



Preparation and Evaluation of Herbal Mouthwash Containing Clove and Peppermint Oil

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Abstract -

Maintaining good oral hygiene is crucial for avoiding dental plaque, gingivitis, and foul breath. The growing interest in natural and safe oral care products has led to the development of herbal mouthwashes that incorporate essential oils with proven antimicrobial and anti-inflammatory characteristics. This study focuses on the formulation and evaluation of a herbal mouthwash containing *Syzygium aromaticum* (clove oil) and *Mentha piperita* (peppermint oil), developed in accordance with the guidelines set by the United States Food and Drug Administration (US FDA) for non-prescription oral rinse products. The primary objective is to summarize evidence from research concerning formulation techniques, phytochemical components, and the biological impacts of these essential oils on oral hygiene. Clove oil, which is rich in eugenol, possesses powerful antibacterial, analgesic, and local anaesthetic properties, while peppermint oil, abundant in menthol and menthone, offers antimicrobial, refreshing, and cooling effects. Studies indicate that a hydroalcoholic base containing glycerine as a humectant, combined with these oils, results in a stable and effective formulation that significantly decreases plaque and suppresses microbial growth. Evaluated studies confirm acceptable pH, viscosity, flavour, and microbial stability. In conclusion, combining clove and peppermint oils provides a promising, naturally-derived alternative to synthetic mouthwashes, ensuring efficacy and safety for consumers.

Keywords: Herbal mouthwash, clove essential oil, peppermint essential oil, dental care, antimicrobial properties, formulation assessment.

Introduction: -

The oral cavity hosts diverse microbial communities, where the balance between helpful and harmful microorganisms impacts dental health. Poor oral hygiene can result in the accumulation of plaque, periodontal disease, and unpleasant breath. Conventional mouthwashes often contain alcohol and synthetic substances like chlorhexidine or cetylpyridinium chloride, which may cause irritation in the mouth, discoloration of teeth, or alterations in taste with prolonged usage. The rising consumer interest in safer and eco-friendly products has sparked an emphasis on mouthwash formulations derived from herbs.

Herbal mouthwashes incorporate essential oils and plant extracts that have shown antimicrobial, anti-inflammatory, and antioxidant benefits. Notably, *Syzygium aromaticum* (clove oil) and *Mentha piperita* (peppermint oil) have been extensively studied for their oral health benefits. Clove oil is well-known for its strong antiseptic and analgesic properties, primarily attributed to eugenol. Peppermint oil provides a cooling sensation and inhibits bacterial proliferation owing to the characteristics of menthol.

2. Taxonomy and Synonyms

Plant Name	Common Name	Synomins	Family	Parts use
Syzygium aromaticum	Clove	Caryophyllus aromaticus	Myrtaceae	Flower buds
Mentha piperita	Peppermint	Peppermint	Lamiaceae	Leaves and oil

3. Chemical Constituents

Clove oil: The primary active ingredient is eugenol(70–85%), with eugenyl acetate and β-caryophyllene following. These compounds offer antibacterial, antifungal, analgesic, and antioxidant benefits.

Peppermint oil: This oil comprises menthol (30–55%), menthone, isomenthone, and limonene. Menthol possesses strong antimicrobial and local anaesthetic qualities, while menthone enhances flavour and exhibits antibacterial activity. The blend of these phytoconstituents broadens the formulation’s antimicrobial properties while providing a refreshing and soothing effect.

4. Mode of Action

Antimicrobial Activity:

Eugenol derived from clove oil disrupts bacterial cell membranes and hinders enzyme activity, resulting in the leakage of cellular contents. Menthol and menthone inhibit microbial biofilm formation and block protein synthesis.

Anti-inflammatory Effect:

Both oils assist in regulating prostaglandin production and diminishing inflammatory cytokines, which reduces inflammation in the gums.

Pain Relief and Soothing Sensation:

Eugenol provides local pain relief by numbing sensory nerves, while menthol activates TRPM8 receptors, producing a cooling sensation that alleviates oral discomfort.

5. Composition and Preparation Method

A hydroalcoholic formulation (O/W system)

Essential Components

Clove oil	Antimicrobial, analgesic
Peppermint oil	Antimicrobial, flavouring, refreshing
Ethanol	Solvent, preservative
Glycerine	Humectant, improves texture
Sorbitol	Sweetening and stabilizing agent
Sodium benzoate	Preservative
Purified water Carrier	Vehicle

Diagram of Preparation Process

1. Start by combining and measuring ethanol, glycerine, and water in a sanitized container.
2. Next, add sorbitol and sodium benzoate; stir until completely dissolved.
3. Gradually incorporate clove and peppermint oils while stirring continuously to ensure a uniform solution.
4. Adjust pH to 6.5–7.0 using citric acid or sodium citrate buffer

6. Evaluation Criteria

Parameter, Method, Expected Result

Visual Aspect, Visual inspection, Clear liquid.

Aroma and Taste, Sensory evaluation, Recognizable pleasant scent.

Acidity, Electronic pH meter, 6.5 to 7.0.

Viscosity, Measurement via Brookfield viscometer, 5 to 10 cP.

Microbial testing, Agar diffusion to assess the inhibition zone against oral bacteria.

Stability, Testing under accelerated conditions ($40^{\circ}\text{C} \pm 2^{\circ}\text{C}$), No phase separation or odour change.

Results and Discussion

Research has shown that mouthwashes containing clove and peppermint oils have notable antimicrobial properties against *Streptococcus mutans*, *Lactobacillus acidophilus*, and *Candida albicans*. Comparative analyses indicate a 60–75% decrease in microbial colony counts after a week of use, which is similar to the effects of 0.2% chlorhexidine mouthwash but without the side effects such as staining or alterations in taste.

The combination of eugenol and menthol offers both enhanced antimicrobial and soothing benefits. The formulations sustained a consistent pH and viscosity for 90 days under both normal and accelerated conditions. Sensory evaluations confirmed a pleasant taste, low irritation levels, and a refreshing sensation. Feedback suggests high patient adherence, making this formulation appropriate for everyday oral hygiene. 14%

Conclusion -

A mouthwash made with clove and peppermint oils offers a scientifically proven, safe, and effective option for managing oral hygiene. Both essential oils provide antimicrobial, analgesic, and revitalizing benefits while adhering to US FDA regulations. Studies reported affirm the stability, sensory acceptability, and effectiveness of these formulations. Additional clinical trials are needed to standardize concentrations and confirm long-term advantages. This herbal oral rinse meets the growing need for natural, gentle oral care products in contemporary pharmacy practices.

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