A Review on medicinal plants in dentistry

Omji Porwal*, Duran Kala

Department of Pharmacognosy, Faculty of pharmacy, Tishk International University-Erbil, Kurdistan Region, Iraq

Abstract

The dental afflictions are indubitably the most important global infectious diseases affecting both children and adults. The most significant dental illness is dental caries and periodontal pathologies. The major reason of oral health troubles is more inhabitants with pathogenic bacteria and for this reason, conservative treatment can often be in efficient because of bacterial resistance or may have unpleasant side effects. For that reason, studies in the field have focused on finding new therapeutic alternatives. The use of natural medicines for dental care is an ancient cross-cultural practice that persists in the majority of cultures today. Over the past decade, interest in drugs derived from medicinal plants has markedly increased. This study was designed at a literature review focusing on studies investigating herbal drugs and their therapeutic application, mechanism of action, side effects, toxicities and probable drug interactions. A small number of studies were established to hold their rational employ in dentistry. Because there is a rising employ of phytotherapeutic agents in dentistry, additional studies are required to evaluate their safety and efficacy for clinical use.

Keywords: Herbal medicine, Oral health, Dentistry, Caries, Infections

Introduction

The employ of medicinal plants has a long history in therapeutic and dental practice and they have long been used worldwide1-3. Anti-inflammatory, antidiabetic, anticancer, Huntington’s disease, antibacterial, analgesic, sedative agents, endodontic irrigants and antioxidant properties of plants with their biocompatibility explain the people’s growing attention in the use of herbal medications4-12. With the knowledge of curative properties of the medicinal plants against oral microorganisms and their biocompatibility, the use of natural medicines for clinical practice we can aim to reduce if not remove this disease entity. Medicinal plants though produce slow recovery but their therapeutic effect is miraculous13. Above the earlier period, pharmaceutical companies have been involved in examined plants as basis for new phytotherapeutic agents with established efficiency, quality and safety 14-16. Dental pathology is a worldwide fitness difficulty, disturbing both undersized and rising or urbanized countries. The most widespread oral pathologies are dental caries and periodontal disease and the gravest oral pathologies are oral and pharyngeal cancer and oral tissue lesions are too of important concern17. For these causes, the WHO believes that oral health is a right of every people 18. An additional matter facing oral health is the huge number of children who are pretentious by tooth decay19. There are presently various treatments for oral pathologies, but these have disagreeable side consequences, such as altered oral microbiota or systemic gastrointestinal symptoms. Above 750 species of bacteria occupy the oral cavity (50% of which are yet to be identified) and a figure of these are concerned in oral diseases20. Therefore, there is a sensitive require for novel options to conservative treatments, medicinal plants being a region of attention. A significant instance in which plants locate their usefulness is the treatment of bacterial infections in the oral height since most conservative antibiotics are unsuccessful because of bacterial resistance and those that are efficient have disagreeable side consequences21. Because of this, natural compounds are a safer substitute to antibiotics in the treatment of oral infections and are too an approach in the deterrence and treatment of additional oral diseases, counting dental caries, but also additional grave diseases such as cancer. Consequently, the reason of this review is to present several new examples of customary medicinal plant extracts or phytochemicals that have been exposed to slow down the enlargement of oral pathogens, decrease the development of dental plaque and decrease the indications of oral illness.

Materials and Methods

The Medline, Pub Med and Google Scholar databases were electronically investigated for pertinent articles and books available in English using the keywords medicinal plant, herb, phytotherapy, dentistry and pediatric.

Overview of the use of plants in dentistry

Medicinal plants are a subject of attention for present investigates in the meadow of medicine, being ever more employed for the treatment of a great number of pathologies. Furthermore, numerous drugs presently employed in allopathic medicine have their source in medicinal plants. So, plants are together basis of conventional medicines and a
substitute to them. Medicinal plants are ever more employed in dentistry because of the components they enclose. The plants employed in dental pathology have dissimilar therapeutic actions such as antimicrobial, antifungal, antiviral, anti-inflammatory, analgesic and also as endodontic irrigant. Table 1. Based on these manifold remedial actions, natural compounds locate their usefulness in a huge amount of dental pathologies.

Table 1: Overview of various plants employed in dentistry

<table>
<thead>
<tr>
<th>Scientific name</th>
<th>Product/extract</th>
<th>Experiment</th>
<th>Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Zingiber officinale</em></td>
<td>n-hexane, ethyl acetate, methanol and aqueous extracts</td>
<td>Antimicrobial analysis such as biofilm inhibition, time-kill kinetics, adherence inhibition was conducted</td>
<td>22</td>
</tr>
<tr>
<td><em>Satureja hortensis</em></td>
<td>extract and its essential oil</td>
<td>Antibacterial activity against <em>S. mutans</em> was evaluated by the disc diffusion method</td>
<td>23</td>
</tr>
<tr>
<td><em>Salvia officinalis</em></td>
<td>Glass-ionomer cement (GIC) modified with of <em>S. officinalis</em> extract</td>
<td>Antibacterial activity against <em>S. mutans</em> and <em>L. casei</em> was evaluated by agar disc diffusion method</td>
<td>24</td>
</tr>
<tr>
<td><em>Psidium guajava</em></td>
<td><em>P. guajava</em> leaf extract used in herbal toothpaste</td>
<td>Herbal toothpaste was studied for its antimicrobial activity against, <em>S.aureus</em>, <em>S. mutans</em>, <em>Bacillus subtilis</em>, <em>S. oralis</em>, and <em>Proteus vulgaris</em></td>
<td>25</td>
</tr>
<tr>
<td><em>Vaccinium vitis-idaea</em></td>
<td>Polyphenol-rich fraction</td>
<td>Evaluation of biofilm formation ability and bioactivity of <em>S. mutans</em>, <em>S. sobrinus</em>, and <em>S. sanguinis</em></td>
<td>26</td>
</tr>
<tr>
<td><em>Tinospora cordifolia</em></td>
<td>Ethanol extract</td>
<td>Seven different concentrations were prepared and tested against <em>S. mutans</em> in brain-heart infusion agar medium</td>
<td>27</td>
</tr>
<tr>
<td><em>Glycyrrhizaglabra/ Terminalia chebula</em></td>
<td><em>G. glabra</em> and <em>T. chebula</em> extracts</td>
<td>The anti-adherence property of the herbal extract was evaluated using a glass surface adherence test</td>
<td>28</td>
</tr>
<tr>
<td><em>Trachyspermum ammi</em></td>
<td><em>T. ammi</em> oil</td>
<td>Serial dilution and disc diffusion method was used for evaluation of <em>T. ammi</em> antibacterial efficacy</td>
<td>29</td>
</tr>
<tr>
<td><em>Mentha piperita</em></td>
<td><em>M. piperita</em> leaf extract</td>
<td>Anti-microbial activity of the <em>M. piperita</em> was tested by the disc diffusion method</td>
<td>30</td>
</tr>
<tr>
<td><em>Camellia sinensis</em></td>
<td>The esterified derivative of EGCG</td>
<td>The number of colony-forming units was assessed for evaluation of EGCG efficiency against cariogenic bacteria</td>
<td>31</td>
</tr>
<tr>
<td><em>Psoraleae semen</em></td>
<td><em>P. semen</em> ethanolic extract</td>
<td>Protein leakage evaluation and scanning electron microscopy was conducted to determine the efficacy of <em>P. semen</em> against bacterial cell membrane</td>
<td>32</td>
</tr>
<tr>
<td><em>Punica granatum</em></td>
<td><em>P. granatum</em> gel</td>
<td>Agar well diffusion method was used for evaluation of <em>P. granatum</em> against cariogenic bacteria such as <em>S. sanguis</em>, <em>S. mutans</em>, and <em>L. casei</em></td>
<td>33</td>
</tr>
<tr>
<td><em>Galla chinensis</em></td>
<td><em>G. chinensis</em> crude aqueous extract</td>
<td>Anticariogenic efficacy of <em>G. chinensis</em> was evaluated by tests like Keyes’ caries diagnosis and scoring technique and the mineral density analysis on molar animal teeth</td>
<td>34</td>
</tr>
<tr>
<td><em>Rosmarinus officinalis</em></td>
<td>Alcoholic extract dentifrice</td>
<td>Single-disc diffusion technique was used for evaluation of herbal dentifrice against cariogenic bacteria</td>
<td>35</td>
</tr>
<tr>
<td><em>Aloe vera</em></td>
<td><em>Aloe vera</em> leaf extract</td>
<td>Agar and broth microdilution method was used for antibacterial evaluation</td>
<td>36</td>
</tr>
<tr>
<td><em>Houttuynia cordata</em></td>
<td><em>H. cordata</em> ethanolic extract</td>
<td>Antibiofilm activity of <em>H. cordata</em> extract was evaluated against oral pathogens</td>
<td>37</td>
</tr>
<tr>
<td><em>Toddalia asiatica/Cortex Lyci/Cimicifuga foetida/ Toddalia asiatica</em></td>
<td>Herbal mouthwash (LongZhang Gargle®)</td>
<td>An Agar diffusion test was conducted to determine antibacterial activity against <em>S. mutans</em></td>
<td>38</td>
</tr>
<tr>
<td><em>Cistus incanus</em></td>
<td><em>C. incanus</em> accelerated solvent extract</td>
<td>A live/dead assay was conducted for evaluation of <em>C. incanus</em> herbal extract</td>
<td>39</td>
</tr>
<tr>
<td><em>Camellia sinensis/Allium sativum/Citrus aurantiifolia</em></td>
<td>Herbal mouthwash</td>
<td>Agar diffusion test was conducted to determine antibacterial activity against <em>S. mutans</em> and <em>C. albicans</em></td>
<td>40</td>
</tr>
<tr>
<td>Plant/Herb</td>
<td>Extract Type</td>
<td>Test/Procedure</td>
<td>Result/Comment</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>-------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Anacardium occidentale/Mangifera indica</td>
<td>Herbal ethanolic extract</td>
<td>An Agar diffusion test was conducted to determine antibacterial activity against S. mutans and E. faecalis</td>
<td>41</td>
</tr>
<tr>
<td>Acacia chundra/Adhatoda vasica/Mimusops elengi/Piper nigrum/Pongamia pinnata/Quercus infectoria/Zyggiyum aromaticum/Terminalia/Zingiber officinale</td>
<td>Ayurvedic herbal extract</td>
<td>ELISA test was conducted for evaluation of IL-8 production by immortalized gingival keratinocytes after herbal extract treatment</td>
<td>42</td>
</tr>
<tr>
<td>Allium sativum/Zizipora clinopodioides</td>
<td>H. rhamnoides pulp oil mouthwash</td>
<td>Biofilm Ring Test was conducted for evaluation of H. rhamnoides efficacy against P. gingivalis, C. albicans, and S. gordonii</td>
<td>43</td>
</tr>
<tr>
<td>Cinnamomum zeylanicum/Salvadora persica</td>
<td>Herbal ethanolic extracts</td>
<td>Agar diffusion test was performed for evaluation of the antibacterial property of the herbal extract against A. actinomycetemcomitans and T. forsythia</td>
<td>44</td>
</tr>
<tr>
<td>Acacia nilotica/Murraya koenigii/Eucalyptus hybrid/Psidium guajava</td>
<td>Herbal ethanolic extract</td>
<td>An Agar diffusion test was conducted to determine antibacterial activity against P. gingivalis and F. nucleatum</td>
<td>45</td>
</tr>
<tr>
<td>Allium sativum/Zizipora clinopodioides</td>
<td>Z. clinopodioides and A. sativum essential oil</td>
<td>The broth macro dilution method and disk diffusion technique were conducted to evaluate the activity of essential oils on S. aureus and P. aeruginosa.</td>
<td>46</td>
</tr>
<tr>
<td>Houttuynia cordata</td>
<td>The decoction of dried H. cordata leaves</td>
<td>The microbial broth dilution method was used for evaluation of H. cordata antibacterial property</td>
<td>47</td>
</tr>
<tr>
<td>Polygoni multiflori</td>
<td>2,3,5,4-Tetrahydroxystilbene-2-O-beta-glucoside (THSG)</td>
<td>Evaluation of modulatory property of THSG on inflammatory responses caused by P. gingivalis in gingival fibroblasts</td>
<td>48</td>
</tr>
<tr>
<td>Morus alba</td>
<td>ethanolic extract</td>
<td>Antibacterial efficacy of the ethanolic extract was assessed by estimating minimum inhibitory concentration against common periodontal pathogens</td>
<td>49</td>
</tr>
<tr>
<td>Ameliea sinensis</td>
<td>A. sinensis solution</td>
<td>Expression of interleukin-10, tumor necrosis factor and RANKL in diabetic rats were evaluated after treatment with A. sinensis solution by immunohistochemistry</td>
<td>50</td>
</tr>
<tr>
<td>Vitis Vinifera</td>
<td>Commercially available grape seed extract</td>
<td>Brekoex Grape seed OPC 30® The modified agar dilution millpore method was conducted for evaluation of seed extract antibacterial property against S. aureus, E. coli, C. albicans, and K. pneumonia</td>
<td>51</td>
</tr>
</tbody>
</table>

**Herbal medicine and periodontal health maintenance**

<table>
<thead>
<tr>
<th>Plant/Herb</th>
<th>Extract Type</th>
<th>Test/Procedure</th>
<th>Result/Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Myrtus Communis/Eucalyptus Galbie</td>
<td>Methanolic extracts in combination with calcium hydroxide powder</td>
<td>Agar diffusion technique, tube dilution test, and microtiter plate assay were conducted for evaluation of antibacterial activity against E. faecalis</td>
<td>52</td>
</tr>
<tr>
<td>Angelica archangelica/Asurum European</td>
<td>Fufang bing peng irrigant</td>
<td>PCR, high-throughput sequencing analyses, and antibacterial test were conducted to evaluate the efficacy of the herbal irrigant against E. faecalis</td>
<td>53</td>
</tr>
<tr>
<td>Emblica officinalis/ Terminalia bellirica/Terminalia chebula</td>
<td>Triphala extract</td>
<td>Dental canals were examined after rinsing with Triphala extract for evaluation of the smear layer by field emission scanning electron microscope</td>
<td>54</td>
</tr>
<tr>
<td>Morinda citrifolia</td>
<td>M. citrifolia juice</td>
<td>Disc and well diffusion tests were conducted for evaluation of M. citrifolia against intracanal bacteria such as E. faecalis and C. albicans</td>
<td>55</td>
</tr>
<tr>
<td>Cymbopogon citratus/ Mentha piperita/Ocimum sanctum</td>
<td>NaOCl herbal solution (9:1 ratio)</td>
<td>A combination of 6% NaOCl and herbal extracts was tested for pH and chlorine content</td>
<td>56</td>
</tr>
<tr>
<td>Psidium guajava/Anacardium occidentale</td>
<td>Herbal extracts</td>
<td>An Agar diffusion test was conducted for evaluation of herbal extracts against E. faecalis and C. albicans</td>
<td>57</td>
</tr>
</tbody>
</table>
### Carica papaya/ Aloe vera
- **Morinda citrifolia**/ **Emblica officinalis**/ **Terminalia bellirica**/ **Terminalia chebula**: *M. citrifolia* extract/Triphala juice
  - Colony-forming units of *E. faecalis* and *C. albicans* were evaluated after intracanal irrigation with Triphala juice, *M. citrifolia* extract and CHX
  - **ISSN: 2250-** 58

### Curcuma longa
- **Curcuma longa** gel
  - Evaluation of anti-bacterial property of *C. longa* against *E. faecalis* infection found in dentinal tubules
  - **ISSN: 2250-** 59

### Cymbopogon citratus/ Ocimum basilicum/ Camellia sinensis
- **C. citratus** oil/0. *basilicum* oil/obicure tea extract
  - Broth micro dilution method was used for evaluating the antimicrobial efficacy of herbal extracts against *E. faecalis* found on gutta-percha cones
  - **ISSN: 2250-** 60

### Emblica officinalis/ Psidium guajava
- Alcoholic extracts
  - The Agar disk-diffusion method was used for evaluating the efficiency of herbal extracts and BioPure MTAD® against *E. faecalis*
  - **ISSN: 2250-** 61

### Morinda citrifolia/ Azadirachta indica/ Aloe vera
- Aqueous extracts
  - An Agar diffusion test was conducted for evaluating herbal extract’s efficacy against *E. faecalis*
  - **ISSN: 2250-** 62

### Allium sativum
- Water extract
  - Fluorescence microscopic analysis and microbial viability assay were used for evaluation of antibacterial efficacy against *E. faecalis*
  - **ISSN: 2250-** 63

### Ferula gummosa
- *F. gummosa* essential oil
  - Broth micro-dilution evaluation and disk diffusion test were conducted to evaluate the antibacterial efficacy of *F. gummosa* oil
  - **ISSN: 2250-** 64

### Herbal medicine and anti-fungal properties

### Nigella Sativa
- Alcoholic extract
  - Candida colony count evaluation was conducted after rinsing *C. albicans*-contaminated acrylic resin specimens with *N. sativa* extract
  - **ISSN: 2250-** 65

### Equisetum giganteum/ Punica granatum
- Combination of herbal ethanolic extracts with denture adhesive
  - Evaluation of the herbal extracts’ efficacy against *C. albicans* by confocal laser scanning microscopy analysis, colony-forming units count, cell viability analysis, and scanning electron microscopy
  - **ISSN: 2250-** 66

### Isodon flavidus
- Methanolic extract
  - Evaluation of anti-fungal property of *I. flavidus* by biofilm breakdown assay against *C. albicans* and *T. rubrum*
  - **ISSN: 2250-** 67

### Lippia citriodora
- Aqueous and ethanolic extract
  - Evaluation of anti-fungal property of *L. citriodora* by the disk and well diffusion tests
  - **ISSN: 2250-** 68

### Centratherum anthelminticum/ Ocimum sanctum
- Seed oils
  - Evaluation of anti-fungal property of herbal oils by disc diffusion and broth micro dilution methods
  - **ISSN: 2250-** 69

### Zataria multiflora
- 0.5 mg/ml *Z. multiflora* extract
  - Evaluation of anti-fungal property of *Z. multiflora* herbal extract against *C. albicans* by mean viable microbial count
  - **ISSN: 2250-** 70

### Origanum dubium
- Origanum oil combined with tissue conditioner
  - Evaluation of anti-fungal property of *O. dubium* herbal extract against *C. albicans* by agar punch well method
  - **ISSN: 2250-** 71

### Anti-inflammatory and wound healing properties

### P. ginseng/ G. glabra/ Z. jujuba/ P. terruta/L. officinalis/ Scutellaria/ Coptis
- Hangeshashinto
  - Evaluation of the effects of Hangeshashinto on scratch induced wound healing in vitro and in vivo
  - **ISSN: 2250-** 72

### Schisandrin chinensis
- *Schisandrin C*
  - Evaluation of reactive oxidative stress and nitric oxide production in dental pulp cells by muscle cell analysis
  - **ISSN: 2250-** 72

### Camellia sinensis
- Herbal extract
  - Evaluation of inflammatory cell infiltration in oral epithelium after treatment with *C. sinensis* herbal extract in rats by histological analysis
  - **ISSN: 2250-** 74

### Antineoplastic properties in herbal medications

### Geranium thunbergii
- Geranin
  - Evaluation of anti-neoplastic property of Geranin against SCC cells by western blot assay
  - **ISSN: 2250-** 75

### Vernonia cinerea
- 8α-tigloyloxyhirsutinolide
  - Evaluation of anti-proliferative property of 8αTGH against
  - **ISSN: 2250-** 76
However toxicities due to herbal agents have been occurring a developed country no regulations and laws for up to now. The past decade. The herbal medicine has gained considerable popularity during the past decade. There are several sites online which are making against the trade of Ayurveda medicines which use herbs and their extracts. People are drawn to such traders who claim herbal medicines to be devoid of side effects. In countries like India which are in the race trying to trade herbal medicines under the tag of being free from side effects. In countries like India which are in the race trying to trade herbal medicines under the tag of being free from side effects. There still are masses which still completely depend on herbal medicine so much so that have replaced the daily prescribed dose of allopathic for diabetes, hypertension, thyroid disease, etc. with herbal medicines where the patient have pledged to have the medicines lifelong. There are several people which claim herbal medicines to be devoid of side effects that is a myth. There still are toxicities of using natural products, discovering their bioactive properties of S. miltorrhiza extracts against oral neoplastic cell DNA. Many researchers in the field of dentistry and pharmacology have devoted their time and resources to evaluation of natural products, discovering their bioactive properties of herbal medicine in dentistry. People are drawn to such traders who claim herbal medicines to be devoid of side effects. In countries like India which are in the race trying to trade herbal medicines under the tag of being free from side effects. Many researchers in the meadow of dentistry and pharmacology have devoted their time and resources to evaluation of natural products, discovering their bioactive properties of herbal medicine in dentistry.

### Table 2 Manifestations of plants

<table>
<thead>
<tr>
<th>Name</th>
<th>Toxicity</th>
<th>Indication</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cranberry</td>
<td>Nephrolithiasis</td>
<td>Dietary supplement</td>
<td>97</td>
</tr>
<tr>
<td>Willow Bark</td>
<td>Renal Dysfunction</td>
<td>Anti Rheumatic</td>
<td>98</td>
</tr>
<tr>
<td>Aconite , Monks Hood</td>
<td>Ventricular Arrhythmia</td>
<td>Pain</td>
<td>99</td>
</tr>
<tr>
<td>Black Cohosh</td>
<td>Acute hepatitis</td>
<td>Menopausal symptoms</td>
<td>100</td>
</tr>
<tr>
<td>Kava kava</td>
<td>Acute liver failure</td>
<td>Tranquilizer</td>
<td>101</td>
</tr>
<tr>
<td>Valerian</td>
<td>Liver toxicity</td>
<td>Sedative</td>
<td>102</td>
</tr>
</tbody>
</table>

**CONCLUSION**

Herbal medicine has gained considerable popularity during the past decade. The chief benefits of using natural options are easy accessibility, cost-effectiveness, improved shelf life, low toxicity and lack of microbial confrontation accounted up to now. Herbal agents have been employed in dentistry for plummeting inflammation, as antifungal, antibacterials, antimicrobial plaque agents, antiseptics, antioxidants, antimicrobials, antivirals, and analgesics. They also help in healing and are efficient in scheming microbial plaque in gingivitis and periodontitis and thus improving immunity. Many researchers in the meadow of dentistry and pharmacology have devoted their time and resources to evaluation of natural products, discovering their bioactive properties of herbal medicine in dentistry.
compounds and finding applications for them in a variety of features of oral health maintenance. In this paper, we tried to create a complete review of recent scientific studies about medicinal plants and their current status in the meadow of dentistry. The gathered data can be employed as a basis for future endeavors to discover novel natural medicaments with lower costs and side effects for oro-dental pathologies.

**Future Direction**

Herbal medicine shows assuring consequences in almost every aspect of oro-dental treatment plans. Although numerous of the studies with reference to the beneficial properties of herbal medicine in dentistry claim that herbal products can be employed as alternatives for conventional drugs, without bearing common side effects, the majority of them lack proper evidence about their protection and biocompatibility. Most of these researches are conducted at in-vitro and pre-clinical settings. Therefore, there is an urgent need to increase research efforts and funding aimed at clinical trials on efficacy, safety, cost-effectiveness, and characterization of these natural compounds. Alternative and herbal therapy can be helpful for the people all around the earth, especially in resource limited countries. This can support and justify the requirement for upcoming studies with up to date and reliable protocols and techniques.

**Funding**

There was no financial support.

**Conflict of interest**

None

**References**


91. Fatima N. Toxic effects as a result of herbal medicine intake. Toxicology-New Aspects to This Scientific Comundrum. 2016, pp93-207. https://doi.org/10.5772/64468


97. Terris MK, Issa MM, Tacker JR. Dietary supplementation with cranberry concentrate tablets may increase the risk of nephrolithiasis. Urology 2001; 57(1):26-29. https://doi.org/10.1016/s0090-4295(00)00884-0


