



LITERATURE REVIEW:

Medicinal Plants and their Potential Application in Health "Green Dentistry":

A Literature Review

Plantas medicinales y su potencial aplicación en salud "Odontología Verde":

Una revisión de la literatura

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ABSTRACT: This study focuses on describing the potential use of medicinal plants in oral health. An electronic search was conducted in the PubMed and Scopus databases, limited to the last ten years. Key terms such as "phytodentistry", "medicinal herbs", "antimicrobials", "dentistry", "hygiene", and "oral health" were used. In addition, a manual search was performed to verify the articles cited in the bibliographies of the initial documents and the websites of the corresponding journals were explored. The search strategy was specifically adapted for Scopus and PubMed. In this review, articles dealing with medicinal plants and their potential use in oral health were selected. The results of the reviewed studies were grouped into three main categories: plants with anti-inflammatory, antimicrobial, and healing properties. An overview of the main characteristics, materials used, and designs of the reviewed studies is provided. It was found that several medicinal plants, such as Aloe Vera, Turmeric, and Cocoa, have significant potential for use in oral health. These plants have proven to be effective in studies to improve oral health. However, further research is needed to confirm these findings and develop practical applications for their use in dentistry. This study underscores the importance of further exploring the potential of medicinal plants in promoting oral health.

KEYWORDS: Phytotherapy; Medicinal plants; Oral health; Review.



RESUMEN: Este estudio se centra en la descripción del uso potencial de las plantas medicinales en la salud bucodental. Se realizó una búsqueda electrónica en las bases de datos PubMed y Scopus, limitada a los últimos diez años. Se utilizaron términos clave como "phytodentistry", "medicinal herbs", "antimicrobials", "dentistry", "hygiene" y "oral health". Además, se realizó una búsqueda manual para verificar los artículos citados en las bibliografías de los documentos iniciales y se exploraron los sitios web de las revistas correspondientes. La estrategia de búsqueda se adaptó específicamente para Scopus y PubMed. En esta revisión, se seleccionaron los artículos que trataban sobre plantas medicinales y su uso potencial en la salud bucodental. Los resultados de los estudios revisados se agruparon en tres categorías principales: plantas con propiedades antiinflamatorias, antimicrobianas y cicatrizantes. Se ofrece un resumen de las principales características, materiales utilizados y diseños de los estudios revisados. Se descubrió que varias plantas medicinales, como el aloe vera, la cúrcuma y el cacao, tienen un potencial significativo para su uso en la salud bucodental. Estas plantas han demostrado su eficacia en estudios para mejorar la salud bucodental. Sin embargo, se necesitan más investigaciones para confirmar estos hallazgos y desarrollar aplicaciones prácticas para su uso en odontología. Este estudio subraya la importancia de seguir explorando el potencial de las plantas medicinales para promover la salud bucodental.

PALABRAS CLAVE: Fitoterapia; Plantas medicinales; Salud oral; Revisión.

INTRODUCTION

Since ancient times, mankind has sought cures for various diseases, therefore, the ancient concept was to discover in plants the healing powers. In traditional medicine, the application of such plants is fundamental and of great importance because they have a wide field of herbal medicine by increasing credibility and therapeutic value (1). In various cultures around the world, plants form a useful skill in the field of health, such as application in different conditions to alleviate or moderate discomfort.

In the dental field, the characteristics of medicinal plants or herbs have benefited to mitigate pain in the teeth, inflammation of the gums or oral mucosa or other oral pathologies, thereby preventing oral diseases (2). Medicinal plants are derived from analgesic agents such as antiseptics, antiseptics, antibacterials, antimicrobials, antioxidants, and antivirals in a direct or indirect way (3).

The herbs pointed out in this article were curcuma, caraway, chamomile, echinacea, myrrh, rosemary, sage, thyme, Aloe vera, mint, cannabis, cocoa, and their respective usefulness in dentistry. There are multiple uses of these medicinal herbs mentioned, since they are used to cleanse blood from some part of the body, reduce inflammation or soothe irritation and elimination of bacterial agents, etc (4). It should be noted that medicinal herbs are used as pills, syrups, and infusions (5, 6). In addition, in dentistry, plants help in oral disorders, whether oral mucosal, fungal, viral, or bacterial infections, gingivitis, biofilm, oral ulcers, among other oral pathologies (7). However, for current treatments, herbs may be a good choice for oral health problems, but it is very clear that more research is needed.

The most prominent among all herbs is Aloe vera, being the most used in the naturopathic industry to produce medicines and standing out among the most consumed plants. In dental work,

it is used as an antibiotic that helps to deal with bacterial plaque and preserves fresh breath, but it not only has antibacterial properties but also has anti-inflammatory and anti-inflammatory properties (8). In the area of dental health, some medicinal plants are manageable in various pharmaceutical formulations, such as mouthwashes or mouth rinses, toothpastes, topical medication, among others. Thus, offering the population an economical therapeutic treatment (9).

The aim of this literature review article was to describe the potential use of medicinal plants in oral health.

MATERIAS AND METHODS

STUDY SELECTION

For the characterization of the studies to be included in this review, an electronic search with date limitation was carried out with the last 10 years in the PubMed and Scopus databases. The following main keywords were used: "phytodontology"; "medicinal herbs"; "antimicrobials"; "dentistry"; "hygiene" and "oral health". Additionally, a manual search was also performed; checking the authorized articles in the bibliographies of the articles initially used and exploring the websites of the corresponding journals.

SEARCH STRATEGY

The following search strategy was established: TITLE-ABS-KEY("medicinal plant*" OR "phytotherapy" OR "plant extracts" OR "ethnopharmacology" OR "herbal medicine" OR "herbal medicine" OR "botanical medicine") AND TITLE-ABS-KEY("oral health" OR "oral mucosa" OR "oral hygiene" OR "oral diseases" OR "green dentistry" OR "sustainable dentistry" OR "ecological dentistry").

INCLUSION CRITERIA

The present review selected articles related to medicinal plants and their potential use in oral health. We also searched for clinical trials and studies that referred to basic concepts of each medicinal plant. Medicinal plants were limited to publications containing turmeric, caraway, chamomile, echinacea, myrrh, peppermint, rosemary, sage, thyme, marijuana (*Cannabis Sativa*), and Aloe vera. The search was limited to articles published in the English language only.

EXCLUSION CRITERIA

Publications focused on meta-analysis, systematic reviews, and case reports are not being included in this review. Additionally, articles in any language other than English that are more than 10 years old have been excluded from the review.

RESULTS

The results of the reviewed studies were classified and presented in 3 main parts: anti-inflammatory, antimicrobial and wound healing plants. The overview of the main characteristics, materials used, and designs of the reviewed studies are reported in Table 1.

ALOE VERA

Aloe vera has 3 important components: antibacterial, healing and anti-inflammatory that were used to study the mouthwash, due to its aloin and emodin derivatives that serve to neutralize any discomfort presented by the patient (2). Several studies have reflected its germ-fighting similarity between aloe vera gel and conventional toothpastes, revealing aloe vera gel to have great ability and effectiveness in neutralizing caries-

causing agents like conventional toothpastes (2). The discovery reveals that the aloe vera product can be used as a second pharmacological option to alleviate the discomfort of carious diseases that infect and inflame tissues, the study tests the product in treatments such as oral surgery, endodontics, and periodontics (3).

CURCUMA (CURCUMA LONGA)

It is an herbaceous perennial plant that is mostly used as a dye at oriental level, it stands out for its anti-inflammatory, anti-pain and antibacterial properties, the dose required for effectiveness comes from curcumin, it helps to reduce body inflammations and at dental level it inhibits bacteria that affect the oral cavity based on a dose required to activate the substance. Curcumin is a mouthwash supplement that acts preventively against any inflammatory agent in the oral cavity, it is also used as a protector against any bacterial infection (3).

COCOA (THEOBROMA CACAO)

It is a plant that grows in humidity and warm lands that stands out for its important components that help treat various problems such as joint, hypertension and blood circulation due to the components containing diuretics and vasodilators. At the dental level Theobroma cacao is being implemented as toothpaste because of its theobromine compound, being an ingredient that stands out for the teeth due to the compound it carries, theobromine helps prevent possible tooth sensitivity and the onset of caries (4).

CHAMOMILE (MATRICARIA CHAMOMILLA)

Its main components of matricaria chamomilla are azulene, caffeic acid, vitamin C, sesquiterpene alcohol among others, which have various anti-inflammatory, antiviral, antibacterial, healing, and antifungal actions (2, 4). It is used in most treatments containing inflammation at periodontal level due to its anti-inflammatory action that the plant has as importance. Additionally, this plant also acts on the biofilm causing one of the main oral diseases in the patient who enters consultation with periodontitis. Studies show that chamomile can reduce these alterations, being generally used in acute and chronic treatments at periodontal level (4).

PEPPERMINT (MENTHA)

It is an aromatic plant that contains several species and varieties, among the best known and used Mentha Piperita, contains a variety of acids such as tannins, triterpene, phenolics and essential oils that generate effects on the skin enriched in menthol compound with refreshing and toning effects (5). In dentistry, the use of peppermint extract serves to mask bad breath giving it a touch of freshness, it also helps to reduce inflammation and swelling of the gums due to gingivitis.

MARIJUANA (CANNABIS)

Cannabis is an herbaceous species of the Cannabaceae family that has no side effects when applied locally, as it is highly effective, it benefits the therapeutic stimulation in the presence of

caries, gingivitis, and periodontal diseases (7). Variety of uses can be provided at a dental level as mouthwashes or for disinfection with solutions in root canals, analgesics are also implemented to reduce inflammation with pain and in treatments that present oral anxiety or oncological therapies. Its applications are in daily doses that vary up to three times a day with a correct brushing, mouthwashes or chewing gums. A complement such as CBD powder and polishing powder serves to combat biofilm with an abrasive air, studies present this method as a new way to remove more biofilm.

ECHINACEA ECHINACEA ANGUSTIFOLIA

It presents main groups that can work together to accelerate the activity of lymphocytes and macrophages, adding alkylamides, which are compounds of polysaccharides and caffeic acid. In dentistry, oral language is implemented with echinacea compound to prevent periodontal diseases and gingivitis, mixed with sage, peppermint, peppermint oil and chamomile (8).

MYRRH

Myrrh, a natural substance, is primarily composed of resin, gum, and volatile oil. The resin component has been found to activate macrophages, potentially aiding in the elimination of these cells, and provides a calming effect on inflamed tissues in the mouth and throat. Research has been conducted to explore the potential anticancer and pain-relieving properties of myrrh resin (9). In a clinical trial, patients with parasitic infections were treated with a blend of myrrh resin and essential oil, which was applied topically to alleviate mild inflammation in the mucosa and throat (10-12). Furthermore, a tincture of myrrh is commonly used

to treat inflammation in oral tissues, such as in cases of gingivitis and stomatitis.

THYME (THYMUS VULGARIS)

Thyme, a plant rich in phenols and thymol that contribute to its volatile oils, is balanced by the actions of flavonoids. Whether used independently or in conjunction with other herbs like solar dew, it continues to be a favored remedy in Europe for the alleviation of dry coughs, including conditions like whooping cough. An ointment composed of thyme, myrrh, and goldenseal is suggested for the treatment of oral herpes (13).

SAGE (SALVIA)

Caraway, also referred to as meadow cumin, is a herb that contains 3-7% volatile oil, primarily composed of carvone and limonene. These components are beneficial in treating gingivitis and periodontal disease, and they also provide relief from intestinal spasms. A successful treatment for irritable bowel syndrome (IBS) has been reported when caraway is used in combination with enteric-coated peppermint oil (14).

ROSEMARY (ROSMARINUS OFFICINALIS L.)

It is a variable oil that complemented with eucalyptus generates an important antibacterial effect that combats chronic candidiasis and acts to relax smooth muscle at the level of the lungs (15). Its antioxidant and antibacterial properties have presented an antimicrobial variety in bacteria, molds, Gram negative and Gram positive and even *Staphylococcus albus*, *Escherichia coli* were found. Rosemary as mentioned in studies at the dental level works as a healing, antiseptic, anti-inflammatory in patients who require it.

Table 1. Characteristics of the studies.

Author	Objective	Country	Study design	Main findings
Natto ZS, <i>et al.</i> (4) 2022	To assess knowledge about the use of herbal medicines and potential benefits and side effects	Arabia Saudita	Descriptive study	Increased awareness of the use and potential side on the effects of herbal medicine in dentistry.
Bhandary S, <i>et al.</i> (6) 2023	To analyze its medical uses of curcuma in dentistry.	India	Narrative review	Efficacy of curcumin in the treatment of acute inflammation as phenylbutazone or in situations of chronic inflammation as cortisone.
Landeo-Villanueva GE, <i>et al.</i> (7) 2023	To estimate the inhibitory activity of commercially available essential oils of <i>Mentha spicata</i> (peppermint) and <i>Eucalyptus globulus</i> (eucalyptus).	Peru	Experimental <i>in vitro</i> study	Essential oils showed antimicrobial activity against planktonic and biofilm cultures of <i>Streptococcus mutans</i> .
Ahuja A, <i>et al.</i> (8) 2022	To provide a cost-effective herbal treatment for oral care.	India	Review	Detection of antimicrobial formulations such as toothpastes, gargles, throat paints, mouthwashes, and mouth sprays containing herbs cost-effective ways to promote medical care.
Lowe H, <i>et al.</i> (12) 2021	To investigate the potential of secondary metabolites of <i>C. sativa L.</i> in the treatment of dental and oral diseases.	Canada	Literature review	This plant is a known anti-inflammatory, analgesic, anxiolytic, antimicrobial and anticancer agent that may have therapeutic potential against conditions such as burning mouth syndrome, dental anxiety, gingivitis, and possible oral cancer.
Venkatesh <i>et al.</i> (13) 2011	To compare the antimicrobial efficacy of chlorhexidine and mouth rinses with cocoa bean shell extract in children.	India	Clinical Trial	Promising biological characteristics for application in dentistry, despite existing patents suggesting current compositions for oral care.
Vara-Delgado A, <i>et al.</i> (17) 2019	To Stabilize scientific support for the use of chamomile in the treatment of periodontal diseases.	Cuba	Review	Chamomile has anti-inflammatory, antimicrobial, regenerating and healing properties, it is also considered a therapeutic property in the treatment of periodontal
Azab, Abdullatif <i>et al.</i> (19) 2016	To provide a broader view on the anti-inflammatory activities of natural products.	Israel	Review	Compounds derived from natural products exert potent anti-inflammatory properties. However, if proven effective and safe.
López Villarreal SM. <i>et al.</i> (20) 2022	To evaluate the antimicrobial, anticoagulant, antioxidant, cytotoxic and anti-inflammatory potential of ethanolic extracts of Aloe vera.	Mexico	Experimental <i>in vitro</i> study	Evaluation of anti-inflammatory activity by ELISA, where A. vera extract showed the best anti-inflammatory capacity.

DISCUSSION

Based on the references reviewed, it is shown that there is a great variety of medicinal plants, which are used in different health areas. However, there are few articles detailing the compounds and methods to verify their effects. One of their disadvantages with respect to treatments that implement the use of plants denigrate these methods due to their lack of scientific validation (4).

At the dental level, one of the biggest problems is biofilm, therefore, to prevent it, good hygiene is needed, which involves brushing, flossing and mouthwash, the latter being an alternative that can be applied with medicinal plants (8). Therefore, in our data collection we have different alternatives that demonstrate their effectiveness, one of the most prominent is cannabis, aloe vera and curcuma.

Medicinal plants or herbs come to play a fundamental role to prevent or alleviate pathologies of the oral cavity, these are used in dentistry in 2 ways, the first through the inquiry of traditional medicine and the second by its preparation in toothpastes, topical paste, mouthwashes, or rinses, etc., to prevent gingivitis, canker sores, odontalgia, relieve pain or inflammatory processes, infections, and other conditions. All these plants mentioned in the review are those healing arts that are part of the cultural heritage, being a mixture of each nation (10).

Natural medicine presents an end to combat with pathogens since these possess components or antimicrobial properties, and for this reason, it has recently received much attention from scientists (15). Due to the presence of a curative method, it allows the individual to make the discovery of a maximum level of health in their lifestyle, since it has multiple uses of natural elements.

In the limitations it is evident the little information regarding the study of medicinal plants a scientific method is needed, first its profile, taxonomy, where it comes from, etc. is studied. For this reason, at present there are regulations that are raised from the World Health Organization (WHO) to each country and each one of them presents its specific legislation on how to collect the plant, its classification and how it should be preserved so that they are of good quality, thus ensuring patients (16-18). All this process makes the person observe the efficacy and safety of each medicinal plant before formulating a new drug.

The strengths in this review are based on getting a healing capacity in a plant and finding effectiveness of several active principles, then, the more you study what is inside a plant, the more you will be able to differentiate and see how they complement each other, for these two plants are complemented to achieve a better effect. From a curative point of view, better synergies have been achieved than with a patent medicine (19-21). On the other hand, research on stem cells derived from dental pulp is also important due to their biomolecules with bioactive properties, as they have shown promising results in the field of regenerative medicine. Some studies underline the importance of research on medicinal plants and their derivatives in combination with biomolecules such as taurine and cordycepin, which could have potential applications in tissue regeneration, including cartilage. However, further research is needed to fully explore these findings and their clinical applicability (22-23).

Finally, it is important to mention that no medicinal plant is prescribed by a dentist because of the scarce scientific research. However, they collaborate in the therapeutic part and play a role in the protection of human health.

CONCLUSIONS

Based on the literature reviewed, natural medicine provides greater benefit to mankind because of its source of biologically active products, facilitating important advances in the therapeutics of various diseases of the oral cavity. In dentistry, the use of medicinal plants is employed since ancient times to alleviate the various pathologies that occur in the oral mucosa. In green ecology, medicinal plants, or herbs such as Aloe vera, turmeric, cocoa, chamomile, mint, cannabis, echinacea, myrrh, thyme, sage, rosemary, keep their value in stomatological therapeutics for having a vigorous, economic, and innocuous method that regularly improves the diversity of stomatological affections such as gingivitis, oral aphthous ulcers, odontalgia and stomatitis. However, there is still not enough scientific basis to be medicated by a dentist, they can be a good choice for oral health problems, but it is very clear that more research is needed.

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CONFLICTS OF INTEREST

There are no conflicts of interest.

AUTHOR CONTRIBUTIONS STATEMENT

Conceptualization and design: N.L and M.B.
Literature review: F.M.T. and F.M.
Methodology and validation: F.E.C. and F.M.
Investigation and data collection: D.A.T.
Data analysis and interpretation: D.A.T., F.M. and F.M.T.
Writing-original draft preparation: N.L. and M.B.
Writing-review & editing: F.E.C. and F.M.T.
Supervision: F.M.T

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