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Herbal Dental Anesthetics: An Ethnobotanical Review

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A B S T R A C T

Objective: Toothache is among the most common health issues worldwide, arising from causes such as dental caries, gingival inflammation, or other pathological conditions. Medicinal plants have long been used as analgesics or local anesthetics for dental pain in traditional medicine and ethnobotanical knowledge across cultures, including Iran. This study reviews ethnobotanical evidence in Iran regarding plants with dental anesthetic and analgesic properties, highlighting key species and exploring potential mechanisms of action. The goal is to integrate traditional and scientific knowledge to identify plants suitable for development into natural dental anesthetic products.

Methodology: A narrative review was conducted using reputable scientific sources. Systematic searches were performed in Persian and English across databases including Google Scholar, SID, Magiran, PubMed, and Scopus using the keywords "toothache," "dental anesthesia," "medicinal plants," and "ethnobotany." Inclusion criteria focused on plants explicitly cited in Iranian ethnobotanical sources for dental analgesic or anesthetic properties.

Results: Numerous plants were identified, including *Syzygium aromaticum*, *Pistacia khinjuk*, *Cichorium intybus*, *Thymus vulgaris*, *Centaurea cyanus*, *Amygdalus scoparia*, *Eucalyptus* spp., *Scutellaria multicaulis*, *Biebersteinia multifida*, *Verbascum thapsus*, *Ruta graveolens*, *Grammosciadium platycarpum*, *Mentha pulegium*, *Echium amoenum*, *Plantago major*, *Celtis australis*, *Seidlitzia rosmarinus*, *Melissa officinalis*, *Dianthus orientalis*, *Amygdalus haussknechtii*, *Isatis raphanifolia*, *Cannabis sativa*, *Amygdalus lycioides*, *Daphne mucronata*, *Pistacia atlantica*, *Papaver dubium*, *Peganum harmala*, *Papaver somniferum*, *Mentha aquatica*, *Glycyrrhiza glabra*, and *Viola odorata*. The family Caryophyllaceae was the most represented, with five species. Aerial parts were most commonly used, and the provinces of Ilam, Fars, and Lorestan reported the highest number of dental anesthetic plants.

Conclusion: The considerable diversity of medicinal plants with dental anesthetic properties in Iranian ethnobotanical sources highlights the potential of indigenous knowledge for natural dental remedy development. However, the paucity of clinical and pharmacological studies on efficacy, safety, and dosing underscores the need for further rigorous research. Integrating traditional knowledge with modern science could facilitate the development of effective, low-side-effect natural alternatives to conventional chemical anesthetics.

Keywords: Dental anesthesia, Medicinal plants, Toothache, Ethnobotany, Analgesic, Herbal anesthetics

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Introduction

Toothache is one of the most common health problems globally, affecting a significant portion of the population at varying intensities throughout life [1]. Epidemiological reports indicate that most children and adults worldwide experience dental pain at some point in their lives [1]. In Iran, epidemiological studies show a high prevalence of dental caries and periodontal disease, placing a substantial burden on the healthcare system and creating an increasing need for safe and effective methods to manage dental pain [2].

Dental pain often results from advanced caries, pulpitis, dental abscesses, periodontal disease, trauma, or exposure to mechanical and thermal stimuli [3]. These conditions provoke inflammatory changes in the dental pulp or surrounding tissues, triggering pain [4]. The pathophysiology of dental pain is complex and primarily involves the activation of sensory nerve endings in the pulp and periodontal ligament [5]. Activation of these receptors transmits pain signals via Aδ and C fibers to the central nervous system, culminating in the clinical experience of acute or chronic pain [6]. Additionally, the release of inflammatory mediators such as prostaglandins, bradykinin, and histamine at the pulp site amplifies pain intensity and contributes to hyperalgesia [7].

Modern dentistry relies on chemical anesthetics such as lidocaine, benzocaine, and prilocaine for pain control [8]. While these agents are effective in rapidly alleviating pain, their use can be accompanied by adverse effects, including allergic reactions, systemic toxicity, cardiovascular complications, and drug resistance, prompting researchers to seek natural and safer alternatives [8]. Medicinal plants, which have been traditionally used for centuries as dental pain relievers or local anesthetics, have thus gained renewed attention [8,9].

Ethnobotany, the interdisciplinary study of the relationship between humans and plants across cultures and societies [10], offers a valuable framework for identifying plant species with therapeutic potential [11]. Ethnobotanical surveys in Iran reveal a remarkable diversity of plants traditionally employed by various ethnic groups, particularly in the western and southern provinces, for alleviating dental pain [12]. Documenting and scientifically evaluating this indigenous knowledge can lead to the discovery of bioactive compounds, elucidation of mechanisms of action, and the development of effective natural dental therapeutics [13,14].

Accordingly, this review aims to collate existing ethnobotanical evidence on medicinal plants with dental anesthetic and analgesic properties in Iran, highlight prominent species, examine the plant parts utilized and their potential mechanisms, and emphasize the importance of leveraging this cultural heritage for the development of natural dental anesthetic products.

Methodology

This study employed a narrative review approach with an ethnobotanical perspective. Its primary goal was to identify and compile medicinal plants used in Iran as dental anesthetics or analgesics based on both scientific and traditional sources.

Search Strategy

A systematic search was conducted in Google Scholar, PubMed, Scopus, SID, and Magiran using a combination of Persian and English keywords: “tootache“ ”,dental analgesic“ ”,medicinal plants ”, “ethnobotanical,” “Toothache,” “Dental anesthesia,” “Medicinal plants,” and “Ethnobotany.” Reputable printed sources, including pharmacognosy texts and Iranian ethnopharmacology references, were also reviewed.

Inclusion Criteria

Included were ethnobotanical and ethnopharmacological studies conducted in Iran that directly reported the use of plants for dental pain relief or local anesthesia, printed sources (books and traditional manuscripts) documenting traditional use of plants for toothache, and reports specifying the scientific name, plant part used, and geographical region.

Exclusion Criteria

Excluded were studies that only addressed anti-inflammatory or antibacterial effects without mentioning dental analgesia, laboratory or clinical studies conducted outside Iran, articles without full text or adequate information about plant names and uses, duplicate reports, or sources lacking scientific credibility.

Data Extraction

All gathered articles and sources were initially compiled. After removing duplicates and screening titles and abstracts according to inclusion and exclusion criteria, eligible sources were selected. Extracted data included the plant's scientific and local names, family, plant part used, geographic region, and type of application (analgesic or anesthetic).

Thesupplementary findings regarding herbal dental anesthetics in Iranian ethnobotanical sources are summarized in Table 1.

The review of Iranian ethnobotanical sources revealed a wide array of medicinal plants traditionally used for dental pain relief and local anesthesia, including Syzygium aromaticum, Pistacia khinjuk, Cichorium intybus, Thymus vulgaris, Centaurea cyanus, Amygdalus scoparia, Eucalyptus spp., Scutellaria multicaulis, Biebersteinia multifida, Verbascum thapsus, Ruta graveolens, Grammosciadium platycarpum, Mentha pulegium, Echium amoenum, Plantago major, Celtis australis, Seidlitzia rosmarinus, Melissa officinalis, Dianthus orientalis, Amygdalus haussknechtii, Isatis raphanifolia, Cannabis sativa, Amygdalus lycioides, Daphne mucronata, Pistacia atlantica, Papaver dubium, Peganum harmala, Papaver somniferum, Mentha aquatica, Glycyrrhiza glabra, and Viola odorata.

Table 1: Medicinal Plants with Local Anesthetic and Analgesic Effects for Dental Pain in Iran

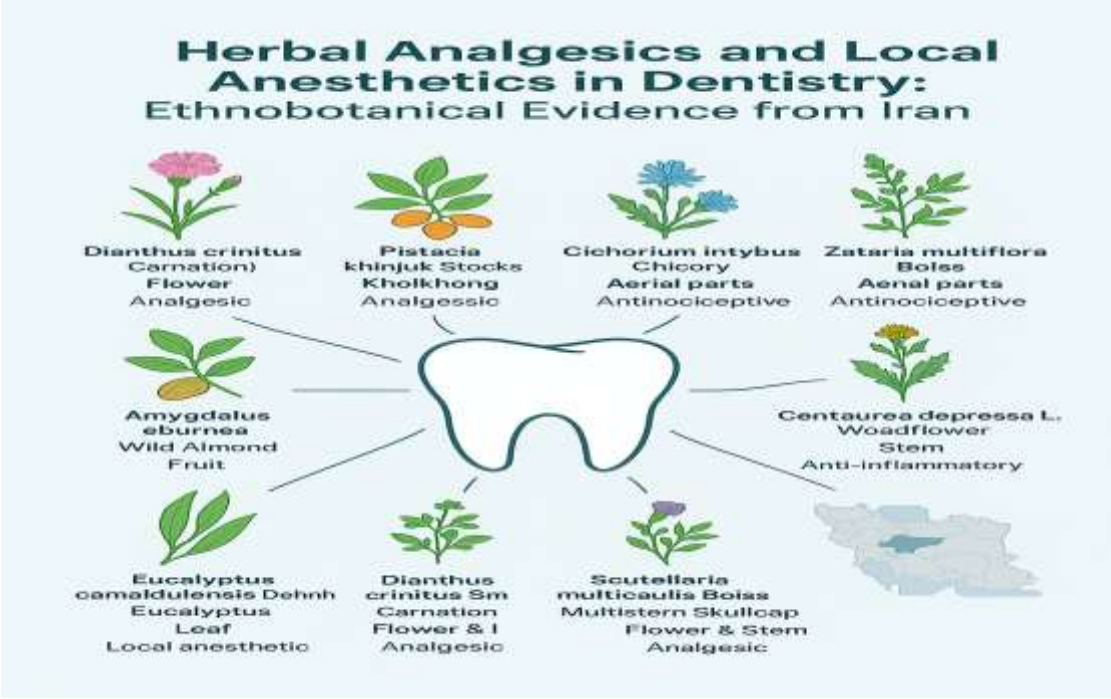
Scientific Name	Common Name	Family	Plant Part Used	Study Area	Province	Ref.
Dianthus crinitus Sm	Carnation	Caryophyllaceae	Seed	Abadeh, Shiraz	Fars	[15]
Pistacia khinjuk Stocks	Kholkhong	Anacardiaceae	Fruit	Arjan, Fars	Fars	[16]
Cichorium intybus L.	Chicory	Asteraceae	Aerial parts	Darab	Fars	[17]
Zataria multiflora Boiss	Thyme	Lamiaceae	Aerial parts	Darab	Fars	[17]
Centaurea depressa L.	Woadflower	Asteraceae	Stem	Sajasarud	Kurdistan	[18]
Amygdalus eburnea	Wild Almond	Rosaceae	Fruit	Fasa	Fars	[19]
Eucalyptus camaldulensis Dehnh	Eucalyptus	Myrtaceae	Leaf	Mobarakeh	Isfahan	[20]
Dianthus crinitus Sm	Carnation	Caryophyllaceae	Flower & Leaf	Natanz	Isfahan	[21]
Scutellaria multicaulis Boiss	Multistem Skullcap	Lamiaceae	Flower & Stem	Natanz	Isfahan	[21]
Biebersteinia multifida DC.	Adamk	Biebersteiniaceae	Root, Leaf, Stem	Bazrjan	Markazi	[22]
Verbascum phlomoides L.	Mullein	Scrophulariaceae	Leaf & Flower	Meshginshahr	Ardabil	[23]
Haplophyllum perforatum	Sadabi	Rutaceae	Leaf & Seed	Shirvan	North Khorasan	[24]
Grammosciadium platycarpum Boiss. & Hausskn	Mountain Dill	Apiaceae	Aerial parts	Abhar	Zanjan	[25]

Mentha longifolia (L.) L.	Wild Mint	Lamiaceae	Aerial parts	Abhar	Zanjan	[25]
Echium amoenum	Borage	Boraginaceae	Flower	Noor	Mazandaran	[26]
Plantago major	Plantain	Plantaginaceae	Seed	Noor	Mazandaran	[26]
Celtis australis L.	European Nettle Tree	Ulmaceae	Aerial parts	Behbahan	Khuzestan	[27]
Seidlitzia rosmarinus	Ashnan	Amaranthaceae	Aerial parts	Ilam	Ilam	[28]
Melissa officinalis L.	Lemon Balm	Lamiaceae	Aerial parts	Ilam	Ilam	[28]
Dianthus orientalis Adams	Eastern Carnation	Caryophyllaceae	Seed	Ilam	Ilam	[28]
Amygdalus haussknechtii	Zagros Almond	Rosaceae	Fruit	Ilam	Ilam	[28]
Isatis raphanifolia Boiss.	Wasmeh	Brassicaceae	Aerial parts	Ilam	Ilam	[28]
Cannabis sativa L.	Cannabis	Cannabaceae	Seed	Ilam	Ilam	[28]
Amygdalus lycioides	Tangres	Rosaceae	Aerial parts	Ilam	Ilam	[28]
Daphne mucronata	Daphne	Thymelaeaceae	Seed	Lorestan	Lorestan	[29]
Pistacia khinjuk	Wild Pistachio	Anacardiaceae	Fruit	Lorestan	Lorestan	[29]
Papaver rhoeas	Field Poppy	Papaveraceae	Aerial parts	Lorestan	Lorestan	[29]
Peganum harmala	Syrian Rue	Zygophyllaceae	Seed	Lorestan	Lorestan	[29]
Papaver somniferum	Opium Poppy	Papaveraceae	Aerial parts	Urmia	West Azerbaijan	[30]

Mentha aquatica L.	Water Mint	Lamiaceae	Leaf & Flower	Amol	Mazandaran	[31]
Glycyrrhiza glabra L.	Licorice	Fabaceae	Root	Raz & Jargalan	North Khorasan	[32]
Dianthus caryophyllus	Carnation	Caryophyllaceae	Flower	Sarein	Ardabil	[33]
Viola odorata	Sweet Violet	Violaceae	Flower	Ajabshir	East Azerbaijan	[34]

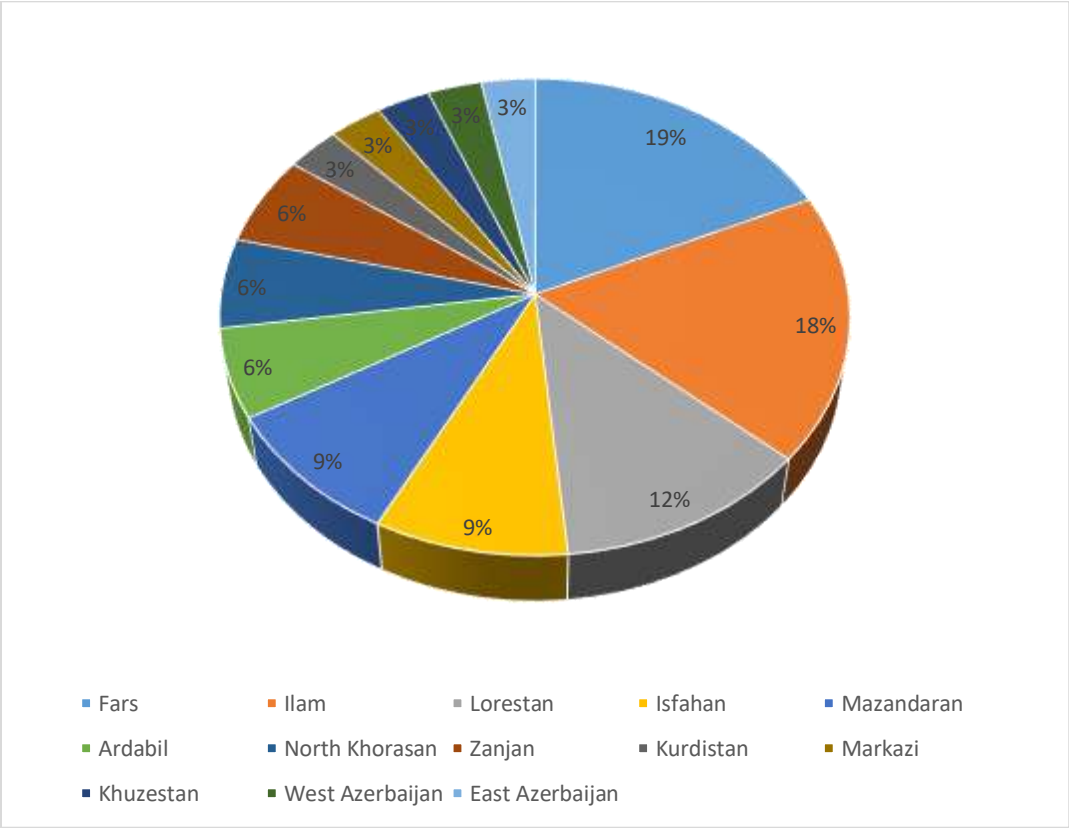
This schematic graphical abstract illustrates Iranian medicinal plants traditionally and ethnobotanically used as local anesthetics and analgesics for dental pain.

Figure 1: Iranian Medicinal Plants for Dental Anesthesia and Pain Relief



This table presents the number of medicinal plants reported with analgesic effects for dental pain in each Iranian province included in the study. The data highlight regional differences in traditional use of plants for dental pain relief

Figure 2: Number of Medicinal Plants with Analgesic Effects for Dental Pain by Province in the Study



Provinces with medicinal plants used for dental pain relief are indicated on the map of Iran in Figure 3.

Figure 3: Distribution of Provinces with Medicinal Plants for Dental Pain Relief in Iran

Discussion

A review of classical Iranian medical texts, including the works of Razi, Avicenna, Ahwazi, Aqili Shirazi, Momen Tankabeni, as well as other reliable historical manuscripts and pharmacological sources, indicates that a wide range of medicinal plants have traditionally been employed to treat various ailments [35–42]. Among the documented plants, many such as Rosa damascena, Plantago ovata, Matricaria chamomilla, Ruta graveolens, Pistacia lentiscus, Linum usitatissimum, Brassica nigra, Althaea lavateriflora, Alcea digitata, Piper nigrum, Hyoscyamus niger, Hyoscyamus albus, Mandragora officinarum, Pimpinella anisum, Opopanax chironium, Iris spp., Anacyclus pyrethrum, Origanum vulgare, Cuminum cyminum, Bunium persicum, Carum carvi, Anethum graveolens, Trigonella foenum-graecum, Zataria multiflora, Capparis spinosa, Punica granatum, Allium sativum, Nepeta bracteata, Peganum harmala, Laurus nobilis, Citrullus colocynthis, Nigella sativa, Cicer arietinum, Cupressus spp., Rhus coriaria, Ferula assafoetida, Pastinaca sativa, Calycotome spinosa, Peucedanum officinale, Potentilla reptans, Iris florentina, Iris germanica, Iris ensata, Ficus carica, Curcuma zedoaria, Rosa spp., Asparagus adscendens, Morus alba, Morus nigra, Helleborus niger, Moringa spp., Ricinus communis, Olea europaea, Physalis alkekengi, Jasminum spp., Syzygium aromaticum, Zingiber officinale, Daphne spp., Corylus avellana, Pinus spp., Myrtus communis, Drimia maritima, Curcuma longa, and Plantago major—have well-documented traditional uses and are supported by modern scientific evidence demonstrating anti-inflammatory, antioxidant, antibacterial, and immune-

modulating properties. Moreover, many of these plants exhibit analgesic effects relevant to dental pain management [43].

Nevertheless, while indigenous knowledge provides a valuable guide for identifying these species, several notable limitations remain. First, the majority of existing evidence is derived from ethnobotanical reports and local experience, with very few controlled clinical studies validating the efficacy and safety of these plants. Second, several of the listed species contain bioactive compounds whose misuse or unstandardized consumption can pose significant risks; for instance, Peganum harmala (Syrian rue) and Cannabis sativa (cannabis) not only exhibit analgesic properties but also possess psychoactive effects and potential toxicity. Third, the lack of standardization in dosage, extraction methods, and pharmaceutical formulation remains a major barrier to transforming these plants into reliable therapeutic products [44].

On the other hand, the present study underscores the importance of compiling dispersed ethnobotanical data, laying the groundwork for future interdisciplinary research. Integrating indigenous knowledge with modern pharmacology, phytochemistry, and clinical trials can facilitate the development of safe and effective herbal medications. Furthermore, natural dental anesthetic products may serve as low-side-effect alternatives to conventional chemical anesthetics, particularly for patients who experience hypersensitivity or adverse reactions to commonly used synthetic agents [45].

Conclusion

Overall, a review of classical Iranian medical sources in conjunction with contemporary scientific evidence highlights the rich heritage of traditional medicine in Iran and its potential to inspire novel research and pharmaceutical innovation on an international scale. The present review demonstrates that Iranian ethnobotanical sources document a remarkable diversity of medicinal plants traditionally used for dental analgesia and local anesthesia. These findings reflect the depth of indigenous knowledge in oral healthcare and reveal significant potential for the development of new natural dental therapeutics.

Statements and Declarations

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Competing interests

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.

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