

ESSENTIAL OILS AS THERAPEUTICS

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ABSTRACT

Oral diseases are major health problems worldwide. Oral health influences the general quality of life and poor oral health is linked to chronic conditions and systemic diseases. More than 750 species of bacteria that inhabit the oral cavity, a number are implicated in oral diseases. The association between oral diseases and the oral microbiota is well established. Several commercially available therapeutic agents alter the oral microbiota and have undesirable side-effects. Hence there is a need for alternative prevention and treatment options that are safe, effective and economical. Medicinal plants are rich in secondary metabolites and essential oils of therapeutic importance such as anesthetic, anti-asthmatic, antimicrobial, anti-venomous, carminative and anti-hypertension. Hence, the natural products isolated from plants used as traditional medicines are considered as good alternatives. The aim of the present review is to describe the therapeutic properties and uses of essential oils in systemic and oral diseases.

KEYWORDS: Essential oils; Therapeutics; Aromatherapy; Anti-microbial

INTRODUCTION

Oral diseases continue to be a major health problem worldwide. The link between oral diseases and the activities of microbial species that form part of the microbiota of the oral cavity is well established. Over 750 species of bacteria inhabit the oral cavity a number of these are implicated in oral diseases. Oral health is integral to general well-being and relates to the quality of life. There is considerable evidence linking poor oral health to chronic conditions, for example, there is a strong association between severe periodontal diseases and diabetes. The global need for alternative prevention and treatment options and products for oral diseases that are safe, effective and economical comes from the rise in disease incidence (particularly in developing countries), increased resistance by pathogenic bacteria to currently used antibiotics

and chemotherapeutics, opportunistic infections in immune compromised individuals and financial considerations in developing countries. Despite several agents being commercially available, these chemicals can alter oral microbiota and have undesirable side-effects such as vomiting, diarrhea and tooth staining. Hence, the search for alternative products continues and natural phytochemicals isolated from plants used in traditional medicine are considered as good alternatives to synthetic chemicals.^[1] Herbal medicines are the gift of 'Mother Nature' to its children, the man kind.^[2] Medicinal plants are rich in secondary metabolites (which are potential sources of drugs) and essential oils of therapeutic importance.^[3] The use of plants and plant products as medicines could be traced as far back as the beginning of human civilization. The earliest mention of medicinal use of plants in

Hindu culture is found in “Rigveda”, which is said to have been written between 4500-1600 BC and is supposed to be the oldest repository of human knowledge. Ayurveda, the foundation of medicinal science of Hindu culture, deals with specific properties of drugs and various aspects of science of life and the art of healing.^[4] The most famous and richest associations and information dates back in Egyptian papyrus manuscripts written 2800 years BC. The ancient Egyptians were the first to recognize the therapeutic potential of essential oils.^[5] According to a survey (1993) of World Health Organization (WHO), the practitioners of traditional system of medicine treat about 80% of patients in India. In traditional systems of medicine the Indian medicinal plants have been used in successful management of various systemic and oral diseases.^[3] The aim of the present review is to describe the therapeutic properties and uses of essential oils in systemic and oral diseases.

ESSENTIAL OILS

Essential oils are volatile and liquid aroma compounds are obtained from natural sources, usually plants. These are not oils in a strict sense, but often share with oils a poor solubility in water. Essential oils often have an odour and are therefore used in food flavoring and perfumery. These oils are distinguished from aroma oils, vegetable oils, absolutes, and concretes. Typically, essential oils are highly complex mixtures of often hundreds of individual aroma compounds.^[6]

EXTRACTION OF ESSENTIAL OILS

Essential oils are present in plants in specialized cells/glands (sub cuticular spaces of glandular cells, organelles), these glands may be anywhere on the plant body depending upon the morphology and physiology of the plant. Some time it may be on leaves, flowers, stems, roots, bark, wood etc. When these glands are ruptured by pressing, rubbing or heat, the smell /aroma come out. Various methods are used for extraction of essential oils. The choice of method depends upon quality, amount and stability of volatile oils obtained, the type of plant material, economy and also the time required for extraction. The methods used for extraction of volatiles from herbal resources can be classified as follows:

- **Pressing / Cold expression:** oils are extracted from the fruit by machinery which mechanically squeezes the oil from the peel.
- **By Effleurage (absorption of the fragrant oil in greasy oil and then separated by solvent extraction):** An intensive and traditional way of extracting oil from flowers. The process involves layering fat over the flower petals. After the fat has absorbed the essential oils, alcohol is used to separate and extract the oils from the fat. The alcohol is then evaporated and the essential oil collected.
- **Solvent extraction / Alcohol extraction (absolute):** Solvent extraction is a technique for the production of concretes & absolutes of aromatic flowers such as rose, jasmine and production of oleoresins from spices. Essential oils can be extracted by using organic solvents and alcohols are mixed with the plant material in order to produce an absolute containing.^[5]

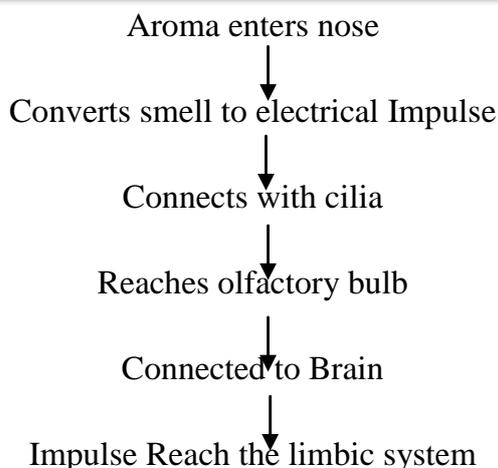
Distillation

The bulk of essential oils are produced by distillation. The three systems include:

- Hydrodistillation system, though the oldest, is still being widely practiced for oil extraction. The plant material is in direct contact with boiling water in a crude metallic distillation outfit. Orange blossom and rose petal oil units employ this method.
- Hydro-steam distillation is employed where the perfumery material is vulnerable to direct steam. Consequently, the plant material is supported on a perforated grid or screen inserted at some distance above the bottom of the still. The lower part of the still contains water up to a level just below the grid.
- In a steam distillation system, live steam under pressure (up to 7 kg/cm²) is injected through steam tubes below the charge and the pressure within the distillation vessel is controlled according to the nature of the material being distilled. This method is efficient and gives higher yields. However, it is not generally employed to delicate flowers.⁷

MECHANISM OF ACTION OF ESSENTIAL OILS

Aromatherapy means treatment or prevention of the disease by use of essential oils. The two basic mechanisms involved in aroma therapy are:



- i. Influence of aroma on the brain, especially the limbic system through the olfactory system.
- ii. The direct pharmacological effects of the essential oils:

ANTIOXIDANTS

Free radicals and other reactive oxygen species cause oxidation of biomolecules including proteins, amino acids, unsaturated lipids and DNA, and ultimately produce molecular alterations related to aging, arteriosclerosis, cancer, Alzheimer's disease, Parkinson's disease, diabetes and asthma. The essential oils of basil, cinnamon, clove, nutmeg, oregano and thyme have proven radical-scavenging and antioxidant properties in the DPPH(1,1-diphenyl-2-picrylhydrazyl) radical assay at room temperature. The order of effectiveness was found to be:

Clove >> Cinnamon > Nutmeg > Basil ≥ Oregano >> Thyme.^[8]

Example: Intake of *Ocimum sanctum* led to significant increase in levels of superoxide dismutase, reduced glutathione and total thiols, but resulted in marked reduction in peroxidised lipid levels. The leaves were found to possess both superoxide and hydroxyl free radical scavenging action. This establishes the efficacy of *Ocimum sanctum* leaves in antioxidant property.^[9]

ANTIMICROBIAL AGENTS

Nowadays multiple drug resistance has developed due to the indiscriminate use of commercial antimicrobial drugs commonly used in the treatment of infectious disease. In addition to this problem, antibiotics are sometimes associated

with adverse effects on the host including hypersensitivity, immune-suppression and allergic reactions. Antimicrobials of plant origin are effective in the treatment of infectious diseases while simultaneously mitigating many of the side effects that are often associated with synthetic antimicrobials.^[4] Thyme and oregano essential oils can inhibit some pathogenic bacterial strains such as *E. coli*, *Salmonella enteritidis*, *Salmonella choleraesuis* and *Salmonella typhimurium*, eugenol and carvacrol showed an inhibitory effect against the growth of four strains of *Escherichia coli* O157:H7 and *Listeria monocytogenes*. Topical preparations containing tea tree essential oil (TTO) were found to be effective with relatively short killing time for multidrug resistant organisms like, methicillin resistant *Staphylococcus aureus*, aminoglycoside resistant *Klebsiellae*, *Pseudomonas aeruginosa* etc.^[8]

ANTI-INFLAMMATORY, ANALGESIC & ANTI-PYRETIC ACTIVITY

Leaf extracts of sacred basil inhibited both acute and chronic inflammation in animal models, and also had analgesic and anti-pyretic activity. Several compounds isolated from sacred basil (eugenol, rosmarinic acid, and the flavonoids cirsilineol, cirsimaritin, isothymonin and apigenin) inhibited the key enzyme involved in the biosynthesis of prostaglandins, cyclooxygenase. The fixed seed oil of sacred basil has been found to have both anti-inflammatory and anti-ulcer activity and appears to exert these effects through dual inhibition of arachidonic acid metabolism, i.e. by inhibiting both the cyclooxygenase and lipoxygenase pathways.^[10]

ROLE OF ESSENTIAL OILS IN GENERAL HEALTH

CANCER

Most cancer chemotherapy regimens make use of highly cytotoxic drugs that target proliferating cell populations. The non-discriminatory nature of these drugs leads to severe side effects in normal cells with a high proliferative index, such as those of the gastrointestinal tract and bone marrow, thus limiting the effective dose of anticancer drug that can be administered. Early reports had indicated that essential oil components, especially monoterpenes, have multiple pharmacological effects on mevalonate

S. No.	DISEASES	ESSENTIAL OILS
1	Abscess	Lavender, tree tea oil
2	Accumulation of toxins	Birch, Carrot seed, Juniper
3	Acne	Bergamot, Chamomile, Geranium, Lavender, Sandal wood, Tea tree oil
4	Anxiety	Lavender, Chamomile, Tea tree, Geranium
5	Arthritis	Birch, Black pepper, Chamomile, Eucalyptus, Ginger, Juniper, Rosemary
6	Asthma	Clary sage, Cypress, Frankincense, Lavender, Marjoram
7	Bronchial infections	Basil, Benzoin, cajeput, Cedar wood, Eucalyptus, Frankincense, Ginger, Lavender
8	Bruises, Burns	Fennel, Marjoram
9	Cold sores	Bergamot, Eucalyptus, Tea tree
10	Constipation	Rose, Fennel
11	Cystitis	Bergamot, Lavender, Sandal wood
12	Depression	Basil, Bergamot, Lavender, Lime
13	Dermatitis	Birch, Chamomile, Lavender, Basil
14	Fever	Eucalypts, Lemon grass
15	Insect bites & Stings	Basil, Chamomile, Lavender, Tea tree
16	Insomnia	Chamomile, Lavender, Marjoram
17	High BP	Lavender, YlangYlang
18	Migraine	Lavender,
19	Muscular aches & Pains	Basil, Black pepper, Chamomile, Eucalyptus, Ginger, Grape fruit

metabolism which could account for the terpene-tumor suppressive activity. Monoterpenes have been shown to exert chemo preventive as well as chemotherapeutic activities in mammary tumor models.

CARDIOVASCULAR DISEASES

ATHEROSCLEROSIS

Atherosclerosis is a process in which deposits of plaque buildup in the innermost layer of the artery, the intima which eventually reduce blood flow, leading to serious health problems. Increased concentrations of oxidatively modified low density lipoproteins (LDLs) in cholesterol play a substantial role in disease initiation. Essential oils and their aroma volatile constituents like Terpinolene, monoterpene hydrocarbon, eugenol and thymol have shown an antioxidative activity against LDL oxidation as it retards the oxidation of intrinsic carotenoids of LDL. Garlic essential oil significantly lowered serum cholesterol and triglycerides while raising the level of high-density lipoproteins in both healthy individuals and patients with coronary heart disease. Intravenous administration of the essential oil of basil (*Ocimum gratissimum*) induced an immediate and significant hypotension and bradycardia.

THROMBOSIS

Thrombosis is usually associated with platelet activation and the release of eicosanoids which contribute to initiation and aggravation of thrombosis. The essential oil of lavender showed a broad spectrum antiplatelet effect and was able to inhibit platelet aggregation induced by ADP, arachidonic acid, collagen and the stable thromboxane receptor agonist U46619 with no prohemorrhagic properties. Linalyl acetate (36% of lavender oil) seemed to be the main active antiplatelet agent. Essential oil of Onion (*Allium cepa*) showed inhibition of platelet aggregation and thromboxane formation by the organo-sulfur components.

DIABETES

Diabetes is a disease in which the body does not produce or properly use insulin. Oral administration of a combination of essential oils including cinnamon, cumin, fennel, oregano, myrtle besides others, was able to enhance insulin sensitivity in type 2 diabetes, in addition to lowering the circulating glucose in the tolerance testing in rats. The essential oil of

Saturejakhuzestanica resulted in significant decreases in fasting blood glucose level in diabetic rats.^[8] *Ocimum sanctum* leaves have been traditionally used in the treatment of diabetes mellitus. Dietary supplementation of fresh tulsi leaves in a dose of 2 gm/kg BW for 30 days led to significant lowering of blood glucose levels. This establishes the efficacy of *Ocimum sanctum* leaves in lowering blood glucose levels.^[9] More research is needed to confirm the veracity of the hypoglycemic activity of other essential oils and to elucidate their mechanism of action.

STRESS AND ANXIETY

Aroma inhalation of lavender, peppermint, rosemary and clary-sage essential oils can significantly decrease symptoms associated with anxiety and stress. Inhalation of essential oils can also modulate sympathetic activity in normal adults: for example, the inhalation of pepper, estragon, fennel or grapefruit essential oils resulted in increase in sympathetic activity. In contrast, fragrance inhalation of rose oil or patchouli oil caused a decrease in sympathetic activity. The rise in rat plasma adrenocorticotrophic hormone caused by stress was significantly reduced by inhalation of chamomile essential oil.^[8]

ROLE OF ESSENTIAL OILS IN ORAL HEALTH

PLAQUE

Essential oils show bactericidal activity against oral and dental pathogenic microorganisms and can be incorporated into rinses or mouth washes for pre-procedural infection control, general improvement of oral health, interdental hygiene and to control oral malodor. Croton cajucara Benth essential oil was found to be toxic for some pathogenic bacteria and fungi associated with oral cavity diseases and may be useful for controlling the microbial population in patients with fixed orthodontic appliances. Charles et al., took up a six month controlled clinical study demonstrated that a mouth rinse containing essential oils showed a comparable antiplaque and antigingivitis activity to that containing the synthetic antibacterial agent, chlorhexidine. Mouth rinses containing essential oils (specially phenolic rich types) with chlorhexidine gluconate are commonly used as preprocedural preparations to prevent possible disease transmission, decrease chances of postoperative infection, decrease oral

bacterial load and decrease aerosolization of bacteria (Hennessy and Joyce, 2004). Mouth washes containing essential oils could also be used as a part of plaque-control routine since they can penetrate the plaque biofilm and kill the pathogenic plaque-forming microorganisms by disrupting their cell walls and inhibiting their enzymatic activity (Ouhayoun 2003). In addition, essential oils in mouth washes prevent bacterial aggregation, slow the multiplication and extract bacterial endotoxins.^[8] Charles CH, conducted a double-blind clinical study to evaluate the comparative efficacy of an essential oil containing antiseptic mouth rinse L (control toothpaste/Listerine rinse) and an antiplaque/antigingivitis dentifrice T (Colgate Total toothpaste/control rinse) and P (Control toothpaste/control rinse). Although both the products produced similar, clinically significant reductions in gingivitis, Listerine when used in conjunction with a fluoride, provided a greater benefit in reducing plaque. The magnitude of reduction for the L group was 22.9%, 70% and 56.1%, respectively, and for the T group, 20.8%, 58% and 22.1%, respectively. Subjects in the L group were not different from subjects in the T group in regard to visual signs of gingivitis (MGI), but were more effective ($p < .001$) than subjects in the T group in experiencing reduced Bleeding Index and Plaque Index.^[11]

DENTAL CARIES

Dental caries is a chronic infectious disease that results in the destruction of tooth tissue. It is caused by a complex interaction of oral microorganisms in dental plaque, diet, and a broad array of host factors that needs to be present for tooth decay to occur. By controlling at least one of the etiological factors tooth decay can be prevented. For example if the presence of *S. mutans* levels is controlled then the incidence of carious lesions can be reduced.^[12] Fine DH et al., conducted an in vitro study to determine the effect of daily rinsing with an essential oil-containing antiseptic mouth rinse (Listerine Antiseptic) on levels of recoverable *S. mutans* and total *Streptococci* in supra gingival plaque and in saliva. The essential oil mouth rinse produced reduction in total recoverable *S. mitis* and *S. mutans* in plaque and saliva and also revealed that *Streptococci* from the *mutans* group were more susceptible to the bactericidal activity of the

essential oil mouth rinse than *Streptococci* from the *mitis* group. This study provides an additional rationale for the inclusion of the essential-oil mouth rinse as an adjunct to daily oral hygiene procedures.^[13] Fluoride containing essential oil mouthwashes have been shown to significantly reduce or even reverse the initiation and progression of dental caries. A randomized controlled crossover trial was conducted by Zero et al., to determine the remineralizing effect of an experimental mouth rinse containing both fluoride and essential oils in an intraoral caries test model. This study has proven that the combination of fluoride and essential oils in a mouth rinse may provide anticaries efficacy, in addition to antigingivitis efficacy.^[12]

APTHOUS ULCERS

Recurrent Aphthous stomatitis (RAS) is a common oral disorder of uncertain etiopathogenesis that its management is largely directed toward symptomatic treatment. Different classes of chemical and biochemical products have been reported to be of some benefit in the management of RAS, but still no definitive treatment is available. The main problem with aphthous ulcers is accompanying pain. If pain could be controlled, more complicated treatments could be avoided. Simple non-synthetic, natural antimicrobial agents including in the commercial mouthwash Listerine, whose active ingredients are a mixture of essential oils have been used to decrease the pain, duration and severity of RAS and possibly reduce the occurrence of ulceration in susceptible patient.^[14] Essential oil mouth rinse decreases the duration & severity of recurrent aphthous ulcers in affected patients. Meiller et al., undertook a six-month double-blind clinical study of 96 adults with the aim of evaluating the effects of a vigorous, twice daily rinsing using a commercially available antimicrobial mouth rinse (Listerine antiseptic) and a hydroalcoholic on the incidence, duration and severity of recurrent aphthous ulcers in persons prone to this disorder. The duration of lesions and the severity of pain in subjects with RAU were significantly reduced in Listerine antiseptic group patients.^[12]

CANDIDIASIS

The yeast *Candida albicans* is a commensal organism frequently found in the oral cavity that can cause opportunistic infections when some predisposing factors like immunodeficiency,

endocrine disorders, antibiotic therapies, transplant, malignant diseases etc. are present. The control of the infections caused by *Candida* faces several problems, including the limited number of effective antifungal agents, the recurrence of the infection and, mainly, the increasing resistance to them. Use of essential oils against *C. albicans* could be a viable alternative, alone or combined with antifungal agents, for therapeutic and/or preventive purposes.^[15] Kang HY et al., conducted a study to examine the effects of oral care with essential oil in improving the oral health status of hospice patients with terminal cancer. Essential oil mouth rinse significantly decreased the number of colonizing *Candida albicans*.^[16]

CANDIDIASIS

Halitosis or bad breath is the general terms used to describe unpleasant breath that emits from a person's mouth regardless of whether the odorous substances in the breath originate from oral or non-oral sources. Essential oils, including hydro alcohol solutions of thymol, menthol, eucalyptol have been used in mouthwashes to reduce Gram-negative anaerobes and volatile sulfur containing compounds.^[17] Luis Fernando Jacinto Alemán et al., conducted a short term study to determine the effectiveness and sustainability of three commercial mouthwashes i.e. Triclosan (T Total Plax Original, Colgate®), Essential oils (EO, Listerine Original Antiseptic Johnson & Johnson®) and cetylpyridinium chlorhite (CC, Astringosol, Complete, Mouth Wash Glaxo Smith Kline®). Triclosan containing mouthwash showed 28.94% and 8.71% reduction of Volatile sulphur compound levels, essential oil mouth wash showed 35.77% and 19.85% reduction and cetylpyridinium chlorhite showed 18.8% and 6.78% reduction. Essential oil mouth washes showed higher reduction percentages of oral mal odour and also decrease the oral microflora.^[18]

CONCLUSION

The important advantages claimed for therapeutic uses of essential oils in various ailments are their safety besides being economical, effective and their easy availability. Hence essential oils isolated from plants used traditional medicine are considered as good alternatives to synthetic chemicals. Different commercially available essential oil containing dental products include tooth paste, tooth powder, chewing gums, mouth

wash and dental floss etc. As demonstrated by the examples included in this review, there is considerable evidence that plant, essential oils have the potential to be developed into agents that can be used as preventative or treatment therapies for several diseases. While it is encouraging to see a number of clinical trials of such products, further studies of the safety and efficacy of these agents will be important to establish whether they offer therapeutic benefits, either alone or in combination with conventional therapies, that can help to reduce the overall burden of oral diseases worldwide. These studies are just the tip of the iceberg and we recommend that further longitudinal studies with larger sample size should be conducted. In particular, studies that address issues such as adequate statistical power, blinding, standardization of extracts or purified compounds, and quality control would be of great value.

BIBLIOGRAPHY

1. Palombo EA. Traditional Medicinal Plant Extracts and Natural Products with Activity against Oral Bacteria: Potential Application in the Prevention and Treatment of Oral Diseases. Evidence-Based Complementary and Alternative Medicine. 2011. Article ID 680354, doi:IO.1093/ecam/nep067
2. Garg SC. Essential oils as therapeutics. Natural product radiance. 2005;4(1):18-26.
3. Prakash P, Gupta N. Therapeutic uses of *ocimum sanctum* linn with a note on eugenol and its pharmacological actions: a short review. Indian J Physiol pharmacol. 2005;49(2):125-131.
4. Joshi Bishnu, Lekhak Sunil, Sharma Anuja. Antibacterial property of different medicinal plants: *Ocimum sanctum*, *Cinnamomum zeylanicum*, *Xanthoxylum armatum* and *Origanum majorana*. Journal of science, engineering and technology. 2009;5(1):143-150.
5. Singh AK. (Chemistry division). Essential oils: their importance for mankind. Scientist, Central Institute of Medicinal and Aromatic Plants, CSIR, Lucknow.
6. Ogunwande IA, Flamini G, Cioni P, Omikorede O, Azeed RA, Ayodele AA et al. Aromatic plants growing in Nigeria: Essential oil constituents of *cassia alata* (linn.) roxb and *helianthus annuus*. Rec Nat

- Prod. 2010;4(4):211-217.
7. Joy PP, Thomas J, Mathew S, Gimjose, Johnson J. Aromatic plants. *J Tropical Horticulture*. 2001;2:633-733.
 8. Edris AE. Pharmaceutical and therapeutic potentials of essential oils and their individual volatile constituents: A review. *Phytotherapy research*, www.interscience.wiley.com. DOI:10.1002/ptr.2072
 9. Sethi J, Sood S, Seth S, Talwar A. Evaluation of hypoglycemic and antioxidant effect of *Ocimum sanctum*. *Indian Journal of Clinical Biochemistry*. 2004;19(2):152-55.
 10. Hanswohlmuth. Sacred basil – An ayurvedic adaptogen. *Botanical pathways information & research on botanical medicine issue 11*.
 11. Sharma NC, Galustians HJ, Qaqish J, McGuire JA, Vincent JW. Comparative efficacy of an antiseptic mouth rinse and an antiplaque/antigingivitis dentifrice. A six-month clinical trial. *J Am Dent Assoc*. 2001;132(5):670-5.
 12. Gopal V. Essential oils some lesser known uses and properties for improved oral health. *J Minim Interv Dent*. 2009;2(3):197-205.
 13. Fine DH, Furgang D, Barnett ML, Drew C, Steinberg L, Charles CH et al. Effect of an essential oil-containing antiseptic mouth rinse on plaque and salivary *Streptococcus mutans* levels. *J Clin Periodontol*. 2000;27(3):157-61.
 14. Amanlou M, Babaee N, Saheb JM, Salehnia A, Farsam H, Tohidast AZ. Efficacy of *Saturejakhuzistanica* extract and its essential oil preparations in the management of recurrent aphthous stomatitis. *Daru*. 2007;15(4):231-35.
 15. Carvalhinho S, Costa AM, Coelho AC, Martins E, Sampaio A. Susceptibilities of *Candida albicans* Mouth Isolates to Antifungal Agents, Essentials Oils and Mouth Rinses. *Mycopathologia*, DOI 10.1007/s11046-012-9520-4
 16. Basavaraj P, Khuller N. Halitosis: A review. *Indian J Stomatol*. 2011;2(3):183-86.
 17. Kang HY, Na SS, Kim YK. Effects of oral care with essential oil on improvement in oral health status of hospice patients. *J Korean Acad Nurs*. 2010;40(4):473-81.
 18. Jacintoaleman LF, Carloshemandezguerrero J, Jimenezfarfan MD, Lopezalgado A. Short term determination of effectiveness and sustainability to fight halitosis of three commercial mouth washes. *Revista Odontológica Mexicana*. 2011;15(4):219-223.

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