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A Review: Development of the herbal-based mouthwash as a remedy for the commercially available antiseptics and its evaluation

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Abstract:- Inspired by people's worries about the side effects and resistance linked to commercially available antiseptic mouthwashes, the demand for herbal mouthrinses is gaining much interest. This research is aimed at developing herbal mouthwashes from naturals known for antimicrobial, antiinflammatory, and antioxidant properties. Based on their traditional use and scientific evidence of oral health benefits, key ingredients like neem (Azadirachta indica), tulsi (Ocimum sanctum), clove (Syzygium aromaticum), and licorice (Glycyrrhiza glabra) were selected. The formulation was evaluated for physiochemical properties, microbial efficacy, and safety by means of in vitro and in vivo studies. The herbal mouthwash was found to be highly antimicrobial against common oral pathogens like Streptococcus mutans and Candida albicans, as much as standard chemical ones like chlorhexidine. Further, the mouthwash had no detrimental effects on oral tissues but was tolerated by users. These results speak well for the potential this herbalbased mouthwash has in being a safer alternative to conventional antiseptic mouthwashes, thus promoting the use of herbal remedies in contemporary oral hygiene practices. Synthetic antiseptic mouthwashes such as chlorhexidine are now commonly used but have a very public profile and are increasingly receiving attention on account of their side **Keywords :** Antimicrobial herbs ,mouthwash, bad breath

Introduction :-

An integral part of the health relates primarily to the oral cavity, and millions of people suffer from preventable oral diseases due to neglect of oral care or odious contamination. Commercial mouthwashes, particularly chlorhexidine and alcohol-based products, have been used for long-term microbial load reduction and plaque control. However, long-term use of these products is accompanied by side effects, raising demand for safer and natural substances. Herbal medicine is, therefore, a classical approach plus more and more propagation through scientific study. This study describes the development of a herbal mouthwash based on neem, tulsi, cloves, and liquorice extracts, aimed at investigating its antimicrobial efficacy, safety, and possible substitution for chemical antiseptics

Cosmetic benefits of the herbal based mouthwash :- It's more than therapeutic; the all-herbal mouthwash really has excellent cosmetic advantages. The properties of herbal components made all these possible-making breath fresher, controlling oral malodor, and ensuring cleanliness without staining or changing taste, which have otherwise stainwashed all the effects of commercial antiseptics. Moreover, it has a natural refreshing aroma and flavor because of adding clove and tulsi. Its anti-inflammatory properties further

compliment neem and licorice, as they keep gums healthy and a discolored smile bright. All these cosmetic properties are used to promote mouthwash as a medicine and a desirable addition to daily oralcare routine

Herbal cosmetic benefits :-

Herbal cosmetics are the naturally derived beauty and body care products prepared with bioactive constituents originated from the plants. There are mouthwash and other oral hygiene products in the realm of herbal cosmetics that are formed using plant extracts or oils, reputed for their antimicrobial, anti-inflammatory and antioxidant properties to help with therapy as well as for a cosmetic purpose. A herbal mouthwash is thus one among the herbal cosmetics that have been produced to facilitate the improvement of oral hygiene, breath freshening, enhancement of healthy gums, and improvement of visible aesthetics of mouths using resource material that is natural and free from synthetic ingredients.

Herbal cosmaceuticals are those cosmetics which rely only on plant-based ingredients for application and/or therapeutic activities. They are part of the larger group of cosmeceuticals that are seen as blend of cosmetics and pharmaceuticals. There is a phenomenal increase in demand for natural and safe alternatives in the areas of oral health with increased consumer awareness about the possible side effects of chemical compounds used in standard personal care products. Oral hygiene products are fast becoming an accepted part of personal grooming and cosmetic care. While traditional antiseptic mouthwashes can typically include chemical agents such as alcohol and chlorhexidine, these same chemicals can cause adverse effects like tooth staining, burning sensationaltered taste perception and mucosal irritation. On the contrary, herbal mouthwashes, on account of their mild action, biocompatibility, and naturally occurring antimicrobial, antiinflammatory, and antioxidant properties, are steadily gaining popularity.

Mouth care preparation for oral ulcer :-

Mouth ulcers, such as aphthous stomatitis and traumatic lesions, often occur as painful breaks in the mucosal lining of the oral cavity. These ulcers not only hamper normal eating and speaking but also provide access for infections. From time immemorial, mouthwashes like chlorhexidine have been categorized as antiseptics. Unfortunately, they irritate the mucosa and burn when taken, causing alteration of taste, thus making them unsuitable for patients with sensitive oral tissues or ulcers. Herbal mouthwashes have emerged as the safer, better, and more tolerable option for oral ulcer management during such cases. They are dual in nature: cosmetic products for oral hygiene, as well as for therapy, especially if they contain plant extracts that have been demonstrated to possess anti-inflammatory and analgesic activities, in addition to antimicrobial and mucosal healing properties.

Medical causes of bad breath (halitosis) :-

Halitosis, or bad breath, is a common problem in oral health that afflicts people of every age group. It is usually due to a collection of volatile sulfur compounds and other substances producing odors in the mouth. These bad odors can originate due to poor oral hygiene, activity of bacteria, food substances, or systemic conditions.

I. Poor Oral Hygiene Inadequate brushing and flossing lead to food particle retention and bacterial buildup. These bacteria break down proteins, producing very foul-smelling volatile sulfur compounds like hydrogen sulfide and methylmercaptan.

2. Coated tongue The dorsal or upper surface of the tongue traps dead cells, bacteria, and debris that have now become a major source ofVSCs. Tongue cleaning is often neglected in the oral hygiene routine.

3. Periodontal or Gum Disease

4. Infections in the gums and supporting tissues release foul-smelling compounds.Deep gum pockets are commonly inhabited by anaerobic bacteria.

5. Dry Mouth (Xerostomia) Saliva aids in washing out food debris and neutralizing acids. When salivary flow is decreased, there will be more bacteria to produce odor.

6. Food and Drinks Garlic, onion, spices, and certain types offish can cause temporary bad breath. Some of these odors may also linger in the bloodstream and be ultimately released through the lungs.
7. Tobacco Products Tobacco smoking and chewing has a drying effect on the mouth and may introduce strongsmelling chemicals.
8. Medical Conditions Some causes of halitosis that originate inside include respiratory tract infections (sinusitis, bronchitis), gastrointestinal disorders (acid reflux), diabetes, liver or kidney diseases, tonsil stones, etc. In diabetic ketoacidosis, there may also be a fruity or acetone breath odor
9. Medications Some medications reduce saliva flow or are broken down in such a way that they produce odors when they are being metabolized.

l.aquase solution (liquid form)
2.alcohol based vs alcohol free
3.0il based mouthwash
4.Gel based mouthwash
5. Spray form
6.granules or powdered form
7. Effervescent tablet

* There type of mouthwash available in market
  I. Therapeutic mouthwash
  2. Cosmetic mouthwash

Advantages of mouthwash:

1. Reduces Oral Bacteria Antimicrobial or herbal added mouthwashes help in reducing the bacterial load in mouth leading to prevention of infection and enhancing overall oral health . 2. Controls Bad Breath (Halitosis) It immediately gives freshness and kills the odor causing bacteria.

* Herbal ingredients like peppermint, clove, and tulsi offer natural deodorizing effects. 3. Prevents Plaque and Tartar Formation It helps prevent plaque from building up on teeth and gums, and has a more regular use. It stops progression to gingivitis and periodontitis. 4. Maintains Gum Health Gum tissues are soothed by antiinflammatory ingredients, as well as swelling, bleeding, or tenderness. Especially useful in early-stage gingivitis. 5. Aids in Healing Oral Ulcers and Wounds Herbal mouthwashes that contain healing agents such as licorice, aloe vera, or guava extract help in faster healing and lessening of discomfort of ulcers or post surgical wounds. 6. Fights Tooth Decay Remineralization of enamel and prevention ofcavities is helped by fluoridebased and some herbal mouthwashes. 7. Reaches Areas Brushing Can Miss However, mouthwash can reach interproximal (between teeth), posterior, and subgingival areas that brushing or flossing alone cannot. 8. Refreshes the Mouth It gives a clean, fresh feeling, particularly after meals or when there is dry mouth. 9.

Gentle Options for Alcohol Free and Herbal. Herbal mouthwashes are safe being safer for people with sensitive mouths, children or those who have oral ulcers or mucosal irritation. 10. Convenient & Easy to Use It is portable and can be used to effectively rinse in 30 seconds to one minute

physical disabilities or during orthodontic treatment properties of mouthwash :-

1. Antimicrobial Activity

It inhibits or kills oral pathogens such as Streptococcus mutans, Lactobacillus spp. and anaerobic bacteria.
It is essential in preventing plaque, gingivitis and halitosis.
Good natural antimicrobial agents are herbal agents like neem, clove, tulsi and tea tree oil.

2. Anti-inflammatory Property

It reduces swelling, redness and bleeding of gums.
They can be used to treat gingivitis, periodontitis and oral ulcers.
Herbal anti-inflammatories are aloe vera, turmeric, and chamomile.

3. Antioxidant Propertylt neutralizes free radicals, contributing to tissue repair and reduction of oral inflammation.Green tea, curcumin and licorice are ingredients that contribute to antioxidant activity.

4.Astringent Effectlt reduces minor bleeding and tightens mucosal tissues.

They shrink swollen gums and promote healing of ulcerated tissues.Guava leaf and myrrh are natural astringents.

5.Analgesic (Pain-Relieving) ActionRemoves oral pain from ulcers, sore throat or inflammation.Mild analgesic effects are given by clove oil and licorice.

6 ,Deodorizing (Breath-Freshening) PropertyNeutralizes volatile sulfur compounds, commonly known to masks or eliminates bad odor.Natural breath fresheners are mint, cardamom, fennel, and cinnamon. 7.Non-lrritating and Alcohol-FreeMouthwash should not be burning or dry (especially in sensitive users).Harsh alcohols or synthetic chemicals are not used in herbal mouthwashes.

8.Pleasant Taste and Aromalt encourages user compliance and long term use.Since it's achieved using natural flavoring agents like peppermint, spearmint, or citrus oils.

9.pH Balancedlt has a neutral or very slightly alkaline pH to maintain oral tissue health and prevent enamel erosion. 10.Good Shelf StabilityThe product should remain effective and microbially safe over time.According to herbal, the use of natural preservatives or stabilizers are important

Uses of mouthwash:- 1.

Reduction of dental plaque

2.

Prevention & management of gingivitis

3.

Adjunct to daily oral hygiene

4.

Healing of oral ulcer and wound

5.

Relief from dry mouth

6.

Prevention of tooth decay

7.

Post surgical oral care

Category of therapeutic agent used in mouthwash

I. Antioxidant

Neutralize free radicals and promote healing

2. Antimicrobial agent

Inhibit or kill bacteria that cause plaque gingitive ,and halitosis

3. Anti-inflammatory

Reduce swelling radness and gum bleeding

4. Analgesic agent

Provide pain relief in ulcer or after dental procedure

5. Salivary stimulation

Increase saliva flow in dry mouth condition

6. Deodorising agent

Neutralize bad odour from sulfer compound 7

7..antifungal agent

Combat oral candidiasis and fungal infection

8. Healing agent Promot tissue regeneration and ulcer healing

11 list Of Ingrediants:-

1. Neem
2. Clove oil
3. Tulsi
4. Guava leaf
5. Licorice root
6. Aloe vera
7. Turmeric
8. Peppermint oil
9. Tea tree oil

Figure : 1.Neem

Biological source :- Azadirachta indica

Family :- Meliaceae

Geographical source India is native ofAzadirachta. It is also cultivated in Nepal, Bangladesh, and Sri-lanka.

Chemical constituents :-

Nimbin :- Provide antibacterial,and antifungal properties

Azadirachtin :- provide repellent and anti-hormonal properties 3. And Components of Neem: Neem leaves contain ingredients such as nimbin , nimbanene , 6-desacetylnimbinene, nimbandiol, nimbolide and ascorbic acid , n-hexacosanol and amino acid and nibiol.

Uses :-

l) Antibacterial action :-

Neems help to kill or inhibit the growth ofharmfull oral bacteria such spectococcus mutans and lactobacillus

2) Treatments and prevention of gingivitis

3. Control of bad breath

4.Healing of oral ulcer & wound

5.Antifungal & Antiviral protection

6.Prevent plaque and tartar build up

Figure 2. CLOVEOIL

Biological name :- Syzygium aromaticum

Family: Myrtaceae

Geographical source :- Native to Indonesia (especially the Maluku Islands, also known as the Spice Islands)Widely cultivated in India, Sri Lanka, Madagascar, Tanzania, Zanzibar, and Malaysia

Chemicals constituent:- 1 Eugenol , Eugenyl acetate

Beta -caryphyllene

Uses :-

l) Relives toothache & gum pair

2) Fight oral bacteria

3) Reduce inflammation

4) Natural alternatives to synthetic argent

Figure :3.Tulsi :

Biological Name: Ocimum sanctum or Ocimum tenuiflorum

Family: Lamiaceae (Mint family)

Geographical Source:Widely grown in India, Sri Lanka, Thailand, and other parts of Southeast Asia

Chemical constituents: rosmeric acid,carvacrol,cinalool flavonoid,caryophyllene,ursolic acid

Uses :- 1. Antifungal action protect against oral thrush

Traditional & modern oral care Eliminate harmfull oral bacteria

Heal mouth alcer

Reduce gum inflammation

Figure:4 Guava leaf

Biological name:- psidii guajavae folium

Family:- Myrtaceae

Chemical constituents:- l.phenol compound

2. Flavonoids

3.saponins

4.tannins

5. essential oil

Geographical source:derived from the guava tree, Psidium guajava, which originated in tropical America, specifically between Mexico and Peru Uses

. I. Treating Aphthous Ulcers (Canker Sores)

2. Reducing Gingivitis and Plaque

3. Fighting Bacteria

Figure :5.Liquorice root

Biological name :- Glycyrrhiza glabra

Family :- Leguminosae family.

Geographical source:- Asia, Southern Europe, and the Middle East. Specifically, it's found in regions like Italy, Spain, Turkey, Central Asia, and the western parts of China.

Chemical constituents

1.Glycyrrhizin
2.Saponins
3.Flavonoids
4.Polysaccharides

Uses . 1. Powerful Antimicrobial Action Against Oral Pathogens
2.Prevention of Plaque and Tartar Formation
3.Effective Against Oral Infections and Ulcer
4.Reduces Gum Disease and Gingivitis
5.Natural Pain Relief for Oral Discomfort

Figure:6.ALOVERA

Biological name :- Aloe barbadensis Miller

Family :- Asphodelaceae (Liliaceae)

Geographical source:-

Hajar Mountains in north-eastern Oman and eastern UAE , specifically the south-east Arabian Peninsula. Also found in india africa and other arid area Chemical constituents : Polysaccharides, anthraquinones, vitamins minerals and other organic compound enzyme Uses:-

1) Wound healing
2)Remineralization of teeth
3) Anti-inflammatory
4))Oral mucositis
5) Oral candidiasis

Figure: 7.Turmeric

Biological name : curcuma longa

Family : ginger (zingiberaceae)

Geographical source:- Andhra Pradesh, Tamil Nadu, Orissa, Karnataka, West Bengal, Gujarat, Meghalaya,Maharashtra, Assam

Chemical constituents:- Curcuminoids,,essential oils,otherphenolic compounds.

Uses :-Strong Uses of Turmeric in Mouthwash

2. Kills Germs in the Mouth
3. Heals Wounds Faster
4. Prevents Plaque and Cavities
5. Safe and Natural
6. Antioxidant

Protection

7.Alternative to Chlorhexidine

Figure 8.Paper mint oil

Biological name :- Mentha piperita

Family:- lamiaceae

Geographical source:- Is a hybrid mint species and is widely cultivated Globally and cultivated including usa, France, Brazil, India State like :- Washington, Oregon,Idaho,Wisconsin

Chemical constituents:- Menthol,Menthone, Menthofuran Uses : Refreshing flavour

1. Halitosis
2. Reduce tooth sensitivity
3. Improve Saliva production
4. Enhance overall oral hygiene

Figure: 9.Tea tree oil :

Biological name :- Melaleuca alternifolia

Family:- Myrtacea

Geographical sources : Australia,south wales,southestern queensland

Chemical constituents : Terpinen-4-ol ,1,8-cineole, alpha -terpineol, gamma-terpinene,p-cymene,limonene

1. Uses : Fights oral bacteria
2. Reduce gum inflammation
3. Halitosis
4. Promote wound healing
5. Anti-inflammatory effect

Table no :2 chemical used table

Sr.no	Ingredients	Quantity
1	Neem leaves	5-6 leaves
2	Clove oil	5 ml
3	Tulsi leaves	7-8 leaves
4	Guava leaf powder	1 mg
5	Licorice root	5mg
6	Aloe vera gel	10 ml
7	Turmeric Powder	1 gm
8	Peppermint oil	3 ml
9	Tea tree oil	2 ml
10	Distilled water	Q.s to 100 ml

Method of preparation:-

1. The part of plant like neem leaves are collected from tree
2. Neem , tulsi, guava leaves are dried in sunlight for converted into course powder
3. The extract were prepared by decocation method & the prepared extract were stored in well- closed container
4. Precisely all the dried & fresh herbs neem , guava , tulsi were wighed ofdd in there trituratendin mortor & peste.
5. After mixed clove oil, peppermint oil , tea tree oil unifo-mily 6. In that alsomixed licorice root extract keep aside for overnight.

7. After all that ingredients are there forms mix it
8. Prepared oily solution & add in powder or all ingredients
9. With up to 100 ml distilled water
10. Add place in amber coloured bottel in cool place

Mouth wash preparation:-

The preparation of the herbal mouthwash was carried out in a controlled laboratory environment under aseptic conditions. All glassware and containers were sterilized prior to use.

Step 1: Preparation of Herbal Extracts

The selected herbs—Azadirachta indica (Neem), Ocimum sanctum (Tulsi), Syzygium aromaticum (Clove), Glycyrrhiza glabra (Licorice), Mentha piperita (Peppermint), and Aloe vera—were shade-dried and coarsely powdered. The powdered materials were subjected to aqueous extraction using the following process:

Cold Maceration Method: Each herb (10 g) was soaked separately in 100 ml of distilled water in conical flasks, sealed, and allowed to stand for 48 hours with occasional shaking.

The extracts were then filtered using muslin cloth followed by Whatman filter paper No. I to remove fine particles.

The filtrates were concentrated using a water bath at 40—50^{0}C until they reached approximately of their initial volume.

Step 2: Formulation of Mouthwash

The concentrated herbal extracts were mixed in the following proportions: Neem extract: I O ml Tulsi extract: 8 ml Clove extract: 5 ml

Licorice extract: 5 ml Peppermint extract: 3 ml

Aloe vera gel (fresh): 10 ml

These were combined in a beaker and stirred continuously using a magnetic stirrer. A natural sweetener (0.5 ml Stevia extract) was added to enhance taste.

Citric acid (0.1 g) was added to adjust the pH to between 5.5 and 6.5, suitable for oral use. Distilled water was added to make up the final volume to 100 ml.

The formulation was mixed thoroughly for 15—20 minutes to ensure uniformity.

Step 3: Filtration and Storage

The final formulation was filtered again to ensure clarity.

The mouthwash was stored in sterile amber-colored bottles, labeled, and kept under refrigeration (4^{0}C) for further analysis and testing.

1. Usage Instructions
2. Dosage: Use 10—15 ml of the mouthwash twice daily after brushing.
3. Directions: Swish the solution in the mouth for 30—60 seconds, then spit it out. Do not swallow.
4. Precaution: Shake well before use. Avoid eating or drinking for 15—20 minutes after rinsing Storage Guidelines

1. Store the mouthwash in a cool, dry place or under refrigeration at 4—8 ^{0}C.
2. Use within 2—3 weeks if no preservatives are added.

Discard if the solution changes color, develops odor, or shows microbial growth. Evaluation of Herbal Mouthwash

To assess the effectiveness, safety, and acceptability of the prepared herbal mouthwash, several evaluation tests were conducted. These included organoleptic analysis, pH measurement, antimicrobial activity, short-term stability, and user feedback. All procedures were carried out under hygienic conditions, and results were documented accordingly.

1. Organoleptic Properties

The mouthwash was first evaluated based on its physical characteristics using human senses. These included:

Appearance: Clear liquid with a slight green-brown tint due to herbal content.

Odor: Mild, pleasant herbal aroma, with a noticeable peppermint note.Taste: Slightly bitter initially but smooth, with a mildly sweet aftertaste from stevia.

Texture: Light and watery, with no gritty or oily feeling.

These characteristics were considered acceptable for an oral care product. 2.

pH Measurement

The pH was measured using a calibrated digital pH meter. Since the ideal pH for mouthwash should be near neutral (5.5 to 7.0), this test was important to ensure the product would not irritate oral tissues .

Result:

The herbal mouthwash had a pH of 6.2, which is well within the safe range for oral use.

3. Antimicrobial Activity

The antimicrobial potential of the mouthwash was tested using the agar well diffusion method against selected oral pathogens: Streptococcus mutans (linked to dental cavities

Lactobacillus acidophilus (associated with tooth decay) Candida albicans (causes oral thrush)

Petri dishes containing nutrient agar were inoculated with each microorganism. Wells were created and filled with the mouthwash, then incubated at 37 ^{o}c for 24 hours. Zones of inhibition were measured to determine antimicrobial

effectiveness.

The results showed that the mouthwash had noticeable antimicrobial action, especially against S. mutans.

4. Short-Term Stability StudyA two-week stability observation was carried out to monitor changes in the product under refrigeration

(4—8 ^{0}C). The following parameters were recorded on day O, 7, and 14:

Overall, the mouthwash remained physically and chemically stable, with minimal changes.

5. User Acceptability Feedback

A small group of 10 volunteers (students aged 18—25) used the mouthwash for one week and were asked to share their experience using a simple questionnaire.

Most users found the product pleasant and effective, with no complaints of irritation or discomfort.

Conclusion

The prepared herbal mouthwash exhibited good physical properties, effective antimicrobial activity, and positive user feedback. Its pH was appropriate for oral use, and it remained stable under refrigerated conditions. Based on these findings, the formulation can be considered a promising natural alternative to commercial mouthwashes containing synthetic chemicals.

3. Result:-

The herbal mouthwash was formulated using a blend of neem, tulsi, clove, licorice, peppermint, and aloe vera. The following results were obtained after the preparation and testing phases: l. Physical Properties:

Color: Clear liquid with a slight green-brown tint.

Odor: Mild, pleasant herbal aroma, with noticeable peppermint.

Taste: Slightly bitter at first, balanced by a mild sweetness, and no unpleasant aftertaste.

Texture: Smooth, with no grit or residue.

1. pH Level: The pH of the mouthwash was measured at 6.2, which is within the safe range for oral care (5.5— 7.0).
2. Antimicrobial Activity:

The mouthwash showed significant antimicrobial properties against common oral pathogens, including: Streptococcus mutans: 18 mm zone of inhibition. Lactobacillus acidophilus: 16 mm zone.

Candida albicans: 14 mm zone.

3. Stability Testing (14 days under refrigeration):

Color: No significant change. Odor: Remained fresh and herbal.

Sediment: Slight residue appeared after 14 days, likely due to aloe vera gel. pH: Slight decrease from 6.2 to 6.0.

4. User Acceptability:

Feedback from 10 participants indicated high satisfaction: Taste satisfaction: 70% positive responses.

Freshness feeling: 80% felt it provided a long-lasting fresh feeling.

Likelihood to reuse: 90% of participants would consider using it again.

These results demonstrate that the herbal mouthwash is a safe, effective, and well-accepted alternative to commercial antiseptic mouthwashes. It exhibited strong antimicrobial action, stable physical properties over two weeks, and positive feedback from users regarding taste and freshness.

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