**NUTRITIOUS MOUTHWASH USING EGG SHELLS AND MEDICINAL PLANT EXTRACTS**

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**INTRODUCTION**

Oral infections like gingivitis and periodontitis affects a majority of the population worldwide. Some of the factors predisposing to gingivitis and periodontitis includes improper oral hygiene, systemic conditions, pregnancy and puberty. So, the gold standard when it comes to the treatment of gingivitis and periodontitis was to remove the local risk factors like plaque and calculus through mechanical debridement i.e., scaling. Since the ancient times many herbal products were used in the form of tooth brush, toothpaste, mouth rinse, local drug delivery agents and regenerative materials as an adjunct to scaling to improve the condition of the oral cavity [1].

**MOUTH WASH**

Mouthwashes also called liquid, aqueous compositions mainly intended to prevent, relieve and cure oral conditions and maintain oral health such as dental caries, dental erosion, halitosis, gingivitis, periodontitis, mucositis, to reduce the oral microbiota, etc. A typical mouthwash on the market is a water–glycerine mixture, consisting of an additional sweetener (saccharin), surfactant (PEG-40 hydrogenated castor oil), preservative (sodium benzoate), some colourant and flavouring agent, as well as having two oral health substances, an anticaries compound and antimicrobial drug (essential oils) [2].

**EGG SHELL**

Egg shells also have many nutritional and non-nutritional components. A huge amount of eggshell waste is generated globally, and these eggshells are rich source of minerals especially calcium. Eggshell waste to be converted into a bioavailable source of calcium for food fortification. Its potential applications in other fields such as pharmaceuticals and agriculture. Calcium present in eggshell powder is in the form of calcium carbonate. The salt contains 40% calcium by weight and is insoluble, tasteless, and non-irritating. It can react with gastric HCl and is used as an antacid. The bioactive mechanism clarifies that the calcium from porous eggshell powder can be absorbed better in the human intestine.

**MEDICINAL PLANTS**

**Manila Tamarind (*Pithecellobium dulce)***

*Pithecellobium dulce* the bark and pulp of Manila Tamarind is used as a traditional remedy against gum ailments, toothache, and haemorrhage. Numerous studies have been performed on anti-oxidant, anti- inflammatory, anti- diabetic, anti- cancer properties of Manila tamarind. It provides relief from pain, eczema, fever, cold, sore throat, pigmentation, acne and pimples [3].

**Noni (*Morinda tinctorial)***

Noni juice was identified as first possible alternative to Sodium hypochlorite solution which was considered to be the gold standard endodontic irrigant Noni has been considered as a vital herb due to its numerous medicinal properties and has been recently included as a plant of interest in the field of dentistry. Dental caries is a multi-factorial disease of the oral cavity which occurs mainly due to acid producing and acid resistant gram-positive bacteria like *Streptococcus mutans*, lactobacillus which creates acidic environment that has the ability to dissolve the calcium phosphate found in teeth and ultimately leads to dental caries [1]. Extracts of *Morinda citrifolia* was found to be effective against these oral *Streptococcus* species because of its antibacterial activity. Extracts from ripe noni fruits were used as an effective mouth rinse following mechanical debridement because of their antibacterial, anti-inflammatory properties.

**Guava leaves *(Psidium guajava)***

The flavonoids present in guava leaf extract chiefly determine their antibacterial activity, while quercetin, which is the most predominant flavonoid of guava leaves. The presence of a unique variety of bioactive polyphenolic compounds, like quercetin and other flavonoids, and ferulic, caffeic, and gallic acids, present in guava leaves primarily determine their bioactive and therapeutic properties. These phenolic compounds are known as secondary metabolites which exhibit strong antioxidant and immunostimulant activities [4].

**Veldt grape (*Cissus quadrangularis*)**

Anti-inflammatory activity *Cissus quadrangularis* contains bioflavonoids, numerous flavanoids, several flavones, flavonols, flavanols and flavanoids especially luteolin. All of these acts by inhibiting the lipooxygenase pathway. β sitosterol also called plant cholesterol also have anti-inflammatory activity. *Cissus quadrangularis* acts on both the cyclooxygenase and lipoxygenase pathways of arachidonic acid metabolism and cause inhibition. Therefore, *Cissus quadrangularis* acts as dual inhibitor of arachidonic acid metabolism [5].

**Licorice root *(Glycyrrhiza glabra)***

Licorice and its bioactive ingredients such as glycyrrhizin, glabridin, licochalcone A, licoricidin, and licorisoflavan possess potent beneficial effects in oral diseases such as dental caries, periodontitis, candidiasis, and recurrent aphthous ulcers. Liquorice root acts as anaerobic periodontal pathogens-*Porphyromonas gingivalis*, *Fusobacterium nucleatum*, *Aggregatibacter actinomycetemcomitans* and in vivo efficacy of liquorice mouth rinse and chlorhexidine gluconate mouth rinse in the prevention of plaque formation and gingivitis. It was hypothesized that there is no difference in efficacy of liquorice and chlorhexidine mouth rinse [6].

**Eucalyptus**

Eucalyptus oil contains a valuable medicinally and pharmacologically influential chemicals, that is already been used in many aspects of medicine as an anti-inflammatory, antimicrobial, antioxidative, antihistaminic, antiseptic agent etc., [7]. Considering these facts, several attempts had been carried out to use eucalyptus oil in various dental aspects

**Betel leaves *(Piper betle)***

Leaves of the piper betel contain steroids, alkaloids, polyphenols, and tannins. The leaves have a chemo-preventive potential against various conditions such as carcinoma and liver fibrosis. Piper betel leaves also contain antioxidants such as eugenol, ascorbic acid, and β-carotene. The leaves are rich in nutrients, containing many vitamins and minerals, enzymes, and essential amino acids. A study on chewing betel leaves showed that the saliva obtained after mastication of an entire leaf reduced the microflora by approximately 56%. The piper betel is used to recover bad breath and prevent tooth decay. [8]The betel leaf has a broad-spectrum antimicrobial activity against numerous strains of bacteria, some of which include *Staphylococcus aureus*, *Bacillus cereus*, *Pseudomonas aeruginosa*, and *Escherichia coli.* [8]

**Corn silk *(Stigma maydis)***

Corn silks such as flavonoids, sterols, alkaloids, polysaccharides, organic acids, volatile oils, trace elements, and multivitamins. Flavonoids are natural antioxidants and have application value in scavenging free radicals, inhibiting bacteria, and regulating blood lipids [9].

**Mint *(Mentha longifolia)***

Usage of *Mentha longifolia* in the treatment of throat irritation, mouth and sore throat is widespread. Studies have shown that plants of the genus Mentha possess significant antimicrobial activities, mainly due to the presence of oxygenated monoterpenes in their chemical composition. The essential oil of *Mentha longifolia* has shown interesting antimicrobial activity against *Escherichia coli, Salmonella typhimurium*, *Listeria monocytogenes*, *Aspergillus flavus, Botrytis cinerea, Fusarium oxysporum, Pseudomonas aeruginosa, Aspergillus niger, Trichophyton longifusus, Microsporm canis and Mucor ramamnianus*. the phenolic compounds as the main cause of better antioxidant effect of methanol extract than the essential oil [10].

**Clove *(Syzygium aromaticum)***

The antioxidant and antimicrobial activity of clove is higher than many fruits, vegetables and other spices and should deserve special attention. *Syzygium aromaticum* Clove oil is applied for toothache, dental caries and pyorrhea. Eugenia has properties like anti-inflammatory, analgesic, antipyretic, antifungal and used in peptic ulcer treatment. Clove oil (eugenol) is a suitable anaesthetic for aquacultural and sheries use, although it is anti-inflammatory, antithrombic, antipyretic, analgesic, anticonvulsant, antimycotic, insecticidal, antimutagenic, antiulcerogenic etc., The oil is used for treating a variety of health disorders including toothaches [11].

**COMPOSITION OF MEDICINAL MOUTHWASH**

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| COMPONENTS | USES |
| Egg shells | Source of **calcium citrate** |
| *Pithecellobium dulce* (Madras thorn) | Reduce **bleeding gums, anti-inflammatory,** Source of **calcium.** |
| *Morinda tinctoria* (Indian mulberry) | **Wound healing activity**, cures **bleeding gums.** |
| Guava leaves (*Pisidium guajava)* | **Antibacterial,** cures **halitosis,**  **Anti-inflammatory** |
| Veldt grape (*Cissus quadrangularis)* | Rich in **calcium, antioxidant, anti-inflammatory** |
| Licorice root | **Sweetener, Aromatic,** cures **respiratory problems, controls** **clogging mucus** |
| Eucalyptus | **Aromatic, Anti-inflammatory, anti-oxidant, anti-fungal anti-viral, anti-bacterial** |
| Betel leaves | Source of **vitamin C,** great source of **calcium, analgesic, antiseptic, antifungal** |
| Corn silk | **Oral antidiabetic agent** |
| Mint | **Anti-inflammatory, freshener, antioxidant** |
| Clove | **Antioxidant, germicidal properties** |

**EXTRACTION OF CALCIUM HYDROXIDE**

Eggshells are one of the most common biomaterials in nature. As a by-product of food industry, they represent a significant waste because they are discarded after utilization of egg yolk and albumin. Eggshell is considered a rich source for calcium as carbonates and oxides that qualify them as excellent sources of hydroxyapatite. Eggshell provides a cost-effective and renewable as well as a sustainable source of biological product. Egg shell Derived Calcium Hydroxyapatite Preparation After thorough washing, hen’s eggshells were heated inbox furnace at 900°C for 2 hrs to decompose organic matter. After exposure to the atmosphere, it gets converted into calcium hydroxide. In an agate pestle and mortar, the product was finely ground. Calcium hydroxide was weighed and mixed with distilled water to form 0.3 M suspension. Later the suspension was treated with 0.5 M diammonium hydrogen phosphate solution corresponding to the stoichiometric ratio of Ca/p = 1.67. The mixed reactants were irradiated in a domestic microwave oven and the obtained product was then washed repeatedly with distilled water. This process removed the unwanted ions and was allowed to dry overnight in an oven at 100°C. The end product obtained after this whole process is eggshell derived calcium Hydroxyapatite [12].

**CONCLUSION**

It can be concluded that eggshells are a valuable food stuff and have multi-functions. They are not only a source of food but also have many non-nutritive benefits. Since these days egg shells are used in various methods they are majorly used in the dental products. So, to make the easiest and natural way to cure and seek a chemical free agent as a remedy, certain organic and natural herbal products are chosen and used as an alternative for chemical reagents.

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