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Research Paper

Formulation and Evaluation of Herbal Mouthwash

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ABSTRACT

Medicinal plants significantly contribute to the treatment and prevention of diseases by exhibiting antiviral and antibacterial properties against human pathogens. Herbal mouthwashes are increasingly preferred over chemical alternatives because they target chemical pathogens and microorganisms, provide quick pain relief, and do not have side effects. The most commonly infectious diseases result from various pathogens and microorganisms, with periodontal disease occurring at different life stages. This study aims to develop and assess its effectiveness against oral microorganisms. It emphasizes the growing popularity of herbal mouthwashes, which leverage the antibacterial and antioxidant properties of various plants, including guava leaves, pomegranate, and reetha, to improve oral health. The discussion also includes the negative effects of chemical mouthwashes and encourages the use of herbal alternatives for better oral hygiene without adverse effects. Additionally, it touches on the medicinal benefits of these herbs, providing insight into their role in the prevention and treatment of oral diseases.

INTRODUCTION

A mouthwash is a type of liquid medicine that is used in the mouth and moved around by the muscles in the face to get rid of germs.¹ Maintaining oral hygiene is its main purpose.² Mouthwashes are made in three different ways

1) antibacterial based mouthwashes

2) fluoride-containing mouthwashes

3) mineral-based mouthwashes³

Mouthwashes come in variations, including cosmetic and medicinal mouthwashes. Cosmetic mouthwash masks unpleasant breath by incorporating a flavoring agent that provides temporary freshness. Therapeutic mouthwash, in contrast, contains ingredients that assist in

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mechanical control and the maintenance of oral health. Mouthwashes have several purposes, including washing food particles from the mouth, lowering the overall bacterial count in the mouth, flavoring the oral cavity, and flavoring the breath. Mouthwash also contains compounds that aid in the breakdown of food. Mouthwashes are accessible in both synthetic and organic types. Nowadays, herbal mouthwashes are in high demand and gaining popularity due to their antibacterial and antioxidant properties. Herbal plants possess diverse medicinal properties and they play a crucial role in the treatment of various diseases due to their antibacterial and antifungal capabilities.⁴ Maintaining good oral health and hygiene can greatly influence a person's personality and overall quality of life. The general demand for prevention and treatment methods has grown as the number of instances of oral illness has increased. chemical mouthwashes tend to discolour teeth owing to the inclusion of chlorine dioxide, cetylpyridinium chloride, an instant whitener, pain reliever, and other ingredients, as well as causing adverse effects and being inexpensive. Periodontal disease and tooth decay are among the most common infectious diseases encountered by numerous individuals. Dental disorders are particularly common in children and adolescents who do not take good care of their oral health.⁵ candies, chocolates, jellies, and other foods with a high sugar content include insoluble glucan, which attaches to the enamel of the tooth and produces a cavity. The enamel on the teeth can also be harmed and worn away, causing the dentine to come through and causing discoloration. The world's oldest type of health care is a traditional drug for precluding and treating physical and internal ails. In the history, colourful societies have developed a variety of treatments to combat different health and life-hanging conditions.^{6,7} Medicines similar as traditional Chinese herbal drug, Kampo,

Ayurveda, Korean traditional drug, and natural products of Unani drug have been used worldwide since hundreds or thousands of times and are used in well-regulated health systems. An important part in some countries moment (Abdullahi, 2011; World Health Organization, 2000). Since ancient times, clinical exploration has been carried out in traditional drug. Clinical exploration provides substantial quantities of data, and this traditional drug supports the development of ultramodern medicines. In the 22 summary, we first linked the remedial goods of medicinal shops on the mouth, and also banded the goods of these shops on endodontic treatment and the juvenescence of living dental cells. numerous herbal excerpts are now available as mouthwash to maintain good oral hygiene.⁹ Spot accumulation and increased oral microorganisms are the main factors of poor oral hygiene. German chamomile, terminal chebra, aloe vera, green tea, peppermint- herbal excerpts similar as Satoba, turmeric, neem, trijara, pomegranate excerpt, guabu excerpt, propolis, alumni, dalim leaves, maltie and other herbal excerpts. Gandaprater, lozenge, vivita, osimum, echinacea, camellia leaves, etc. Numerous sauces have been searched for antioxidant parcels as combinations of neem, clove, and tripara (amaraki, chrysalis, ribsalis, libisalis, libisalis, bisalis, libisalis, libisalis, libisalis, grapefruit, grapefruit, cerashi, cassalis, cassalis, cassalis, cassalis, cassalis, ether, ether). Treatments with chamomile excerpts kill skin pathogenicities similar as *Staphylococcus* and *Candida* species. An admixture of *staphysaglia*, *chamomira*, *echinacea*, *otago*, *oshimamu*, and cystic bone excerpts has been used as mouthwash to reduce the number of streptococci in central salivary bacteria. thus, the use of herbal water and fairly oral hygiene is bettered without side goods.^{9, 10}

❖ PLANT PROFILE



1) Guava Leaves

Synonyms: Psidium pomiferum, P. aromaticum

Common Names: Guava (English), Amrood (Hindi), Peru (Marathi), Koyya (Tamil), Jama (Bengali)

Biological Source: Leaves of Psidium guajava Linn.

Family: Myrtaceae

Genus: Psidium

Species: Guajava

Part Used: Leaves

Origin: Native to Central and South America; widely grown in tropical/subtropical regions (Asia, Africa, Caribbean)

Plant Description: A small tree or shrub, 3-10 meters in height, with spreading branches and Aromatic, oval-shaped leaves with pronounced veins

Chemical Constituents: Flavonoids, Quercetin, Kaempferol, Tannins, Saponins, Essential oils. (Eucalyptol), Phenolic acids, Triterpenoids (Ursolic acid)

Uses:

- Antimicrobial, antioxidant, wound healing
- Antidiarrheal, anti-inflammatory, antidiabetic
- Oral care, skincare¹¹

2) Pomegranate

Synonyms: Punica granatum

Common names: Pomegranate, Anar (Hindi), Dalimb (Marathi)

Biological Source: Peel, seeds, flowers, and bark of Punica granatum Linn.

Family: Lythraceae

Genus: Punica

Species: Punica granatum

Part Used: Fruit rind, seeds, flower, bark

Description: A deciduous shrub or small tree growing 5 to 10 meters tall. It has glossy, narrow. Leaves and showy red flowers. The fruit is a round, leathery-skinned berry containing numerous. Juicy seeds called arils. Native to the Middle East and South Asia, it thrives in hot, dry climates.

Origin: Native to the Middle East and North India; cultivated in Mediterranean regions, Asia, and the Americas

Chemical Constituents: Polyphenols, Ellagic acid, Punicalagin, Tannins, Flavonoids,

Anthocyanins (in fruit juice), Alkaloids (in bark)

Uses:

- Antimicrobial, antioxidant
- Astringent (used in wound healing)
- Anti-inflammatory, cardioprotective
- Gastrointestinal health, dental hygiene

3) Reetha

Synonyms: Soapnut, Indian Soapberry, Reetha

Biological Source: Sapindus macrofossil

Family: Sapindaceae

Genus: Sapindus

Species: Sapindus mukorossi (Indian soapberry)



Part Used: Fruit pericarp (dried)

Description: A deciduous tree native to the Indian subcontinent. It grows up to 20 meters tall and bears yellow berries rich in saponin, which is a natural soap. Commonly used in Ayurvedic shampoos and detergents.¹²

- Natural cleanser for skin, hair, and clothes.
- Used in Ayurvedic medicine for treating dandruff, eczema, and head lice.
- Eco-friendly alternative to chemical detergents.

❖ MATERIAL

Uses:

Table No. 1 Formulation Table

Sr. No.	Ingredients	Quantity for 100 mL (mg)	Quantity for 80 mL (mg)	Quantity for 50 mL (mg)
1	Guava leaf Extract	5 g	1.6g	1.0g
2	Pomegranates Extract	3g	1.6g	1.0g
3	Cardamom Extract	2g	0.4g	0.25g
4	Glycerin	5g	4.0 ml	2.5g
5	Honey	2g	1.6g	1.0g
6	Peppermint oil /menthol	0.5ml	0.08g	0.05g
7	Sodium Extract benzoate/Rosemary	0.3g	0.08g	0.05g
8	Citric acid	0.2g	0.16g	0.1g
9	Distilled Water	qs to 100 ml	qs to 100ml	qs to 100ml
10	Reetha	1.0 gm	0.8g	0.5

❖ METHOD

Plant Method

➤ **Extraction of Guava leaves**

Wash the leaves. Rinse the guava leaves thoroughly with clean water to remove any dust and dirt. Chop the leaves (optional): You can roughly chop the leaves and raise the surface for better extraction. Cook the water: Pour measured water into a pot and cook. Add Guava leaves: As

soon as the water boils, add guava leaves to the pot. Simmer: Reduce heat and simmer the mixture for about 15 minutes (cook gently). (The water should decrease by about half the original volume.) Cooling and Loading: Turn off the heat and let the decoction cool slightly. The leaves are then fed with a sieve or cloth to remove the leaves. Collect the extract: Collect a filtered decoction of guava leaves in a clean container. Can be used immediately or stored in the fridge for later use (up to 2 days).¹³





Fig. No. 1 Guava leaves Extract

➤ Extraction of Pomegranate

Carefully cut each pomegranate into half or quarters. Remove the seeds. Carefully remove the seeds (called ARIL) from the shell and timber membrane onto a bowl. Mould the seeds: Place the seeds in a clean bowl or blender. Draw a bit with the pulse of a spoon, pestle, or mixer (only two

quick impulses - make sure the bitter inner seeds are finely chopped to avoid overlooking). Distort the juice: Pour finely the mixture through a cloth of sieve or muslin to remove the sperm cellar. Collect the juice: Press carefully or carefully to extract as much juice as possible into a clean container. Use fresh pomegranate juice immediately or allow it to cool within 1 to 2 days.¹⁴

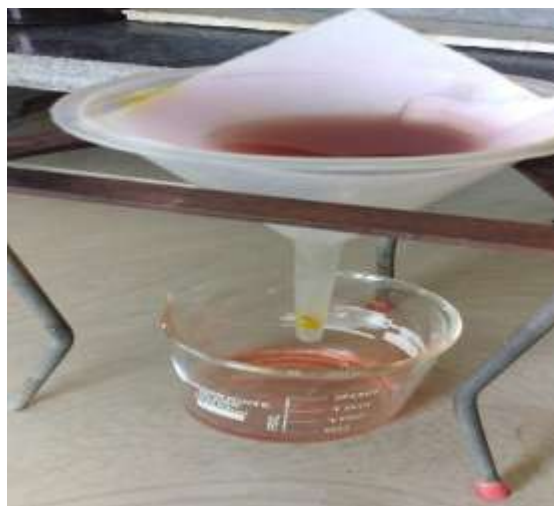


Fig. No. 2 Pomegranate Extract

➤ Extraction of Reetha

Easily crush or crack Reetha Fruits to clear your interior. This will speed up extraction. Cook the water: Put 500 ml of clean water in a pan and cook. Add Reetha: Add washed (and cracked) reetha

fruit to boiling water. Simmer: Reduce the heat and simmer for about 20 minutes. Cool and Load: After cooking, let cool a little. Strain the liquid through a cloth or sieve to remove the fruit. Collect decoctions: Store the extracted reetha liquid in clean container.^{15,16}



Fig. No. 3 Reetha Extract

➤ General procedure

1 for mouthwash formulations. Preparation of herbal extract: Take 10 grams of guava leaves, pomegranate shells and rest bowls. Grins them separately to form a coarse flour. Soak the powder in 100 ml of distilled water in separate containers. Incubate the mixture at 37 °C for 48 hours to allow for the extraction of active ingredients. After incubation, filter each solution individually with a muslin cloth or filter paper to remove solid deficits. The filtered extracts are gently cooked for 15 minutes to easily concentrate and cool at room temperature. Add glycerin (25% f/v) to act as a sweetener and mouthfeel.^{17,18} Mixing main and part mixture: As soon as all extracts and solutions have cooled, mix the guabene extract, pomegranate extract, and its -extract in the desired ratio. Add cardamoms powder (0.5% f/v), add the herbal extract mixture and stir well. Slowly add a solution of the small ingredients (honey, citric acid, sodium benzoate, glycerin) to the herbal mix. Mix thoroughly to ensure an even solution. 4. Add

aroma agent: Add peppermint oil (several drops, about 0.05% v/v) for taste and refreshing effects. Stir carefully to wipe off the peppermint oil evenly. 5. Final Step: Adjust the final gargling preparation volume to the required amount using distilled water. Measure the pH value of mouthwash (ideal pH value of 5.5°C for mouthwash). Set the pH value with citric acid or sodium hydroxide solution if necessary.^{19,20}

❖ Evaluation of mouthwash

- **colour and odour:** evaluation parameters like odour and colour were assessed through visual examination
- **pH:** a digital pH meter was used to measure the pH of the produced herbal mouthwash A buffer solution of known pH was employed to adjust the pH meter. A pH meter was employed to determine the pH of 1 ml of mouthwash that had been dissolved in 50 ml of distilled water.



Fig. No. 4 pH testing

- **Test for microbial growth:** the mouthwash formulation was streaked onto agar mediaplates, and a control plate was also prepared. The plates were placed in the incubator. After incubating for 24 hours at 37°C, the plates were taken out and examined for any signs of microbial growth.²¹
- **In vitro antibacterial activity:** The antibacterial activity of streptococcus mutans was tested on isolated colonies. The zone of inhibition and lowest inhibitory concentrations were measured using the agar well diffusion method (mic). The S. Mutans strains were introduced onto a pre-made blood agar plate. Using a 6 mm agar well cutter, the plates were dried and four evenly spaced wells were formed. Four different amounts of mouthwash, namely 20 litres, 40 litres, 60 litres, and 80 litres, were poured into each well. To allow the herbal mouth wash to passively diffuse into the agar culture media, the agar plates were left undisturbed. The plates were left to incubate for 24 hours at a temperature of 37°C. The area of inhibition was measured in centimetres 38.²²
- **Foaming Test:** To conduct a foaming test, measure 50 ml of mouthwash using a 100 ml graduated cylinder. Wrap the cylinder and jiggle it 10 times energetically. Position it vertically on a level surface promptly. After 1 minute, determine the foam level from the liquid surface to the highest point of the foam. Repeat 3 times and record the average foam height.²³
- **Viscosity Test:** Test Conduct the viscosity test by pouring the mouthwash sample into the designated beaker or sample container of the viscometer. Prepare the brookfield viscometer (or a similar device) by attaching the designated spindle (e.g., spindle number 1 or 2). Submerge the spindle completely into the sample, ensuring it does not come into contact with the sides or bottom. Adjust the viscometer to the desired speed (e.g., 50 rpm). GiveGive the reading time to settle and note down the viscosity (in centipoise, cp). Repeat the measurement three times and calculate the average value.^{24,25}



Fig. No. 5 Viscosity Testin

❖ RESULT

✓ Result of Organoleptic Character

Table No. 2 Organoleptic test result

Batches	Organoleptic Test	Result
F1	Colour Odour Taste	Slightly Pink Pleasant Aroma Sweet
F2	Colour Odour Taste	Yellowish Pleasant Aroma Sweet
F3	Colour Odour Taste	Reddish Pink Pleasant Aroma Fruity Flavor

✓ pH Test Result

Table No. 3 pH test results

Batches	pH determination	Results
F1	pH	6.2
F2	pH	5.6
F3	pH	5.4

✓ Viscosity Test Result

Table No. 4 Viscosity test result

Batches	Viscosity Test	Result
F1	Viscosity	1.2 cP
F2	Viscosity	1.1 cP
F3	Viscosity	1.0 cP

✓ **Result of Foaming Test****Table No. 5 Foaming test result**

Batches	Foaming Test	Result
F1	Foaming Ability	3 cm
F2	Foaming Ability	2.8 cm
F3	Foaming Ability	3.2 cm

✓ **Result of Microbial Test****Table No. 6 Microbial test result**

Batches	Microbial Test	Result
F1	Microbial Test	Slightly Growth
F2	Microbial Test	No Growth
F3	Microbial Test	No Growth

❖ **CONCLUSION**

Based on the results of the evaluation tests, the herbal mouthwash formulation developed in this study is safe, effective, and stable. The mouthwash demonstrated excellent organoleptic qualities, maintaining a desirable pH and viscosity, and it was microbiologically safe with effective preservatives ensuring no microbial growth. Additionally, it was found to be stable over a period of 30 days and compatible with typical packaging materials, making it a suitable candidate for commercial production. Furthermore, the mouthfeel and foaming properties were satisfactory, indicating that this product would provide a pleasant and refreshing experience for users. The positive results across all tests support the potential for herbal mouthwash to be a viable natural alternative to synthetic mouthwashes available in the market. In conclusion, this herbal mouthwash formulation is well-suited for mass production and can offer a natural, safe, and effective solution for oral hygiene, making it an attractive product for consumers seeking plant-based alternatives.

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