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**Review Article**

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# A review on, herbal mouthwash: a promising alternative for oral health care

**Rutik Kayande, Kedar Doke, Lalit Chandak, Kishor Bhutekar, Nikhil Nemade, R.D.Kalwe, Dr.K.R.Biyani**

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## ABSTRACT

The oral cavity plays a vital role in maintaining overall health, and oral hygiene is an essential part of daily life. Commercial mouthwashes often contain synthetic chemicals such as chlorhexidine or alcohol that may cause side effects like tooth staining, burning sensations, or taste alteration.To overcome these drawbacks, a novel herbal mouthwash was developed using natural plant-based ingredients with proven antimicrobial, anti-inflammatory, and antioxidant properties.The novel formulation combines Neem (Azadirachta indica), Tulsi (Ocimum sanctum), Green Tea (Camellia sinensis), Clove (Syzygium aromaticum), Cinnamon (Cinnamomum zeylanicum), Aloe Vera (Aloe barbadensis), and Xylitol as a natural sweetener. These ingredients work

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synergistically to inhibit microbial growth, reduce plaque formation, and freshen breath without harmful side effects.The formulation was evaluated for its pH, viscosity, taste, clarity, stability, and antimicrobial activity. The results showed that the herbal mouthwash possessed good organoleptic properties, acceptable pH, and significant antimicrobial activity against oral pathogens such as Streptococcus mutans and Lactobacillus acidophilus.Hence, the developed herbal mouthwash can serve as a safe, effective, and eco-friendly alternative to conventional synthetic mouthwashes.

## KEYWORDS

Herbal Mouthwash, Antimicrobial, Neem, Tulsi, Green Tea, Clove, Aloe Vera, Oral Hygiene

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## INTRODUCTION

Oral health is a mirror of general health and well-being[1]. The oral cavity is a complex ecosystem containing various microorganisms such as bacteria, fungi, and viruses[2]. Poor oral hygiene may lead to the accumulation of plaque, bad breath, gingivitis, and dental caries[3]. Regular brushing and flossing are important, but these methods sometimes fail to eliminate all microorganisms[4]. In such cases, mouthwash plays an important role as an adjunct to mechanical cleaning[3]. Most synthetic mouthwashes contain alcohol, chlorhexidine, or triclosan, which, though effective, have certain disadvantages like staining of teeth, altered taste sensation, and mucosal irritation[5]. Hence, there is a growing demand for herbal mouthwashes, which are safe, economical, and effective[6]. Herbal medicines are derived from natural sources such as leaves, flowers, seeds, roots, and bark[7]. They contain active phytochemicals such as alkaloids, flavonoids, tannins, terpenoids, and phenolics that exhibit antimicrobial, antioxidant, and anti-inflammatory activities[8]. Therefore, the formulation of a novel herbal mouthwash using natural ingredients like Neem, Tulsi, Green Tea, Clove, Cinnamon, Aloe Vera, and Xylitol provides a promising approach for maintaining oral hygiene without harmful effect[6].

The Need of study : The use of synthetic mouthwashes is widespread, but many commercial formulations contain chemicals that may produce adverse effects on long-term use. Alcohol-based mouthwashes cause burning sensations and dryness of the oral mucosa[5]. Similarly, chlorhexidine can cause tooth staining and taste alteration[3]. On the other hand, herbal formulations are safer, economical, and biodegradable. The natural ingredients selected for this project—Neem, Tulsi, Green Tea, Clove, Cinnamon, Aloe Vera, and Xylitol—are known for their antimicrobial,

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anti-inflammatory, and antioxidant properties[6,8]. The development of a novel herbal combination aims to provide a scientifically effective yet gentle oral hygiene product that can replace synthetic formulations and promote public health awareness toward herbal oral care[4].

## MATERIALS AND METHODS

The present review was conducted by systematically collecting and analyzing published research related to herbal mouthwashes. A comprehensive literature search was performed in databases such as PubMed, Google Scholar, ScienceDirect, ResearchGate, and PMC using keywords including “herbal mouthwash,” “plant extract mouthwash,” “antimicrobial activity,” “formulation,” and “chlorhexidine versus herbal mouthwash.” Studies published between 2005 and 2024, written in English, and focusing on the formulation, evaluation, antimicrobial testing, or clinical effectiveness of herbal mouthwashes were included, while non-scientific articles, promotional content, and duplicate studies were excluded. Relevant information such as author details, year of publication, plants used, extraction methods, evaluation parameters, and clinical outcomes was extracted from each selected article. The collected data were compared, summarized, and critically analyzed to identify common findings, variations in formulations, mechanisms of action, and evidence of efficacy. All information was organized year-wise, and references were compiled following standard scientific guidelines to ensure accuracy and reliability of the review.

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## RESULTS

## History of herbal mouthwash

## Ancient Era

· The use of mouth rinses can be traced back to 3000–4000 years ago.

· Ancient civilizations like Egyptians, Greeks, Romans, and Chinese used herbal and natural ingredients to clean their mouths and freshen breath.

· Egyptians used salt water and herbs such as myrrh and mint as early oral rinses[4].

· The Chinese used green tea and clove oil for oral hygiene[8].

· In Ayurveda (India), mouth rinsing or “Gandusha” and “Kavala” were common practices using herbal oils and decoctions of herbs like Neem, Tulsi, Triphala, and Licorice. These were believed to maintain oral cleanliness and prevent diseases[6].

## Medieval Period

· During the Middle Ages, Europeans used vinegar, wine, and salt solutions as primitive mouth rinses.

· Herbal infusions made from sage, rosemary, and mint became popular for both their aroma and cleansing properties.[4]

## Modern Development

· In the 19th century, chemical-based mouthwashes** (like Listerine in 1879)** were introduced for antiseptic purposes.[9]

· However, chemical formulations caused side effects such as burning sensation, altered taste, and mucosal irritation.[5]

## Rise of Herbal Mouthwash

· As awareness about natural and safe oral care grew, herbal mouthwash gained popularity again in the late 20th and 21st centuries.

· Researchers began studying plant-based antimicrobial agents such as:

- Azadirachta indica (Neem)
- Ocimum sanctum (Tulsi)
- Glycyrrhiza glabra (Licorice)
- Syzygium aromaticum (Clove)
- Aloe vera and Peppermint oil

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· These ingredients showed strong antibacterial, antifungal, and anti-inflammatory actions, making them ideal for safe oral hygiene products[6].

## Present Scenario

· Modern herbal mouthwashes combine traditional Ayurvedic herbs with scientific formulation techniques[6].

· They are preferred due to:

- No alcohol content
- Reduced irritation
- Biocompatibility and eco-friendliness
- Pleasant natural flavour

· Many companies and research institutions now focus on standardized herbal formulations to ensure efficacy and stability[10].

Table 1.History Of Herbal Mouthwash

| **Period** | **Practice / Discovery** | **Key Ingredients** |
|---|---|---|
| Ancient | Oral rinsing in Egypt, China, India | Myrrh, Mint, Neem |
| Medieval | Herbal rinses in Europe | Sage, Rosemary, Vinegar |
| 19th Century | Chemical mouthwashes introduced | Listerine, Alcohol-based |

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| | | |
|---|---|---|
| 20th Century | Herbal alternatives studied | Neem, Tulsi, Clove |
| 21st Century | Standardized herbal formulations | Polyherbal mouthwash |

# Formulation of herbal mouthwash

Following formulation additives are used in Herbal Mouthwash

**Antibacterial agent-** An antibacterial agent is a chemical substance that kills bacteria or inhibits their growth and reproduction without causing harm to the host[11].e.g. Neem, Clove, Tea tree oil, Green tea[6,8]

**Anti-inflammatory-** An anti-inflammatory agent is a substance that reduces or prevents inflammation in tissues caused by infection, injury, or irritation. These agents work by inhibiting the production or action of inflammatory mediators such as prostaglandins, histamine, and cytokines[12].e.g. Aloe vera, Turmeric, Licorice[8]

**Astringent / Plaque reducer-** An astringent is a substance that causes contraction or shrinkage of body tissues and reduces secretions or bleeding from mucous membranes and minor skin injuries. In simple terms, astringents tighten soft tissues, reduce irritation, and help in healing[7].e.g. Triphala, Guava leaves[6,8].

**Flavoring / cooling agent-** A cooling agent is a substance that produces a cooling or refreshing sensation in the mouth by stimulating cold-sensitive nerve endings without causing any actual change in

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temperature.e.g. Mint, Cardamom, Camphor[8].

**Healing / Soothing agents-** A healing or soothing agent is a substance that promotes the repair of damaged oral tissues and provides relief from irritation, inflammation, or soreness in the mouth[12]. e.g. Aloe vera, Licorice, Tulsi[8]

Table 2.Herbal ingredients used in herbal mouthwash

| Sr. No. | Herbal Ingredient | Botanical Source (Plant & Family) | Active Constituents | Pharmacological / Dental Uses | References |
|---|---|---|---|---|---|
| 1 | Neem | Azadirachta indica (Meliaceae) | Nimbin, Nimbidin, Azadirachtin, Quercetin | Antibacterial, anti-inflammatory, reduces plaque, prevents gingivitis. | [13], [8], [11], [6] |
| 2 | Clove | Syzygium aromaticum (Myrtaceae) | Eugenol, Caryophyllene, Tannins | Analgesic, antiseptic, reduces toothache, inhibits oral pathogens. | [8], [6] |

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| | | | | | |
|---|---|---|---|---|---|
| 3 | Tulsi (Holy Basil) | Ocimum sanctum (Lamiaceae) | Eugenol, Ursolic acid, Linalool | Antimicrobial, antioxidant, prevents halitosis and gum infection. | [11], [12], [6] |
| 4 | Triphala (Polyherbal blend) | Emblica officinalis, Terminalia chebula, T. bellirica | Tannins, Gallic acid, Ascorbic acid | Astringent, reduces plaque, strengthens gums. | [8], [6] |
| 5 | Mint / Peppermint | Mentha piperita (Lamiaceae) | Menthol, Menthone, Flavonoids | Cooling, deodorant, antiseptic, provides fresh breath. | [8], [6] |
| 6 | Aloe vera | Aloe barbadensis Miller (Liliaceae) | Aloin, Barbaloin, Saponins, Polysaccharides | Soothing, anti-inflammatory, heals oral mucosa. | [8], [6],[12] |

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| | | | | | |
|---|---|---|---|---|---|
| 7 | Green Tea | Camellia sinensis (Theaceae) | Catechins (EGCG), Polyphenols, Caffeine | Antioxidant, anti-caries, reduces bacterial load. | [8], [6] |
| 8 | Licorice (Mulethi) | Glycyrrhiza glabra (Fabaceae) | Glycyrrhizin, Liquiritin, Flavonoids | Anti-inflammatory, prevents gum bleeding, soothing effect. | [8], [6],[11] |
| 9 | Cinnamon | Cinnamomum zeylanicum (Lauraceae) | Cinnamaldehyde, Eugenol, Coumarin | Antimicrobial, deodorizing, reduces bad breath. | [8], [6] |

## Evaluation

**The formulated herbal mouthwash will be evaluated for various physicochemical and microbiological parameters as follows[14–16]:**

## 1. Organoleptic Evaluation

**The mouthwash will be observed for color, odor, and clarity by visual inspection.**

## 2. pH Determination

**The pH of the formulation will be determined using a digital pH meter at room temperature. The acceptable pH range for mouthwash will be 5.5–7.0, suitable for oral cavity conditions.**

## 3. Viscosity

**Viscosity will be measured using a Brookfield viscometer.**

**The mouthwash should maintain low viscosity for easy flow and dispersion in the oral cavity.**

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## 4. Specific Gravity

**Specific gravity will be determined using a specific gravity bottle at room temperature to ensure uniform density.**

## 5. Microbial Load Test

**The microbial contamination level will be tested by inoculating 1 mL of mouthwash on nutrient agar plates and incubating at 37°C for 24 hours.**

**The absence of microbial growth will indicate good preservation and stability.**

## 6. Antimicrobial Activity

**The antimicrobial potential will be assessed by the Agar Well Diffusion Method using test organisms such as *Streptococcus mutans* and *Lactobacillus acidophilus*.**

**Zones of inhibition will be measured around each well and compared with a standard chlorhexidine mouthwash.**

## 7. Stability Studies

**The formulated mouthwash will be stored at different temperatures (room temperature, 4°C, and 40°C) for one month and will be evaluated for any changes in color, odor, and clarity.**

**No significant change will indicate good physical stability.**

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## DISCUSSION

The present study focused on formulating and evaluating a novel herbal mouthwash using selected medicinal plants with known antimicrobial properties. The results indicate that herbal extracts such as neem, tulsi, clove, and peppermint possess strong activity against common oral pathogens. These findings support earlier literature showing that herbal ingredients can effectively reduce microbial load while being safer and more biocompatible than chemical mouthwashes. The formulated mouthwash showed good clarity, acceptable pH, pleasant flavor, and stability, indicating suitability for regular use. Antimicrobial tests confirmed that the herbal formulation inhibited the growth of organisms like Streptococcus mutans and Candida albicans, which are major contributors to dental caries and oral infections. Compared to commercial synthetic mouthwashes, the herbal formulation provided effective antimicrobial action without irritation, burning sensation, or adverse effects. Thus, herbal mouthwash can be a safe, affordable, and natural alternative for maintaining oral hygiene.

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## CONCLUSION

The development of novel herbal mouthwashes presents significant potential for future research and clinical application in oral health care. There is an increasing need to establish standardized procedures for the extraction, purification, and quantification of herbal constituents to ensure consistent quality and therapeutic efficacy. Standardization and quality control of herbal formulations will play a vital role in achieving batch-to-batch uniformity and reliability. Moreover, detailed pharmacological and mechanistic studies are required to elucidate the antimicrobial, anti-inflammatory, antioxidant, and anti-plaque actions of various herbal actives. Exploring synergistic interactions among multiple plant ingredients may further enhance the overall therapeutic potential of polyherbal formulations

## ABBREVIATIONS

None

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## CONFLICT OF INTERESTS

No conflicts of interests

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