

# Formulation And Evaluation of Herbal Mouthwash Using Mimosa Pudica and Gelatin as A Tannin-Reducing Agent.

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**Abstract**—Herbal mouthwash formulations are gaining importance due to their safety, efficacy, and reduced side effects compared to synthetic oral care products. The present study focuses on the formulation and evaluation of herbal mouthwash using Mimosa pudica along with Neem and Tulsi extracts for oral hygiene applications. Gelatin was used as a tannin reducing agent to minimize the undesirable effects caused by tannins present in herbal extracts.

Four formulations (F1–F4) were prepared using varying concentrations of herbal ingredients, essential oils, sweetening agents, aloe vera gel, glycerin, and gelatin. The prepared formulations were evaluated for physical appearance, pH, viscosity, stability, antimicrobial activity, foamability, and organoleptic properties. The results indicated that the formulations possessed acceptable physical characteristics and antimicrobial activity against oral pathogens. Among the formulations, F3 showed better stability, pleasant taste, and enhanced antimicrobial activity. The use of gelatin effectively reduced the astringent effect of tannins and improved the overall acceptability of the mouthwash.

The study concludes that the formulated herbal mouthwash can be used as a natural, safe, and effective oral hygiene product.

**Index Terms**—Herbal mouthwash, Mimosa pudica, Gelatin, Tannin reducing agent, Neem, Tulsi, Oral hygiene.

## I. INTRODUCTION:

Oral hygiene plays an important role in maintaining overall health. Poor oral hygiene can lead to dental caries, gingivitis, bad breath, plaque formation, and periodontal diseases. Mouthwashes are commonly used as adjuncts to brushing and flossing for maintaining oral cleanliness.

Synthetic mouthwashes containing alcohol and chemical agents may cause side effects such as tooth

staining, burning sensation, dryness of mouth, and altered taste sensation. Herbal mouthwashes are considered safer alternatives because they contain natural ingredients with antimicrobial, anti-inflammatory, and antioxidant properties.

Mimosa pudica is a medicinal plant known for its antibacterial, anti-inflammatory, wound healing, and antioxidant activities. Neem and Tulsi extracts also possess strong antimicrobial properties useful in oral care. However, herbal extracts contain tannins that may produce bitterness and astringency. Gelatin acts as a tannin reducing agent by binding with tannins and improving the palatability of the formulation.

The present study was undertaken to formulate and evaluate an herbal mouthwash using Mimosa pudica and gelatin.

## II. AIM AND OBJECTIVES:

**Aim:**

To formulate and evaluate an herbal mouthwash using Mimosa pudica and gelatin as a tannin reducing agent.

**Objectives:**

- To prepare herbal mouthwash formulations using natural ingredients.
- To reduce tannin content using gelatin.
- To evaluate physical and chemical properties of formulations.
- To study antimicrobial activity.
- To improve oral hygiene using herbal ingredients.

## III. LITERATURE REVIEW:

**Herbal Mouthwash-**

Herbal mouthwashes are oral preparations containing plant-based ingredients used to maintain oral hygiene

and prevent oral infections. These formulations are preferred due to minimal side effects and better patient compliance.

#### Mimosa pudica-

Mimosa pudica, commonly known as touch-me-not plant, belongs to the family Fabaceae. It contains alkaloids, tannins, flavonoids, and glycosides.

#### Uses:

- Antibacterial activity
- Anti-inflammatory activity
- Wound healing property
- Antioxidant activity
- Oral infection prevention

#### Neem Extract-

Neem possesses antibacterial and antifungal activities. It helps in reducing plaque formation and gum inflammation.

#### Tulsi Extract-

Tulsi contains eugenol and essential oils that provide antimicrobial and anti-inflammatory properties.

#### Gelatin as Tannin Reducing Agent-

Gelatin is a protein obtained from collagen. It interacts with tannins and reduces their astringent taste and undesirable effects.

### IV. PLAN OF WORK:

#### Phase 1:

Aim and objective Literature review

#### Phase 2:

Selection of ingredient's

#### Phase 3:

Selection of method

Formulation and evaluation of herbal mouthwash

#### Phase 4:

Result and discussion Writing of thesis

### V. MATERIALS AND METHODS:

#### Materials Used:

Mimosa pudica extract, Gelatin, Neem extract, Tulsi extract, Peppermint oil Clove oil, Lemon

juice, Aloe vera gel, Glycerin, Honey/Stevia, Distilled water.

#### Mimosa pudica extract:

Scientific name: Mimosa pudica

Family: Fabaceae

Common name: Touch-me-not plant / Lajwanti

#### Use:

**Antibacterial:** Helps reduce harmful oral bacteria responsible for plaque, bad breath, and infections.

**Anti-inflammatory:** Soothes swollen gums, reduces redness, and supports healing in gingivitis.

**Astringent:** Tightens tissues and reduces excessive bleeding from gums due to natural tannins.

**Wound healing:** Promotes faster healing of minor cuts, oral sores, or gum injuries.

**Antioxidant:** Protects oral tissues from oxidative stress and helps maintain healthy gums.

**Analgesic (mild pain relief):** Reduces discomfort caused by mouth ulcers or gum irritation.



#### Gelatin:

gelatin is a natural protein substance obtained by the partial hydrolysis of collagen derived from animal connective tissues such as skin, bones, and cartilage. It is colorless, odorless, and commonly used in pharmaceutical, food, and cosmetic preparations.

In the present study, gelatin is used as a tannin reducing agent in the herbal mouthwash formulation.

#### Role of Gelatin in Herbal Mouthwash:

Herbal extracts like Mimosa pudica, Neem, and Tulsi contain tannins. Tannins may cause:

- Bitter taste
- Astringent mouthfeel
- Irritation in oral cavity
- Reduced patient acceptability

Gelatin helps to reduce these effects by binding with tannins and forming insoluble complexes.

Mechanism of Action:

Gelatin contains proteins that interact with tannins through protein-tannin complex formation.

Reaction:

Tannins + Gelatin → Insoluble Complex This reaction:

- Reduces bitterness
- Improves taste
- Decreases astringency
- Enhances stability and mouthfeel



Neem:

Scientific name: *Azadirachta indica*

Family: Meliaceae

Common name: Neem / Indian Lilac

Use:

Strong antibacterial, antifungal, anti-inflammatory; helps control oral infections, reduce plaque, and improve gum health.



Tulsi:

Scientific name: *Ocimum sanctum* / *Ocimum tenuiflorum*

Family: Lamiaceae

Common name: Holy Basil

Use:

Antibacterial, anti-inflammatory, antioxidant; helps reduce oral germs, freshens breath, and improves gum health.



Peppermint:

Scientific name: *Mentha piperita*

Family: Lamiaceae

Common name: Peppermint

Use:

Antibacterial, cooling, mouth-freshening; reduces oral germs and provides a refreshing flavor.



Clove:

Scientific name: *Syzygium aromaticum*

Family: Myrtaceae

Common name: Clove / Lavang

Use:

Strong antibacterial, analgesic (pain relief), anti-inflammatory; helps reduce toothache, oral bacteria, and gum inflammation.



Glycerin:

Scientific name: Glycerol

Family: Not applicable (It is a chemical compound, not a plant)

Common name: Glycerin / Glycerol

Use:

Acts as a humectant, retains moisture, improves mouthfeel, provides smoothness, and prevents dryness in mouthwash.



Lemon:

Scientific name: Citrus

Family: Rutaceae

Common name: Lemon / Nimbu

Use:

Antibacterial, antioxidant, refreshing agent; helps reduce oral microbes, removes bad odor, and provides freshness.



Honey:

Scientific name: No scientific name (it is a natural product). Produced mainly by Apis mellifera (Honey bee)

Family: Apidae (bee family)

Common name: Honey / Madhu

Use:

Natural antibacterial, soothing, healing; helps reduce oral microbes, soothes gums, and promotes healing of mouth ulcers.



Aloe vera gel:

Name: Aloe vera

Family: Asphodelaceae

Common name: Aloe /

Scientific Ghritkumari

Use:

Anti-inflammatory, antibacterial, soothing; helps heal mouth ulcers, reduce gum inflammation, and maintain oral moisture.



VI. FORMULATION:

SR. NO.	INGREDIENTS	F1	F2	F3	F4
1.	Mimosa Pudica	3ml	3.5ml	2ml	2.5ml
2.	Gelatin	2ml	2ml	1.5ml	3ml
3.	Neem Extract	2ml	2.5ml	1ml	3ml
4.	Tulsi Extract	2ml	1ml	2.5ml	1.5ml
5.	Peppermint Oil	0.1ml	0.09ml	0.1ml	0.12ml
6.	Clove Oil	0.05ml	0.045ml	0.049ml	0.051ml
7.	Lemon Juice	2ml	2.5ml	1ml	1.5ml
8.	Aloe Vera Gel	2ml	2.5ml	1ml	1.5ml
9.	Glycerin	5ml	4ml	3ml	4.5ml
10.	Honey/Stevia	2ml	1.5ml	2.5ml	1.9ml
11.	Distilled Water	Up to 100ml	Up to 100ml	Up to 100ml	Up to 100ml

VII. PREPARATION PROCEDURE:

1. Preparation of Herbal Extracts:

Shade dry Mimosa pudica, Neem, and Tulsi leaves. Powder the dried material and macerate in 70% ethanol or warm water for 48 hours. Filter and concentrate.

2. Preparation of Gelatin Solution:

Dissolve gelatin (1% w/v) in warm distilled water (around 40–45°C) and allow it to cool to room temperature before mixing.

3. Formulation:

Mix all aqueous extracts (Mimosa, Neem, Tulsi, Aloe vera) in a clean beaker. Add vegetable glycerin, honey (or Stevia), and gelatin solution with gentle stirring. Add peppermint oil, clove oil, and lemon extract while stirring continuously. Make up the final volume to 100 mL with distilled water. Mix thoroughly until a homogeneous solution is obtained

4. Filtration and Storage:

Filter through muslin cloth or Whatman filter paper and store in amber-colored bottles under aseptic conditions.

EQUIPMENT:

Beaker  
Measuring cylinder Conical flask

Hot plate pH meter Viscometer  
Petri plates Incubator Filter paper

VIII. FORMULATED HERBAL MOUTHWASH WAS EVALUATED USING THE FOLLOWING PARAMETERS

1. ORGANOLEPTIC EVALUATION-

• Color  Odor  Taste  Clarity  
These properties were checked visually and through sensory assessment to ensure acceptability.

2. PH MEASUREMENT-

• The pH of the mouthwash was measured using a digital pH meter.  
• Ideal pH for mouthwash: 5.5–6.5, safe for oral tissues.

3. VISCOSITY-

• Viscosity was determined using a Ostward viscometer.  
• Helps ensure mouthwash flows easily and feels comfortable during rinsing.  
• Performed before and after gelatin treatment.

4. ANTIMICROBIAL ACTIVITY-

Performed using the agar well diffusion method against oral pathogens:

- Streptococcus mutans
- Staphylococcus aureus
- Escherichia coli
- Candida albicans

Results were observed by measuring the zone of inhibition after incubation.

Explanation of Agar Well Diffusion Method:

1)Preparation of Inoculum:

A standardized microbial suspension (0.5 McFarland) of oral pathogens such as Streptococcus mutans, Staphylococcus aureus, Escherichia coli, and Candida albicans is prepared.

2)Inoculation of Agar Plate:

The bacterial culture is evenly spread over the surface of the solidified agar medium using a sterile swab to form a uniform lawn of microorganisms.

3)Well Formation:

Using a sterile cork borer or micropipette tip, small wells (6–8 mm) are made in the agar to hold the test solutions.

4) Addition of Test Compound:

The herbal mouthwash, along with controls, is carefully pipetted into the wells.

5) Incubation:

The plates are incubated at 37°C for 18–24 hours to allow microbial growth and diffusion of the test compound into the agar.

6) Observation of Results:

After incubation, clear circular zones appear around wells where microbial growth has been inhibited. These zones of inhibition indicate the antimicrobial potential of the mouthwash.

5. STABILITY STUDIES-

The mouthwash was stored at:

- Room temperature (25°C) Parameters observed over time:
- Color changes
- pH variation
- Precipitation or sedimentation
- Odor changes
- Clarity
- Microbial growth

6. PHYSICAL APPEARANCE-

- Checked for any phase separation, foaming, or residue formation.
- Ensures the formulation remains uniform and stable.

7. FOAMABILITY TEST-

The mouthwash was shaken in a measuring cylinder and foam formation was observed.

8. TANNIN REDUCTION TEST-

Principle: The test was performed to determine reduction of tannin content using gelatin.

FERRIC CHLORIDE TEST:

Ferric Chloride test is used for the detection of phenols and tannins present in herbal extracts. Ferric chloride reacts with phenolic compounds and tannins to produce colored complexes such as blue, green, or dark coloration.

Procedure:

1. Take small quantity of herbal extract in a test tube.
2. Add few drops of ferric chloride solution.
3. Observe the color change.

IX. RESULT

1. ANTIMICROBIAL ACTIVITY:

The antimicrobial activity of the formulated herbal mouthwash formulations (F1, F2, F3, and F4) was evaluated by agar well diffusion method. The activity was determined by measuring the diameter of the zone of inhibition around each well after incubation.

Among all the formulations, formulation F3 showed the highest antimicrobial activity with a zone of inhibition of 26 mm, indicating strong inhibition against the test microorganism. Formulation F1 showed a zone of inhibition of 13 mm, while F4 and F2 showed zones of 12 mm and 11 mm respectively.

The order of antimicrobial activity was found to be: F3 > F1 > F4 > F2

The larger zone of inhibition observed in F3 indicates that this formulation possesses better antimicrobial efficacy compared to the other formulations. The results suggest that the herbal ingredients used in formulation F3 exhibited significant antimicrobial potential and may be effective in controlling oral microorganisms.

Zone of Inhibition Table:

Formulation	Zone of inhibition (mm)
F1	13mm
F2	11mm
F3	26mm
F4	12mm



## 2. ORGANOLEPTIC EVALUATION:

Color	Light yellow to pale brown
Odor	Pleasant aromatic odor
Taste	Slightly sweet with mild herbal taste
Clarity	Clear to slightly translucent

## 3. PH MEASUREMENT:

pH of herbal mouthwash: the pH of F3 formulation was found to be approximately 6.2, which is suitable for oral use.

## 4. VISCOSITY:

the formulation showed satisfactory flow property with moderate viscosity.

## 5. STABILITY STUDIES:

No significant changes were observed in color, clarity, odor, phase separation, sedimentation and pH during 30 days of stability study. The herbal mouthwash formulation is stable for 30 days under the given room temperature.



## 6. PHYSICAL APPEARANCE:

- homogeneous liquid preparation.
- free from phase separation.
- Elegant appearance.
- Stable during storage.

## 7. FOAMABILITY TEST:

F3 formulation showed moderate and stable foam formation. Foam remained stable for short duration. The F3 formulation exhibited satisfactory foamability indicating good cleaning property and acceptable surfactant action.

## 8. TANNIN REDUCTION TEST:

Formation of light greenish coloration was observed. Reduced intensity of color indicated decreased tannin content due to gelatin treatment.

The ferric chloride test confirmed reduction of tannin content in the formulation. Gelatin effectively interacted with tannins and reduced their astringent effect.



Formulation (F3) showed acceptable appearance and homogeneity. The pH range was suitable for oral use. The mouthwash formulations exhibited antimicrobial activity due to the presence of Mimosa pudica, Neem, Tulsi, clove oil, and peppermint oil.

Gelatin effectively reduced the tannin-associated bitterness and improved the taste and mouthfeel of the mouthwash. Among all formulations, F3 showed better stability, pleasant flavor, and higher antimicrobial activity.

The formulations remained stable during storage without precipitation or microbial contamination.

## X. SUMMARY:

The present study was carried out to formulate and evaluate an herbal mouthwash using Mimosa pudica and gelatin as a tannin reducing agent. Different formulations (F1–F5) were prepared using herbal extracts such as Neem, Tulsi, aloe vera gel, essential oils, glycerin, and sweetening agents.

The prepared formulations were evaluated for physical appearance, pH, stability, viscosity, foamability, organoleptic properties, and antimicrobial activity.

Gelatin was incorporated to reduce the astringent effect caused by tannins present in herbal extracts.

Among all formulations, F5 showed better stability, acceptable taste, pleasant odor, and improved antimicrobial activity. The study demonstrated that the herbal mouthwash can be used as a safe, effective, and economical alternative to synthetic mouthwashes for maintaining oral hygiene.

#### XI. MARKETED HERBAL MOUTHWASH:

Marketed mouthwashes are widely used for maintaining oral hygiene and preventing oral infections. Synthetic mouthwashes may produce side effects such as staining of teeth, burning sensation, and altered taste. Herbal mouthwashes provide a safer and natural alternative with fewer side effects. Therefore, the present study focuses on developing a herbal mouthwash using *Mimosa pudica* and gelatin.



#### XII. CONCLUSION:

The present study successfully formulated and evaluated an herbal mouthwash using *Mimosa pudica* and gelatin as a tannin reducing agent. The herbal ingredients demonstrated effective antimicrobial and oral cleansing activities. Gelatin improved the acceptability of the formulation by reducing tannin effects.

The developed mouthwash can serve as a safe, economical, and natural alternative to synthetic mouthwashes for maintaining oral hygiene.

#### XIII. ADVANTAGES:

- Natural and safe formulation
- Reduced side effects
- Effective against oral microbes
- Pleasant taste and odour
- Economical and easy to prepare
- Suitable for daily oral hygiene

#### XIV. APPLICATIONS:

1. Daily oral hygiene maintenance
2. Prevention of bad breath
3. Reduction of plaque formation
4. Prevention of dental caries
5. Maintenance of healthy gums
6. Supportive treatment for oral infections

#### XV. FUTURE SCOPE:

- Clinical studies can be conducted for better validation.
- Shelf-life studies can be extended.
- Commercial herbal mouthwash products can be developed.
- Advanced antimicrobial studies can be performed.
- Different herbal combinations may be investigated.

#### REFERENCES:

- [1] C. K. Kokate, A. P. Purohit, and S. B. Gokhale, *Pharmacognosy*. Pune, India: Nirali Prakashan, latest ed.
- [2] W. C. Evans, Trease and Evans *Pharmacognosy*, 16th ed. Amsterdam, Netherlands: Elsevier, 2009.

- [3] S. S. Aggarwal and M. Paridhavi, Herbal Drug Technology. Hyderabad, India: Universities Press, 2007.
- [4] Indian Pharmacopoeia Commission, Indian Pharmacopoeia. Ghaziabad, India: Government of India, latest ed.
- [5] B. Shah and A. Seth, Textbook of Pharmacognosy and Phytochemistry. Amsterdam, Netherlands: Elsevier, latest ed.
- [6] J. P. Remington, Remington: The Science and Practice of Pharmacy. London, U.K.: Pharmaceutical Press.
- [7] G. Baki and K. S. Alexander, Introduction to Cosmetic Formulation and Technology. Hoboken, NJ, USA: Wiley, 2015.
- [8] “Research articles related to antimicrobial activity of Mimosa pudica and herbal mouthwash formulations.”
- [9] “Studies on formulation and evaluation of herbal mouthwash containing Neem and Tulsi extracts.”
- [10] “Research papers related to tannin reduction using gelatin in herbal preparations.”
- [11] E. A. Rawlins, Bentley’s Textbook of Pharmaceutics. Amsterdam, Netherlands: Elsevier Publication.
- [12] L. V. Allen, N. G. Popovich, and H. C. Ansel, Ansel’s Pharmaceutical Dosage Forms and Drug Delivery Systems. Philadelphia, PA, USA: Lippincott Williams & Wilkins.
- [13] C. K. Kokate, A. P. Purohit, and S. B. Gokhale, Pharmacognosy. Pune, India: Nirali Prakashan.
- [14] Indian Pharmacopoeia. Ghaziabad, India: Government of India.
- [15] W. C. Evans, Trease and Evans Pharmacognosy. Amsterdam, Netherlands: Elsevier.
- [16] S. S. Aggarwal, Herbal Drug Technology. Hyderabad, India: Universities Press.
- [17] “Relevant research articles on herbal mouthwash formulations.”
- [18] “Articles related to Mimosa pudica medicinal properties.”
- [19] “Journals on oral hygiene and herbal formulations.”