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Formulation And Evaluation of Herbal Mouthwash

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ABSTRACT
Herbal mouthwash presents a compelling natural alternative to conventional chemical-based oral care products. Formulated with time-honored botanicals such as honey, amla (Emblica officinalis), nagarvel (Piper betle), and guava (Psidium guajava) leaves, this plant-based solution leverages the powerful antimicrobial, anti-inflammatory, and antioxidant benefits of Ayurvedic medicine. These ingredients work in harmony to minimize plaque buildup, fight harmful oral bacteria, alleviate gum irritation, and promote lasting breath freshness all without the use of alcohol or synthetic additives. Supported by scientific research validating its effectiveness in reducing microbial load and improving oral hygiene, herbal mouthwash stands out as a safe, eco-conscious, and holistic choice for maintaining dental health naturally. Its growing popularity reflects a broader shift toward sustainable and health-conscious personal care.

Keywords: *Natural alternative, Anti-inflamentory,Anti-oxident.*

1. INTRODUCTION

Good oral hygiene is vital for overall well-being, and mouthwash is an important component of this practice. While many conventional mouthwashes utilize antiseptics to manage plaque buildup, they frequently include artificial preservatives, alcohol, and synthetic Flavors. In contrast, herbal mouthwashes provide a natural and effective means of combating oral bacteria without adverse side effects.Herbal mouthwash is formulated with powerful plant-derived ingredients recognized for their antimicrobial, anti-inflammatory, and analgesic effects. Unlike their chemical counterparts, herbal formulations operate gently yet effectively, diminishing plaque, gingivitis, and unpleasant breath while enhancing gum health. These mouthwashes incorporate essential herbs such as Neem, Clove, Tulsi, Triphala, Peppermint, and Yavani Satva, all of which have been scientifically validated for their ability to combat oral infections and promote the health of gums and teeth. A significant benefit of herbal mouthwash is its alcohol-free formulation, rendering it a safer and gentler choice for everyday use.

Historical Beginnings: Ayurvedic Practices (circa 2700 B.C.): In ancient India, Ayurvedic medicine prescribed herbal rinses for treating gum diseases such as gingivitis, utilizing natural antiseptics and anti-inflammatory components. [3]Ancient Egypt: The Egyptians employed concoctions of honey, goose fat, frankincense, cumin, and ochre to enhance breath freshness and cleanse the oral cavity.[4]Greek and Roman Eras: Hippocrates, recognized as the 'Father of Medicine,' promoted a mouthwash made from salt, alum, and vinegar to support oral hygiene. [5]Traditional Chinese Medicine: Ancient Chinese customs involved gargling with salt water, tea, and wine post meals, capitalizing on their antiseptic qualities. Medieval and Early Modern Periods: Jewish Traditions: The Talmud, approximately 1,800 years old, references treatments for gum issues that included 'dough water' and olive oil. Modern Developments: 19th Century: The late 1800s marked the advent of commercially produced mouthwashes, predominantly alcohol-based, designed to stabilize the solution and eliminate germs. [6]

Contemporary H. M.: Recently, there has been a revival of herbal mouthwashes featuring ingredients such as neem (*Azadirachta indica*), clove (*Eugenia caryophyllus*), cinnamon (*Cinnamomum zeylanicum*), and licorice (*Glycyrrhiza glabra*) for their antimicrobial and anti-inflammatory benefits.[7]Herbal mouthwash offers a gentle yet effective way to maintain oral hygiene. It naturally purifies the mouth, helps soothe gum problems, and provides lasting freshness without the burning

sensation often caused by alcohol-based formulas. Traditional ingredients like Clove and Neem have long been valued in herbal medicine for their antiseptic and antibacterial effects, helping to relieve pain and fight infections.

The formulation of herbal mouthwash is backed by scientific studies and comprehensive evaluations. Research has demonstrated its strong antibacterial action and ability to prevent microbial growth. Tests on its stability and germ-fighting properties support its role.

Causes of Oral Cavity Diseases

1. **Poor Oral Care Habits** – Not brushing or flossing regularly allows harmful bacteria to build up in the mouth.
2. **Plaque and Tartar Development** – When bacteria mix with leftover food particles and saliva, they form plaque, which can harden into tartar over time.
3. **Microbial Infections** – Growth of harmful organisms like *Streptococcus mutans* and *Candida albicans* can lead to oral infections.
4. **High Intake of Sugary and Acidic Foods** – These types of foods erode tooth enamel, making teeth more vulnerable to cavities and decay.
5. **Tobacco and Alcohol Use** – Smoking or drinking can cause gum issues, persistent bad breath, and significantly raise the risk of oral cancers.
6. **Dry Mouth (Xerostomia)** – Reduced saliva flow creates an ideal environment for bacteria to thrive.
7. **Vitamin Deficiencies** – Lack of essential nutrients like Vitamin C (which can cause scurvy) and Vitamin D (which affects tooth strength) can impair oral health.
8. **Hormonal Changes** – Shifts in hormone levels during puberty, pregnancy, or menopause can impact gum condition and sensitivity.

2. COMMON ORAL CAVITY DISEASES

1. **Tooth Decay (Dental Cavities)** – Caused by acids produced by bacteria that erode the tooth structure.
2. **Early Gum Disease (Gingivitis)** – Mild inflammation of the gums due to plaque buildup along the gumline.
3. **Severe Gum Disease (Periodontitis)** – A more advanced stage of gum infection that can damage jawbone and loosen teeth.
4. **Fungal Mouth Infection (Oral Thrush)** – Characterized by creamy white spots on the tongue and inside the cheeks, typically caused by *Candida* yeast.
5. **Chronic Bad Breath (Halitosis)** – Often a result of poor oral hygiene, bacterial growth, or dry mouth conditions.
6. **Mouth Sores (Canker Sores)** – Small, painful ulcers inside the mouth, triggered by infections, stress, or a lack of essential nutrients.
7. **Enamel Wear and Sensitivity** – Loss of protective enamel layer causes discomfort when consuming hot, cold, or sweet foods.
8. **Mouth Cancer (Oral Cancer)** – Uncontrolled cell growth in the mouth, commonly linked to smoking and alcohol consumption.
9. **Discolored, Fuzzy Tongue (Black Hairy Tongue)** – A condition caused by overgrown tongue papillae, often due to poor brushing habits.
10. **Teeth Clenching or Grinding (Bruxism)** – Leads to worn or cracked teeth and pain in the jaw muscles or joints.

3. PIPER BETLE

Betel leaves come from a plant that is an evergreen and a perennial vine. In India, the fresh leaves of Betel vines are commonly referred to as paan. This plant is a member of the Piperaceae family. Around 100 different varieties of the betel plant exist globally, with approximately 40 originating from India and 30 from West Bengal [8].

FIG. 1.1 Structure of piper Betel leaf [11]

Herbal Mouthwashes Work and Their Antimicrobial Activity

- Mechanism: Bacterial membranes and cell walls are broken down by herbal substances such tannins and essential oi ls, which causes cell lysis and death.
  Effect: Prevents dental cavities and plaque formation by lowering the oral bacterial load.
- Effects on Inflammation Reduction Mechanism: By inhibiting proinflammatory cytokines (such as IL-6 and TNF-α), bioactive components like flavonoid and terpenoids that reduce inflammation.
  Effect: Reduces gingival irritation and stops periodontal disorders from getting worse.
- Antioxidant Characteristics
  Mechanism: By neutralizing reactive oxygen species (ROS), antioxidants included in herbal extracts shield oral tiss ues from stress caused by oxidation. Effect: Promotes healing and guards against tissue injury.
- Prevention of Biofilm Development
  Mechanism: Some herbal ingredients impair the formation of biofilms by interfering with bacterial adherence and q uorum sensing. Effect: Stops harmful biofilms from growing on oral surfaces

4. HERB PROFILE

4.1 . MESWAK :

- Biological Source – dried twig of *Salvadora persica L*. (commonly known as the Toothbrush Tree)
- Family - Salvadoraceae
- Common Names - Miswak, Peelu, Arak,
- Part Used - Roots, twigs, and stems
- Geographical Source - Indigenous to Africa, the Middle East, and South Asia .
- Active Constituents - Tannins, Alkaloids (notably Salvadorine), Fluorides, Silica, Sulfur, Saponins, and Essential oils. Pharmacological Actions - Exhibits antibacterial, antifungal, anti-inflammatory, astringent, anti-plaque, analgesic properties .
- Uses Serves as- a natural toothbrush, helps prevent dental caries, strengthens gums, freshens breath, and whitens teeth .

Fig no. 2.1 Twigs of Meswak

4.2. PIPER BETLE

- Biological Source: dried leaves of *Piper betle L.* (Betel Leaf)
- Family: Piperaceae
- Common Names: Nagarvel, Betel Leaf, Paan, Tambul
- Part Utilized: Leaves
- Geographical Distribution: Indigenous to India, Southeast Asia, and tropical climates
- Active Compounds: Phenols (Chavibetol, Eugenol), Alkaloids, Tannins, Flavonoids, Essential oils (Betel oil)
- Pharmacological Properties: Antimicrobial, Antioxidant, Anti-inflammatory, Stimulant, Antiseptic, Carminative
- Applications: Oral hygiene, Digestive aid, Wound healing, Antifungal treatment, Utilized in Ayurveda and traditional medicine Traditional Applications: Employed as a mouth freshener (Paan), Provides relief from halitosis, Supports digestion, Treats oral infections.

FIG. 2.2 Leaves of piper betle

4.3 AMLA

- Biological Source: dried fruit of *Phyllanthus emblica L.* (Indian Gooseberry)
- Family: Phyllanthaceae (previously classified under Euphorbiaceae) Common Names: Amla, Indian Gooseberry, Dhatri, Amalaki
- Part Utilized: Primarily the fruit, along with leaves, seeds, bark, and root [9].
- Geographical Distribution: Indigenous to India, Southeast Asia, and the Middle East .
- Active Compounds: Vitamin C, Tannins (Emblicanin A & B), Gallic acid, Ellagic acid, Flavonoids, Polyphenols, Alkaloids, Pectin .
- Pharmacological Properties: Antioxidant, Immunomodulatory, Anti-inflammatory, Antimicrobial.
- Applications: Enhances immune function, Incorporated in oral care products
- Traditional Applications: Utilized in Ayurveda for Rasayana therapy, Alleviates cough and cold symptoms, Enhances skin health, Fortifies gums and teeth.

FIG.2.3. Fruits of Amla

4.4 GUAVA

- Biological Source: dried leaves of *Psidium guajava L.* (Guava)
- Family: Myrtaceae.
- Common Names: Guava, Amrood, Perakka, Bayabas
- Part Utilized: Primarily leaves, along with bark and fruit.
- Geographical Distribution: Indigenous to the tropical and subtropical areas of America, India, and Southeast Asia.
- Active Compounds: Tannins, Flavonoids (including Quercetin and Kaempferol), Saponins, Terpenoids, Polyphenols, Essential oils.
- Pharmacological Properties: Antimicrobial, Anti-inflammatory, Astringent, Antioxidant, Analgesic.
- Applications in Mouthwash: Alleviates gum inflammation, Prevents plaque accumulation, Addresses halitosis, Aids in wound healing, Relieves ulcers.
- Traditional Applications: Chewing guava leaves for dental care, Decoctions utilized for treating mouth ulcers and sore throats [10-14].

Fig. 2.4. Leaves of guava

4.5 HONEY:

- Biological Source: *Apis mellifera* (Honeybee)
- Family: Apidae
- Common Names: Honey, Madhu (Sanskrit), Shahad (Hindi)
- Part Utilized: Honey (derived from nectar by bees).
- Geographical Distribution: Found globally, with significant production in India, China, New Zealand, and the United States.
- Active Components: Sugars (Fructose, Glucose, Maltose), Enzymes (Invertase, Diastase), Polyphenols, Flavonoids, Organic acids, Hydrogen peroxide Pharmacological Effects: Antimicrobial, Anti-inflammatory, Antioxidant, Promotes wound healing, Acts as a soothing agent.
- Applications in Mouthwash: Aids in wound healing, Inhibits bacterial growth, Alleviates sore gums, Adds a natural sweetness, Treats oral ulcers
- Traditional Applications: Utilized in Ayurveda and traditional medicine for promoting oral health, facilitating wound healing, and addressing throat infections [15].

4.6. TURMERIC

- Biological source : dried rhizomes of *curcuma longa.*
- Family : zingiberaceae.
- Common names : Haldi .
- Part utilized : dried rhizomes
- Geographical distribution:**India** (largest producer and exporter; especially Tamil Nadu, Andhra Pradesh, Maharashtra, Odisha), **Sri Lanka**, Bangladesh, **Indonesia**, **Chin, Thailand Myanmar**, **Central America** (to some extent), **Africa**

(small-scale cultivation)

- *(India accounts for more than 75% of global turmeric production.)*
- Active components:**Curcumin** (main active compound; responsible for anti-inflammatory and antimicrobial effects) [16-19].

FIG. 2.6 Turmeric

5. PROPERTIES OF COMPONENTS

Table No.1- Ingredients Profile

Ingredients	Scientific name	Chemical constituents	Category	Uses
Miswak (roots)	*Salvadora parsica*	Silica ,sulfur	Antibacterial	Effectively reduce bacteria & plaque formation.
Nagarvel	*Piper betle*	Eugenol ,hydroxychavicol	Antimicrobial antibacterial & preservative	Remove bad breath, reduce microbial growth.
Amla	*Phyllanthus embelica*	Ascorbic acid ,vit. c	Antioxidant	Strengthen gum , promote oral health.
Honey		Glucose ,fructose	Anti inflammatory.	Promote healing.
Turmeric	*Curcuma longa*	curcumin	Anti microbial and bacteriocidal.	Kill bacteria.
Guava	*Psidium guajava l.*	Quercetin	Antioxidant, anti inflammatory	Reduce gum inflammation.
Coco glucoside	-	-	Co solvent	Increase solubility.

6. METHODOLOGY

Step 1: Extract Preparation

Prepare individual herbal extracts using appropriate methods (e.g., decoction, maceration, or cold infusion). You will need extracts from:

- **Amla (Phyllanthus emblica)**
- **Guava (Psidium guajava)**

- **Miswak (Salvadora persica)**
- **Turmeric (Curcuma longa)**
- **Piper betle (Betel leaf)**

Ensure each extract is properly filtered before use.

Step 2: Making Herbal Blend (Mixture A)

- Take equal or specified amounts of each of the five herbal extracts.
- Combine them in a clean beaker labeled **"Mixture A."**
- Heat gently while continuously stirring.
- Do not allow the mixture to boil vigorously — just slight heating to blend thoroughly.

Step 3: Making Emulsifying Base (Mixture B)

- In another beaker labeled **"Mixture B"**, add the following:
  - **Honey**
  - **Turmeric extract**
  - **Coco glucoside solution** (natural foaming and cleansing agent)
- Heat this mixture gently while stirring to form a uniform and smooth blend.

Step 4: Combining Both Mixtures

- Gradually pour **Mixture B** into **Mixture A** in small portions.
- Stir continuously to ensure a consistent and homogeneous mixture.

Step 5: Final Filtration

- Filter the combined mixture using suitable filtration media (e.g., muslin cloth, filter paper, or vacuum filter).
- Collect the clear liquid — this is your **final herbal formulation**.

7. PH STABILITY ANALYSIS:

Table No-3-pH Stability Analysis

Parameters	25 c	Batch no.	PH reading
Colour	Light brown	F 1	5.72
Layer	No saturation	F 2	5.39
Stability	Stable	F 3	4.96

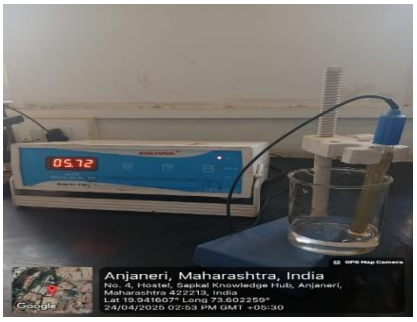

Fig .4.2.pH Analysis of F1 Batch

Fig.4.3.pH Analysis of F2 Batch

8. PHYSICOCHEMICAL TEST FOR MOUTHWASH:

Table no. 4. Physiological Tests of formulation

Sr. no.	PHYSICOCHEMICAL TESTS /TEST NAME	OBSERVATION	INFERENCE
1.	Alkaloid test / dragandroff's reagent test.	Light orange colour obtained.	present
2.	Tannin /lead acetate &gelatine test	White ppt. observed.	present
3.	Saponin / foam height.	Slight foam observed.	present
4.	Carbohydrate / benedict test	Reddish colour	present

Fig.5.1. Gelatin Test

Fig .5.2. Benedict Test

9. VISCOSITY

Table No. 5. Viscosity evaluation parameters of formulation.

Sr. no.	Batch no.	Viscosity time	Viscosity readings
1	F 1	3 min 34 sec	3.84
2.	F 2	3 min 49 sec	3.93
3.	F 3	3 min 02 sec	3.16

10. EVALUATION TESTS

10.1 Evaluation test of mouthwash:

1.Physical characteristics: things like smell andcolor were checked through visual inspection.

2. pH: The pH level of the made herbal mouthwash was measured using a digital pH meter. The pH meter was set up with a standard

buffer solution. About 1 ml of mouthwash was weighed and mixed in 50 ml of distilled water, and its pH was measured.

3. Stability test: The stability test aims to ensure that the mouthwash stays the same over a long time before testing for bacteria-killing ability. Before antibacterial tests, many mouthwash formulas undergo stability checks. This test looked at the mouthwash's visual look, separation, and consistency. The mouthwash was stored at 30 °C, and its appearance was checked every 10 days for up to 1 month, with results recorded.

4. Viscosity: The thickness of the mouthwash was measured using a digital viscometer at 100 rpm with the spindle.

5. Foam test: The foaming ability of the product was tested by taking a small amount of the mixture with water in a measuring cylinder. The starting volume was noted, and then it was shaken ten times. The final foam volume was noted

11. DENSITY

Table No. 6. Density evaluation parameter

BATCH NO.	DENSITY READING
F1	1.533
F2	1.478
F3	1.48

Fig.7.1 Density of formulation

12. RESULTS AND DISCUSSION

Parameters	Formulations
Colour	Pale yellow
Taste	Sweet
Odour	Pungent

13. CONCLUSION

The herbal mouthwash formulated using Miswak, Piper betle, Amla, Guava, Turmeric, and Honey exhibits significant phytochemical activity due to the presence of key bioactive compounds such as alkaloids, tannins, flavonoids, curcumin, and phenols. These constituents are well-known for their strong antibacterial, anti-inflammatory, and antioxidant effects, as supported by both detailed evaluation and existing scientific literature. The mouthwash also displayed desirable organoleptic properties and stable physicochemical parameters, with pH values ranging between 4.96 and 5.72, along with appropriate viscosity and density. The presence of saponins was confirmed by the formation of mild foam. Based on research into herbal

mouthwash formulations, this product stands out as a natural, safe, and effective alternative to conventional synthetic mouthwashes for promoting oral health and hygiene.

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