ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 11| Issue: 6| June 2025|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2025: 8.691 || ISI Value: 1.188

FORMULATION AND EVALUATION OF MOUTH WASH FOR ORAL FRESHESS

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ABSTRACT
Oral hygiene is essential for maintaining general health and boosting social confidence. Mouthwash serves as an effective supplement to daily brushing and flossing by reducing oral microbial load, controlling bad breath, and promoting a sensation of freshness. This study aimed to formulate and evaluate a mouthwash specifically designed to enhance oral freshness using a combination of herbal and synthetic ingredients. The formulation included peppermint oil, glycerin, sodium benzoate, ethanol, citric acid, and purified water. The prepared mouthwash was assessed for organoleptic properties (color, odor, taste, clarity), physicochemical characteristics (pH, viscosity, specific gravity), and antimicrobial activity against Streptococcus mutans. Stability testing was conducted under ambient conditions to evaluate shelf-life and formulation integrity. Results showed that the mouthwash exhibited acceptable organoleptic qualities and maintained a suitable pH range of 5.5–6.5. It demonstrated effective antimicrobial action, with notable zones of inhibition in agar diffusion tests. The formulation remained stable during the testing period with no significant changes in physical or chemical properties. Overall, the formulated mouthwash proved effective in delivering oral freshness and may serve as a promising alternative to existing commercial products.

KEYWORDS- *Oral Hygiene, Bad Breath, Freshnes, Mouthwash.*

INTRODUCTION

Mouthwashes that kill 99.9% of the bacteria in your mouth are also killing off good bacteria. This can damage the mouth's microbiome and its ability to fight cavities, gingivitis and bad breath. Chlorhexidine gluconate, or CHG, is a powerful germicidal agent that kills bacteria in the mouth[2]. It is certainly fine to rinse with mouthwash in the morning, but you will also want to rinse right before bed. This practice helps prevent harmful oral bacteria action while you sleep. Plus, you will awaken with a fresher feeling in your mouth. Overbrushing, over-flossing, or even using too much teeth whitener can be problematic for your tooth enamel[1]. Mouthwash every day is also a great addition to your oral care routine. If used daily, it is a great way to freshen your breath and kill any harmful bacteria left over after flossing and brushing[2].

Peridex is a brand of medicated mouthwash known generically as chlorhexidine gluconate oral rinse. Saltwater is acidic, and gaggling it every day can soften the teeth enamel and gums. Therefore, you can't gargle salty water daily Also, people with special medical conditions such as those with high blood pressure should take extra precaution or simply look for other alternatives they can use. Rinse, gargle, spit out the mouthwash and that should be enough. But don't use water[2,3]. Wait at least half an hour after brushing your teeth to drink water or consume beverages. Some mouth rinses contain high levels of alcohol — ranging from 18 to 26 percent. This may produce a burning sensation in the cheeks, teeth, and gums. Burning can also come from consistent mouthwash use, which causes irritated mouth tissue and can lead to mouth sores[4].

History

The first known references to mouth rinsing is in Ayurveda for treatment of gingivitis. Later, in the Greek and Roman periods, mouth rinsing following mechanical cleansing became common among the upper classes, and Hippocrates recommended a mixture of salt, alum, and vinegar. The Jewish Talmud, dating back about 1,800 years, suggests a cure for gum ailments containing "dough water" and olive oil. There are references to mouthwash in Chinese, Greek, Egyptian and Roman literature, but the most well recorded early instances of humanity using mouthwash comes from ancient Rome, in A.[7,8]. The Romans used to buy bottles of Portuguese urine and use that as a rinse. Mouthwash was developed in the late 1800s. Oral care products as we know them first appeared on the scene when toothpaste was developed in the 1800s. Mouthwash was first mass-produced commercially in the late 1800s. Dr. Joseph Lawrence, the creator of LISTERINE mouthwash, wanted to name his work after ascientist who paved the way. Lister, an English doctor and surgeon, became the first surgeon to perform an operation in a chamber sterilized with pulverized antiseptic[6,9].

Advantages

1. Fresh breath.
2. Reducing tooth decay using sodium fluoride.
3. Reducing gum inflammation by killing bacteria.
4. Whitening teeth using a bleaching agent.
5. Preventing gum disease using an antiseptic or anti-plaque ingredient.
6. Mouthwash prevents gingivitis and gum disease by killing the bacteria that would otherwise infect the dental sockets and gums[3,6,7].
7. It can prevent the buildup of plaque, strengthen the enamel, and demineralize your teeth, allowing you to prevent tooth decay[5].

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Side effect of mouthwash for oral freshness

1. **Dry Mouth (Xerostomia)**
   - Some mouthwashes contain alcohol, which can dry out the mouth and reduce saliva production.
   - A dry mouth can lead to bad breath over time and increase the risk of cavities.
2. **Burning Sensation**
   - Especially in alcohol-based mouthwashes or those with strong essential oils (e.g., menthol, eucalyptol).
   - May cause discomfort or irritation in sensitive individuals.
3. **Taste Alteration**
   - Temporary change or loss of taste (dysgeusia) after use, especially with strong formulations like chlorhexidine.
4. **Staining of Teeth or Tongue**
   - Some antibacterial mouthwashes (e.g., those with chlorhexidine or cetylpyridinium chloride) may cause brown staining of teeth, tongue, or fillings.
5. **Allergic Reactions**
   - Ingredients like flavorings, dyes, or preservatives can cause allergic responses such as swelling, itching, or rash.

Method of preparation

1. **Preparation of Aqueous Phase**
   - Measure the required amount of purified water into a clean beaker.
   - Add water-soluble ingredients such as glycerin**,** preservatives (e.g., sodium benzoate), and chlorhexidine gluconate**.**
   - Stir continuously using a magnetic stirrer or glass rod until all ingredients are completely dissolved.
2. **Preparation of Oil Phase**
   - In a separate container, mix the peppermint oil with a surfactant like sorbitol to help disperse the oil in water.
   - Mix well until a clear solution is obtained.
3. **Combining Both Phases**
   - Slowly add the oil phase to the aqueous phase with constant stirring.
   - Mix thoroughly until a uniform solution is obtained. The mixture should appear clear or slightly translucent.
4. **Adjusting pH**
   - Check the pH of the solution using a pH meter.
   - If needed, adjust the pH using a small amount of citric acid to keep it in the safe range of 5.5 to 6.5**.**
5. **Addition of Color**
   - Add a small amount of Ethylene blue colour if desired for aesthetic purposes. Stir well.
6. **Final Volume Adjustment**
   - Add more purified water to make up the total volume 50 ml.
7. **Filtration**
   - Filter the solution if needed to remove any undissolved particles for a clear final product.
8. **Packaging**
   - Transfer the final mouthwash into a clean, airtight, and labeled bottle.
   - Store in a cool, dry place, away from direct sunlight.

REVIEW OF LITERATURE

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4.Kamal Rai Aneja, et;al. (2010) "The antimicrobial potential of ten often used mouthwashes against four dental caries pathogens". Hexidine mouthwash (ICPA Health Products Ltd., Ankleshwar, India) showed excellent antimicrobial activity against the four dental caries causing microorganisms in vitro. The six mouthwashes found to be effective against all the four tested microorganisms at all the four concentrations, comprising of Chlorhexidine gluconate as the basic constituent, presented different antimicrobial activities.

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pleasant odour and a better after effects.

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10. Kuntal Das, et;al. (2020) "Stevia oral hygiene preparation: A noble herbal toothpaste". Stevia extract containing herbal toothpaste was formulated with selected suitable ingredients. Evaluation and comparison of results (as the standards specified by Bureau of Indian standards) with commercial herbal and non-herbal toothpastes are demonstrated that formulated toothpaste in Lab was having better patronizing and engrossing passion over the marketed formulations.

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12. Shivani B. Shambharkar, et;al (2021) "formulation and evaluation of herbal mouthwash". The data presented in this study, it was concluded that the developed herbal mouthwash possess significant, therapeutically efficacious, suitable vehicle for drug delivery in low cost but definitely with high potential. This study should be completed with more investigations and studies, to explore the product in long term follow-up and laboratory tests to improve all the effects and side effects of the new products, since it will be used as medical product. Herbal mouthwash preparation have potent action and minimal side effects when compared with that of the other marketed mouthwashes, hence there is need for increased usage of herbal preparation to avoid the adverse effects.

13. Priyanka Namdeo, et;al. (2021) "preparation and evaluation of herbal antibacterial mouthwash against oral pathogens". The data presented in this study, it was concluded that the developed herbal mouthwash possess significant, therapeutically efficacious, suitable vehicle for drug delivery in low cost but definitely with high potential. Herbal Mouthwash preparations have potent action and minimal side effects when compared with that of the other marketed mouthwashes, hence there is need for increased usage of herbal preparations to avoid the adverse effects.

14. Yogesh B. Rau, et;al. (2024) "review on signifacnce of some hreb formulation and evaluation of herbal mouthwash". Natural Ingredients:Herbal mouthwashes are crafted from plant-based ingredients, often known for their antimicrobial, anti-inflammatory, and soothing properties. Common herbs include neem, tea tree oil, peppermint, clove, aloe vera, and more. Oral Health Benefits:Many herbal ingredients in these mouthwashes have been traditionally used to promote oral health. They may help combat bacteria, soothe gums, and contribute to fresher breath. Reduced Chemicals:Herbal mouthwashes often contain fewer synthetic chemicals compared to conventional mouthwashes, appealing to those who prefer more natural oral care options.

NEED OF STUDY

1. **Improving Oral Freshness:** Mouthwashes offer a quick and effective way to freshen breath, especially in situations where brushing is not possible.
2. **Reducing Oral Bacteria:** A well-formulated mouthwash can reduce bacterial load in the oral cavity, thereby decreasing the risk of bad breath and oral infections.
3. **Enhancing Compliance and Convenience:** Mouthwashes are easy to use, require minimal effort, and are convenient for people with physical or medical limitations that prevent effective brushing.
4. **Market Demand:** There is a growing consumer preference for herbal or naturally formulated oral care products. This work also explores the possibility of incorporating natural ingredients for better consumer

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acceptance.

5. **Need for Safer Alternatives:** Some commercial mouthwashes contain high levels of alcohol or synthetic chemicals that may cause irritation or dryness. Developing an effective, safer, and well-tolerated formulation is necessary.

AIM AND OBJECTIVE

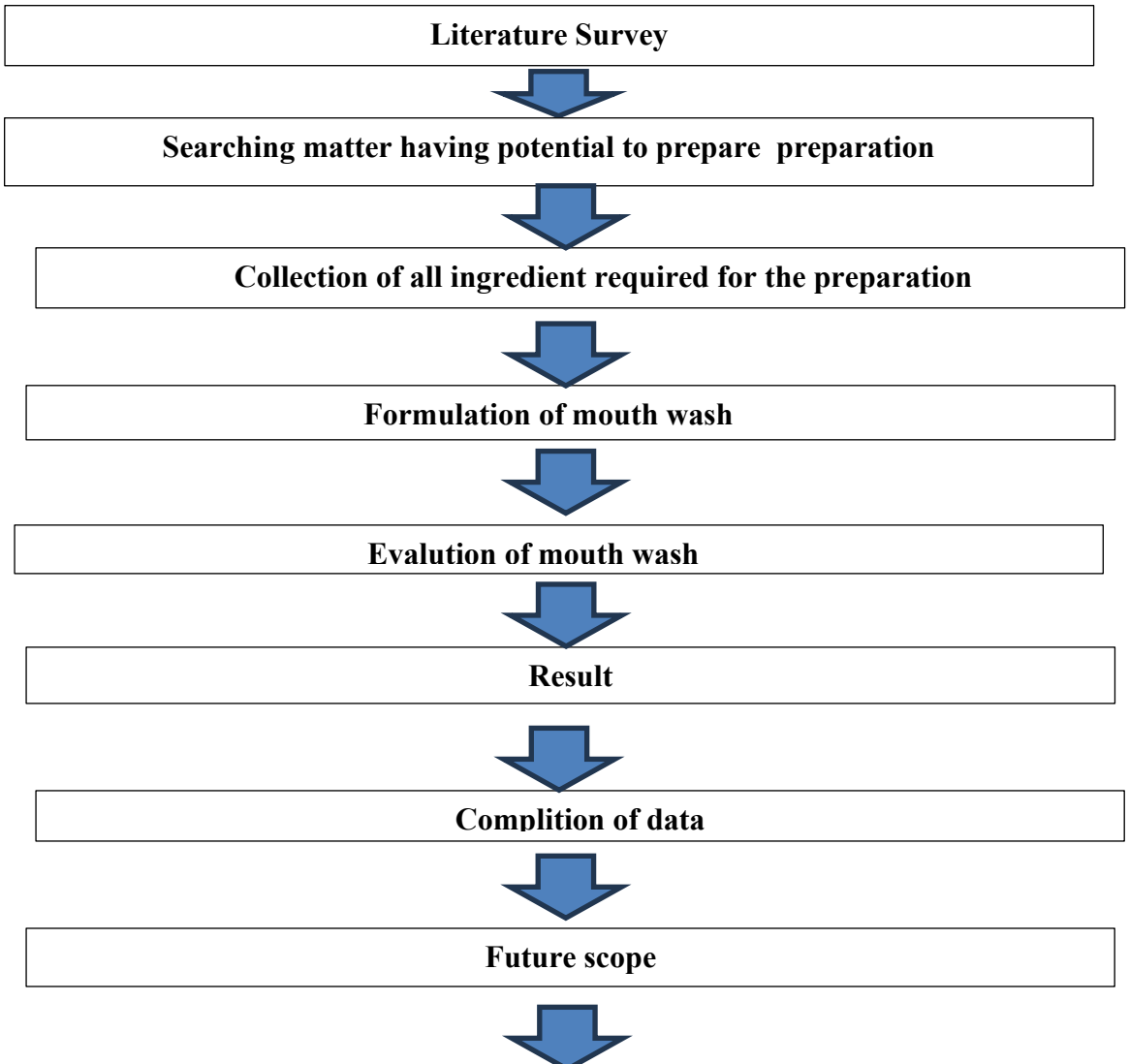
Aim

Formulation and evaluation of mouth wash for oral freshness

Objectives

1. To assess the immediate and long-term effects of different types of mouthwash on oral freshness.
2. To compare the efficacy of alcohol-based and alcohol-free mouthwashes in reducing bad breath.
3. To examine the role of antibacterial agents in mouthwash (e.g., chlorhexidine, essential oils) in reducing oral bacteria responsible for malodor.
4. To evaluate user tolerance, side effects, and overall satisfaction with regular mouthwash use.
5. To determine the importance of combining mouthwash with other oral hygiene practices (brushing, flossing, tongue cleaning) for optimal freshness.
6. To develop a stable and effective mouthwash formulation using non-herbal ingredients such as essential oils, alcohol, sweeteners, and preservatives.
7. To evaluate the physicochemical properties of the mouthwash, including pH, specific gravity, viscosity, and clarity.
8. To assess the organoleptic characteristics such as color, taste, odor, and overall acceptability.
9. To perform microbial limit tests to ensure the formulation is free from harmful microorganisms.
10. To determine the antimicrobial efficacy of the mouthwash against common oral pathogens *(e.g.,* Streptococcus mutans*)*.
11. To conduct stability studies to assess changes in appearance, pH, and performance under different storage conditions.
12. To ensure safety and non-irritability of the mouthwash for regular oral use.

PLAN OF WORK



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Conclusion

Summary

References

MATERIAL & METHOD

1.Chlorhexidine Gluconate

Chlorhexidine gluconate is a symmetrical bisbiguanide synthetic antiseptic consisting of four chlorophenyl rings and two biguanide groups connected by a hexamethylene bridge. The dicationic nature of Chlorhexidine makes it extremely interactive with anions, which is relevant to its efficacy, safety and side effects. It is available in three forms, digluconate, acetate and hydrochloride salts[14].



Fig.1 Chlorhexidine

Method

1. Mouthwash

Formulation: 20% chlorhexidine gluconate solution Methods of Use**:**

- Treatment of gingivitis and periodontitis
- Post-dental surgery rinse
- Pre-procedural rinse in dental clinics

2.Sodium Benzoate

- **Preservative**: Sodium Benzoate helps prevent the growth of harmful microorganisms (such as bacteria, yeast, and molds) in the mouthwash. This ensures that the product stays safe for use over time, especially when it is exposed to air or moisture.
- **Prevents Contamination**: By inhibiting microbial growth, Sodium Benzoate reduces the risk of contamination, helping to maintain the integrity and safety of the mouthwash during its use.



Fig.2 Sodium Benzoate

Method

1. Basic Formulation (As a Soothing, Mild Antiseptic)

- Sodium benzoate: 0.1%–0.2%
- Purified water: q.s. to 100 mL
- Optional additives:
  - Menthol or peppermint oil (flavoring)
  - Glycerin (for viscosity and soothing)
  - Saccharin sodium (sweetener)

pH range: 6.5–7.5

3.Glycerin

- **Moisturizing Agent**: Glycerin helps retain moisture in the mouth, preventing it from becoming dry after using the mouthwash. It helps maintain oral comfort and prevents the mouth from feeling overly dry or irritated.
- **Smooth Texture**: Glycerin adds a smooth, slightly viscous texture to mouthwash, making it easier and more pleasant to use. It helps to create a more comfortable mouthfeel, enhancing the overall sensory experience.



Fig.3 Glycerin

Method

1. Oral and Dental Use

a) Glycerin Mouthwash

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- Used for dry mouth relief, oral ulcer soothing, and post-surgical care
- Acts as a humectant (retains moisture) and demulcent (protective coating)
- Used diluted (typically 10%–20% in water)

4.Ethanol

1. **Solvent**
   Ethanol helps dissolve the active ingredients in mouthwash, ensuring they mix properly and are effective when used.
2. **Freshens Breath**
   The strong, clean sensation provided by ethanol can give the mouth a refreshing feeling, helping to mask bad breath temporarily.
3. **Aids in Mixing Other Ingredients**
4. Ethanol assists in blending essential oils and other ingredients, which are often oil-based, into the mouthwash formula.



Fig.4 Ethanol

Method

Mix Ethanol and Peppermint Oil

- Add 10 mL of ethanol into a clean beaker.
- Add 1–2 drops of peppermint oil.
- Stir until the oil is completely dissolved.

5. Sorbital

Sorbitol is a sugar alcohol used in mouthwash primarily as a humectant and sweetener.

It adds a mild sweetness, improves mouthfeel, and helps retain moisture, preventing the mouth from drying out.

Benefits in Mouthwash:

1. Moisturizes dry mouth tissues
2. Mild sweetness improves taste and compliance
3. Safe for diabetics (low glycemic impact)



Fig.5 Sorbital

Method

Prepare Flavor Base

- In a small beaker, mix 2–3 drops of peppermint oil (or menthol) with 5 mL ethanol
- Stir until dissolved.

Add Sorbitol

- Add 15 mL of sorbitol solution (70%) to the flavor mixture.

6. Peppermint oil

Peppermint oil can be a great addition to a hair serum formulation due to its potential benefits for hair and scalp health. Here's a possible formulation

Antimicrobial Properties

- Peppermint oil contains menthol, menthone, and limonene, which help:
  - Inhibit the growth of bacteria (e.g., Streptococcus mutans, which causes cavities)
  - Reduce plaque formation

Freshens Breath

- Menthol gives a strong, clean minty aroma and taste.
- Neutralizes bad breath by masking odor and targeting bacteria.



Fig.6 Peppermint Oil

➢ **Method**

1.Dissolve Peppermint Oil

- In a small beaker, add 2–3 drops of peppermint oil to 5 mL of ethanol.
- Stir well until the oil is fully dissolved. (If alcohol-free, use gentle heating to help disperse the oil in water with a surfactant like polysorbate-20 or just stir vigorously.)

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INGREDIENTS AND THEIR FUNCTION

Table No.1 Ingredients And Their Function

Ingredient	Function
Chlorhexidine Gluconate	Antiseptic, kills bacteria, reduces plaque buildup, prevents gingivitis and bad breath
Water (Distilled)	Solvent and base for the mouthwash, dilutes the active ingredients
Glycerin	Provides moisture, prevents dryness, makes the mouthwash smoother and more comfortable
Peppermint Oil	Provides fresh taste, masks unpleasant taste, and adds a refreshing sensation
Sorbitol	It gives a mild sweet taste, making the mouthwash pleasant to use.
Sodium Benzoate	Preservative, prevents microbial contamination, extends shelf life
Alcohol (Ethanol)	Solvent, helps dissolve active ingredients, provides a clean, fresh feeling by killing bacteria (optional in alcohol-free versions)
Citric Acid	pH adjuster, ensures the mouthwash is in a safe pH range (5.5-7) to prevent irritation

FORMULATION TABLE FOR 50 ML

Table No.2 Sample Basic Formula For 50 ml

Ingredient	Purpose	Quantity (per 50 ml)
Chlorhexidine Gluconate (20%)	Antibacterial agent	0.2 ml
Glycerin	Humectant, smooth mouthfeel	5 ml
Peppermint Oil	Flavoring and freshness	0.2 ml
Sodium Benzoate	Preservative	0.1 ml
Ethanol	Solvent	5ml
Citric Acid	pH adjuster	0.05 ml
Ethelene Blue	colorant	1-2 drop
Sorbitol	Sweetner	2-3 drop
Distilled Water	Solvent/Base	Up to 50 ml

PREFORMULATION STUDIES

1. Organoleptic Evaluation
- Peppermint oil: strong aroma, cooling taste
- Glycerin, sorbitol: sweet, viscous
- Ethanol: clear, volatile solvent

2. Solubility Tests
- Menthol and peppermint oil: soluble in ethanol, not in water
- Chlorhexidine: moderately soluble in water and ethanol
- Ethanol selected as co-solvent

3. pH Compatibility
- Target pH: 5.5 – 7.0 (ideal for oral use and chlorhexidine stability)

4. Compatibility Studies
- No precipitation, discoloration, or phase separation observed in binary mixtures of ingredients

5.Stability Screening
- Ingredients stable under ambient conditions (light, temperature) for short-term storage.

EVALUATION TEST

1. Organoleptic evaluation
- **Purpose**: To assess the physical appearance and sensory properties.
- **Parameters**:
  - **Color** – should be uniform and stable
  - **Odor** – should have a pleasant, fresh scent
  - **Taste** – should be acceptable (minty, cooling, etc.)
  - **Clarity** – solution should be clear and free from particles

2. pH Determination
- **Purpose**: Ensures the mouthwash is safe and non-irritating to oral tissues.
- **Method**: Use a digital pH meter.
- **Ideal range**: 5.5 – 6.5

3. Viscosity Test (if applicable)
- **Purpose**: To check the flow properties of the formulation.
- **Method**: Measured using a Brookfield viscometer (only applicable for slightly viscous mouthwashes).
- **Ideal**: Low viscosity for easy pouring and rinsing.

4. Microbial limit test
- **Purpose**: Ensure the mouthwash is free from harmful microorganisms.
- **Tested for**:
  - Total bacterial count
  - Absence of pathogens like E. coli, Pseudomonas aeruginosa, and Staphylococcus aureus
- **Method**: Plate count agar or nutrient agar plating as per pharmacopeial standards.

5. Antimicrobial efficacy test
- **Purpose**: Evaluate the antibacterial activity against oral pathogens.
- **Method**: Agar well diffusion or disk diffusion method using organisms like:
  - Streptococcus mutans (causes cavities)
  - Lactobacillus acidophilus
- **Result**: Measure the zone of inhibition (in mm).

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6. Stability studies

- **Purpose**: Check the formulation over time under various conditions.
- **Conditions**:
  - Room temperature
  - Accelerated temperature (e.g., 40°C, 75% RH)
- **Duration**: Typically 1, 2, and 3 months.
- **Parameters**:
  - Color
  - Odor
  - pH
  - Microbial load
  - Phase separation

7. Foam test

- **Purpose**: Check if excessive foaming occurs during rinsing.
- **Method**: Shake 10 mL of mouthwash vigorously and observe foam formation.

RESULT

SR NO.	PARAMETER	RESULT
1.	Physical appearance	
	o Colour	Light bluewish
	o Odour	Characteristics
	o Texture	Soft
2.	pH	6.8
3.	Viscosity	Medium

FUTURE SCOPE

1. Development of Alcohol-Free Formulations

- Demand for non-alcoholic formulations that are gentle yet effective is increasing.
- Use of synthetic antimicrobials (e.g., Chlorhexidine) as alternatives to ethanol.
- Suitable for sensitive users, children, and elderly.

2. Advanced antimicrobial agents

- Research into new synthetic antimicrobial agents with minimal side effects and high efficacy against oral pathogens.
- Combination of **f**luorides with antibacterial agents to provide both cavity protection and breath freshness.

3. Ph-Controlled and Enamel-Protective Mouthwashes

- Future formulations may include pH-modifying agents to maintain a neutral or slightly alkaline oral environment.
- Incorporation of remineralizing agents like sodium fluoride, calcium phosphates, or nano-hydroxyapatite to protect enamel.

4. Long-lasting freshness technologies

- Use of controlled-release or film-forming agents to provide longer-lasting breath freshness.
- Encapsulation of flavoring agents for sustained release in the oral cavity.

5. Personalized mouthwash formulations

- Development of customized formulations based on individual oral microbiome analysis.
- Potential for AI or smart diagnostic tools to recommend mouthwash types tailored to the user's oral condition.

6. Smart Packaging and Dosing Systems

- Integration of smart packaging with tracking features (e.g., reminders, usage tracking).

SUMMARY

This project involved the formulation and evaluation of a mouthwash designed to provide oral freshness and reduce bad breath. The mouthwash was prepared using ingredients such as chlorhexidine (or essential oils) for antibacterial action, peppermint oil for a fresh taste, xylitol as a sweetener, and other safe additives.

The finished product was clear, had a pleasant minty flavor, and a suitable pH that is safe for daily use. It showed good antibacterial activity against harmful oral bacteria and remained stable over time without changes in color, smell, or pH.

Volunteers who tested the mouthwash reported a clean and fresh feeling in the mouth, with no irritation or side effects. Based on these results, the mouthwash can be considered effective, safe, and suitable for regular oral care.

CONCLUSION

The mouthwash was successfully prepared using ingredients like peppermint oil, xylitol, and chlorhexidine to give a fresh feeling and fight germs. It was clear in appearance, had a pleasant minty taste and smell, and the pH was within a safe range for the mouth.

Tests showed that the mouthwash could reduce the growth of bacteria that cause bad breath, and it stayed stable over time without any changes in smell, color, or effectiveness. People who used the mouthwash said it made their mouth feel fresh and did not cause any irritation.

DISCUSSION

The mouthwash was developed to provide oral freshness and help reduce bad breath by using safe and effective ingredients. Chlorhexidine gluconate or natural essential oils were used as the main antibacterial agents to reduce harmful bacteria in the mouth. Flavoring agents like peppermint oil and sweeteners like xylitol improved the taste and provided a refreshing effect.

The pH of the mouthwash was adjusted to stay within the range of 5.5–6.5, which is safe for the oral cavity and helps maintain the natural balance of the mouth. The solution was clear and had a pleasant color and smell, showing that the ingredients were properly mixed and stable.

Antibacterial testing showed that the mouthwash could effectively reduce the growth of common oral bacteria. This supports its use in maintaining oral hygiene and reducing bad breath. Volunteers who tested the product reported that it made their mouth feel clean and fresh, and no irritation or discomfort was noticed.

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ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 11| Issue: 6| June 2025|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2025: 8.691 || ISI Value: 1.188

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