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Research Article

Formulation and Evaluation of Herbal Mouthwash

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

Anuradha College of Pharmacy, Chikhli, Buldana, Maharastra, India, 443201

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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 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.

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. 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,

***Corresponding Author:** Rutik Kayande
Address: *Anuradha College of Pharmacy, Chikhli, Buldana, Maharastra, India, 443201*
Email : kayanderutik@gmail.com

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and effective[4,6].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 [10].

Need of the study

The use of synthetic mouthwashes is widespread, but many commercial formulations contain chemicals that may produce adverse effects on long-term use[3]. Alcohol-based mouthwashes cause burning sensations and dryness of the oral mucosa. Similarly, chlorhexidine can cause tooth staining and taste alteration[9].On the other hand, herbal formulations are safer, economical, and biodegradable[6]. The natural ingredients selected for this project—Neem, Tulsi, Green Tea, Clove, Cinnamon, Aloe Vera, and Xylitol—are known for their antimicrobial, anti-inflammatory, and antioxidant properties[11,12].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[18].

MATERIALS AND METHODS

1) Procedure of neem extraction

1) First, one cup of fresh neem leaves is washed properly to remove dirt.

2) Then, the leaves are cut or crushed into small pieces. Next, two cups of water are boiled, and the neem leaves are added to it.

3) The mixture is allowed to cook for 10 to 15 minutes. After that, it is cooled at room temperature.

4) Then, the liquid is filtered using a cloth or filter paper to remove solid particles[15,16].

2) Procedure of tulsi extraction

1) First, wash one cup of fresh tulsi leaves properly to remove dirt.

2) Then crush or cut the leaves into small pieces.

3) Take two cups of water and boil it. After boiling, add the tulsi leaves and let it cook for 10 to 15 minutes.

4) Then switch off the heat and allow it to cool.

5) After cooling, filter the liquid using a cloth or filter paper[15,16].

3) Procedure of aloevera extraction

1) First, a fresh aloe vera leaf is taken and washed properly to remove dirt.

2) Then, the sides of the leaf are cut, and the outer green skin is carefully removed.

3) Next, the transparent gel inside the leaf is collected. The gel is washed with clean water to remove the yellow part (latex).

4) After that, the gel is blended to make a smooth liquid.

5) Then, it is filtered if required to remove any solid particles[15,16]

MATERIAL USED

Tulsi Extract, Clove Oil, Neem extract, Peppermint oil, Aloe Vera extract, sodium benzoate, Distilled water

FORMULATION

Ingredient	Quantity (%)
Neem extract	2.0
Tulsi extract	1.5
Aloe Vera extract	2.0
Clove oil	0.5
Glycerin	5.0
Peppermint oil	0.2
Sodium benzoate	0.1
Gum acacia	1.0
Distilled water	q.s. to 100 ml

PROCEDURE

1) Firstly we measured quantity of distilled water (about 60–70 ml) is taken in a clean and dry beaker.

2) Then,Sodium benzoate (0.1 g) is added and stirred until completely dissolved.

3) Glycerin (5 ml) is then added and mixed thoroughly to obtain a uniform solution.

4) After that , neem extract (2 ml), tulsi extract (1.5 ml), aloe vera extract (2 ml), are added one by one with continuous stirring.

5) In a separate container, clove oil (0.5 ml) and peppermint oil (0.2 ml) are mixed together.

6) A suitable quantity of gum acacia is added to the oil phase to enhance solubility.

7) The oil phase is slowly added to the aqueous phase with constant stirring to obtain a uniform dispersion.

8) The final volume is made up to 100 ml using distilled water and mixed thoroughly.

9) The prepared formulation is filtered using muslin cloth or filter paper to remove particulate matter[14-16].

EVALUATION

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

1) Organoleptic Evaluation

We observed mouthwash 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 a pH range of mouthwash is 6.68 which is 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.

4) 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.

5) Stability Studies

The formulated mouthwash will be stored at different temperatures for one month and will be evaluated for any changes in color, odor, and clarity.

No significant change will indicate good physical stability.

RESULT

1. Microbial Load Test

The microbial contamination level was tested by inoculating 1 ml of Mouthwash on

Nutrient Agar plate and incubating at 37°C for 24 hours. No microbial growth detected.

2. Consistency and Appearance

The prepared herbal mouthwash was evaluated for physical characteristics including color, odor, and consistency. The formulation was found to be stable, with no signs of phase separation or sedimentation during the study period.

3. pH and Viscosity

The pH of the mouthwash remained within the acceptable range for oral use (pH 6.68), ensuring safety for the mucosal lining. The viscosity was ideal for easy rinsing and user comfort.

4. Stability Studies

Stability testing conducted over 30 days revealed that the formulation retained its physical, chemical, and antimicrobial properties without degradation or contamination.

Observation

Evaluation parameters	Observations	Result
Color	Pale Yellow	yellowish
Odour	Characteristics Odour	Characteristics Odour
Texture	Elegance	Elegance
Ph	5-7	6.68
Stability	Stable at cool temp./ Stable at room temp.	stable at cool temp./ stable at room temp.
Solubility	Soluble in Water	Water soluble

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.

CONCLUSION

The formulated herbal mouthwash was found to be safe, stable, and effective in reducing microbial load in the oral cavity. The study confirms that herbal ingredients such as Neem, Tulsi, Clove oil, and Peppermint can be used to develop a natural, alcohol-free alternative to chemical mouthwashes. This herbal mouthwash provides antimicrobial, anti-inflammatory, and analgesic benefits without harmful side effects, making it suitable for daily oral hygiene, especially for sensitive individuals like children, diabetics, and pregnant women. The results support the potential of herbal mouthwash

as a cost-effective, safe, and eco-friendly solution for maintaining oral health.

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