



# Contributions of Medicinal Plants in the Treatment of Oral Diseases

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## Abstract

In dentistry, herbal medicine naturally falls within the professional capacity of stomatologists or dental surgeons and can be particularly useful. The use of medicinal plants, for preventive, therapeutic purposes or for oral hygiene, falls within the professional capacity of doctors-stomatologists and dental surgeons. But they have to be competent in the matter, especially since no plant is harmless. After regulatory information, for documentary purposes, some examples of use are reported and, finally, an opening towards systemic herbal medicine. This study will contribute to the development and sustainable management of plant resources used in oral pharmacopoeia in Morocco. Specifically, these are: 1) list the species of plants used in oral hygiene and care; 2) document the endogenous knowledge linked to them.

## Subject Areas

Pharmacology

## Keywords

Medicinal Plants, Medicinal Herbs, Oral Cavity, Herbal Extract, Oral Tissues, The Treatment of Oral Diseases

## 1. Introduction

Since the beginning of time, herbs have been valued for their pain-relieving and healing abilities. Similarly, we still rely on the healing properties of plants in about 75% of our medicines. Over the centuries, societies around the world have developed their own traditions to give meaning to medicinal plants and their uses. Some of these medicinal traditions and practices may seem strange and magical, others seem rational and sensible, but all are attempts to overcome ill-

ness and suffering and to improve the quality of life. Indeed, medicinal plants are a precious heritage for the vast majority of populations and especially for poor communities in developing countries, especially in the absence of a modern medical system [1]. According to Tamboura *et al.*, knowledge related to plant resources is transmitted from generation to generation within society and remains essentially a family or social group heritage [2]. This fact increases the risk of disappearance of this endogenous knowledge if it is not documented [3]. However, thanks to new scientific studies, this plant-based medication is currently experiencing a notable revival. Thus, the medical and pharmaceutical world is discovering more and more the validity of the prescriptions of medicinal plants [4] [5]. The National Council of the Order of Physicians in France has stated: “Phytotherapy should be part of every doctor’s arsenal; every general practitioner should practice it; it cannot therefore be considered a specialty.” [6] Obviously, the same should be true for dentists. The World Health Organization has placed the promotion and integration of medicinal plants in the health system among its priorities [7]. According to this organization, more than 80% of the African populations rely on traditional medicine for their health care. Certainly, the African continent is overflowing with very diverse medicinal plants. More than 200,000 plant species live in the tropical countries of Africa [8].

In Morocco, medicinal plants occupy an important place in traditional medicine and play a great role in the national economy [9]. Due to its biogeographical position, Morocco offers a great ecological and floristic diversity. It is one of the Mediterranean countries with a long medical tradition and traditional know-how based on medicinal plants. This wealth could systematically contribute to the substantial development of backward regions and provide substantial supplementary income for these populations. However, this potential capital is under-exploited and often left uncultivated. Certainly, this Moroccan flora contains about 500 potentially aromatic and/or medicinal species and subspecies of which only an extremely small number is exploited by the pharmaceutical industry [9].

Moreover, the monetary cost of treatment and prevention programs for oral diseases in modern medicine are still high and difficult for the population living below the poverty line. Thus, the use of these plant resources constitutes an alternative to be explored given their effectiveness and their very low cost. Indeed, these plants have interesting antibacterial activities and their use can be protected from resistance and toxicity phenomena [1] [10]. Traditional plant remedies as well as modern medications can complement each other very advantageously. However, one must be wary of possible interactions between certain plants and current drug treatments [11]. The objective of this literature review is to highlight the medicinal plants that may have antibacterial activity for the treatment and prevention of oral diseases.

## 2. Phytotherapy and Scientific Evidence

Phytotherapy can be defined as an allopathic discipline that targets the preven-

tion and treatment of certain pathological conditions by means of plants or their preparations [12]. It is a therapeutic method using the plant as a whole or a part of the plant (root, leaf, flower, ...) to cure or prevent diseases. Thus, all the physico-chemical constituents of the plant act in synergy and reinforce the effectiveness of the remedy [12]. It is a complementary and alternative treatment method, scientifically recognized with a proven effectiveness. It helps not only to alleviate symptoms, but also to solve an underlying problem and to strengthen the overall functioning of a particular organ or system. Its advantage is the exceptional tolerance of medicinal plants, if they are chosen carefully and respecting the possible interactions. This is a major advantage that avoids the side effects so frequently encountered with synthetic drugs [12].

There are two types of phytotherapy:

**-Traditional Phytotherapy:** Sometimes very old based on the use of medicinal plants. According to the World Health Organization, this herbal medicine is the main component of traditional medicine, used for thousands of years. It is based on theories, beliefs and experiences acquired and transmitted from generation to generation [13].

**-Clinical Phytotherapy:** It is a substitute therapy which integrates the study of the medicinal plant in the physiology of the individual in order to complete or reinforce the effectiveness of a classic allopathic treatment [13].

Today, despite the spectacular progress and advantages of conventional medicine, it is clear that phytotherapy is on the agenda. We tend to forget that over the past 70 years or so, humans have relied almost entirely on plants to treat everything from minor problems such as coughs and colds to deadly diseases such as tuberculosis and malaria [14]. Certain tests that are performed almost routinely, such as research into anti-tumor, antibacterial, antiviral or cardiovascular activity, have led to the selection of a hundred or so plant species that are used successfully. Thus, treatments based on medicinal plants are regaining importance because the effectiveness of conventional drugs such as antibiotics, which were once almost universally effective against serious infections, is declining. Over the years, germs and microorganisms have developed resistance to synthetic drugs, and in some situations no longer respond to conventional treatment [12]. However, one should also not overlook the fact that, despite the way herbal medicine is considered with its scientific evidence, it also has a subjective effect on patients. Herbal medicine has an emotional component as well as psycho-physiological effects that interact with each other. Patients associate herbal medicines with remedies from “nature” which normally do not cause any harm or inconvenience. Many patients feel much more concerned and challenged by herbal remedies than by synthetic preparations and thus offer better compliance and adherence.

Nowadays, herbal medicine is based on scientific advances and research of active plant extracts. There is now a multitude of clinical studies that meet the GCP (good clinical practice) requirements. According to a large study by Nartey

*et al.*, the quality of 89 phytotherapeutic studies was rather better than those where synthetic preparations were used [15]. In addition, there are several published monographs of medicinal plants recognized by different official bodies (e.g. European Medical Agency and WHO) with areas of application and indications that have been reviewed and validated by many professional experts, taking into account both data from empirical and traditional knowledge; and scientific knowledge. In fact, most of the plant species that grow in the world have therapeutic virtues, as they contain active principles that act directly on the body. They are used both in classical medicines and in phytotherapy. Medicinal plants are important for pharmacological research and drug development; not only when the constituents of plants are used directly as therapeutic agents, but also as raw materials for drug synthesis [12] [14] [15].

A plant can be identified by its morphological specificities, at the origin of the botanical classification, but also biochemical, representing the interest of its use. In the sense of the European pharmacopoeia, medicinal plants are plant drugs of which at least one part has medicinal properties. They can also have food or hygienic uses. In other words, a medicinal plant gathers one or several organs which are used for their therapeutic virtues. It can be the stem, the leaves, the bark or the roots that are used for curative purposes. The therapeutic power of a plant is the result of one or more active principles [16] [17]. These are located in their different organs, and their effectiveness depends on the climate, altitude, sunshine, their conservation or their preparation. According to Bollinger and Farley, the active components of plant medicines belong to several different chemical groups, among them [16] [17] [18]:

**-Alkaloids:**

These are a diverse group of compounds with alkaline properties and contain mainly a nitrogenous molecule (NH<sub>2</sub>) that makes them particularly pharmacologically active. The physiological effects of alkaloids are focused on the circulatory and nervous systems. Most herbs in this group have a bitter taste and are toxic to varying degrees [16] [17].

**-Phenolic compounds:**

According to Alamgir, phenols are widely distributed in the plant kingdom and are the most abundant secondary metabolites of plants (>8000 phenolic structures currently known) ranging from simple molecules (phenolic acids) to highly polymerized substances (tannins) [19]. In addition, Hoffmann reports that phenolic compounds contribute significantly to the color, taste and flavor of many herbs, foods and beverages [19] [20]. They are often produced by plants to protect themselves from infections and insects. The various classes of phenolic compounds produced by plants are known to play multifunctional roles in plant-rhizosphere microbe interactions. Phenolic acids have various pharmacological properties and health benefits. They also have antioxidant, analgesic, choleric properties, etc. These phenolic compounds can act on the stimulating nerves and the immune system, and can sometimes cause liver damage and skin

irritation [19] [20]. The main groups in this category are phenolic acids or phenols, coumarins, flavonoids, lignans, tannins and quinines.

#### **-Terpenes:**

Terpenes, also called isoprenoids, are the largest group of secondary plant metabolites. According to Alamgir, about 2000 plant species from 60 families including Lamiaceae, Asteraceae, Rutaceae, Myrtaceae, Apiaceae, Pinaceae, etc., produce more than 55,000 terpenes and their derivatives [19]. Plants with distinctive terpenes provide many compounds used as research leads for pharmaceutical, agricultural and other commercial applications [19] [20]. According to Alamgir, many terpenes are used as main biosynthetic building blocks steroids (derived from triterpene squalene), vitamin A (derived from tetraterpenoid carotene) [20]. They have functions ranging from pigments and fragrances to vitamins and sex hormone precursors. There are so many important aspects of pharmacological use of natural terpenoids, including antimicrobial, antifungal, antiviral, antiparasitic, anti-allergenic, anti-inflammatory, antioxidant, antiseptic, expectorant, gastrointestinal disorders, analgesic, immunomodulatory and cholesterol improving, tracheal and bronchial disorders, arthritis, rheumatism.

#### **-Glycosides:**

These are products of the secondary metabolism of plants that contain a sugar unit attached to a non-carbohydrate molecule, called aglycone. Each glycoside is associated with a specific enzyme of the plant. These enzymes are stored in cells at different locations in the plant. When the plant part is chewed or crushed, the cell walls are broken and the enzymes come into contact with the glycoside. A hydrolysis occurs afterwards which will cause the activation of the aglycone. The important point for the practitioner to remember is that glycosides, because of their sugar component, are more rapidly absorbable, and thus the aglycone is more readily bioavailable. Many of these plant glycosides play many important roles in living organisms and are used as very effective medicines [20].

#### **-Essential Oils:**

According to Bollinger and Farley, essential oils (volatile oils) are liquid components of plant cells. They are the highly concentrated essences from plants [17]. Unlike fatty or fixed oils, they do not leave a permanent mark on the paper. They represent the essence or perfume of the plants from which they are extracted. They evaporate when exposed to normal air and pressure. They are of a very complex chemical nature (>200 components) represented essentially by mixtures of hydrocarbons and their oxygenated derivatives. Some popular essential oils are derived from whole plants, but most are derived from specific sections of the plants for which they are named. They are obtained either by steam distillation, by a mechanical process (cold expression), by dry distillation or by other processes such as solvent extraction. They are the most important medicinal plant constituents [17] [18] [20]. While whole plants or plant parts from which they are derived have beneficial qualities, essential oils are much more potent. They are mainly used as flavoring agents in cosmetics (perfumes,

soaps and other products), in food products (food and beverages), in household cleaning products. Moreover, they are used in all branches of medicine such as pharmacy, balneology, massage and homeopathy. The medicinal essential oils act as digestive tonics, antiseptics, anthelmics, antirheumatic, rubefacient. They also have a carminative action and other therapeutic properties such as anesthetic, anti-inflammatory, analgesic, decongestant [17] [18] [20].

### 3. The Use of Phytotherapy in Dentistry

Phytotherapy has its place in odontostomatology. Plants for oral use fall into two categories: those used for oral hygiene, and those used to treat oral diseases. It complements the conventional allopathic arsenal and the classic chemical medications in the daily practice in the dental chair. Indeed, many medicinal plants can be used for adjuvant or curative treatments, depending on the oral pathology, and this either by their direct use in the form of infusion, decoction or mother tincture; or in the form of essential oils which have different therapeutic properties (antiseptic, anti-inflammatory, analgesic and others). Phytotherapy can be prescribed according to the oral pathologies, but also according to the oral therapeutics performed, namely conservative dentistry, periodontology and oral medicine [19].

Among the many modes of use of phytotherapy, we mention the external use, in particular at the level of the oral and pharyngeal mucous membranes, by mouthwash and gargle, practiced to treat the oral-dental pathologies. The gargle consists of an infusion or decoction of plants as hot as possible used to rinse the throat, pharynx, tonsils and mucous membranes, in order to disinfect or soothe them, without swallowing it [19]. While the medication based on mouthwash consists of an infused, decocted or macerated plants. It is used in contact with the mucous membranes of the oral cavity to treat oral affections [19].

### 4. Selected Medicinal Plants in Odontostomatology

It is well known and accepted throughout the world that the oral cavity is the mirror of the total body health. Simply because it represents a favorable ecological niche that allows the colonization and growth of a diverse range of microorganisms, mainly bacterial, attributed to favorable conditions of temperature, humidity, pH and nutrients, where more than 700 bacterial species, including non-culturable, live in the human oral cavity [9]. Thus, the oral cavity is the gateway to the human body for a wide range of viruses, bacteria and a wide range of pathogens [9]. The diseases that can occur in the oral cavity are numerous. They can be distinguished in 3 main groups: caries, periodontal diseases and pathologies of the oral mucosa.

The therapeutic choice of plants depends of course on the etiology of the pathology and will most often focus on plants with antiseptic and analgesic effects. The list of plants described below is not exhaustive and concerns the most commonly used plants, as many others have similar properties that are useful in



oral care. The choice depends on their power of action and their ease of use to treat oral diseases effectively. In all cases, the choice of plants for the dental surgeon in the treatment of oral pathologies must take into account the effects sought in relation to the biochemical properties.

**-*Melaleuca alternifolia*, Myrtaceae: (Figure 1)**

Native to Australia. Previously, the small number of trees limited its use. Research was then carried out and led to mechanized plantations, which made it possible to increase its production [6] [21] [22]. This plant is endowed with a powerful antibacterial activity against a great number of pathogenic germs. It is also antiviral and fungicidal. It is used in local treatment in the cases of periodontopathies and aphthosis, or of candidosis. Although it is not very toxic, it should be used as an anti-infectious treatment for short periods, less than 10 days. Moreover, it can be dermocaustic on sensitive or young skin. In this case it is advisable to dilute it in a vegetable oil, sweet almond or hazelnut, up to 20%. It has a very particular action on the streptococcus and the candida albicans.

**-*Aniba rosaeodora*, Lauracea: (Figure 2)**

Not to be confused with the rose. A terpene alcohol, linalool, constitutes 90% of the Essential Oil of this plant [23] [24]. It is this molecule which confers its powerful antibacterial properties to him, but also antifungal and antiviral. This Essential Oil finds its application in the care of mouth ulcers, herpes, oral candidiasis, but also gingivitis.

**-*Eugenia caryophyllata*, Myrtaceae: (Figure 3)**

Clove (*Eugenia caryophyllata*, Myrtaceae) is the floral bud of the clove tree, a very large tree found in the Molucca Islands, Reunion, the West Indies and Madagascar [6].

The Essential Oil extracted from the flower buds contains 70% to 80% eugenol, a phenol, eugenyl acetate (10% to 15%) and betacaryophyllene (5% to 12%),



**Figure 1.** *Melaleuca alternifolia*, Myrtaceae.



**Figure 2.** *Aniba rosaeodora*, Lauraceae.



**Figure 3.** *Eugenia caryophyllata*, Myrtaceae.

a sesquiterpene. In addition to the essential oil, cloves contain tannins (about 12%), flavonoids, furfural and traces of vanillin [12].

The main properties of clove are antiseptic and analgesic. It has broad-spectrum anti-infectious and antibacterial properties, including inhibition of bacteria responsible for the formation of dental plaque (thanks to the presence of eugenol, tannins and flavonoids), antiviral and antifungal properties. The clove is used in local treatment in dental caries, as an analgesic and antiseptic. The goal is to relieve the pain of the patient while waiting for his consultation with the dentist. It is also used in the treatment of candidiasis, thanks to its antifungal properties or in case of dental neuralgia thanks to its analgesic properties. It is used in mouthwash, toothpaste and chewing gum.

Nowadays, in Asia, a crushed clove or a cotton ball soaked in clove essential oil is placed against the tooth to fight against odontalgia; more generally, cloves are chewed all over the world to improve breath and prevent dental infections; it



is used as a topical dental analgesic against gingivitis, mouth ulcers, odontalgia and to calm the inflammations of the oral mucous membranes (property that it owes to its tannins and its flavonoids). Eugenol, given its numerous recognized applications in the oral sphere, is of course widely used by dentists, both in temporary filling materials and in root canal filling cements [6] [12].

***-Lavendula latifolia or spica, Lamiacée: (Figure 4)***

Called the big lavender, grows in edge of sea. The essence of aspic is extracted from it. This plant has a powerful healing activity. Moreover, it has antibacterial, antifungal and analgesic properties. It is thanks to this last property, that the Essential Oil of lavender aspic is used to relieve the pain in the event of dental caries. It is indicated in the event of herpes labialis for its healing virtues. It is also used in case of mycosis, because its antifungal activity is effective [15] [16].

***-Mentha piperata, Lamiaceae: (Figure 5)***

Cultivated in France, in Italy, in England and in America (Valnet, 1990). The sensation of freshness that one experiences when chewing mint is due to the numbing of the mucous membranes by menthol [25]. It has very powerful anesthetic and analgesic properties. It is also decongestant, antipruritic, anti-inflammatory, antiviral and antinauseant. All these properties lead the Essential



**Figure 4.** *Lavendula latifolia or spica, Lamiacée.*



**Figure 5.** *Mentha piperata, Lamiaceae.*

Oil of peppermint to find an application in many oral pathologies, in particular in the relief of caries and neuralgia, in the treatment of herpes and periodontal disease and in case of halitosis. These conditions are treated locally. Many medicines contain menthol as an adjuvant or supplementary treatment for all these conditions. There are menthol pastes and elixirs. Due to its high ketone content, Peppermint Essential Oil is contraindicated for pregnant or breastfeeding women and children under 6 years old. Its use is disadvised without medical opinion [6] [24] [25].

***-Satureia montana, Lamiaceae: (Figure 6)***

Also called Pebre d'aï (Donkey pepper), is a Mediterranean-mountainous plant of the stages of wet vegetation with fresh and cold winters. It covers vast spaces in the south of France, and develops as well in the fields of thyme as lavender. It has a very powerful antiviral, antibacterial and antifungal action. In mouthwash, the decoction of whole plant is advised against the evils of teeth, but also the gingivites, as well as for the treatment of the mouth ulcers [13].

***-Salvia officinalis, Lamiacée: (Figure 7)***

Sage is a common plant that grows on all continents. It is a very famous plant since antiquity. Sage has local astringent and healing activities that are useful in the treatment of mouth ulcers, but also in periodontal disease. Its active ingredients are found in some toothpastes and mouthwashes [6] [25].

Sage has strong antiseptic and bactericidal properties (due to the combined action of tannins, monoterpenes, flavonoids, ketones and salvin), febrifuge properties, digestive (related to monoterpenes and cineol), antispasmodic (related to flavonoids), emmenagogues (thanks to thujone), hypoglycemic, anti-hemorrhagic (thanks to the tannins), anti-sweat (because the essential oil by the action of the ursolic acid paralyzes the nervous terminations of the sweat glands), astringent (thanks to the tannins), healing, oestrogenic (it favours).

The essential oil is bactericidal in relation to gram + and gram – germs, antiviral



**Figure 6.** *Satureia montana, Lamiaceae.*

and antifungal. The aqueous extract of sage inhibits the enzyme responsible for the collagenolytic activity of *Porphyromonas gingivalis*.

Nowadays, sage is still used against dental neuralgia, as a mouthwash against mouth ulcers and thrush, as a gargle or ointment in inflammations of the oral and pharyngeal mucosa, gingivitis or injuries due to the wearing of traumatic dental prostheses (in fact, the ketones, tannins, ursolic acid and flavonoids have anti-inflammatory properties); the essential oil is also used in the manufacture of toothpastes [26] [27] [28] [29] [30].

***-Thymus vulgaris, Lamiacée: (Figure 8)***

Thyme (*Thymus fontanesii*) is an aromatic plant native to Algeria and Tunisia. It is locally known as Zaàtar, and is the most popular medicinal plant. More used in Algerian folk medicine for its expectorant properties, antitussives, anti-broncholitics, antispasmodics, anthelmintics, carminatives and diuretics [31].

Has powerful antibacterial, antiviral and antifungal activities. Therefore, it is



**Figure 7.** *Salvia officinalis, Lamiacée.*



**Figure 8.** *Thymus vulgaris, Lamiacée.*

used in case of mycosis, gingivitis or in case of aphthosis. It is to be used with precaution because it is dermocaustic and irritating for the skin and must be diluted in an oily substrate [31]

***-Anthemis nobilis L. (Figure 9)***

Roman chamomile is a perennial herbaceous plant of the Asteraceae family. German chamomile or matricaria chamomilla (*Matricaria chamomilla L.*) has the same virtues and is used in the same cases as Roman chamomile, although in the past German chamomile was more widespread than Roman chamomile. Chamomile has antispasmodic properties (due to esters), anti-inflammatory properties (due to the combined action of esters, camphor, azulenes, coumarins and flavonoid derivatives). Coumarins and flavonoid derivatives, febrifuge, tonic, emmenagogues, analgesic (linked to camphor), antiseptic (linked to camphor and flavonoid derivatives), stomachic, digestive, aperitive, carminative (due to lactones) and is used in the dermatological affections, abrasions, chapped skin... as soothing and healing.

Its analgesic properties, quite recently revealed, are the most interesting; indeed the chamomile dissipates or attenuates appreciably the migraines of nervous or flu origin and the facial neuralgias including, in certain subjects, those of the trigeminal.

Chamomile oil was used by Ambroise Paré as a soothing and softening product and soothing during dental eruptions; in the same way and at an earlier time, Paul d'Égine recommended chamomile in decoction to relieve the pains related to the push of the teeth. It made service formerly in the intermittent malarial fevers.

We notice that the anti-inflammatory, antiseptic, febrifuge and analgesic properties of the chamomile analgesic properties of the chamomile, justified by its composition, were well known of our ancestors, but that its digestive properties were unexploited [32] [33] [34] [35] [36].

***-Althaea officinalis L. (Figure 10)***

Marshmallow is a perennial herbaceous plant, melliferous, of the family



**Figure 9.** *Anthemis nobilis L.*



Malvaceae. Its leaves are toothed, whitish and velvety. The marshmallow has emollient, laxative, béchiques properties (due to the presence of mucilage), anti-pruritic in the dermatological affections and anti-inflammatory (related to flavonoïdes and tannins) in bronchitis, colitis or cystitis.

Pline the Old in his “Natural history” conferred to the marshmallow of the virtues against toothache and halitosis; thus he writes: the marshmallow relieves the toothache if one toothache if you rub the sick tooth with its root; marshmallow is all the more beneficial the fresher it is. According to Dioscorides, marshmallow is good for toothache but also for wounds, inflammation of the parotid glands, abscesses, dysentery, burns, bites...

Marshmallow does not have analgesic properties in itself, which is paradoxical paradoxical in relation to what the uses mentioned above show us, but it can it can be insofar as, decreasing the inflammations, it calms the pains which related pain [37] [38] [39] [40].

***-Cinnamomum verum* J.S. PRESL: (Figure 11)**

*Cinnamomum verum* J. S. PRESL is a small tree (5 to 10 m) of the family of the lauraceae, native of Sri Lanka and are arranged in panicles.



**Figure 10.** *Althaea officinalis* L.



**Figure 11.** *Cinnamomum verum* J.S. PRESL.

As early as the Renaissance, cinnamon oil was used to treat dental pain and as a disinfectant for carious cavities after their instrumentation [41] [42] [43] [44].

***-Pistacia terebinthus L. (Figure 12)***

The terebinth is a small tree belonging to the family of Anacardiaceae (or terebinthaceae), specific to the Mediterranean region and not exceeding 5 m greenish flowers form elongated panicles; its small, almost spherical fruits are red and then turn brown their sour taste reminds that of the pistachio and they are (their sour taste is reminiscent of the pistachio and they are very appreciated for that by the Greeks).

Chio's terbenhine is an oleoresin which exudes from the wounds inflicted on the trunk of this tree. Trunk of this tree; subjected to distillation, it separates into a fixed resin, the terebinthine proper, and into a volatile essential oil, terbenhine oil.

In ancient Egypt, cavities were filled with a mixture of natron and terbenhine resin; the same application is found in the Ebers papyrus.

This use has continued through the centuries, as shown by Solingen in 1687 who still performs fillings of carious cavities with putty and terbenhine [45] [46] [47] [48].

***-Commiphora erythraea EHRENB: (Figure 13)***

Myrrh is an aromatic gomme-oleoresin provided by a shrub with large pointed spines of the Burseraceae family: *Commiphora erythraea* EHRENB. This shrub grows in Somalia, Ethiopia, Sudan and more generally in East Africa. Myrrh is used to disinfect small wounds because it has an antibacterial activity in local application; it is antiviral, antispasmodic, astringent, antidiarrheal and has analgesic effects.

The Egyptians used it to disinfect the wounds, to carry out the embalming and to make the kyphi; in their eyes, it was also effective to calm the irritations of the gum and the toothache.

Nowadays, myrrh is used to treat inflammations of the oral and pharyngeal



**Figure 12.** *Pistacia terebinthus L.*



(mouth ulcers, gingivitis... but also those created by the port of traumatic prostheses) in the form of tincture diluted in tepid water employed in the form of gargle, mouthwash or stain; it enters the composition of current toothpastes (up to 10%) and it is exploited in Germany to to treat the thrush of the infants; it is analgesic in the oral affections and toothache [49] [50] [51] [52].

**- *Vaccinium myrtillus L.* (Figure 14)**

Bilberry is a perennial, creeping subshrub of the Ericaceae family. It is found in the undergrowth, the moors its deciduous leaves are oval, toothed and shiny green; its fruit is a blue or black berry very appreciated in gastronomy also called bilberry.

The bilberry has antiseptic, antihemorrhagic, astringent, antidiarrheal (all these properties are due to the presence of tannins), hypoglycemic and diuretic; the berries are bactericidal on various enterobacteria.

The bilberry is rarely mentioned by ancient doctors who in Central Europe often confused often confused bilberry with myrtle; it has long remained at the rank of an astringent astringent.



**Figure 13.** *Commiphora erythraea* EHRENB.



**Figure 14.** *Vaccinium myrtillus L.*

Nowadays, its fresh juice or its tincture with brandy is used in gargles and mouthwashes in cases of gingivitis, thrush, canker sores and angina [52] [53] [54] [55].

***-Malva sylvestris L. (Figure 15)***

Mallow is a perennial plant of the family Malvaceae, which can reach 1m in height. Its port is spread out, its stems are drawn up and covered with hairs, its tomentose leaves are rounded and lobed with crenellated edge. Its flowers present a pink purplish pink and are veined with red; they are born grouped with the armpits of the plant.

The mallow contains an anthocyanic glucoside: the malvine, the malvidol which is a genin of malvin and a water-soluble mauve dye, mucilage (5% to 10% in flowers and leaves) in flowers and leaves, flavonoids, pectins and vitamin A and C.

Mallow has antiseptic properties (thanks to malvin), emollient, softening, antipruritic, laxative these last ones being due to the presence astringent and anti-inflammatory (linked to flavonoids). One allotted to him a crowd of medicinal properties, by underlining its anti-inflammatory action. Saint Hildegarde advised the mallow against the retentions of urine, the diseases of the kidneys, the constipation or the pulmonary affections. Today, the decoction of whole mallow is used in the form of gargles or mouthwashes in cases of mouth ulcers, stomatitis, glossitis and gingivitis [26] [27] [28] [29] [30].

***-Urtica dioica L. (Figure 16)***

The nettle is a herbaceous plant of the family Urticaceae, having the covered with stinging hairs; the hairs have at their end a silica tip which, when penetrating the skin. The hairs have at their end a silica point which, while penetrating the skin, breaks and releases the formic acid with the urticating properties present in the bulb of the hairs. The dark green leaves are elliptical and toothed, the nettle was used by the Greeks against cough, tuberculosis, rheumatism, arthritis indeed the therapeutic flagellations with stems of nettle go up Dioscorides already mentioned its hemostatic properties. Diocles of Carystos made a preparation



**Figure 15.** *Malva sylvestris L.*



**Figure 16.** *Urtica dioica L.*

based on nettle seeds reduced to powder mixed with wax to be placed against the sick tooth.

In the Middle Ages, it was attributed all the virtues. Lusitanus in his “Opera Omnia” (1694) praises the hemostatic action of nettle against hemoptysis and the value of the juice of the plant to stop the hemorrhages and metrorrhagia.

Dr. Cazin, author of the “Traité pratique et raisonné des plantes médicinales” (1876), used nettle to treat hemorrhage.

(1876), used the juice of nettle with almost constant success as a hemostatic in hemoptysis and especially in uterine losses. Nowadays, fresh nettle juice is still used as a mouthwash for sore throats, canker sores, thrush and gingivitis due to its anti-inflammatory properties. In Sweden, it is used to fight against anemia (thanks to its high iron content); nettle is also used to stop spontaneous bleeding such as uterine hemorrhages or epistaxis [32] [33] [34] [35] [36].

***-Equisetum arvense L:* (Figure 17)**

Horsetail is a perennial plant of 10 to 30 cm and belonging to the family Equisetaceae; it does not flower, does not produce seeds but reproduces by means of spores. The spores are carried by the brown fertile ribbed stems which come out in spring and carry an oblong spike of 3 cm. Green sterile branches appear in summer, which can reach 50 cm and have medicinal virtues.

Currently, the horsetail is used in gargle and bath of mouth to look after the oral affections, but oral affections, but one can also apply its fresh juice on the mouth ulcers (indeed, the saponins and silicates present in its composition are healing and the tannins and flavonoids are anti-inflammatory) [37] [38] [39] [40].

***-Plantago major L:* (Figure 18)**

The plantain is a perennial herbaceous plant of the family of plantaginaceae; its broad light green leaves are cut and arranged in rosette at the base of the stem; its very small flowers (white at the beginning of the bloom) form very dense dark brown spikes.

Several other species of plantain also have medicinal properties of the same



**Figure 17.** *Equisetum arvense L.*



**Figure 18.** *Plantago major L.*

order: the lanceolate plantain (*Plantago lanceolata L.*) and the various “fleabane” (*Plantago psyllium, ramosa, cynops L.*).

The medicinal properties of plantain have been known since Greek antiquity; Paul of Aegina recommended plantain water in case of hemorrhage. The plantain was also used in Rome against halitosis, its root against odontalgia and the juice of plantain in mouthwash against gingivorrhagia. Plantain is still used to treat stomatitis and oral-pharyngeal inflammations [41] [42] [43] [44].

***- Cupressus sempervirens L: (Figure 19)***

The cypress is a conical and tapered tree from around the Mediterranean, which can reach 25 m and is part of the Cupressaceae family; its bark is fibrous, dark gray in color; its leaves are evergreen, very smallsize, dark green, in the form of triangular scales.

Cypress is used against heavy legs, hemorrhoids, varicose veins, poor blood circulation and diarrhoea; it is astringent and anti-inflammatory.

All these properties can be attributed to the presence of tannins in the composition of cypress and sesquiterpenes for anti-inflammatory properties.

Oribase used cypress against odontalgia (this prescription can be justified by



the many monoterpenes present in cypress), but Celse also used a cypress-based poultice to treat ulcerative-necrotic gingivitis (thus appealing to the anti-inflammatory, antiseptic, analgesic and astringent cypress) [45] [46] [47] [48].

***-Rosmarinus officinalis.* (Figure 20)**

Rosemary is a perennial and shrubby plant, belonging to the labiate or lamiales family, characteristic of scrubland and rock gardens around the Mediterranean. This melliferous plant has persistent leaves, dark green, lanceolate, with a very camphorous smell.

Rosemary contains tricyclic phenolic diterpenes such as carvosolic acid, triterpenes, labiate specific tannins, verbenone, saponins, flavonoids, steroids derived from ursolic acid and an essential oil.

Rosemary is stomachic, tonic, analgesic, antispasmodic (thanks to flavonoids), antiseptic, healing (thanks to saponins), antirheumatic and cholagogue (thanks to eucalyptol and monoterpenes); it is a recognized antibacterial (thanks to flavonoids, tannins, camphor and monoterpenes), a general stimulant, a specific hepatic and biliary drainer; externally, it stimulates blood circulation.



**Figure 19.** *Cupressus sempervirens L.*



**Figure 20.** *Rosmarinus officinalis.*

Nowadays, rosemary is used in aqueous decoction in the form of bath of mouth for its analgesic action against canker sores, to improve oral hygiene and in the form of a gargle against angina [49] [50] [51] [56].

**-*Rubus fruticosus* L: (Figure 21)**

The bramble is a perennial sub-shrub of the Rosaceae family, with vining stems armed with thorns, its leaves are palmate; his pinkish flowers appear in clusters; its black fruit, the blackberry, is formed of a set of drupes very tight against each other.

Bramble leaves are rich in tannins but also contain organic acids (citric and isocitric acid) and flavonoids; blackberries contain sugars (4% - 7%), pentacyclic triterpene acids, pectin and vitamins A and C.

The bramble has astringent, antidiarrheal, antihemorrhagic properties (all due to the presence of tannins), diuretic and analgesic in bucco-pharyngeal affections.

Today, a decoction of bramble leaves is still used as a mouthwash and in the form of a gargle to treat canker sores, angina, stomatitis, gingivitis, glossitis (thanks to the anti-inflammatory and antiseptic properties conferred on bramble by the presence tannins and flavonoids in its composition) and dental neuralgia. Its infusion is diuretic and is also useful against bleeding or diarrhea [52] [53] [54] [55].

## 5. For Each Oral Pathology, Useful Plants

Phytotherapy treatments used in case of dental caries, can in no way replace the act of the dental surgeon. In these treatments, we must fight the infection and inflammation while acting on its etiological factors, relying essentially on oral hygiene. For this purpose, we use E.O. of clove (*Syzygium aromaticum*) in external use directly in the tooth or on a piece of cotton or compress. It is one of the leading remedies in phytotherapy that inhibits many bacterial germs and is locally analgesic and anti-inflammatory [25]. It has also been suggested to use an infusion for internal use for recurrent infections based on Sage (*Salvia officinalis*)



**Figure 21.** *Rubus fruticosus* L.



and Plantain (*Plantago major*) for its soothing, anti-inflammatory and antiseptic action. The infusion is used as a mouthwash and then swallowed for 8 to 10 days after the end of dental care. In addition, and according to a Brazilian study, the use of a toothpaste containing essential oil of peppermint (*Lippia sidoides*) would allow to significantly reduce the number of this bacteria in a durable way contrary to chlorhexidine. And although this study shows the effectiveness of the essential oil of *Lippia sidoides* against a bacterium responsible for dental caries, no protocol for the use of this essential oil has been found in the literature [57].

Moreover, in a classic allopathic practice, infectious cellulitis requires the use of antibiotics. However, the aromatic complex below, acting in an undifferentiated way on most germs, could be an alternative to the systematic use of antibiotics. An overconsumption of antibiotics makes the bacteria resistant. Moreover, this alternative would avoid the discomfort felt by the patient due to their toxicity (intestines, kidneys, skin, lungs) [57] [58]. Thus, take, by sublingual way, 1 drop per day during 5 days of the following complex.

- 5 drops of essential oil of Satureja Montana (mountain savory).
- 4 drops of Ravensara aromatica essential oil (aromatic ravensare).
- 4 drops of *Thymus vulgaris* linaloliferum essential oil (linalol thyme).
- 4 drops of essential oil of Rosmarinus officinalis cineoliferum (Rosemary officinalis cineol).
- 3 drops of essential oil of Anetum graveolens (fragrant dill) [59].

A Brazilian study published in 2015, demonstrates that thymol and carvacrol, present in the essential oil of *Origanum vulgare* (Wild Marjoram) allow to potentiate the action of antibiotics and reduce the resistance mechanisms developed by bacteria. Indeed, the values of the minimal inhibitory concentration are lower when antibiotics are combined with the essential oil of wild marjoram in order to inhibit the growth of *Staphylococcus aureus* [59]. Similarly, another South African study conducted in 2015 showed the antifungal action on *Candida albicans* of thymol and carvacrol. Indeed, these 2 molecules compromise the membrane permeability of *Candida*, thus its proper cellular functioning, which leads to its decline [60]. Thus, for cases of candidiasis, it was advised to carry out a mouthwash with bicarbonate of soda then to carry out 6 applications per day of the following mixture:

- 2 drops of essential oil of *Pelargonium asperum* (scented geranium).
- 2 drops of essential oil of *Origanum compactum* (Oregano).
- 1 drop of essential oil of Satureja Montana (mountain savory).

For herpes infections, a German study has demonstrated the in vitro effectiveness of thyme essential oil on HSV1. The study also shows that several essential oils could be an alternative to the resistance of the virus to aciclovir [61]. It has been proposed in the literature to apply 2 to 5 drops on the lesion 3 times a day of the following mixture:

- 3 ml of essential oil of *Melaleuca quinquenervia* cineolifera (Niaouli).
- 1 ml of essential oil of *Lavandula latifolia* (Lavender aspic).
- 1 ml of essential oil of *Thymus vulgaris* (common thyme).

As for gingival inflammation, a 2004 study published in the Australian Dental Journal showed that the application of a gel containing tea tree oil, for 2 minutes twice a day for 8 weeks, significantly reduced gingival inflammation compared to a gel containing 0.2% Chlorhexidine [62]. However, when it is induced by plaque and tartar, hygiene motivation and plaque and tartar removal by the practitioner is required.

Application 3 to 4 times a day of the following mixture:

- 0.75 ml of essential oil of *Laurus nobilis* (noble laurel).
- 1.5 ml of essential oil of *Melaleuca alternifolia* (tea tree).
- 0.75 ml of essential oil of *Salvia officinalis* (sage).
- 1 ml of essential oil of *Ravensara aromatica* (aromatic ravensare).
- 0.75 ml of essential oil of *Gaultheria procumbens* (wintergreen).
- 0.25 ml of essential oil of *Mentha piperata* (peppermint) [57] [58] [59].

In cases of chronic periodontitis, the following preparation can be instilled into the periodontal pockets in the dental office:

- 3 ml of essential oil of *Melaleuca alternifolia* (tea tree).
- 3 ml of essential oil of *Laurus nobilis* (noble laurel).
- 2 ml of essential oil of *Commiphora molmol* (myrrh).
- 1 ml of essential oil of *Helichrysum italicum* (Italian helichrysum).
- 1 ml of essential oil of *Eugenia caryophyllus* (cloves).
- 20 ml of vegetable oil of *Calophyllum inophyllum* (calophylla inophyllum).
- 80 ml of vegetable oil of *Hypericum perforatum* (St. John's wort) [57] [58] [59].

The complex below can be prescribed in gingival massages using a cotton swab 3 to 4 times a day:

- 0.75 ml of essential oil of *Eugenia caryophyllus* (cloves).
- 1 ml of essential oil of *Lavandula burnatii* (hybrid lavender).
- 1 ml of essential oil of *Melaleuca alternifolia* (tea tree).
- 0.75 ml of essential oil of *Laurus nobilis* (laurel).
- 1.5 ml of essential oil of *Ravensara aromatica* (aromatic ravensare) [57] [58] [63].

An article published in 2004 in "Oral Microbiology Immunology" shows the importance of tea tree and lavender essential oils in the treatment of periodontitis [63]. Indeed, lavender essential oil has a bacteriostatic effect on the tested bacteria (*Porphyromonas gingivalis*, *Aggregatibacter actinomycetemcomitans*, *Fusobacterium nucleatum*, *Streptococcus mutans*, and *Streptococcus sobrinus*). Tea tree oil has a bactericidal action on *Porphyromonas gingivalis* and *Fusobacterium nucleatum*, which are, among others, bacteria involved in periodontal disease. Moreover, this essential oil inhibits the adhesion of *Porphyromonas gingivalis* to dental plaque [63].

## 6. Conclusion

In spite of the development of the chemical drug industry, traditional phytothe-

rapy is currently a source of remedy par excellence. The latter is widely used by people who trust popular medical practices and who cannot afford the costs of modern medicine. It can and should figure prominently in our everyday therapeutic arsenal, without being considered a marginal or outdated practice. Of course, it cannot solve all pathological situations on its own, but it is an undeniable ally in the search for well-being and must be developed.

### Conflicts of Interest

The authors declare no conflicts of interest.

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