Development of Herbal Mouthwash Containing Mimosa Pudic and Casein for Tannin Reduction

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***Abstract*—Oral diseases such as dental plaque, gingivitis, halitosis, and dental caries are among the most common health concerns affecting individuals worldwide. Mouthwashes are widely used as an adjunct to regular oral hygiene practices to reduce microbial load and maintain oral health. However, prolonged use of synthetic mouthwashes may be associated with undesirable effects, creating a growing interest in herbal alternatives.**

The present study focuses on the development and evaluation of an herbal mouthwash containing Mimosa pudica extract and casein as a tannin-reducing agent. Mimosa pudica is a medicinal plant known for its antimicrobial, anti-inflammatory, and wound-healing properties, making it a promising ingredient for oral care formulations. However, the presence of tannins in the extract may impart excessive astringency and affect the overall acceptability of the formulation. To overcome this limitation, casein was utilized as a tannin-binding agent to reduce tannin content and improve formulation characteristics.

The herbal mouthwash was formulated using suitable excipients and evaluated for various physicochemical parameters including appearance, colour, Odor, pH, and stability. The antimicrobial activity of the formulation was assessed using the agar well diffusion method against selected oral microorganisms by measuring the zone of inhibition.

The formulated herbal mouthwash demonstrated satisfactory physicochemical properties and exhibited notable antimicrobial activity. The incorporation of casein effectively reduced tannin-related undesirable characteristics, resulting in an improved and more acceptable formulation. The findings suggest that the developed herbal mouthwash has potential as a natural and effective oral hygiene product and may serve as a promising alternative to conventional synthetic mouthwashes.

***Index Terms*—Mimosa pudica, Herbal Mouthwash, Casein, Tannin Reduction, Antimicrobial Activity, Oral Hygiene, Formulation Development.**

I. INTRODUCTION

Oral health plays a vital role in maintaining overall health and well-being. Poor oral hygiene can lead to various dental problems such as plaque formation, gingivitis, dental caries, and bad breath. Mouthwashes are commonly used as an adjunct to brushing and flossing to reduce microbial growth and maintain oral hygiene. However, prolonged use of synthetic mouthwashes may cause side effects such as tooth staining, altered taste sensation, and oral irritation, increasing the demand for herbal alternatives.

Herbal mouthwashes have gained considerable attention due to their natural origin, safety, affordability, and therapeutic benefits. Medicinal plants contain various bioactive compounds that possess antimicrobial, anti-inflammatory, and antioxidant properties, making them suitable for oral healthcare applications.

Mimosa pudica Linn., commonly known as the Touch-Me-Not plant, is a medicinal herb with significant antimicrobial, anti-inflammatory, and wound-healing properties. It contains phytoconstituents such as tannins, flavonoids, alkaloids, and phenolic compounds that contribute to its therapeutic effects. These properties make Mimosa pudica a promising ingredient for herbal mouthwash formulations.

Despite its medicinal benefits, the presence of tannins in Mimosa pudica may impart excessive astringency and affect the taste and acceptability of the formulation. To overcome this limitation, casein, a milk-derived protein, can be used as a tannin-reducing agent. Casein binds with tannins and helps improve the palatability and quality of herbal preparations.

The present study focuses on the formulation and

development of an herbal mouthwash containing Mimosa pudica extract and casein as a tannin-reducing agent. The formulated mouthwash is evaluated for its physicochemical characteristics and antimicrobial activity to determine its potential as a safe and effective natural oral care product.

II. BACKGROUND OF THE STUDY

Oral diseases such as dental caries, gingivitis, periodontitis, and halitosis are among the most prevalent health problems worldwide. These conditions are primarily caused by the accumulation of microorganisms in the oral cavity, leading to plaque formation and inflammation of oral tissues. Maintaining good oral hygiene is therefore essential for preventing oral diseases and promoting overall health.

Mouthwashes are widely used as supplementary oral hygiene products to reduce microbial load and improve oral health. Although conventional mouthwashes are effective, their long-term use may be associated with certain side effects, including tooth staining, altered taste sensation, oral irritation, and mucosal dryness. These limitations have encouraged researchers to explore herbal alternatives that are safer, cost-effective, and environmentally friendly.

Medicinal plants have been used for centuries in traditional healthcare systems due to their therapeutic properties. Among them, Mimosa pudica has gained attention because of its antimicrobial, anti-inflammatory, antioxidant, and wound-healing activities. The plant contains several bioactive compounds that may help control the growth of oral microorganisms and support oral health.

However, Mimosa pudica is rich in tannins, which can impart an undesirable astringent taste and affect the acceptability of herbal formulations. Excessive tannin content may also influence the stability and overall quality of the product. Therefore, reducing tannin levels while retaining the beneficial properties of the plant extract is an important consideration during formulation development.

Casein, a naturally occurring milk protein, possesses the ability to bind with tannins and form insoluble complexes. This property makes it a suitable tannin-reducing agent for herbal formulations. The use of casein may improve the taste, clarity, and consumer acceptability of the mouthwash while preserving its therapeutic effectiveness.

Based on these considerations, the present study was undertaken to develop and evaluate an herbal mouthwash containing Mimosa pudica extract using casein as a tannin-reducing agent. The study aims to provide a natural, effective, and patient-friendly alternative to conventional mouthwash formulations.

Plan Of Work

Phase I – Preliminary Studies

1. Literature review
2. Selection of Mimosa pudica and casein
3. Collection and authentication of plant material Phase II – Extract Preparation
4. Cleaning and shade drying of plant material
5. Powdering of dried material
6. Preparation and filtration of Mimosa pudica extract

Phase III – Formulation of Herbal Mouthwash

7. Preparation of mouthwash formulations with Mimosa pudica extract and casein
8. Addition of flavouring and stabilizing agents
9. .Filtration and storage of formulations

Phase IV – Evaluation Studies

10. Organoleptic evaluation (colour, odour, taste, appearance)
11. pH determination
12. Viscosity measurement
13. Tannin reduction study

Phase V – Data Analysis and Documentation

14. Analysis and interpretation of results
15. Selection of optimized formulation

III. NEED OF THE STUDY

The increasing demand for natural and safe oral care products has encouraged the development of herbal alternatives to conventional mouthwashes. Although Mimosa pudica possesses significant antimicrobial and anti-inflammatory properties beneficial for oral health, its high tannin content may affect the taste and acceptability of the formulation.

Therefore, there is a need to develop an effective herbal mouthwash with reduced tannin content using casein as a tannin-reducing agent, while maintaining its therapeutic benefits.

IV. AIM OF THE STUDY

Development of an Herbal Mouthwash containing Mimosa Pudica and Casein for Tannin Reduction.

V. OBJECTIVES OF THE STUDY

1. To prepare Mimosa pudica extract for mouthwash formulation.
2. To reduce tannin content in the extract using casein.
3. To formulate an herbal mouthwash containing the treated extract.
4. To evaluate the physicochemical properties of the formulated mouthwash.
5. To assess the antimicrobial activity of the formulation by agar well diffusion method.
6. To determine the suitability of the formulation as a natural oral healthcare product.

V. SCOPE OF THE STUDY

This study is limited to the formulation and evaluation of an herbal mouthwash containing Mimosa pudica extract with casein as a tannin-reducing agent. The research includes the preparation of the extract, reduction of tannin content using casein, formulation of the mouthwash, and evaluation of its physicochemical properties and antimicrobial activity. The study aims to assess the potential of the developed formulation as a natural oral hygiene product. However, clinical trials, long-term stability studies, and large-scale commercial production are beyond the scope of this research.

VI. FUTURE SCOPE

The developed herbal mouthwash containing Mimosa pudica and casein as a tannin-reducing agent shows promising potential as a natural oral healthcare product. Further studies can be carried out to evaluate its long-term stability, safety, and effectiveness through clinical trials in human subjects. The formulation may also be optimized by incorporating additional herbal extracts to enhance its antimicrobial and therapeutic properties.

Future research can focus on comparing the efficacy of the developed mouthwash with commercially available products. Advanced analytical techniques may be employed to quantify tannin reduction and assess the retention of active phytoconstituents. Large-scale production and commercialization of the formulation can also be explored after successful clinical validation. The study may contribute to the development of safe, effective, and affordable herbal oral care products for wider public use.

VII. LITERATURE REVIEW

Sr. No.	Paper Title	Author(s)	Methodology Used	Relevance to Present Study
1|	Plant Products as Antimicrobial Agents	Cowan MM (1999)	Review of medicinal plants and their antimicrobial properties	Established the importance of plant-derived antimicrobial agents for healthcare applications.
2|	Antimicrobial Properties of Tannins	Scalbert A (1991)	Evaluation of tannins against various microorganisms	Demonstrated the antimicrobial activity of tannins present in medicinal plants such as Mimosa pudica.
3)	The speciality of Proanthocyanidin-Protein Interaction	Hagerman AE, Butler LG (1981)	Investigation of tannins-protein binding mechanisms	Provided scientific evidence for the use of casein as tannin reducing agent.
4)	Pharmacologycal and traditional uses of Mimosa pudica.	Joseph B, George J, Mohan J (2013)	Review of phytochemical and pharmacological studies	Reported antimicrobial, antioxidant and anti-infammatory propertys of mimosa pudica.

5)	Phytochemical and Antimicrobial Properties of Mimosa pudica Linn	Prabu K et al. (2012)	Phytochemical screening and antimicrobial testing	Confirmed the antimicrobial potential of Mimosa pudica extracts.
6)	Traditional Medicinal Plant Extracts and Natural Products with Activity Against Oral Bacteria	Palombo EA (2011)	Evaluation of herbal extracts against oral pathogens	Supported the use of herbal extracts in oral healthcare products.
7)	Contemporary Perspective on Plaque Control	Marsh PD (2012)	Review of oral microbial control strategies	Highlighted the importance of antimicrobial agents in preventing oral diseases.
8)	Antimicrobial Activity of Plant Extracts Against Oral Pathogens	Aneja KR et al. (2010)	In-vitro antimicrobial studies using agar diffusion methods	Demonstrated the effectiveness of herbal extracts against oral microorganisms.
9)	Methods for In Vitro Evaluation of Antimicrobial	Balouiri M et al. (2016)	Comparative review of antimicrobial testing methods	Supported the use of agar well diffusion
	Activity: A Review			method in the present study.
10)	Microbial Aspects of Dental Plaque and Oral Diseases	Haffajee AD, Socransky SS (2005)	Review of oral microbiology and plaque formation	Explained the role of microorganisms in oral diseases and the need for antimicrobial mouthwashes.

ADVANTAGES

1. Contains natural herbal ingredients.
2. Mimosa pudica possesses antimicrobial and anti-inflammatory properties.
3. Casein helps reduce tannin content and improves taste.
4. May help maintain oral hygiene and reduce microbial growth.
5. Cost-effective and easy to formulate.
6. May help reduce bad breath.
7. Less likely to cause side effects associated with some synthetic mouthwashes.
8. Promotes the use of herbal and eco-friendly products.

LIMITATIONS

1. Stability may be lower than synthetic mouthwashes.
2. Effectiveness may vary depending on the quality of Mimosa pudica used.
3. Complete tannin removal may not be achieved.
4. Not suitable for individuals with milk protein allergies.
5. Clinical trials and long-term studies were not conducted.
6. Large-scale production and commercialization were not evaluated.

VIII. MATERIALS AND METHODS

- 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.
CASEIN

Scientific Name: Casein (Milk Protein)

Family: Not applicable (Casein is a protein derived from milk and does not belong to any plant family)
Common Name: Casein, Milk Protein

Source: Milk of mammals, primarily cow's milk

Use in the Study: Casein was used as a tannin-reducing agent. It binds with tannins present in Mimosa pudica extract and forms insoluble complexes, which can be removed by filtration. This helps reduce the astringency and bitterness of the extract, thereby improving the taste, acceptability, and quality of the formulated herbal mouthwash.

- 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.

- 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.

- Aloe

Scientific name: Aloe vera

Family: Asphodelaceae

Common name: Aloe / Ghritkumari

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

- 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.

- 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.

CHEMICALS AND REAGENTS

Nutrient agar Distilled water
Ethanol (if required for extraction) Peptone
Ferric chloride Equipment Used Beaker
Measuring cylinder Conical flask
Hot plate pH meter Viscometer Petri plates Incubation
Filter paper

FORMULATION BATCH

Ingredients	F1	F2	F3	F4	F5
Mimosa pudica extract	3ml	3.5ml	2ml	2.5ml	4ml
Casein (tannin-reducing)	2ml	4ml	5ml	7ml	9ml
Neem extract	2ml	2.5ml	1ml	3ml	3ml
Tulsi extract	2ml	1ml	2.5ml	1.5ml	3ml
Peppermint oil	0.1ml	0.09ml	0.1ml	0.12ml	0.08ml
Clove oil	0.05ml	0.045ml	0.049ml	0.051ml	0.047ml
Lemon juice/ extract	2ml	2ml	2ml	1.9ml	2ml
Aloe vera gel extract	2ml	2.5ml	2ml	2ml	3ml
Vegetable glycerin	5ml	4ml	3ml	4.5ml	5.5ml
Honey / Stevia extract	2ml	2ml	2.5ml	2ml	3ml
Distilled water	Upto100ml	Upto100ml	Upto100ml	Upto100ml	Upto100ml

METHODOLOGY

Collection and Authentication of Plant Materials

Fresh Mimosa pudica leaves were collected from a nearby local area for experimental use.

Casein powder was procured from a reliable chemical/pharmaceutical supplier and used as the tannin-reducing agent in the formulation.

The plant material was authenticated by a qualified botanist prior to extraction, and the casein sample was verified for laboratory use before formulation.

PREPARATION OF MIMOSA PUDICA EXTRACT

a. Cleaning and Drying

Freshly collected Mimosa pudica leaves were rinsed thoroughly with distilled water to eliminate dust, dirt, and other unwanted impurities. The cleaned leaves were shade-dried for about 5–7 days to avoid degradation of active phytoconstituents.

After complete drying, the leaves were crushed and converted into coarse powder using a mechanical grinder.

b. Extraction Procedure

An aqueous extraction technique was employed for preparation of the extract.

Approximately 20 g of powdered Mimosa pudica material was mixed with 200 mL of distilled water. The mixture was heated at 60–70°C for 1 hour under continuous stirring to facilitate extraction of active constituents.

After heating, the solution was allowed to cool and then filtered initially through muslin cloth and subsequently through Whatman No.1 filter paper.

The obtained filtrate was collected and used as the Mimosa pudica extract for further formulation studies.

PREPARATION OF CASEIN SOLUTION

Casein powder was obtained from a reliable laboratory/chemical supplier and used as the tannin-reducing agent for the formulation.

A measured quantity of casein powder was taken and gradually mixed with warm distilled water. The mixture was stirred continuously to facilitate proper dissolution and formation of a uniform solution.
The prepared solution was allowed to stand for complete hydration of the protein material. The solution was further stirred to ensure uniform consistency and proper dispersion.
The obtained casein solution was used for the tannin reduction process in the herbal mouthwash formulation.

Tannin Reduction Step
Using Casein Solution as Protein-Based Tannin Reducing Agent

A measured quantity of Mimosa pudica extract was transferred into a clean beaker. Prepared casein solution (1–2%) was added gradually with continuous stirring.
The mixture was stirred continuously for about 15–20 minutes to facilitate the formation of a protein–tannin complex.
The coagulated tannin complex was allowed to settle at the bottom of the container.

The supernatant liquid was carefully separated and filtered to obtain a clarified extract with reduced tannin content.
Formulation of Herbal Mouthwash

Ingredients
Clarified Mimosa pudica extract Casein-treated filtrate
Sweetening agent
Flavoring agent Preservative
Distilled water to make up the final volume

PROCEDURE
The clarified Mimosa pudica extract was measured and used as the base for the formulation. Sorbitol (5–10%) was incorporated as a sweetening and tonicity-adjusting agent.
Peppermint oil (1–2 drops/100 mL) was added to impart flavor and improve acceptability of the mouthwash.
If required, sodium benzoate (0.1%) was included as a preservative to enhance the stability of the preparation.
The final volume was adjusted with distilled water.
The mixture was stirred continuously using a magnetic stirrer to obtain a homogeneous solution.
The prepared herbal mouthwash formulation was filled into amber-colored bottles and stored for further evaluation studies.

Evaluation Parameters of Herbal Mouthwash

1. Organoleptic Evaluation
The prepared herbal mouthwash containing Mimosa pudica extract and casein-treated filtrate was evaluated for:
Colour: Pale yellowish-white / light cloudy cream
Odour: Mild herbal odour with mint fragrance
Taste: Slightly sweet and minty

Observation:
The formulation showed acceptable colour, pleasant aroma, and satisfactory appearance suitable for oral use.

2. pH Determination Principle
pH determination indicates the acidity or alkalinity of the herbal mouthwash formulation.

Procedure
The pH of the prepared mouthwash was measured using a calibrated digital pH meter.

Observation: pH – 6.3
The formulation exhibited a pH within the acceptable oral range (5.5–7.0) and was considered suitable for oral application.

3. Viscosity Test Principle
Viscosity determines the flow property and consistency of the mouthwash formulation.

Procedure
The viscosity of the prepared formulation was measured using an Ostwald viscometer under laboratory conditions.

Observation
The mouthwash exhibited good flow behaviour with slightly low viscosity, indicating suitable consistency for rinsing and oral application.

4. Foamability Test Procedure

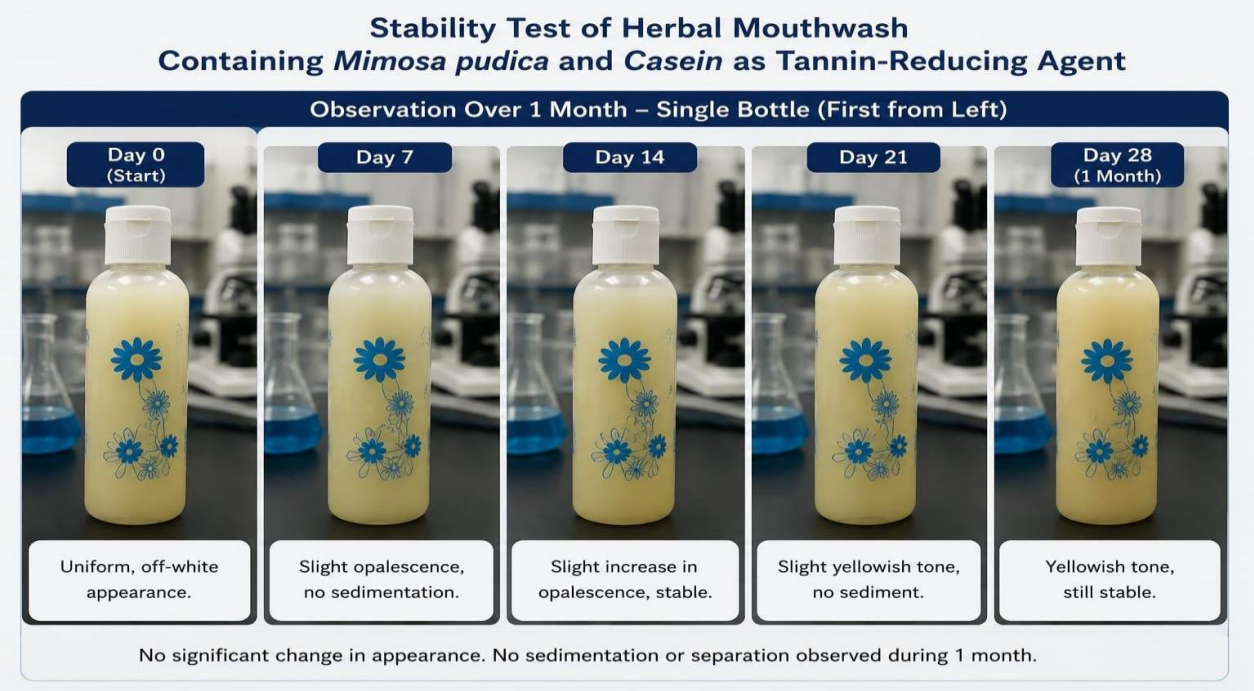
The prepared herbal mouthwash was shaken in a measuring cylinder and observed for foam formation.

Observation
Moderate foam formation was observed, demonstrating acceptable foaming characteristics of the formulation.

5. Stability Study Principle
Stability testing evaluates the physical stability of the mouthwash during storage.

Procedure
The formulation was stored under room temperature and refrigerated conditions and observed periodically for changes in colour, odour, clarity, and phase separation.

Observation
No significant change in colour, odour, clarity, or consistency was observed during the storage period. The formulation remained physically stable.



6. Tannin Reduction Evaluation Principle
The test was performed to evaluate the tannin-reducing effect of casein solution on Mimosa pudica extract.

Procedure
The extract was treated with prepared casein solution, mixed thoroughly, allowed to settle, and filtered to obtain a clarified filtrate.

Observation
A noticeable reduction in tannin content was observed after treatment, resulting in a lighter, clearer filtrate suitable for mouthwash formulation.

Ferric Chloride Test

Principle
Ferric chloride test is used for the detection of tannins and phenolic compounds present in herbal extracts. Ferric chloride reacts with phenolic compounds to produce coloured complexes.

Procedure
Take a small quantity of casein-treated Mimosa pudica extract in a test tube. Add a few drops of ferric chloride solution.
Observe the colour change.

Observation
Formation of yellowish-brown / light brown coloration with slight precipitate formation was observed after addition of ferric chloride solution.

ANTIMICROBIAL TESTS

Principle:
Antimicrobial activity was evaluated by the agar well diffusion method using nutrient agar plates.

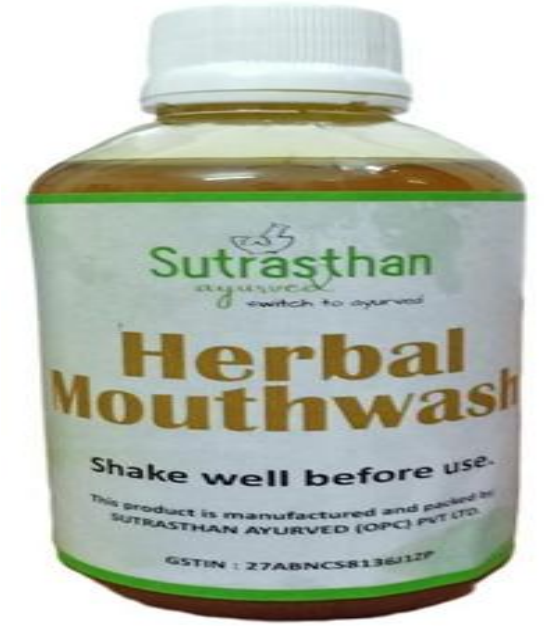
Procedure:
Microorganisms were inoculated on agar plates, mouthwash samples were added into wells, incubated for 24 hours, and the zone of inhibition was measured.

Observation
Clear zones of inhibition were observed around all sample wells, indicating antimicrobial activity of the herbal formulation. The measured zones of inhibition were approximately:

- Sample 1 – 1.45 cm (14.5 mm)
- Sample 2 – 1.28 cm (12.8 mm)
- Sample 3 – 1.23 cm (12.3 mm)
- Sample 4 – 1.32 cm (13.2 mm)
- Sample 5 – 1.37 cm (13.7 mm)

Among the tested formulations, Sample 1 exhibited the highest antimicrobial activity with the largest zone of inhibition (1.45 cm).

MARKETED HERBAL MOUTHWASH



FINAL PRODUCT

APPLICATIONS OF THE HERBAL MOUTHWASH

1. Maintains Oral Hygiene
Helps in cleaning the oral cavity and maintaining healthy teeth and gums.

2. Controls Bad Breath
Assists in reducing unpleasant mouth odour and provides a refreshing effect.

3. Antimicrobial Activity
Inhibits the growth of harmful oral microorganisms associated with oral infections.

4. Reduces Plaque Formation
Helps minimize plaque accumulation on tooth surfaces.

5. Supports Gum Health
May help reduce gum irritation, inflammation, and oral discomfort.

6. Tannin-Reduced Formulation
Casein treatment reduces tannin content, thereby decreasing bitterness and astringency and improving acceptability.

7. Antioxidant Property
Mimosa pudica extract may help protect oral tissues from oxidative stress.

8. Natural Herbal Alternative
Can be used as an herbal substitute for conventional chemical oral formulations.

9. Improves Acceptability
Pleasant taste and aroma enhance user compliance and ease of use.

10.Suitable for Daily Oral Care
Can be used routinely to maintain oral cleanliness and fresh breath.

RESULT

The herbal mouthwash containing Mimosa pudica extract and casein-treated filtrate was successfully formulated and evaluated. The formulation showed acceptable colour, odour, taste, suitable pH, good viscosity, moderate foamability, and satisfactory stability. Casein treatment reduced tannin content and improved formulation acceptability. The mouthwash also exhibited good antimicrobial activity, making it suitable for oral use.

Sr. No	Evaluation parameter	Observation	Result
1.	Organoleptic Evaluation	Pale yellowish-green / light brownish-green colour, mild herbal-mint odour, slightly sweet minty taste	Acceptable appearance, pleasant odour, and satisfactory taste
2.	pH Determination	pH observed = 6.3	Suitable for oral use
3.	Viscosity Test	Good flow property observed	Satisfactory viscosity
4.	Foamability Test	Moderate foam formation observed	Acceptable foamability

5.	Stability Study	No significant change in colour, odour, or appearance during storage	Stable formulation
6.	Tannin Reduction Test	Reduction in tannin content observed	Successful tannin reduction
		after casein treatment	
7.	Ferric Chloride Test	Yellowish-brown / brownish precipitate or colour change observed	Presence of tannins and phenolic compounds indicated
8.	Antimicrobial Activity Test	Zone of inhibition observed	(≈1.23–1.45 cm; highest 1.45 cm / 14.5 mm)

FINAL RESULT TABLE

Parameter	Final Result
Best sample	Sample 1
Casein-treated formulation	
Maximum Zone of Inhibition	≈ 14.5 mm (1.45 cm)
Overall evaluation	Formulation showed good stability, acceptable physicochemical properties, successful tannin reduction by casein treatment, and satisfactory antimicrobial activity.

- The mouthwash demonstrated:
- Good tannin-reducing activity after casein treatment
- Antimicrobial activity against common oral microorganisms
- Reduction in plaque-forming bacterial growth
- Mild soothing and anti-inflammatory effect on oral tissues
- Acceptable cleansing and refreshing properties

The presence of phytoconstituents such as tannins, flavonoids, alkaloids, and phenolic compounds contributed to the therapeutic potential of the formulation. The casein-treated Mimosa pudica herbal mouthwash was found to be suitable, economical, and a safer herbal alternative for oral care applications.

IX. SUMMARY

The present study aimed to develop and evaluate an herbal mouthwash containing Mimosa pudica extract and casein as a tannin-reducing agent. Mimosa pudica was selected for its antimicrobial and anti-inflammatory properties, while casein was used to reduce tannin content and improve the acceptability of the formulation.

The mouthwash was prepared using the treated extract and evaluated for its physical characteristics, pH, stability, and antimicrobial activity. The formulated herbal mouthwash showed satisfactory properties and demonstrated antimicrobial effectiveness against selected microorganisms.

The study suggests that the developed formulation has potential as a natural and effective oral healthcare product. Further clinical and stability studies are recommended for future development.

X. CONCLUSION

The study concludes that the herbal mouthwash formulated using Mimosa pudica extract and casein-treated filtrate possesses promising oral healthcare properties. The formulation exhibited effective tannin reduction, antimicrobial activity, acceptable physicochemical characteristics, and good stability, which may help in maintaining oral hygiene and reducing oral problems such as plaque formation, bad

breath, and microbial growth.

The herbal mouthwash can serve as a natural alternative to conventional chemical mouthwashes due to its potential safety, affordability, and reduced side effects. However, further clinical studies and formulation standardization are required to establish its long-term efficacy, stability, and commercial applicability.

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