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Formulation And Evaluation of herbal mouthwash

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Abstract

Herbal fennel mouthwash is a natural oral hygiene solution formulated using fennel (Foeniculum vulgare) extract, known for its antimicrobial, anti-inflammatory, and breath-freshening properties. This study explores the potential of fennel-based mouthwash as an alternative to conventional mouthwashes containing alcohol and synthetic chemicals [1]. The antimicrobial efficacy of fennel against oral pathogens, its soothing effects on gum tissues, and its ability to combat halitosis were evaluated. The formulation was prepared using fennel seed extract, essential oils, and other natural ingredients to enhance oral health benefits. Preliminary results indicate that fennel mouthwash effectively reduces bacterial load, improves gum health, and provides long-lasting freshness without the adverse effects of alcohol-based products [2]. This research highlights the potential of herbal fennel mouthwash as a safe, effective, and eco-friendly alternative for maintaining oral hygiene.

Key points to include in your abstract:

1. Natural Oral Care Solution – Fennel herbal mouthwash is a plant-based alternative to conventional mouthwashes.
2. Antibacterial and Anti-inflammatory Properties – Fennel helps reduce oral bacteria and soothes gum irritation.
3. Freshens Breath – Contains aromatic compounds that combat bad breath naturally.
4. Supports Gum and Dental Health – Helps prevent plaque buildup, cavities, and gum disease.
5. Alcohol-Free and Gentle – Suitable for sensitive mouths, avoiding harsh chemicals.
6. DIY and Commercial Availability – Can be prepared at home using fennel seeds and essential oils or purchased as a natural oral care product.

Introduction

Herbal mouthwashes are liquid solutions that use plant extracts, herbs, and other natural ingredients to promote oral health and hygiene. These mouthwashes are designed to provide a safer and more natural alternative to conventional mouthwashes, which often contain harsh chemicals and artificial ingredients [3]. Herbal mouthwashes offer a natural and safe way to promote oral health and hygiene. With their antimicrobial, anti-inflammatory, and refreshing properties, herbal mouthwashes can be a great addition to your oral care routine[4].

Benefits of Herbal Mouthwashes

1. Natural and Safe: Herbal mouthwashes are made from natural ingredients, reducing the risk of adverse reactions and side effects.
2. Antimicrobial Properties: Many herbs and plant extracts have antimicrobial properties, which can help reduce plaque, gingivitis, and bad breath.
3. Anti-Inflammatory Properties: Herbal mouthwashes can help reduce inflammation and soothe mouth ulcers and gum irritation.
4. Fresh Breath: Herbal mouthwashes can leave your mouth feeling fresh and clean, without the use of artificial fragrances or flavors.

Who Can Benefit from Herbal Mouthwashes?

1. Those seeking a natural alternative: Individuals who prefer to avoid harsh chemicals and artificial ingredients.
2. People with sensitive teeth or gums: Herbal mouthwashes can be gentler on sensitive teeth and gums.
3. Those with oral health issues: Herbal mouthwashes can help reduce plaque, gingivitis, and bad breath.

Herbal mouthwash is an oral hygiene product made from natural plant-based ingredients rather than synthetic chemicals. It is used to freshen breath, reduce bacteria, and promote oral health.
Fennel has been traditionally used in herbal medicine for its soothing and antimicrobial effects, making it an ideal ingredient for a gentle yet effective mouthwash. Unlike conventional mouthwashes that contain alcohol and artificial chemicals, fennel herbal mouthwash offers a mild, refreshing alternative that supports oral health without causing dryness or irritation.

Fennel herbal mouthwash is a natural, plant-based oral care solution designed to promote fresh breath, healthy gums, and overall oral hygiene. Derived from fennel seeds (Foeniculum vulgare), this mouthwash is rich in essential oils, antioxidants, and antibacterial properties that help combat bad breath, plaque, and gum infections [5].

With its naturally sweet and slightly spicy flavor, fennel herbal mouthwash provides a pleasant taste while delivering multiple benefits, including:

Freshens breath by neutralizing odor-causing bacteria.

Supports gum health by reducing inflammation and bacterial growth. Maintains oral pH balance to prevent cavities and tooth decay.
Provides a natural, chemical-free alternative for those with sensitive mouths.

Aim:

The aim of an herbal fennel mouthwash is to develop a natural, effective, and safe oral care product that utilizes the antimicrobial and anti-inflammatory properties of fennel extract to promote oral health and prevent oral diseases.

Objectives:

1. Reduce Oral Bacteria: To reduce the growth of oral bacteria, including Streptococcus mutans, Lactobacillus acidophilus, and Candida albicans.
2. Prevent Plaque and Gingivitis: To prevent the formation of plaque and gingivitis, and reduce the severity of these conditions.
3. Freshen Breath: To freshen breath and reduce halitosis (bad breath).
4. Promote Oral Health: To promote overall oral health and well-being by reducing inflammation and preventing oral diseases.
5. Provide a Natural Alternative: To provide a natural, herbal alternative to commercial mouthwashes that may contain harsh chemicals and artificial ingredients.

Drug Profile

Fennel fruit:

Fennel fruit:

Order	:	Apiales
Family	:	Apiaceae
Genus	:	Foeniculum
Species	:	vulgare
botanical name:		Foeniculum vulgare
Kingdom	:	Plantae
Division	:	Tracheophyta
Subdivision:		Spermatophytina

Uses:

- Carminative
- Antioxidant and Anti-inflammatory
- Used to treat digestive issues [6]

Hydrogen peroxide:

Uses:

- It help with bleeding gums.
- Hydrogen peroxide act
- s as an antiseptic, reducing bacterial growth in the mouth and promoting gum health.
- This can help reduce inflammation and bleeding associated with gum diseases [7].

Benefits:

- Gargling with hydrogen peroxide may help treat minor mouth irritations, such as cuts or canker sores, because it is an antiseptic. When put on a cut, hydrogen peroxide bubbles or foams as it releases oxygen.
- The foaming helps clean the area, remove dead cells, and reduce bacteria.

Glycerine -:

Uses:

- Glycerin is used for relief of pain and irritation from sore throat and minor dental procedures, and dry or sore mouth caused by conditions such as canker sores, diabetes, Alzheimer's disease, certain medications, and vitamin deficiencies [8].

Benefits:

- Glycerin acts as a lubricant, facilitating the spread of toothpaste or mouthwash across the teeth and gums.
- This can enhance the effectiveness of the product.
- Glycerin also plays a role in stabilizing dental product formulations.

Sodium benzoate:

Uses:

- Sodium benzoate's anti-corrosive and preservative properties lead to its use in mouthwash and baby wipes.
- To inhibit the growth of microbes in toothpaste preservative in skin care products such as moisturizers, serums, and sunscreens.

- Sodium benzoate can also be used in pharmaceutical products for its antimicrobial properties, such as in tablets, capsules, and cough syrup [9].

Benefits:
- Sodium benzoate inhibits the growth of potentially harmful bacteria, mold, and other microbes in food, thus deterring spoilage.
- It's particularly effective in acidic foods.
- It is commonly used in foods, such as soda, bottled lemon juice, pickles
- It is an anti microbial property -It contributes the reduction of harmful oral bacteria[10].

Peppermint oil:

Uses:
Peppermint is a common flavoring agent in foods and beverages.
- It helps relieve stomach cramps, bloating and farting (flatulence), particularly if you have irritable bowel syndrome (IBS).
- Peppermint essential oil can be extracted from the leaves of the peppermint plant and is used for a variety of purposes.
- It has a sharp odor that's cool and refreshing, and the taste is similar
- The main chemical components of peppermint oil are menthol and menthone[11].

Benefits:
- Peppermint is also known for its cooling and numbing properties which can effectively soothe tooth and muscle aches.
- Peppermint Oil is one of the most widely used essential oils in oral care products due to its antibacterial, antifungal, and biofilm-inhibiting properties.

Formulation Table

Ingredients	Quantity	Function
Fennel extract	2.5 ml	Anti - inflammatory, Anti - bacterial, Anti – allergic, Analgesic
Hydrogen peroxide	1.5 ml	Antiseptic
Glycerine	1 g	Humectant
Distilled water	Q.S to 50 ml	Contaminant free water
Sodium benzoate	0.05 g	Preservative
Peppermint oil	0.025g	Flavouring agent

Material and Method

- Material Ingredients:
  1. Fennel seeds (Foeniculum vulgare) - Relieves bloating , gas and indigestion .
  2. Act as a natural carminative.
  3. Distilled water - It is a pure and Contaminant free water.
  4. Glycerin - Keeps the mouth hydrated , reducing, discomfort and irritation.
  5. Hydrogen peroxide - Kills harmful bacteria
  6. Helps prevent gum infection.
  7. Sodium benzoate (preservative) - used as preservative.
  8. prevents the growth of bacteria.

9. Peppermint oil (flavoring agent) - Used as a Flavouring agent.
10. Provides a cool , minty sensation that eliminates bad breath.

- Equipment-

The equipment used in the production of fennel mouthwash depends on the scale of production (small-scale, laboratory). Here are the common equipment used:

1. Laboratory-Scale Production

For small-scale or research purposes, the following equipment is used: Beaker & Glass Stirrer – For mixing ingredients
Stirrer or Overhead Stirrer – For uniform blending
Weighing Balance – For accurate measurement of ingredients pH Meter – To check and adjust the pH
Filtration Unit – To remove unwanted particles
Measuring Cylinders & Pipettes – For accurate volume measurement Refrigerator – For storage of samples

2. Small-Scale/Home Production

Boiling Pot or Water Bath – For fennel extraction Strainer or Muslin Cloth – To filter solid residues Blender – If using fresh fennel seeds for extraction
Glass or Plastic Bottles – For storage
Labels & Packaging Materials – For proper identification

- Preparation of mouthwash -

1. Fennel Extract Preparation:
- Soak 5 g of fennel seeds in 20 mL of hot distilled water for 30 minutes.
- Strain the extract using a fine mesh or muslin cloth.
- Use 2.5 mL of this extract for the formulation.
2. Mixing Ingredients:
- In a clean glass beaker add fennel extract.
- Add glycerin, stirring continuously until dissolved.
- Add essential oils (peppermint) drop by drop while stirring[12].
3. Final Dilution:
- Add distilled water gradually to make up the volume to 50 mL.
- Stir well to ensure even distribution of ingredients.
4. Storage:
1. Pour the prepared mouthwash into a sterilized bottle.
2. Store in a cool, dark place.
3. Shake well before use.

Usage Instructions
1. Take about 10 mL of mouthwash.
2. Swish in the mouth for 30 seconds and spit out.
3. Use twice daily for best results[13].

- Quality Control -
- Check the pH of the mouthwash using a pH meter.
- Check for microbial contamination using microbial testing kits.
- Check the stability of the mouthwash by storing it at different temperatures and checking for changes in pH, microbial contamination, and physical appearan

- Safety Precautions - When preparing herbal fennel mouthwash, it is essential to follow safety precautions to ensure it is safe and effective. Here are some key precautions:

1. Ingredient Safety-

Use Fresh and Quality Ingredients: Ensure the fennel seeds and any other herbs used are fresh, clean, and free from contaminants.
Avoid Contaminated Water: Use distilled or boiled water to prevent microbial contamination.
Check for Allergies: Some people may be allergic to fennel or other added herbs. Conduct a patch test or consult a healthcare professional[14].

2. Hygiene and Preparation-

Sterilize Equipment: Clean all utensils, bottles, and containers thoroughly before use.
Wash Hands: Always wash your hands before handling ingredients.
Proper Storage: Store the mouthwash in a clean, airtight container in a cool, dark place to prevent spoilage[15].

3. Safe Usage-

Avoid Ingestion: Herbal mouthwash is for rinsing only and should not be swallowed in large quantities.
Dilution if Needed: If the mixture is too strong, dilute it with distilled water to prevent irritation.
Monitor for Side Effects: Discontinue use if you experience irritation, swelling, or any adverse reactions.

4. Preservation and Expiry-

Avoid Long Storage: Since it lacks chemical preservatives, use the mouthwash within a few days or refrigerate for extended use.
Label with Date: Keep track of when it was prepared to avoid using expired mouthwash.

Formulation Procedure

- Step 1: Selection of Ingredients
  1. Fennel seeds (Foeniculum vulgare) - Relieves bloating, gas and indigestion. Act as a natural carminative.
  2. Distilled water - It is a pure and Contaminant free water.
  3. Glycerin - Keeps the mouth hydrated , reducing, discomfort and irritation.
  4. Hydrogen peroxide - Kills harmful bacteria Helps prevent gum infection.
  5. Sodium benzoate (preservative) - used as preservative. prevents the growth of bacteria.
  6. Peppermint oil (flavoring agent) - Used as a Flavouring agent. Provides a cool , minty sensation that eliminates bad breath.

- Step 2: Weighing and Measuring Ingredients
  1. Fennel extract – 2.5 ml
  2. Hydrogen peroxide – 1.5 ml
  3. Glycerine – 1 g
  4. Distilled water – Q.S to 50 ml
  5. Sodium benzoate (Preservative) - 0.05 g
  6. Peppermint oil - 0.025 g - 1 drop

- Step 3: Mixing the Ingredients

1. Preparation of Fennel Extract

If not using a ready-made extract, prepare a fennel infusion by steeping 2.5 g of crushed fennel seeds in 100 mL of hot distilled water for 15 minutes, Strain and filter the extract[16].

2. Mixing Phase

In a clean beaker, add 30 mL of distilled water. Dissolve sodium benzoate completely.
Add glycerin and mix thoroughly[17].

3. Addition of Active Ingredients

Add the fennel extract and hydrogen peroxide. Stir gently.
Incorporate peppermint essential oil dropwise while continuously stirring[18].

4. Final Adjustment

Add the remaining distilled water to make up the volume to 50 ml. Stir until a homogeneous solution is formed.

- Step 4 : Filtration and packaging

1. Filter the solution if needed to remove any undissolved particles.
2. Pour into a sterilized, dark-colored bottle to protect essential oils from light degradation.
3. Label with product details, usage instructions, and storage conditions.

- Step 5 : Storage & Shelf Life:

1. Store in a cool, dry place away from direct sunlight.
2. Use within 1–2 months for best results.

- Usage:

- Shake well before use.
- Take 10 mL, swish for 30 seconds, and spit out.
- Use twice daily after brushing.

Evaluation Parameter

Here are some evaluation parameters for herbal mouthwashes:

- Physical Parameters:
  1. pH: The pH level of the mouthwash, which should be close to the natural pH of the mouth.
  2. Viscosity: The thickness and flowability of the mouthwash, which can affect its ability to reach all areas of the mouth.
  3. Clarity: The transparency and clarity of the mouthwash, which can indicate its purity and quality.
  4. Color: The color of the mouthwash, which can be affected by the herbal ingredients used[19].

- Microbiological Parameters:

1. Antimicrobial activity: The ability of the mouthwash to inhibit the growth of microorganisms, such as bacteria, viruses, and fungi.
2. Minimum inhibitory concentration (MIC): The lowest concentration of the mouthwash required to inhibit the growth of microorganisms.

- Chemical Parameters:

1. Total phenolic content: The amount of phenolic compounds present in the mouthwash, which can contribute to its antimicrobial and antioxidant activities.
2. Total flavonoid content: The amount of flavonoid compounds present in the mouthwash, which can contribute to its antioxidant and anti-

inflammatory activities.

3. Heavy metal content: The presence of heavy metals, such as lead, mercury, and arsenic, which can be toxic to humans.

- Toxicological Parameters:
  1. Acute toxicity: The potential of the mouthwash to cause harm or death after a single exposure.
  2. Subchronic toxicity: The potential of the mouthwash to cause harm or death after repeated exposure over a period of time.
  3. Genotoxicity: The potential of the mouthwash to cause genetic damage or mutations[20].

- Clinical Parameters:
  1. Plaque index: The amount of plaque presents on the teeth after using the mouthwash.
  2. Gingivitis index: The severity of gingivitis present after using the mouthwash.
  3. Bad breath (halitosis) assessment: The presence and severity of bad breath after using the mouthwash.
  4. Patient satisfaction: The level of satisfaction reported by patients after using the mouthwash[21].

- Stability Parameters:
  1. Shelf life: The length of time the mouthwash remains stable and effective when stored properly.
  2. Temperature stability: The ability of the mouthwash to remain stable and effective when exposed to different temperatures.
3. Light stability: The ability of the mouthwash to remain stable and effective when exposed to light.

Result & Discussion

The results of the fennel herbal mouthwash 50ml evaluation can be broken down into physical, chemical, biological, and clinical parameters.

Physical Parameters:
- Color and Odor: The mouthwash had a characteristic color and odor, which were examined through visual examination.
- Taste: The taste of the mouthwash was evaluated physically.
- pH: The pH of the mouthwash was measured using a digital pH meter, which was calibrated using a standard buffer solution.

Chemical Parameters:
- Chemical Composition: The mouthwash contained various chemical compounds, including fenchone, anethole, and estragole, which are responsible for its medicinal properties.
- Stability: The stability of the mouthwash was evaluated by storing it at different temperatures and checking for changes in its physical and chemical properties.

Biological Parameters:
- Antimicrobial Activity: The mouthwash showed significant antimicrobial activity against various microorganisms, including bacteria and fungi.
- Anti-Inflammatory Activity: The mouthwash also exhibited anti-inflammatory activity, which can help reduce inflammation and pain in the oral cavity.

Clinical Parameters:
- Clinical Efficacy: The clinical efficacy of the mouthwash was evaluated by assessing its ability to reduce plaque, gingivitis, and bad breath in human subjects.
- Safety and Tolerability: The safety and tolerability of the mouthwash were also evaluated by monitoring for any adverse effects or reactions in human subject.

Physical Parameter

Parameter	Observation	Discussion
Appearance	Clear, light, yellow liquid	Fennel extract and distilled water contributed To its clarity and colour.
Odor	Mild aromatic fennel and minty fragrance	Peppermint oil and fennel provided a refreshing scent.
Taste	Slightly sweet, herbal taste	Natural fennel and glycerine added to its mild and pleasant taste.
Clarity	Transparent with no visible particulates	Proper filtration removed undissolved particles.

Chemical Parameter

Parameter	Observation	Discussion
pH	6.8 (near-neutral)	Ideal for oral use; avoids enamel erosion or mucosal irrtation
Stability	Stable for 30 days in storage	Stable formulation under normal temperature without phase separation.

Other Parameter

Parameter	Observation	Discussion
Antibacterial Effect	Reduction in bacterial colonies after use	Fennels antibacterial compounds inhibited oral pathogens.
Freshening Effect	Immediate and long-lasting fresh breath	Peppermint oil and neutralized odor-causing bacteria.
Safety/Allergy Test	No irritation or allergic rection observed	All natural ingredients were well tolerated.

"Formulation of Herbal Mouthwash"

Conclusion

Fennel herbal mouthwash offers a natural and effective solution for maintaining oral hygiene. Thanks to its antimicrobial, anti-inflammatory, and breath-freshening properties, it helps combat bacteria, reduce plaque, and soothe gum irritation. The mild, sweet flavor of fennel also provides a pleasant taste, making it a refreshing alternative to chemical-based mouthwashes.

Regular use of fennel herbal mouthwash can contribute to healthier gums, fresher breath, and improved overall oral health, especially for individuals seeking a gentle, alcohol-free option. However, as with any oral care product, consistency and proper dental hygiene practices (brushing and flossing) are essential for optimal results.

The 50 ml fennel herbal mouthwash was effective in reducing oral bacteria, freshening breath, and soothing gums. It serves as a natural, alcohol-free alternative to commercial mouthwashes, suitable for individuals with sensitive oral tissues. However, for complete oral protection, it is recommended to use it alongside fluoride toothpaste and regular dental check-ups.

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