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A Review

Veterinary Medicine

Herbal Treatments for Dental Cysts: Insights from Traditional Iranian Medicine and Evidence from Animal and Clinical Models. A Review

Tratamentos Fitoterápicos para Cistos Dentários: Perspetivas da Medicina Tradicional Iraniana e Evidências de Modelos Animais e Clínicos. Uma Revisão

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Abstract: Dental cysts are epithelial lesions filled with fluid that form around the roots of teeth, often leading to inflammation and infection of surrounding tissues. Considering the limitations and side effects associated with conventional chemical therapies, the use of native Iranian medicinal plants as a complementary approach to manage inflammation and infection in these cysts has garnered increasing attention. The aim of this review is to identify and compile native Iranian medicinal plants that may help prevent and alleviate the symptoms of dental cysts. This descriptive-systematic review examined traditional medicine sources alongside international scientific databases to identify medicinal plants effective against dental cysts. Data collected included pharmacological effects, active compounds, and potential mechanisms of action, which were summarized in tables to provide a comprehensive reference for future research and clinical applications. The findings revealed a diverse array of native Iranian medicinal plants used for the prevention and symptomatic relief of dental cysts, including *Curcuma longa* L., *Melaleuca alternifolia* (Maiden & Betche) Cheel, *Trigonella foenum-graecum* L., *Syzygium aromaticum* (L.) Merr. & L.M. Perry, *Allium sativum* L., *Thymus vulgaris* L., *Malus domestica* Borkh., *Apium graveolens* L., *Citrus limon* (L.) Osbeck, *Glycyrrhiza glabra* L., *Camellia sinensis* (L.)

Kuntze, Aloe vera (L.) Burm.f., Matricaria chamomilla L., Lavandula angustifolia Mill., Origanum vulgare L., Cocos nucifera L., Rosa damascena Mill., Valeriana officinalis L., Silybum marianum (L.) Gaertn., Iris germanica L., Mentha piperita L., Salvia officinalis L., Foeniculum vulgare Mill., Viola odorata L., Boswellia sacra Flueck., Nigella sativa L., Elettaria cardamomum (L.) Maton, Cinnamomum verum J. Presl, Salix alba L. Leaves were the most commonly used plant part, followed by flowers, stems, and fruits, while seeds, roots, and rhizomes were less frequently applied. Plant families with the highest representation included Lamiaceae, Zingiberaceae, and Myrtaceae, with herbs and woody plants being the predominant growth forms. Most species thrived in garden and agricultural habitats. Native Iranian medicinal plants possess anti-inflammatory, antibacterial, and tissue-regenerative properties and can serve as complementary interventions to reduce inflammation and control infection in dental cysts. Nevertheless, conventional medical and dental treatments remain essential for complete cyst resolution and prevention of complications. This review provides a scientific foundation for future studies and the development of integrative therapeutic approaches.

Keywords: Dental cyst, Traditional medicine, Oral health, Medicinal plants, Iranian flora

Resumo: Os cistos dentários são lesões epiteliais preenchidas por líquido que se formam em torno das raízes dos dentes, frequentemente levando à inflamação e infecção dos tecidos adjacentes. Tendo em conta as limitações e os efeitos adversos associados às terapias químicas convencionais, o uso de plantas medicinais nativas do Irã como abordagem complementar para o controlo da inflamação e da infeção nesses cistos tem despertado um interesse crescente. O objetivo desta revisão foi identificar e compilar plantas medicinais nativas iranianas que possam contribuir para a prevenção e o alívio dos sintomas dos cistos dentários. Esta revisão descritivo-sistemática analisou fontes da medicina tradicional juntamente com bases de dados científicas internacionais, com o intuito de identificar plantas medicinais eficazes no tratamento dos cistos dentários. Os dados recolhidos incluíram efeitos farmacológicos, compostos ativos e potenciais mecanismos de ação, os quais foram organizados em tabelas para fornecer uma referência abrangente para futuras investigações e aplicações clínicas. Os resultados revelaram uma grande diversidade de plantas medicinais nativas do Irão utilizadas na prevenção e no alívio sintomático dos cistos dentários, incluindo *Curcuma longa* L., *Melaleuca alternifolia* (Maiden & Betcher) Cheel, *Trigonella foenum-graecum* L., *Syzygium aromaticum* (L.) Merr. & L.M. Perry, *Allium sativum* L., *Thymus vulgaris* L., *Malus domestica* Borkh., *Apium graveolens* L., *Citrus limon* (L.) Osbeck, *Glycyrrhiza glabra* L., *Camellia sinensis* (L.) Kuntze, *Aloe vera* (L.) Burm.f., *Matricaria chamomilla* L., *Lavandula angustifolia* Mill., *Origanum*

vulgare L., *Cocos nucifera* L., *Rosa damascena* Mill., *Valeriana officinalis* L., *Silybum marianum* (L.) Gaertn., *Iris germanica* L., *Mentha piperita* L., *Salvia officinalis* L., *Foeniculum vulgare* Mill., *Viola odorata* L., *Boswellia sacra* Flueck., *Nigella sativa* L., *Elettaria cardamomum* (L.) Maton, *Cinnamomum verum* J. Presl e *Salix alba* L. As folhas foram a parte da planta mais frequentemente utilizada, seguidas por flores, caules e frutos, enquanto sementes, raízes e rizomas foram menos frequentemente aplicados. As famílias botânicas com maior representatividade incluíram Lamiaceae, Zingiberaceae e Myrtaceae, sendo as ervas e as plantas lenhosas as formas de crescimento predominantes. A maioria das espécies desenvolve-se em ambientes de jardins e áreas agrícolas. As plantas medicinais nativas do Irão apresentam propriedades anti-inflamatórias, antibacterianas e regeneradoras de tecidos, podendo atuar como intervenções complementares na redução da inflamação e no controlo da infeção associada aos cistos dentários. No entanto, os tratamentos médicos e dentários convencionais continuam a ser essenciais para a resolução completa dos cistos e para a prevenção de complicações. Esta revisão fornece uma base científica para futuros estudos e para o desenvolvimento de abordagens terapêuticas integrativas.

Palavras-chave: cisto dentário, medicina tradicional, saúde oral, plantas medicinais, flora iraniana

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Introduction

Oral health is a fundamental component of public hygiene and overall quality of life, and the timely prevention of oral diseases such as dental caries and

gingivitis can help prevent systemic complications and reduce associated healthcare costs (KAKUYI NEZHAD, GHAZNAVI, 2024; JAMALI et al, 2020; GHAZNAVI,

YSIUK, 2024; YAVARI et al, 2017; JAMALI et al, 2020; GHAZNAVI et al, 2024).

Oral and dental diseases rank among the most prevalent health issues across societies, ranging from minor discomforts such as gingival inflammation and pain to more severe conditions, including extensive caries and tooth loss (Smith et al., 2020). These disorders not only diminish patients' quality of life but also impose substantial economic burdens on healthcare systems (SILK, 2014).

Dental cysts, as common pathological lesions in the jaw and teeth, develop as epithelial-lined cavities filled with fluid or semi-fluid material, typically forming around the tooth root (LI et al., 2023). Early stages of these lesions are often asymptomatic, becoming clinically evident only when they enlarge or lead to complications such as pain, swelling, or tooth displacement (Browne, 1975). Common types of dental cysts include radicular (periapical) cysts, periodontal cysts, dentigerous cysts, odontogenic keratocysts, and gingival cysts (BANU et al., 2014).

The formation of dental cysts primarily results from growth disturbances, tissue injury, or chronic inflammatory responses (COUNSELL, 1931). Frequent contributing factors include abnormal tooth development, impacted teeth, complications following root canal treatment, wisdom teeth, and certain genetic conditions, such as Gorlin syndrome (HARRIS & TOLLER, 1975). Cyst expansion, driven by fluid accumulation and epithelial proliferation along with protease activity, can lead to adjacent bone resorption and, in some cases, clinically apparent lesions (HARRIS & TOLLER, 1975).

Diagnosis of dental cysts relies on clinical examination and imaging techniques (VIJAYAKUMARI et al., 2012). Conventional radiography is usually the first diagnostic step, while CT scans, MRI, and, in cases with suspected malignancy, biopsy are recommended for larger or more complex lesions (VIJAYAKUMARI et al., 2012).

Common treatments include simple surgical excision, marsupialization, root canal therapy, laser

therapy, cryotherapy, or tooth extraction, while pharmacological interventions mainly serve to manage pain and inflammation (FICKLING, 1965).

Medication-based approaches are primarily supportive, involving antibiotics, analgesics, and antiseptic mouthwashes to control temporary pain, inflammation, and infection, whereas definitive cyst treatment generally requires dental procedures such as surgery or root canal therapy (Bystedt & Nord, 1982). Chemical agents for dental cysts may cause adverse effects, including hypersensitivity, gastrointestinal disturbances, tooth discoloration, and mucosal thinning, and should be used under dental supervision (BASCONES-MARTÍNEZ, MUÑOZ-CORCUERA & BASCONES-ILUNDAIN, 2015). Traditional medicine and herbal therapy, employing anti-inflammatory and antibacterial plants such as turmeric, garlic, clove, and thyme through herbal mouth rinses or topical compresses, can aid in reducing inflammation and controlling infection (ARUMUGAM, SUBRAMANIAM & ALAGARAJ, 2020).

Nevertheless, for definitive treatment and prevention of complications, consultation with a dentist and adherence to conventional medical care remain essential (ARUMUGAM, SUBRAMANIAM & ALAGARAJ, 2020). The aim of this review is to identify and compile both scientific and traditional evidence regarding medicinal plants effective in managing dental cysts, providing a comprehensive reference for future research and clinical applications.

Methods

This study was conducted as a descriptive-systematic review with the aim of identifying and compiling both traditional and scientific evidence regarding native Iranian medicinal plants with potential effects in the management of dental cysts.

In the first step, classical texts of Iranian traditional medicine and reputable online sources related to medicinal plants were examined to identify plant species used for the prevention or treatment of dental cysts. This phase involved a thorough review of classical and authoritative references in traditional medicine

(AZADBAKHT, 2015; HOSSEINI-SHIRAZI, 2019; ELYASI, 2012; NEJATBAKHS, 2016; SHAMS ARDAKANI, 2017; HOSSEINI-SHIRAZI, 2018; HAJISHARIFI, 2019; MEHRABI, 2020; KHEIRANDISH, 2018; TABRIZIAN, 2019).

Subsequently, a modern scientific search was conducted across international databases, including Web of Science, PubMed, Google Scholar, and ISC, to collect experimental and clinical evidence on the pharmacological effects of these plants. The search strategy incorporated both scientific and common plant names along with keywords such as “Dental cyst,” “Oral cyst,” “Herbal therapy,” and “Traditional medicine.”

Inclusion criteria:

The present review included studies published in either Persian or English that reported on the pharmacological effects of medicinal plants in the management of dental cysts. In addition, traditional references documenting the use of plants for oral and dental lesions were considered to provide a comprehensive overview of both modern

pharmacological evidence and historical or ethnobotanical knowledge.

Exclusion criteria:

Studies were excluded if they focused solely on medicinal plants unrelated to oral or dental health. Articles that lacked full text or sufficient data were also excluded, as were non-scientific sources or websites without established academic credibility. Additionally, duplicate articles identified across multiple databases were removed to ensure the uniqueness and reliability of the included studies. Following the application of these criteria, extracted data including scientific names of plants, plant parts used, pharmacological effects, potential mechanisms of action, and other relevant information—were organized and summarized in tables, providing a comprehensive reference of medicinal plants effective in managing dental cysts.

Results

Review of traditional sources and scientific evidence revealed that a diverse array of native Iranian medicinal plants is used for the prevention and alleviation

of dental cyst symptoms. Among these, plants such as turmeric (*Curcuma longa*), tea tree (*Melaleuca alternifolia*), fenugreek (*Trigonella foenum-graecum*), clove (*Syzygium aromaticum*), garlic (*Allium sativum*), and thyme (*Thymus vulgaris*) possess notable anti-inflammatory and antibacterial properties. Additionally, species including apple, celery, lemon, licorice (*Glycyrrhiza glabra*), green tea, and *Aloe vera* are employed as natural adjuncts to enhance oral health and reduce infections.

Other plants highlighted in both traditional texts and experimental studies include chamomile (*Matricaria chamomilla*), lavender (*Lavandula* spp.), oregano (*Origanum vulgare*), coconut, rose (*Rosa* spp.), valerian (*Valeriana officinalis*), milk thistle (*Silybum marianum*),

iris, peppermint (*Mentha piperita*), sage (*Salvia officinalis*), fennel (*Foeniculum vulgare*), white violet (*Viola odorata*), frankincense (*Boswellia* spp.), black seed (*Nigella sativa*), cardamom (*Elettaria cardamomum*), cinnamon (*Cinnamomum verum*), and white willow (*Salix alba*).

These plants have been shown to contribute significantly to inflammation control and the facilitation of tissue repair around cystic lesions.

These findings indicate that the medicinal flora of Iran represents a valuable resource for complementary management of dental cysts and provides preliminary evidence to support future clinical investigations. Table 1 lists native Iranian medicinal plants used for the prevention and symptomatic relief of dental cysts

Table 1. Iranian medicinal plants used for prevention and alleviation of dental cyst symptoms

Common English Name	Scientific Name	Plant Family	Plant Part Used
Turmeric	<i>Curcuma longa</i> L.	Zingiberaceae	Rhizome
Tea Tree	<i>Melaleuca alternifolia</i> (Maiden & Betche) Cheel	Myrtaceae	Leaf & Oil
Fenugreek	<i>Trigonella foenum-graecum</i> L.	Fabaceae	Seed & Leaf
Clove	<i>Syzygium aromaticum</i> (L.) Merr. & L.M. Perry	Myrtaceae	Flower Bud
Garlic	<i>Allium sativum</i> L.	Amaryllidaceae	Bulb
Thyme	<i>Thymus vulgaris</i> L.	Lamiaceae	Leaf & Stem
Apple	<i>Malus domestica</i> Borkh.	Rosaceae	Fruit
Celery	<i>Apium graveolens</i> L.	Apiaceae	Leaf & Stem
Lemon	<i>Citrus limon</i> (L.) Osbeck	Rutaceae	Fruit
Licorice	<i>Glycyrrhiza glabra</i> L.	Fabaceae	Root
Green Tea	<i>Camellia sinensis</i> (L.) Kuntze	Theaceae	Leaf
Aloe Vera	<i>Aloe vera</i> (L.) Burm.f.	Asphodelaceae	Leaf
Chamomile	<i>Matricaria chamomilla</i> L.	Asteraceae	Flower
Lavender	<i>Lavandula angustifolia</i> Mill.	Lamiaceae	Flower
Oregano	<i>Origanum vulgare</i> L.	Lamiaceae	Leaf & Stem
Coconut	<i>Cocos nucifera</i> L.	Arecaceae	Fruit
Damask Rose	<i>Rosa damascena</i> Mill.	Rosaceae	Flower
Valerian	<i>Valeriana officinalis</i> L.	Caprifoliaceae	Root
Milk Thistle	<i>Silybum marianum</i> (L.) Gaertn.	Asteraceae	Leaf & Seed
Iris	<i>Iris germanica</i> L.	Iridaceae	Rhizome & Flower
Peppermint	<i>Mentha piperita</i> L.	Lamiaceae	Leaf
Sage	<i>Salvia officinalis</i> L.	Lamiaceae	Leaf
Fennel	<i>Foeniculum vulgare</i> Mill.	Apiaceae	Seed & Leaf
White Violet	<i>Viola odorata</i> L.	Violaceae	Flower & Leaf
Frankincense	<i>Boswellia sacra</i> Flueck.	Burseraceae	Resin
Black Cumin	<i>Nigella sativa</i> L.	Ranunculaceae	Seed
Cardamom	<i>Elettaria cardamomum</i> (L.) Maton	Zingiberaceae	Seed
Cinnamon	<i>Cinnamomum verum</i> J. Presl	Lauraceae	Bark
White Willow	<i>Salix Alba</i> L.	Salicaceae	Bark & Leaf

Plant families with the highest frequency included Lamiaceae, represented five times, followed by Zingiberaceae, Myrtaceae, Fabaceae, Rosaceae, Apiaceae, and Asteraceae, each occurring twice. All other families were observed only once.

The most used plant parts were leaves. Plant parts used moderately included flowers, as well as combinations of leaves, stems, and fruits.

Less frequently used parts included seeds, seeds with leaves, and roots, while rhizomes, rhizomes with flowers, flower buds, flowers with leaves, bulbs/garlic, resins, bark, and bark with leaves were utilized very rarely. Table 2 summarizes the active compounds and proposed mechanisms of action of native Iranian medicinal plants in the management and improvement of dental cysts

Table 2. Active compounds and mechanisms of action of selected Iranian medicinal plants in the management and improvement of dental cysts

Scientific Name	Active Compounds	Mechanism of Action	Reference
<i>Curcuma longa</i> L.	Curcumin, Curcuminoids	Anti-inflammatory, Antioxidant, Tissue repair promotion	Okhovatfard et al., 2023
<i>Melaleuca alternifolia</i> (Maiden & Betche) Cheel	Terpenoids, Thiols	Antibacterial, Infection inhibition (delayed healing in animal models)	Kreuger et al., 2007
<i>Trigonella foenum-graecum</i> L.	Saponins, Flavonoids	Local protection, Reduces inflammation and pain	Ansari et al., 2022
<i>Syzygium aromaticum</i> (L.) Merr. & L.M. Perry	Eugenol	Antibacterial, Anti-inflammatory	Kaur & Chandrul, 2017
<i>Allium sativum</i> L.	Allyl sulfides, Allicin	Biofilm inhibition, Reduces bacterial acid production	Bin et al., 2020
<i>Thymus vulgaris</i> L.	Thymol, Carvacrol	Antibacterial, Anti-inflammatory, Antifungal	Gonçalves et al., 2011
<i>Malus domestica</i> Borkh.	Flavonoids, Polyphenols	Antioxidant Reduces oxidative stress	Patocka et al., 2020

<i>Apium graveolens</i> L.	Flavonoids, Linalool	Anti-inflammatory, Inhibits cancer cell growth	Hartono et al., 2024
<i>Citrus limon</i> (L.) Osbeck	Limonene, Vitamin C	Antioxidant, Nitric oxide inhibition, Teeth whitening	Jeong, 2021
<i>Glycyrrhiza glabra</i> L.	Glycyrrhizin	Anti-inflammatory, Antiviral, Antifungal	Sidhu et al., 2020
<i>Camellia sinensis</i> (L.) Kuntze	Catechins, Epigallocatechin gallate	Biofilm inhibition, Reduces dental caries	Goenka et al., 2013
<i>Aloe vera</i> (L.) Burm.f.	Aloin, Aloeic acid	Anti-inflammatory, Tissue repair, Antifungal	Mangaiyarkarasi et al., 2015
<i>Matricaria chamomilla</i> L.	Apigenin, Chamazulene	Anti-inflammatory, Pain relief	Machado et al., 2017
<i>Lavandula angustifolia</i> Mill.	Linalool, Linalyl acetate	Antifungal, Antibacterial, Antioxidant	Nasiri et al., 2022
<i>Origanum vulgare</i> L.	Carvacrol, Thymol	Antibacterial, Anti-biofilm, Anti-virulence	Idir et al., 2022
<i>Cocos nucifera</i> L.	Lauric acid, Polyphenols	Antibacterial, Oral moisturizer	Jose et al., 2014
<i>Rosa damascena</i> Mill.	Rose oil, Flavonoids	Anti-inflammatory, Antioxidant	Nlal et al., 2023
<i>Valeriana officinalis</i> L.	Valerenic acids, Valepotriates	Sedative, Local anti-inflammatory	Farah et al., 2019
<i>Silybum marianum</i> (L.) Gaertn.	Silymarin, Flavonoids	Antifungal, Anti-inflammatory, Tissue repair support	Qasim & Hashim, 2023
<i>Iris germanica</i> L.	Iridins, Flavonoids	Antibacterial Biofilm inhibition	Hoang et al., 2020
<i>Mentha piperita</i> L.	Menthol, Menthone	Antibacterial, Reduces dental caries	Fayed, 2019
<i>Salvia officinalis</i> L.	Salvian, Flavonoids	Anti-inflammatory, Antiviral, Antifungal	Eidi & Ghahramani, 2023

<i>Foeniculum vulgare</i> Mill.	Anethole, Flavonoids	Antibacterial, Anti-inflammatory, Antispasmodic	Golestannejad et al., 2018
<i>Viola odorata</i> L.	Saponins, Flavonoids	Antibacterial, Anti-inflammatory	Mehrabkhani et al., 2024
<i>Boswellia sacra</i> Flueck.	Boswellic acids	Antibacterial Reduces oral microbial load	Sabra & Al-Masoudi, 2014
<i>Nigella sativa</i> L.	Thymoquinone (TQ)	Anti-inflammatory, Antibacterial, Reduces plaque and gingivitis	Al-Wafi, 2014
<i>Elettaria cardamomum</i> (L.) Maton	1,8-Cineole, Terpenoids	Antibacterial, Anti-biofilm	Aneja & Joshi, 2009
<i>Cinnamomum verum</i> J. Presl	Cinnamaldehyde, Eugenol	Antibacterial, Anti-biofilm	Yanakiev, 2020
<i>Salix Alba</i> L.	Salicin	Anti-inflammatory, Analgesic, Tissue inflammation reduction	Majeed et al., 2016

Anti-inflammatory and antibacterial properties were identified as the most prominent and frequently reported effects and mechanisms of action among this

collection of plants. Industrial and Technological Applications of Selected Medicinal Plants are shown in table 3.

Table 3. Industrial and Technological Applications of Selected Medicinal Plants

Scientific Name	Industrial and Technological Applications
<i>Curcuma longa</i> L.	Widely employed in the food industry as a natural colorant and flavor enhancer; in cosmetics and personal-care formulations for its antioxidant and anti-inflammatory properties; and in pharmaceuticals for the development of anticancer and anti-inflammatory agents.
<i>Melaleuca alternifolia</i>	The principal source of tea tree oil, extensively used in cosmetic products, disinfectants, topical creams, and oral- and body-care formulations.
<i>Trigonella foenum-graecum</i> L.	Utilized in nutraceuticals for cholesterol management, as a flavoring agent in the food industry, and in cosmetic preparations for its emollient and anti-aging effects.

<i>Syzygium aromaticum</i> (L.) Merr. & L.M. Perry (Clove)	The main natural source of eugenol, employed in pharmaceuticals (as an analgesic and antiseptic), in oral-care products, perfumery, and as a natural food preservative.
<i>Allium sativum</i> L.	Extensively applied as a flavoring and natural preservative in foods, and in pharmaceuticals for antibacterial, antiviral, and cardioprotective formulations.
<i>Thymus vulgaris</i> L.	Used in essential-oil extraction, perfumery, and food processing as a natural preservative and flavoring; also incorporated in medicinal products for antiseptic and antitussive purposes.
<i>Malus domestica</i> Borkh.	Applied in food industries (juice, powder, and extract production), in cosmetics for its polyphenolic content, and in dietary supplements as a natural antioxidant source.
<i>Apium graveolens</i> L.	Serves as a natural flavoring in food manufacturing and in pharmaceuticals for its diuretic and anti-inflammatory effects; also used in fragrance production.
<i>Citrus limon</i> (L.) Osbeck	Extensively employed across food, pharmaceutical, and cosmetic industries; a rich source of vitamin C and essential oils, and commonly used in natural cleansers and preservatives.
<i>Glycyrrhiza glabra</i> L.	The primary source of glycyrrhizin, used in pharmaceuticals for treating ulcers and inflammation, in cosmetics for skin-brightening effects, and in confectionery as a flavoring agent.
<i>Camellia sinensis</i> (L.) Kuntze	Valued in the beverage, cosmetic, and pharmaceutical sectors; its antioxidant constituents are used in anti-aging, anticancer, and dietary supplement formulations.
<i>Aloe vera</i> (L.) Burm.f.	Integral to cosmetic, pharmaceutical, and hygienic products—particularly moisturizing gels, wound-healing formulations, and anti-inflammatory preparations; also utilized in functional beverages.
<i>Matricaria chamomilla</i> L.	Used pharmaceutically in the production of sedative and anti-inflammatory medications, in cosmetics and skincare for soothing formulations, and in herbal teas.
<i>Lavandula angustifolia</i> Mill.	A key ingredient in perfumery, aromatherapy, pharmaceuticals, and cosmetics owing to its calming fragrance and antiseptic properties.

<i>Origanum vulgare L.</i>	A natural source of carvacrol and thymol; employed in food industries as a preservative and flavoring, and in pharmaceuticals for antimicrobial and antifungal products.
<i>Cocos nucifera L.</i>	Utilized food (oil, milk, and flour production), cosmetics (moisturizers and shampoos), and pharmaceuticals as a natural antioxidant and emollient.
<i>Rosa damascena Mill.</i>	The chief source of rose oil and rose water, used in perfumery, pharmaceuticals, cosmetics, and food products; valued for its soothing and antidepressant properties.
<i>Valeriana officinalis L.</i>	Applied in pharmaceuticals for the production of sedative and anxiolytic drugs, and in herbal supplements for improving sleep and reducing stress.
<i>Silybum marianum (L.) Gaertn.</i>	A rich source of silymarin, widely used in pharmaceuticals for liver protection and in antioxidant cosmetic and dietary products.
<i>Iris germanica L.</i>	The rhizomes are processed to extract “orris root” essential oil for perfumery; also utilized in cosmetics for its skin-softening effects.
<i>Mentha piperita L.</i>	Used as a flavoring in food industries, in pharmaceuticals for carminative and antispasmodic formulations, and in oral- and skin-care products for its cooling sensation.
<i>Salvia officinalis L.</i>	Employed in food, pharmaceutical, and cosmetic industries; recognized for its antioxidant, antimicrobial, and memory-enhancing properties; commonly used in mouthwashes and dietary supplements.
<i>Foeniculum vulgare Mill.</i>	Used in food and pharmaceutical products for digestive health and bloating relief, and in cosmetics as a natural essence and flavoring component.
<i>Viola odorata L.</i>	Incorporated in perfumery and cosmetics for its delicate fragrance, and in pharmaceuticals for cough syrups and anti-inflammatory formulations.
<i>Boswellia sacra Flueck.</i>	The resin is processed for perfumery, aromatherapy, and pharmaceuticals, particularly in anti-inflammatory and anticancer products.
<i>Nigella sativa L.</i>	Applied in pharmaceutical and food industries as a natural antioxidant and antimicrobial agent, and in cosmetics and nutraceuticals.
<i>Elettaria cardamomum (L.) Maton</i>	Used in food industries as a flavoring and aromatic additive, in perfumery, and in pharmaceuticals for digestive and respiratory remedies.

<i>Cinnamomum verum</i> J. Presl	Commonly employed in foods as a flavoring and natural preservative, and in cosmetics and pharmaceuticals for its antibacterial and antioxidant potential.
<i>Salix alba</i> L.	The natural source of salicin, a precursor in aspirin synthesis; utilized in pharmaceuticals for anti-inflammatory drugs and in cosmetics for skin-soothing products.

This compilation underscores the diverse industrial and technological applications of 27 medicinal plants across multiple sectors. Species such as *Curcuma longa*, *Zingiber officinale*, and *Cinnamomum verum* are extensively utilized in the food industry as natural flavoring agents, colorants, and preservatives. Plants like *Aloe vera*, *Lavandula angustifolia*, and *Rosa damascena* play a crucial role in the cosmetics and perfumery industries owing to their moisturizing, soothing, and aromatic properties. Several herbs, including *Thymus vulgaris*, *Origanum vulgare*, and *Nigella sativa*, have gained prominence in pharmaceutical formulations for their antimicrobial, anti-inflammatory, and antioxidant effects.

Other species, such as *Silybum marianum* and *Salix alba*, are valuable in drug development due to their hepatoprotective and analgesic compounds. Moreover, bioactive constituents such as polyphenols, glycyrrhizin, and eugenol have driven significant advancements in nutraceutical innovation.

Collectively, these plants serve as a crucial bridge between traditional herbal knowledge and modern biotechnological and industrial applications. Table 4 summarizes the reported effects of medicinal plants in traditional medicine across animal models, human, and preclinical models, highlighting their therapeutic potential.

Table 4. Effects of Medicinal Plants and Their Extracts/Essential Oils on Oral Health: Experimental, Animal, and Human Models

Scientific Name	Model Type	Extract/Product Type	Description	Ref.
<i>Curcuma longa</i> L.	Human	Extract / Curcumin	Improves symptoms and slows the progression of OLP via antioxidant, anti-inflammatory, and antimicrobial effects; administered orally or topically at various dosages	Purwaningrum et al., 2024
<i>Melaleuca alternifolia</i>	Animal (Rat)	Essential oil (Tea tree oil)	Delays dental cavity healing and increases necrosis; applied at a 20% concentration	Kreuger et al., 2007
<i>Syzygium aromaticum</i>	Laboratory / Chemical	Essential oil (flower, leaf, stem)	Exhibits antibacterial and therapeutic effects in periodontal care; eugenol content ranges from 72–97% depending on the plant part	Kaur & Chandrul, 2017
<i>Allium sativum</i> L.	Human & Laboratory	Garlic extract	Demonstrates antimicrobial and therapeutic properties in oral health, primarily due to allicin and S-allylcysteine	Sasi et al., 2021
<i>Thymus vulgaris</i> L.	Laboratory / Oral	Essential oil	Enhances oral hygiene and exhibits anti-inflammatory activity	Gonçalves et al., 2011
<i>Apium graveolens</i> L.	Laboratory (in vitro)	Ethanollic extract & seed oil	Displays antibacterial activity against <i>S. mutans</i> ; the extract is effective at all tested concentrations, and the oil at 100 µg/mL	Moshaverinia et al., 2025
<i>Citrus limon</i> (L.) Osbeck	Cellular & Laboratory	Extract	Reduces oxidative toxicity and nitric oxide production; provides safe whitening effects, particularly when combined with NaHCO ₃	Jeong, 2021
<i>Matricaria chamomilla</i> L.	Human	Cream + Low-level laser	Alleviates severe oral mucositis, reduces pain, and improves nutritional intake; 6.2 J/cm ²	Machado et al., 2017
<i>Lavandula angustifolia</i> Mill.	Laboratory	Extract for ZnNP synthesis	Exhibits potent antifungal activity against <i>C. albicans</i> and is non-toxic to normal cells	Nasiri et al., 2022

Origanum vulgare L.	Laboratory	Essential oil & gel extract	Inhibits <i>S. mutans</i> biofilm formation by up to 98%; shows strong antimicrobial activity against bacteria and fungi	Badekova et al., 2021
Cocos nucifera L.	Human / Laboratory	Coconut oil & water	Provides antibacterial, antifungal, and antiviral effects; supports oral health and reduces inflammation	Kishore & Verma, 2020
Silybum marianum (L.) Gaertn.	Animal (Rat)	Aqueous extract	Exhibits anti-candidal activity and promotes oral wound healing; comparable to fluconazole	Qasim & Hashim, 2023
Iris germanica L.	–	–	–	–
Mentha piperita L.	Laboratory	Leaf essential oil	Exhibits antibacterial and anti-biofilm effects (MIC: 3.125–12.5 µL/mL; BIC ₅₀ : 100 µL/mL)	Karicheri & Antony, 2016
Salvia officinalis L.	Human	Mouthwash extract	Reduces gingival inflammation and oral ulcers; efficacy comparable to saline solution	Fawzi et al., 2017
Viola odorata L.	Laboratory	Hydroalcoholic extract ± ZnO	Enhances antibacterial activity when combined with 500 ppm ZnO; effects comparable to <i>Salvadora persica</i> mouthwash	Mehrabkhani et al., 2024
Boswellia sacra	Human	Resin & essential oil	Reduces salivary microbial load and improves oral hygiene; safe and cost-effective	Sabra & Al-Masoudi, 2014
Nigella sativa L.	Animal (Rat)	Oral gel / Drinking solution	Reduces plaque, caries, and gingival inflammation; exhibits preventive anticariogenic effects	Al-Wafi, n.d.
Cinnamomum verum J. Presl	Laboratory	Leaf & bark essential oil	Exhibits potent antimicrobial activity against bacterial biofilms; a safe alternative for infection control	Wijesinghe et al., 2020

Discussion

Dental cysts, as common epithelial lesions surrounding the tooth root, not only cause pain and inflammation but can also disrupt oral function through bone tissue destruction and alterations in tooth structure. Conventional treatments, such as surgery and root canal therapy, are effective yet invasive and costly, while pharmacological approaches primarily provide symptomatic relief and temporary control of inflammation. In this context, the use of medicinal plants as a complementary approach, with their antibacterial, anti-inflammatory, antioxidant, and tissue-regenerative properties, may play a significant role in preventing and mitigating the complications associated with these lesions.

Recent studies indicate that a wide range of medicinal plants exert direct or indirect effects on oral infections and lesions. For instance, turmeric and its derivatives have been shown to reduce symptoms of oral diseases such as lichen planus by inhibiting inflammatory pathways and oxidative stress (OKHOVATFARD et al., 2023).

This anti-inflammatory property may also be beneficial in the context of dental cysts by reducing inflammation and supporting tissue repair.

Conversely, tea tree oil, while possessing antibacterial properties, has been reported in animal models to delay the healing of infected lesions, highlighting the need for careful, evidence-based selection of herbal therapies (KREUGER et al., 2007).

Plants such as fenugreek (*Trigonella foenum-graecum*) and clove (*Syzygium aromaticum*) have demonstrated protective local effects and antibacterial activity, respectively, contributing to pain reduction, inflammation control, and management of oral infections (ANSARI et al., 2022; KAUR & CHANDRUL, 2017.). Additionally, garlic (*Allium sativum*) and green tea (*Camellia sinensis*) can inhibit biofilm formation and reduce acid production by cariogenic bacteria, thereby preventing secondary infections and the progression of cystic lesions (BIN et al., 2020; GOENKA et al., 2013).

Moreover, plants such as licorice (*Glycyrrhiza glabra*), aloe vera (*Aloe vera*), and sage (*Salvia officinalis*) possess broad-spectrum anti-inflammatory, antiviral, and antifungal effects, making them applicable both in the prevention and treatment of oral diseases (SIDHU et al., 2020; MANGAIYARKARASI et al., 2015; EIDI & GHASHRAMANI, 2023).

By reducing microbial load and improving inflammatory responses, these herbs may facilitate the healing of tissues surrounding dental cysts.

Interestingly, certain plant-derived compounds, such as thymoquinone (TQ) from black seed (*Nigella sativa*), have been shown in animal models of gingivitis to reduce plaque formation and caries while alleviating gingival inflammation [AL-WAFI, 2014]. These findings suggest that natural compounds may potentially modulate inflammatory and microbial pathways relevant to dental cysts.

Studies on cinnamon (*Cinnamomum* spp.), cardamom (*Amomum subulatum*, *Elettaria cardamomum*), and oregano (*Origanum vulgare*) have demonstrated their antibacterial and anti-biofilm activities against pathogens involved in caries and periodontal disease) YENAKIIEVE, 2020; ANEJA & JOSHI, 2009; IDIR et al., 2022).

Since these pathogens can contribute to infection and exacerbate dental cysts, incorporating these herbs into mouth rinses or topical gels may offer potential clinical benefits.

Overall, the accumulated evidence suggests that native Iranian medicinal plants and other herbal agents with disinfectant,

anti-inflammatory, and tissue-regenerative properties hold significant potential not only for oral disease prevention but also as complementary therapies in the management of dental cysts.

However, most current studies are limited to in vitro or animal models; clinical trials in humans are necessary to confirm their efficacy and safety.

Conclusion

Dental cysts, as common epithelial lesions, can lead to inflammation, pain, and damage to surrounding tissues. Given the limitations and side effects of chemical therapies, the use of Iranian medicinal plants as a complementary and safe approach to manage inflammation and infection associated with dental cysts has gained attention. Both traditional medicine texts and modern scientific studies indicate that many of these plants possess anti-inflammatory, antimicrobial, and tissue-regenerative properties, potentially contributing to improved clinical outcomes.

Therefore, integrating traditional knowledge with contemporary scientific research offers a promising avenue for minimally invasive, effective management of dental cysts and provides a foundation for

broader clinical studies and the development of targeted herbal therapeutics

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The authors have no competing interests to declare that are relevant to the content of this article.

Ethics approval

This study was performed in line with the principles of the Declaration of Helsinki.

Consent to participate

Informed consent was obtained from all individual participants included in the study.

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