yl acetate) [25-26], Acetate linalyl, lavandulol, 1,8-cineole, lavandulyl acetate, as well as camphor make up the majority of lavender oil, which is extracted by steam distilling from the flower petals pertaining to the species *Lavandula angustifolia* (Lamiaceae).

#### • Terpenes and Terpenoids

As previously stated, the head-to-tail paradigm was utilised when C5 units, also known as this compound components, and 3-butadiene 2-methyl-1, were combined to generate flavone; as supplementary metabolites [27-28]. The various categories in terpenes are physically as well as physiologically derived from distinct isoprene compositions. The structural composition (C<sub>5</sub>H<sub>8</sub>)<sub>n</sub> is used to classify it based on its amount of isoprene subunits; n was The quantity of connected Units of isoprene; [29-30] for instance, two isoprene units produce These compounds (two C<sub>5</sub> groupings) with the chemical structure of C<sub>10</sub>H<sub>16</sub>, C<sub>20</sub> diterpenes, and C<sub>30</sub> triterpenes, C<sub>40</sub> tetraterpenes alternatives hemiterpenes (C<sub>5</sub>), as well as these substances (C<sub>15</sub>) are among the Various chemicals that are generated by other combinations. The primary terpene groups found in spices or herbs are monoterpenes, diterpenes, as well as sesquiterpenes. These compounds possess noteworthy physiological properties, including antimicrobial actions on many pathogens, including *Candida* species [31]. Terpenes are abundant in the natural world. They are readily accessible in plenty as well as are reasonably priced components. In addition to serving pollination or antimicrobial barriers, chemical compounds within vegetation also serve as ecological deterrents against herbivore grazing [32-33]. They are used in animals as cellular of cells stabilisers, chemical pathway authorities, or biochemical process moderators. Flavone; should also be helpful for disinfectant. media in practical applications including metals removing grease, cleaning electronics connections or elements, or cleaning aviation

parts [34]. Research is also being done on the commercial monoterpenes' use as alternatives to ozone-depleting chlorine fluorocarbon Monoterpenes are the most common frameworks, like a variety of monochromatic, velocipede or Acyclic elements among biological reactive community, together with alcohols like linalool, borneol, or menthol, as well as hydrocarbons like camphene, p-cimene, and myrcene. In addition to chemical groups, including ethers like 1,8-cineole as well as menthofurane; peroxides like ascaridole; phenols like thymol when carvacrol; aldehydes such as citronellal or carvone, and pulegone; geranial; ketones as camphor, linalyl acetate as well esters like citronellyl acetate, while menthyl were also adde[35]d. Such chemicals are found in a wide variety of plants, including CBD, Alecrim, orange, bay leaves, celery, ylang-ylang, parsley, laurel, thyme, hops, mugwort, wormwood, mint, tea tree, bergamot, as well as sweet basil, among others.

These compounds are formed when triple isoprene units (C<sub>15</sub>) have been gathered, as was covered in the preceding sections. A vast variety of configurations are produced as a result of the link expansion, which also raises the amount of cycles. Sesquiterpenes are structurally identical to monoterpenes: Hydrocarbons include azulene, cadinenes, logifolene, β-bisabolene, β-curcumenes, elemenes, zingiberene, caryophyllene, or farnesenes; Alcohols: farnesol, patch oulol, carotol, viridiflorol, bisabol[36], cedrol, β-nerolidol, β-santalol, and farnesol; germacrone, cis-β-vetinone, Nootkatone, and turmerones longipinan-2,7-dione, are examples of ketones; Epoxides include humulene as well as caryophyllene oxide.

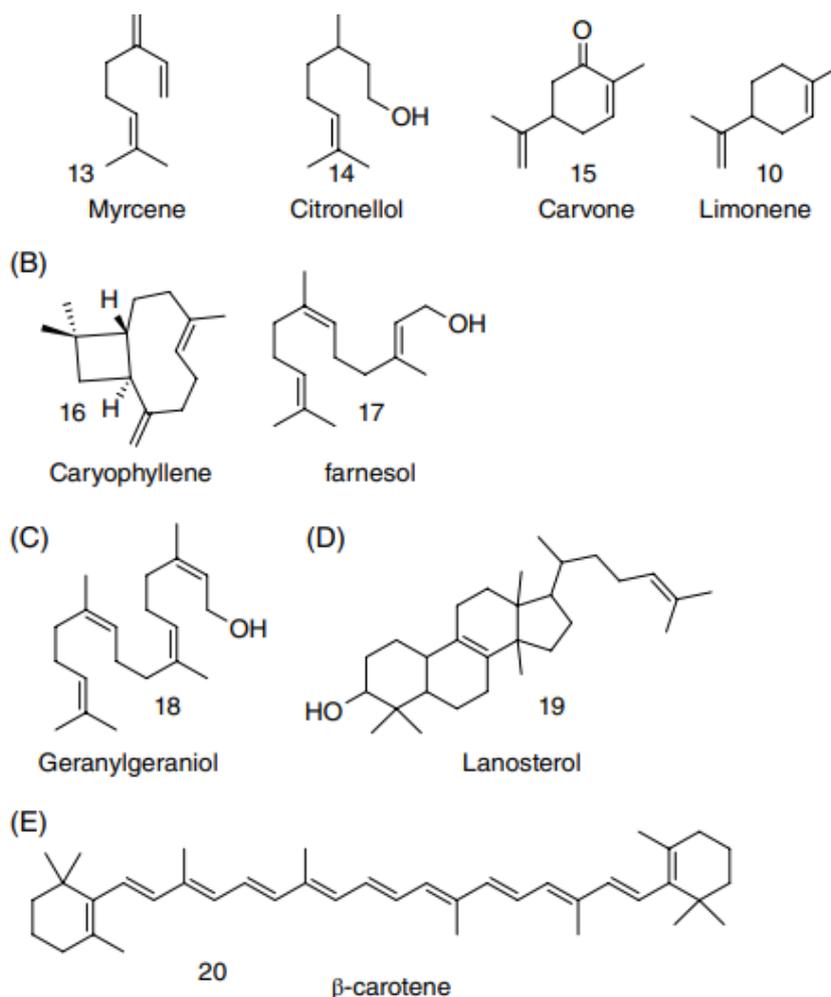
- Orange, pine, petitgrain, sage, mandarin, bergamot, citronella, celery, juniper, geranium, lavandin, lemongrass, peppermint, lavender, lemon, mint, angelica, coriander, eucalyptus, caraway, rosemary, or thyme are a few instances of plants that contain these chemicals. The common ordering of C<sub>10</sub> (mono), C<sub>15</sub> (ses qui), C<sub>20</sub> (di), C<sub>30</sub> (tri), C<sub>40</sub> (tetra), and C<sub>>40</sub> (poly) isoprenoids are investigated by researchers using these kinds' fundamental five-carbon units formed similarly to the successive mixing of terpenes (Table 4.3 and Figure 4.2) . Characteristically, they occur in plants as combinations of molecules with various forms of

five-carbon groups [37]. Frequently to as "lower terpenoids," C10 or C15 compounds are typically referred to as "essential oils" when they coexist. Conversely, the term "higher terpenoids" refers to substances with 20 or more carbons.

Whenever remanent, isoprenoids (diterpenoid or triterpenoids) interact to become flammable ones, such as sesquiterpene as well as monoterpenoids, the word "resin" is employed as the most recent category.

**Table 1. Terpene nomenclature for isoprenes.**

Carbon atoms	Isoprene units	Nomenclature
40	8	Tetraterpenes
30	6	Triterpenes
25	5	Sesterterpenes
20	4	Diterpenes
15	3	Sesquiterpenes
10	2	Monoterpenes



**Figure 3: Chosen prototypical terpene compounds.**

farnesanes: 16=trans-caryophyllene 17=Trimethyldodeca (C) deterrence: 18=tetramethylhexadeca; (D) Triterpenoid: 19=Lanosta-; (E) tetraterpene: 20=β-carotene; (B)monoterpenoid,: 13= Octadiene, 14=citronellol, 15= Carvol and 10=limonene.

For instance, some oxygenated volatile monoterpenoids that were earlier believed to be lipophilic molecules are water soluble at physiologically engaged levels, as well as their environmental consequences have likewise endured examined [38-39]. Despite the fact that terpenoids are currently acknowledged as lipophilic substances, numerous observations illustrate which these inferences need to be meticulously looked at greater instead of we implemented to Within the terpenoids that exist in glycosides are these water-soluble monoterpenoids. For instance, glucosidic bonds are present in the iridoids monoterpenes with saponins as well as cardenolides as triterpenoid. Mono- and sesquiterpenes are examples of flammable terpenoids, but di- and triterpenes are not [40]. Actually, the most useful and noteworthy characteristic of monoterpenoids is their instability. Terpenoids found in plants or their oxygenated counterparts have been used as tastes and scents for ages.

- **Aromatic Compounds**

In general terms, terpenes are more common than volatile chemicals. Nutmeg, clove, Anise, sassafras, parsley, star anise, fennel, the herb, as well as pharmacological groupings are among the many botanical resources that contain these chemicals. Like phenylpropane, these substances are often less prevalent than terpenes [41]. Although terpenes or phenylpropanic compounds are often synthesised by different biosynthesis processes in plants, they may sometimes be created by distinct mechanisms.

Under certain circumstances, the primary technique could coexist alongside other biosynthesis ways of phenylpropanoids including terpene derivatives, which are often derived from plants. Applications for aromatic substances are comparable to those of monoterpenoids or sesquiterpenoids [42-43]. They include methoxy chemicals phenols (eugenol, chavicol,) (elemicine, methyleugenol, estragole, anethole), aldehydes (cinnamaldehyde), alcohols (cinnamic alcohol), or methylene dioxy derivatives (safrole, myristine, apiole)

### 3. Application of oils in dentistry

The condition of the teeth, gums, tongue, cheeks, or the overall orofacial system—which supports human physiological processes—is referred to as oral health. Furthermore, shown in Table 3, EOs appear to be helpful for treating the most prevalent dental conditions, which include cavities, gingivitis, periodontitis, or oral cancer [44]. Before employing these EOs as medicinal representatives, more medical examinations need to be conducted, despite the fact that the study topic is rather broad.

The buildup of microbiological plaque on tooth structures is the initial stage of both periodontal or dental cavities, which are among the most common global health issues in the world. The bacteria then go on to generate acids, which severely erode the teeth [45-46]. This dental cavity contains around twenty-five species of Streptococci, of these *S. mutans* and *S. sobrinus* are directly linked to tooth decay.

Dental Disease	EOs	Therapeutic Effect	Reference
Dental cavities	<i>Clove oil</i>	antibacterial	<a href="#">[37,59,61,62]</a>
	<i>Sesame oil</i>	antimicrobial	
	<i>Cinnamon oil</i>	antifungal	
	<i>Sumac oil</i>	anticariogenic	
	<i>Citrus oil</i>	antiadhesion properties	
Periodontitis	<i>Clove oil</i>	anti-inflammatory	<a href="#">[15,28,37,63]</a>
	<i>Lavender oil</i>	antibiofilm growth effect	
	<i>Lemongrass oil</i>		
	<i>Eucalyptus oil</i>		
Dental pain	<i>Lavender oil</i>	anxiolytic	<a href="#">[37,64,65,66]</a>
	<i>Clove oil</i>	analgesic-like effect	
		anti-inflammatory	
Oral cancer	<i>Clove oil</i>	anti-inflammatory	<a href="#">[67,68,69,70]</a>
	<i>Cinnamon oil</i>	antimutagenic	
		cytotoxic immunomodulatory	

**Table 2: dental conditions and applications of EOs.**

The following describes the possible ramifications of EOs, and Table 2 compiles the data.

Essential oils and their potential implications in dentistry

Name of EO	Potential implications in dentistry
Lavender EO	As an anxiolytic in dental clinics Reduces pain of needle insertion <sup>[19]</sup>
Eucalyptus EO	Anticariogenic agent
Peppermint EO	Antimicrobial activity Use in oral hygiene products
Cinnamon EO	In treating oral candidiasis <sup>[40]</sup>
Lemon EO	In treating candidiasis <sup>[39]</sup>
Eugenol EO	Shows antimicrobial activity against several oral pathogens <sup>[41]</sup>
Tea Tree Oil	Oral candidiasis <sup>[42]</sup> Suitable for use in prophylactic oral hygiene products
Combination of EOs	Antibiotic resistance-modifying agent <sup>[43]</sup>

*EO=Essential oil*

- **Lavender oil**

- **Composition**

Among these primary components found include Acetate linalyl, 1,8 cineole, terpinen 4 ol, , B ocimene, camphor l fenchone, as well as viridiflorol. Yet, throughout different species, all of these elements have a unique proportionate quantity [47-48]. The main constituents from lavender oil are Acetate linalyl (3,7 dimethyl 1,6 octadien 3yl acetate), linalool (3,7 dimethylocta 1,6 dien 3 ol), Acetate linalyl lavandulol, 1,8 cineole, Lavandulyl acetate, well as camphor. It is taking out by vapour distilling from the flowers of the lavender plant (Lamiaceae is the family.). Linalool might be the active ingredient in lavender oil since its function is comparable to that of the entire oil.

- **Therapeutic properties**

- **Antibacterial operation:** The majority of bacteria, filamentous fungi, as well as Yeasts are vulnerable to the antibacterial properties of essential oils (EOs) derived from *Lavandula stoechas* L. The lowest suppressive the Benabdelkader dosage et al. investigation ranged from 0.16 to 11.90 mg/ml. Additionally, it has antipseudomonal properties.

According to an in vitro research, *Lavandula coronopifolia*'s essential oil has a bactericidal impact on germs that are resistance to antibiotics.

- **Anxiolytic:** When taken ingested as well as breathed, the oil of lavender has been shown to elevate morale or lessen discomfort or nervousness. During situations when apprehension is strong, it is not particularly helpful.

- **Antifungal:** *Lavandula luisieri* essential oils have an inhibitory impact on infections of *Aspergillus*, dermatophytes, or yeast [49]. It has been stated that *Lavandula viridis* has fungicidal properties. This highest prevalent pathogen was *Cryptococcus neoformans*, which follows by *Candida* species.

- **Eucalyptus oil**

- **Composition**

Cryptone,  $\alpha$  pinene,  $\alpha$  terpineol, trans phellandral, p cymene pinocarveol, globulol, cuminal, aromadendrene, spathulenol, as well as limonene, terpinene 4 ol are the next most important constituents, after 1,8 cineole.

- **Therapeutic properties**

- **Antimicrobial effect:** contrary to the amount of one element, the antimicrobial effectiveness was discovered to be associated with a combined impact of important or smaller components. *Eucalyptus globulus* leaf essential oil (EO) has antibacterial action against both Gramme affirmative (*Staphylococcus aureus*) and Gramme negatives (*Escherichia coli*) pathogens [50]. Research on eight eucalyptus species demonstrates showed the cytotoxicity or strong bacterial assets of *Eucalyptus odorata* compounds oil towards *Staphylococcus aureus*, *H. influenzae*, *Staphylococcus pneumonias* well as *Staphylococcus pyogenes*. Both astringent. as well as *Eucalyptus bicostata* exhibited antimicrobial properties.

- **Anti-inflammatory effect:** Immuno regulatory agent: Serafino et al.'s research shows that eucalyptus essential oil (EO) may boost the immunological system mediated by innate cells system reaction, indicating therefore it may be used as an adjuvant in suppression of immunity, infectious illness, and tumour treatment [51].

- **Peppermint oil**

One of the most well-known and often used essential oils is peppermint (*Mentha piperita*) oil. The primary ingredient found in *M. piperita*'s essential oil is menthol, which follows by menthyl acetate as well as menthofuran.

- **Therapeutic properties**

- **Antibacterial:** There is evidence that peppermint oil inhibits the growth of staphylococci.

- **Antifungal:** Research indicates that at doses between 0.5 or 8  $\mu$ L/mL, EOs have fungistatic or fungicidal properties towards both traditional and pathological varieties of *Candida* species [52-53]. When it comes to azole-resistant as well as azole-susceptible strains, EOs has comparable antifungal effects.

- **Antibiofilm:** Inhibiting biofilms in fungal strains reduces drug resistance or pathogenicity. According as research, EO totally prevents *Candida albicans* from forming biofilms upwards to 2  $\mu$ l/ml in a dose-dependent approach.

The organic makeup is cinnamon oil is complex makeup of the volatile oils extracted from the bark, leaves, or roots varies greatly. With 82.5% of the overall composition, trans cinnamonaldehyde[54-55], eugenol,

or linalool are three of the initial constituents of the essential oils extracted from the cinnamon bark *zeylanicum*. The primary constituent of cinnamon essential oil is cinnamonaldehyde, which research indicates is also its most potent ingredient and medicinal qualities.

- **Antimicrobial effect:** inhibits the development of several bacterial isolates, particularly fungi or Bacteria that are both Gram-positive and Gram-negative. Regarding unexpected alterations of biological in humans, it has antimutagenic properties. Additionally, an animal research by Cabello et al. demonstrates that consumption of cinnamon aldehyde (CA) has a strong anti-melanoma effect. In addition to these actions, research indicates that cinnamon *zeylanicum* (CZ) has antioxidant, antiparasitic, or reactive radical scavenging qualities.
- **Lemon EO**
- **Composition**

Terpenes or oxygenated terpenes make up the majority of its contents. Antifungal potential is shown by therapeutic action against all three kinds of *Candida* (*C. albicans*, *Candida tropicalis*, or *Candida glabrata*). Lemon essential oil is recommended as a successful treatment for *Candida albicans*-induced candidiasis.

#### 4. Safety and toxicity of oils.

Because of this incidence of infectious, inflammatory, or fungus oral disorders is increasing, pharmaceutical research for dental becomes crucial. The relationship between HIV/AIDS and the human pathogenic virus dental illness, dental caries[56], periodontal disease, oral mucosal lesions tooth loss, oral including oropharyngeal malignancies, including orodental trauma remain global public health issues. They also significantly affect people's well-being or day-to-day lives.

Because of its antibacterial or anti-inflammatory qualities, essential oils may be useful in dentistry; nevertheless, there are safety issues, especially when used internally or in high doses [57-58]. Although certain oils, like coconut oil or spearmint oil, are frequently utilised, others as well, like clove or oil of tea tree, need to be carefully considered because of the possibility of toxicity or negative responses.

#### 5. Effect of oils on some properties of heat cured acrylic resin

Because of their exceptional qualities, heat-cured base of dentures resins is often used as denture foundation materials. There are several advantages when employing heat-cured polymethyl methacrylate (PMMA) for the foundation material for prosthetic teeth, including its low level of water adherence as well as dissolution, relative lack of toxic effects, reparability, nor simplicity of manufacture.

- Additionally, PMMA is being acknowledged for its low cost, ease of usage and polishing, or dependence on few manufacturing tools.
- Chemically-activated as well as auto-polymerizing resins are alternative kind of polymer which is seldom utilized to create dentures bases as heat-activated polymers [59].
- Its primary distinction between chemically stimulated resin or heat-cured acrylic resin for denture bases is how the cold-cured one's polymerisation starts at ambient temperature. In order to trigger benzoyl peroxide or initiate the polymerisation manage, a chemical accelerator in the manner of a secondary amine, like as dimethyl paratoludin, is added to the monomer to change its structure.
- Cold-cured acrylics resin remains one of the most widely utilised periodontal for dentistry. It may be applied for maxillofacial prosthesis, orthodontics appliances, relining, repair, or interim crowns or bridges.
- The length of time needed for laboratory procedures are decreased by self-cured resins with tissues responding or reduced fracture durability; nevertheless, the leftover monomer increased the risk of tissue responses with decreased fracture resistance [60].
- The primary disadvantages of cold-cured acrylic consisted of its growing permeability its colour volatility.
- Durability and other mechanical properties may be impacted by the manufacturing method.

- the quantity of leftover monomer in the polymerised resin would have a significant impact on the firmness.
- Because PMMA has greater surface expanses or shielded colonisation locations, surface ruggedness directly affects *C. albicans* adhesion or biofilm development in acrylics surfaces.
- Certain investigations have demonstrated a direct correlation between surface roughness with *C. albicans* adhesion. Plaque buildup or microorganism adhesion significantly improved as interface hardness rose [61].
- Oral microbial infections may be effectively treated with herbal therapies that have little or no adverse effects. As a result, there is a global trend of investigating herbs as an effort that discover herbal-based drugs with strong antifungal abilities that are appropriate for the body.
- Among such natural remedies are oils made from plants. Numerous researches have lately examined the effects of different oils on *Candida albicans*, and the results indicate that plant oils are a promising therapeutic option with strong antifungal properties for denture-induced stomatitis.
- In recent years, the use of naturally generated products has gained popularity. Essential oils are plant-based concentrate hydrophobic liquids with a range of medicinal effects. Because essential oils have antimicrobial qualities, they are used in herbal medicine in many nations [62-63].
- Growing rosemary (*Rosmarinus officinalis* L.) is widely recognised as a very important medicinal or fragrant herb in the Lamiaceae family. Rosemary is believed that it has been utilized as a culinary, cosmetic, or medicinal element in Ancient Egypt, Mesopotamia, China, or India.
- Precisely such, it is a plant that is often employed in modern medicine. Antioxidant and antibacterial qualities are only two of rosemary's many therapeutic benefits.
- It is recognised as a powerful chemopreventive agent [64-65].
- Fresh coconut or its by-products (coconut oil or the milk from coconuts residues) that have not undergone chemical treatment after extraction are used to make virgin coconut oil (VCO), a substance devoid of chemicals and additives. As shown through its very low peroxide concentration as well as its natural saturated fat material, it is the purest type of coconut oil [66]. It is white in colour, naturally includes vitamin E, it has not been subjected to hydrolytic and atmospheric oxidation [67]. Consumption this oil has many advantages, including enhancing immunity, regulating weight, as well as preventing heart disease. One of the features of VCO is the presence of MCTs [68-69], or medium-chain triglycerides, are medium-chain the acid Lauric is a particularly significant medium-chain lipid present within VCO. It makes up 48% of VCO.
- During the polymer industry, coconut oil may be utilised as an alternative plasticizer [70]. It is well acknowledged that oil contains more fatty acids as well as can serve as an excellent plasticiser, even in little quantities [71-72].
- However, no research has yet examined the effects of plant-based oils on the structural or physiological characteristics of cold-cured acrylic resin [72-73]. The intention of this in vitro research was to determine the effects on incorporating two quantities of coconut oil or rosemary on the hardness or stiffness of cold-cured acrylic resin [74-75]. The null hypothesis states that adding coconuts or rosemary oils to cold-cured acrylic epoxy would neither impact its hardness or roughness.

### Conclusion

Essential oils show clear in-vitro antimicrobial and antifungal activity and have demonstrated modest clinical benefits in short-term studies (for example, reduced plaque regrowth with EO mouthrinses and reduced anxiety with aromatherapy). These properties indicate potential usefulness as adjunctive measures in prosthetic dentistry—most notably for denture cleaning,

prevention and management of denture stomatitis, and improving patient comfort during dental procedures.

#### Clinical relevance

- Denture care: EO-based cleansers or EO-incorporated tissue conditioners may help reduce *Candida* colonization and associated stomatitis when used alongside mechanical cleaning.
- Patient experience: Aromatherapy (e.g., lavender, orange) can be considered to reduce dental anxiety in select clinical settings.
- Material considerations: Some EOs may act as plasticizers or solvents and can alter PMMA hardness and surface roughness; this risk must be weighed before incorporating EOs into prosthetic materials or prolonged exposure protocols.

#### Priority research actions

1. Standardize EO characterization (GC–MS profiles and chemotype reporting) so studies are comparable.
2. Conduct dose-finding and safety studies (topical and material-incorporation concentrations), including monitoring for irritation, allergy, phototoxicity and drug interactions.
3. Perform randomized controlled trials with clinically relevant endpoints (denture stomatitis cure/reduction rates, plaque indices, patient-reported outcomes) and sufficient follow-up.
4. Evaluate long-term effects of EO exposure on prosthetic polymers (hardness, roughness, flexural strength, residual monomer release) using standardized protocols.

Until such data are available, EOs should be used as evidence-based adjuncts rather than substitutes for established preventive and therapeutic approaches in prosthetic dentistry, with careful attention to formulation, concentration, exposure time and patient safety.

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