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Natural Herbal Remedies For Common Dental And Oral Diseases.

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ABSTRACT

Dental and oral diseases are a costly burden to health care services. Worldwide the treatment of dental caries and oral disease is highly expensive. They cost between 5 and 10% of total health care expenses exceeding the cost of treating cardiovascular disease, cancer and osteoporosis. In low-income countries, the prevalence rate of dental caries is high and more than 90% of caries is untreated. Huge financial benefits can be gained from preventing oral and dental diseases by natural products. With the aim of developing alternative approaches to reduce or prevent the dental caries and oral diseases, numerous investigations showed those natural herbs, shrubs, and their derivatives largely being considered for therapeutic applications for the common oral and dental ailments. Among them, green tea, white mulberry, bloodroot, caraway and licorice are the most common herbs.

eywords: Natural remedies, oral conditions, dental caries, periodontal diseases, ulcers, oral and dental.

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INTRODUCTION

Realization that dental caries is a reversible, dynamic process at a micron level has changed the way the profession recognizes the caries disease. GV black in 1908 advised the profession not to ignore the biological nature of dental caries. He stated that" this attitude of profession is an anomaly in science that should not continue".

Dental caries is a highly prevalent disease to be considered a major public health problem. Signs of the caries process cover a continuum from the first molecular changes in the apatite crystals of the tooth structure, to a visible white-spot lesion, through to dentin involvement and eventual cavitations [1].
Progression through these stages requires a continual imbalance between pathological and protective factors that results in the dissolution of apatite crystals and the net loss of calcium, phosphate and other ions from the tooth (dimeneralization) [2].

Numerous chemicals and antibiotics like sporamycin, vancomycin, chlorhexidine are being used for antibacterial agents against S. mutans to reduce plaque mediated diseases including dental caries [3, 4]. However, these chemicals possess many adverse effects such as microorganisms getting tolerance, vomiting, diarrhea and teeth staining [5]. These drawbacks justify further research and development of natural antimicrobial agents that are safe for the host or specific for the oral pathogens. It has been well documented that medicinal plants confer considerable antibacterial activity against various microorganisms [6-8].

Natural herbal remedies:

Green Tea: (table 1)
Many reports in experimental animals and humans suggested that green tea consumption (without added sugar) reduces dental caries as it acts as antibacterial agent

The chemical composition:

Fresh tea leaves contain 75%-80% of water and 20%-25% of stem compounds, which are mainly categorized into tea polyphenols, proteins, alkaloids, amino acids, mineral compounds, vitamins, pigments fats and fragrance elements.

Tea Polyphenols content is of the highest amount and plays a key role for tea quality and its health effects. Compared with other plants, tea plants contain higher amounts of caffeine, vitamins C, B1, B2 and E and the mineral compounds such as potassium, fluoride, aluminum (table 2).

Mode of action:

Flavonoids:

Flavanols also known as catechins are the most abundant class of flavonoids in tea. The principal Flavanols found in tea are epicatechin, epigallocatechin , epicatechin gallate , and epigallocatechin gallate . When catechins are enzymatically oxidized by polyphenol oxidase during fermentation, they form Polymers known as theaflavins and thearubigins.

Tea Flavanols have power effect against dental caries and periodontitis. Studies show that just the lowest concentration (MIC) of 1000ug/ml epigallocatechin gallate is enough to effectively suppress the growth of dental caries bacteria. It also suppresses the activity of carbohydrates caused by dental caries with epicatechin gallate or epigallocatechin gallate. Usually 100ml tea water contains 50-100mg tea flavanols, which is sufficient to inhibit the growth of dental caries.

Tea Polyphenols can also be used to treat bad breath, caused by some food or diseases from oral cavity, digestion system or breath system. Therefore, Green tea is nowadays used in toothpastes, mouthwash and chewing gums [9].

Fluoride:

Tea plants accumulate fluoride in their leaves. In fact, the oldest tea leaves contain the most fluoride. Most high quality teas are made from the bud or the first four leaves-the youngest leaves on the plant. Brick tea, a lower quality tea, is made from the oldest tea leaves, and is often very high in fluoride. Symptoms of fluoride excess (dental and skeletal fluorosis) have been observed with consuming large amounts of brick tea. Fluoride levels in green and black teas are generally comparable to those recommended for the prevention of dental caries[10].

Conclusion:listed in table 3

White mulberry:(table 1)

The root bark of MorusAlba has been traditionally used in Asian countries for medicine purposes due to its anti-hyperlipidemic, anti-hypertensive, anti-hyperglycemic, anti-microbial, anti-allergic, anti-inflammatory, hepatoprotective, neuroprotective, immuno-modulatory, and anti-venom activities [11-17].

The chemical composition:

Photochemical studies have identified alkaloids, flavonoids, flavones, flavanones, stilbenes, benzophenones, coumarin derivatives and terpenoids in Morus species (table 2). These compounds are likely responsible for the bioactivities of the Morus plants [18].

Mode of action:

The chloroform fraction of the root bark of Morus Alba reported strong activity against Bacilllus subtilis, and the acetic acid fraction against Staphylococcus aureus, B. subtilis and Escherichia coli. It has been reported that, M. Alba has strong antibacterial activities against some oral pathogens by its bioactive ingredient Kuwanon G. It exhibited specific activity against the cariogenic bacteria such as S. mutans, S. sobrinus and S. sanguis, and periodontal bacterium, P. gingivalis[19].

Many studies indicate that kuwanon G confers much stronger antibacterial activity than other commercial agents. The activity was comparable to antibiotic vancomycin and chlorhexidine, which, however, possess the detrimental side effects such as discoloring of teeth, reducing of immune defense, disrupting of normal ecology of plaque, diarrhea, vomit [20, 21]. It is also worth mentioning that kuwanon G conferred four times higher minimum inhibitory concentration (MIC) than sanguinarine, which is a natural agent isolated from S. canadensis, being used for the industrial mouthwash products [22, 23].

Conclusion: listed in table 3

Bloodroot plant: (table1)

Bloodroot is an early spring white wildflower that grows in the woodlands of the eastern of North America. The rhizome yields a bright red latex when cut, giving the plant its common name. The root and rhizome are collected in the fall for medicinal use [24, 25]. It is used by eastern American Indian as a red dye and to treatskin disease, and also as a blood purifier. The juice of the plant was also taken for coughs and sore throats. Higher oral doses were observed to have expectorant and emetic properties. The root was used in 19th century medicine as a caustic topical treatment for skin cancers, polyps, and warts. In 1983, an extract of bloodroot was marketed in toothpastes and mouthwashes for prevention of gum disease and plaque[26].

The bloodroot alkaloid sanguinarine has anti-oxidant, anti-tumor, anti-bacterial, and anti-inflammatory properties. Numerous scientific studies have indicated that sanguinarine has a promising role in cancer therapy and management due to its antiproliferative effects. In veterinary medicine, sanguinarine has been used to topically treat proud flesh, warts and skin cancers [27].

The Chemical composition:

Bloodroot is an abundant source of isoquinoline alkaloids, with the two major quaternary alkaloids sanguinarine and chelerythrine having been isolated in the 19th century. Sanguinarine is a bright red benzophenanthradine alkaloid and is considered to be the most active constituent in the plant. Highest levels of sanguinarine are found in the rhizomes, then the roots, with lesser amounts found in the flowers and leaves (table 2). Other related compounds include berberine, sanguidimerine, protopine [28-29].

Mode of action:

In respect of its possible modes of action, it has also been shown that sanguinarine at a concentration of 16 microgram per milliliter completely inhibited 98% of microbial isolates from human dental plaque and that sanguinarine and zinc act synergistically in suppressing the growth of various oral strains of streptococci [30-35]. Sanguinarine mouth rinse and toothpaste regime given for 6 months during orthodontic treatment reduced plaque by 57% and gingival inflammation by 60% compared with figures of 27% and 21% for the placebo control group [36-38].

In 1983, an extract of bloodroot was marketed in toothpastes and mouthwashes for prevention of gum disease and plaque

Conclusion: listed in table 3
Caraway: (Carumcarvi) (table 1)

Trachyspermumammi, Ajowan caraway, belongs to the family Apiaceae. Also, it is an aromatic spice closely resembling thyme in flavour. It is native of Egypt and is distributed in the Mediterranean region and south-west Asia. It has long being used as the principal source of thymol. Caraway seeds are employed as an antiseptic, aromatic, carminative and antioxidant source. Its oil is used in the preparation of lotions and ointments in cosmetics industries and as spice in many food preparations. It is reported to possess strong insecticidal activity, bronchodilatory effect on asthmatic airways and analgesic effect [39, 40].

Chemical composition:

The chemical components of Caraway oil are Acetaldehyde, Cumuninic aldehyde, Furfurol, Carvone and Limonene (table2).

Mode of action:

Despite the traditional use of caraway seeds, its use against dental caries was reported [41]. Previous investigation recorded reduction in acid production of S. mutans with regular use of caraway oil. Additionally S. mutans adheres to the enamel surface by hydrophobic bond interaction. Therapeutic agents, which help prevent hydrophobic bond formation, would reduce the incidence of caries. The investigations revealed that decrease hydrophobicity, one of the most important initial factors for the oral pathogenic bacteria to adhere to the tooth surface [42]. Cell surface hydrophobicity of S. mutans is mainly associated with cell surface proteins, and it is possible that the caraway active compound binds to cell surface proteins reducing the overall cell hydrophobicity [43]. Mutans streptococci can colonize the tooth surface and initiate plaque formation by their ability to synthesize extracellular polysaccharides from sucrose, mainly water insoluble glucan, forming a barrier that prevents the diffusion of acids produced by the bacteria. Extracellular glucans promote adhesion and colonization of cariogenic organisms and provoke resistance against antimicrobial agents [44].

The compound might have exerted its influence either by affecting the ability of S. mutans to produce extracellular glucans that resulted in a decrease in extracellular matrix component or by increasing the diffusion coefficient of the biofilm, making it more permeable and thus more prone to reduced microbial adhesion [45**].**

Conclusion: listed in table 3
Licorice: (table 1)

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The licorice root plant is an herbaceous perennial, which requires little maintenance once established. The licorice plant is stoloniferous, it spreads similar to the strawberry plant by growing new plants.

Licorice is found in both dry areas and damp valleys in the Mediterranean and some south-western areas of Asia. The extract is prepared by boiling the roots and allowing the water to evaporate, resulting in the creation of 'licorice syrup'.

Licorice has many modern and traditional uses. It is one of the earliest known remedies for coughs and respiratory conditions.

Licorice has a long history of use for its rejuvenating and nutritious properties. Records show it was being used as energy drink by Roman and Egyptians.

Chemical composition:

The main active ingredient in licorice root is glycyrrhizin. However, over 600 active components have been identified in the plant, including 10 bioflavanoids which act to strengthen the immune system[46].

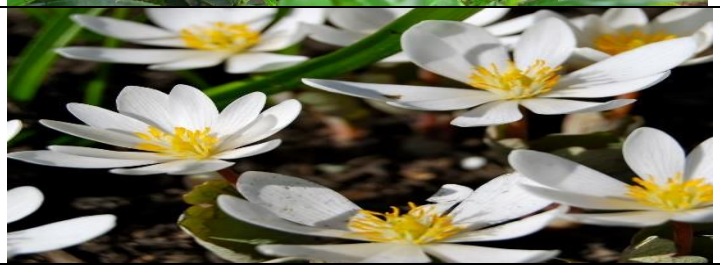
Two antibacterial ingredients were extracted from licorice root; licoricidin and licorisoflavan A. In 2012, an international published research by the American Chemical Society linked these chemicals to oral health (table2).

The researchers found that each chemical strongly inhibited two major cariogenic bacteria - Streptococcus mutans, which is the most important bacterium, induce dental caries, and Streptococcus sobrinus. The chemicals also had a major inhibitory effect on two common gum disease bacteria; Porphyromonasgingivalis and Prevotella intermedia. In addition, the licoricidin moderately inhibited a third bacterium, Fusobacterium nucleatum, which is often associated with periodontal disease [47].

Mode of action:

Licorice compounds (licoricidin and licorisoflavan) block an enzyme needed by Streptococcus mutans when it forms biofilms. Bacteria in biofilms are much harder to attack than those outside biofilms [48]. Listed in table 3

Table 1: Common names and plants images

Common name	Plants photos
Green Tea	
White mulberry	

Bloodroot plant	
Caraway	
Licorice	

Table 2: Common name, Botanical name and their active components

Common name	Botanical Name	Active chemical component
Green Tea	Camellia sinensis	Theaflavins,thearubigins and fluoride
white mulberry	Morus Alba	Kuwanon G.
Bloodroot plant	Sanguinaria canadensis	Sanguinarine
Caraway	Trachyspermumammi	Acetaldehyde, Cumuninicaldehyde, Furfurol, Carvone and Limonene.
Licorice	Glycyrrhiza glabra	Licoricidin and licorisoflavan

Table 3: Common names and their effects on dental disease

Common name	Their effects on dental disease
Green Tea	Several studies in animals and human prove that dental caries And periodontitis can be well prevented by drinking tea frequently or rinsing the mouth with tea water after food.
White mulberry	Kuwanon G can find its potential as a novel oral care

	agent, preventing dental caries, particularly due to its fast bactericidal effectiveness against S. mutans This result strongly indicates industrial potential of kuwanon G in toothpaste, mouthwash and oral care products,
Bloodroot plant	Reviews on antimicrobial mouth rinses including sanguinarine conclude that short-term studies have shown variable but significant plaque inhibitory effects but the effect on gingivitis appears to be unclear. Clinical applications beyond the use of sanguinarine in mouthwashes have not been investigated
Caraway	Caraway possesses powerful anticariogenic potential with antibiofilm activity against S. mutans. It significantly reduced its adherence as well as biofilm formation, insoluble glucan synthesis and hydrophobicity.
Licorice	Licorice compounds strongly enhance oral health by preventing dental caries, gingivitis as well as periodontitis.

Concluding Remarks:

A goal of modern dentistry is the non-invasive management of caries lesions.

Numerous studies on herbal products have shown that certain herbs can offer effective prevention of dental caries.

Dental products containing these herbal components generally help maintain oral hygiene by protecting against bacterial infections, preventing from plaque accumulation, formation ofbad breath, dental caries, and gingival and periodontal diseases.

However these findings are very interesting, Lab results are sometimes the same as the clinical results, but not always.

Despite the fact that several herbal products have been primarily tested, not many reports on systematic controlled, clinical trials, studies on those herbal products to prove the effectiveness and safety, and to identify any adverse effects and interactions with other conventional drugs are available to date.

Therefore, appropriate cautions must be exercised in the use of these herbs or herbal products.

Recommendations:

There is a need of further chemical analysis of herbal products used in dentistry. Animal laboratory studies and RCT are needed to be designed both in university settings and pharmaceutical facilities. The side effects of those products, doze dependent information and shelf life of refined and finalized products should be documented.

Further research is needed to collaborate between basic science specialist, animal researchers and oro-dental experts to share their skills to develop and utilize the herbal products as risk free. Undesired effects and cost-effective preventive and curative medicaments be readily available with proven clinical efficacy for patients use, to improve the quality of life with predictable outcome of the preventive and therapeutic use of those products.

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