



The Significance of Herbal Components in Oral Care: A Review of Herbal Toothpaste

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ABSTRACT:

Toothpaste is a commonly used product among the population. Its main purpose is to cleanse the teeth and oral cavity, while also addressing a variety of dental issues. Many dental professionals recommend the use of toothpaste to manage problems such as tooth sensitivity and chronic gingivitis. Herbal toothpastes can be created using a range of herbal extracts sourced from various medicinal plants recognized for their antibacterial and antimicrobial properties. Typical components of these herbal mixtures include extracts from ginger, Cassia sinensis, Celastrus paniculata, Vateria indica, Babul leaves, lemon oil, neem stem and bark, guava leaves, and Kalmi bark. The effectiveness of these herbal toothpastes can be evaluated through several tests, including physical examination, relative density, abrasiveness, spreadability, pH measurement, homogeneity, foaming ability, stability, moisture content, organoleptic assessment, fragrance evaluation, shape retention, storage stability, and total flavonoid content analysis. The primary objective of this review article is to compile existing knowledge regarding herbal toothpaste, covering its introduction, various formulations, and evaluation parameters. This compilation may prove to be a valuable resource for researchers seeking to delve deeper into this area.

Keywords: Toothpaste, Oral care, Neem, Herbs, Astringent

INTRODUCTION:

Toothpastes serve as a highly effective preventive tool for the preservation of oral health. Although numerous commercially available toothpastes assert to have antimicrobial properties, there is a significant deficiency in extensive research to validate these assertions. The practice of using toothpaste for dental hygiene has a history spanning over 2000 years, with traditional implements such as toothpicks and brushes still in use today. Modern toothpastes integrate many principles that have been refined over centuries. In India, the tradition of utilizing natural or Ayurvedic remedies for oral care is well-established, with a variety of Ayurvedic toothpastes claiming enhanced antimicrobial advantages.

Herbal toothpastes have played a crucial role in oral hygiene since ancient times. The inception of toothpaste can be traced back to China and India around 300-500 BC, where substances like crushed bones, eggshells, and mussel shells were employed as abrasives for dental cleaning. The contemporary toothbrush was developed in the 19th century, coinciding with medical advancements that led to the inclusion of chalk and soap in toothpaste formulations. After gaining independence, considerable advancements were made in creating diverse formulations, including the use of sodium lauryl sulfate as an emulsifying agent. Presently, the focus in toothpaste development is on the efficient release of active ingredients designed to prevent and address oral diseases.

Advantages of Herbal Toothpaste

1. Efficient abrasive characteristics
2. Gentle and safe for the skin
3. Does not cause staining on teeth
4. Enhances oral cleanliness and freshness
5. Delivers long-lasting effects
6. Cost-effective and easily accessible
7. Should not endanger oral tissues or fluids, nor induce tooth staining.
8. Must not harm the enamel of teeth and should be safe for ingestion.
9. Should have a pleasant scent and taste, without adversely affecting oral fluids and tissues.

Advantages of Using Herbal Toothpastes

1. It assists in preventing dental ailments.
2. It thoroughly cleanses the teeth.

3. It encourages oral airflow.
4. It helps prevent gum diseases.
5. Herbal Toothpaste is made from natural ingredients, including Ayurvedic components, essential oils, minerals, and herbal extracts.
6. Regular use of Herbal Toothpaste aids in resolving dental problems.
7. Herbal Toothpaste is devoid of side effects.

Method of formulation:

There are two main techniques for the preparation of toothpastes, which are as follows:

1. Dry gum method,
2. Wet gum method.

Dry Gum Method:

Preparation of Base:

1. The solid components, including calcium carbonate, sodium fluoride, SLS, sodium CMC, methyl paraben, sodium benzoate, and sodium saccharin, were carefully measured according to the specified formula and subsequently passed through an 80-mesh sieve to ensure uniform particle size.
2. These ingredients were then combined using a mortar and pestle, where they were triturated with a precisely measured amount of sorbitol until a semisolid consistency was achieved.

Incorporation of Herbal Ingredients:

1. Herbal extracts, in powdered form, were accurately measured, sieved, and introduced into the base along with Aloe Vera gel and clove oil.
2. Finally, peppermint oil was added as a flavoring agent.

Sr. No	Ingredients	Quantity	Uses
1	Calcium Carbonate	41gm	Abrasive
	Sodium Fluoride	0.9gm	Anti caries agent ^[12]
3	Sorbitol	44gm	Humectant
4	Sodium lauryl Sulphate	1.5gm	Detergent and foaming agent
5	Sodium CMC	1.8gm	Binding agent
6	Methyl paraben	0.2gm	Preservative
7	Sodium benzoate	0.1gm	Preservative
8	Sodium saccharine	0.2gm	Sweetening agent
9	Peppermint oil	q.s	Flavoring agent

MATERIAL AND METHOD:

A specialized herbal toothpaste formulation is created by combining various ingredients, including Fenugreek Powder, known for its anti-inflammatory properties; Clove Oil, which serves as a dental analgesic; and Neem Powder, recognized for its antimicrobial benefits. Additionally, Aloe Vera gel is included to help prevent infections due to its antifungal, antiviral, and anti-inflammatory qualities. Trikatu Powder acts as both an anti-caries and antimicrobial agent, while Pomegranate Peel contributes antifungal and anti-inflammatory properties. This mixture is blended with a base that contains Calcium Carbonate as an abrasive, Sodium Fluoride to combat cavities, Sorbitol as a humectant, Sodium Lauryl Sulphate as a foaming and cleansing agent, and Sodium CMC as a binding agent. Preservatives such as Methyl Paraben and Sodium Benzoate are added, along with Sodium Saccharin for

sweetness and Peppermint Oil for flavor enhancement. The final formulation is then evaluated and compared to commercially available herbal toothpaste. The preparation of the herbal toothpaste involves the use of a mortar and pestle for homogenization to achieve the desired toothpaste consistency.



Fig-1:Fenugreek powder



Fig-2:Clove oil



Fig-3:Neem powder



Fig-4:Aleo vera gel



Fig-5: Trikatu powder



Fig-6:Pomegranate peel

Selection of Herbal Ingredients

The choice of herbal ingredients in herbal toothpaste plays a vital role in determining its effectiveness and attractiveness. Various herbs are selected for their unique properties that can enhance oral health and hygiene.

Common herbs and plant extracts in toothpaste

Incorporating herbal components into oral hygiene products, such as toothpaste and mouthwash, is a widespread practice. Notable herbs include Peppermint (*Mentha piperita*), Tea Tree Oil, Licorice (*Glycyrrhiza glabra*), Miswak (*Salvadora persica*), Triphala, sanguinarine, Babul (*Acacia arabica*), Ginger (*Zingiber officinale*), propolis, Azadirachta indica (neem), charcoal, clove, and miswak. In rural regions of South Asia, the traditional use of natural items like neem twigs and charcoal powder for daily oral care underscores the cultural significance of herbal remedies. Furthermore, numerous herbal and plant extracts have been recognized for their potential anti-inflammatory, antipyretic, analgesic, antibacterial, antiviral, anticarcinogenic, and antioxidant properties, as demonstrated by various in vitro, in vivo, and animal studies.

The therapeutic properties and benefits of herbal ingredients in toothpaste enhance the overall effectiveness and appeal of these natural oral care products. Key properties and advantages include:

- Antibacterial: Many herbal components, such as neem, clove, and tea tree oil, possess antibacterial properties that help eliminate harmful bacteria in the oral cavity, thus preventing cavities and periodontal disease.
- Anti-inflammatory: Herbs like aloe vera, licorice, and ginger exhibit anti-inflammatory effects, reducing and alleviating gum inflammation.
- Antioxidant: Certain herbs, including green tea extract and Triphala, are abundant in antioxidants that assist in neutralizing free radicals, thereby promoting overall oral health.
- Analgesic: Clove is well-known for its pain-relieving properties, providing relief from toothaches and related discomfort.

Astringent: Various herbs also possess astringent qualities.

Evaluation of Herbal Toothpaste

The assessment procedure guarantees that the toothpaste is effective, safe, and stable.

1. Physical Assessment

- Appearance: Assess for uniformity in color and the absence of lumps or air bubbles.
- Consistency: The toothpaste must possess a smooth and homogeneous texture.
- Spreadability: Test by applying a small quantity on a flat surface to determine if it spreads easily without excessive effort.

pH Assessment

The pH level of the toothpaste should be neutral or slightly alkaline (6-7.5), which can be measured using a pH meter.

Foaming Capability

While herbal toothpaste may produce less foam compared to commercial products containing synthetic surfactants, a minimal amount of natural foaming should still be evident. Foam stability and volume can be assessed by agitating a mixture of the toothpaste and water.

Abrasiveness Evaluation

Abrasiveness is essential to ensure that the toothpaste does not harm the enamel. This can be quantified using the RDA (Relative Dentin Abrasivity) value.

Antibacterial Efficacy

The antibacterial effectiveness of herbal toothpaste can be evaluated through agar diffusion methods against oral pathogens such as *Streptococcus mutans*.

Stability Assessment

Perform stability tests under varying temperature and humidity conditions to determine the product's shelf life. The product should remain stable without separation or degradation under different storage scenarios.

Organoleptic Assessment

Assess sensory attributes such as taste, aroma, and mouthfeel by conducting a sensory panel test with volunteers.

Objectives of Stability Testing

1. To maintain product integrity: The toothpaste must exhibit stability, meaning there should be no physical separation, alteration in color, or development of any odors.
2. To verify the effectiveness of active components: Herbal extracts and essential oils should preserve their therapeutic benefits.
3. To assess microbial stability: The toothpaste must prevent microbial proliferation, particularly in the absence of synthetic preservatives.
4. To evaluate shelf life: Determine the duration for which the toothpaste remains effective under both standard and extreme conditions.

Parameters for Stability Testing:

1. Physical Stability

Appearance: Monitor for any alterations in color, texture, or phase separation (such as the separation of water from the toothpaste base).

Consistency: The toothpaste should retain a smooth texture, avoiding any drying, hardening, or excessive liquidity.

pH: Regularly measure the pH to ensure it remains stable within the acceptable range (generally between 6 and 7.5). Significant pH fluctuations may indicate product degradation.

Odor: Herbal toothpaste containing essential oils may develop undesirable odors over time. Assess any changes in scent.

Taste: Periodically evaluate the flavor to ensure it remains enjoyable and does not develop any bitter or unpleasant notes.

2. Chemical Stability

Active Ingredient Potency: Herbal extracts and essential oils may deteriorate over time. Employ chromatographic techniques (such as HPLC) to quantify the concentration of essential active compounds (e.g., neem extract, clove oil) at regular intervals to confirm their continued effectiveness.

Moisture Content: Significant moisture loss or gain can impact the consistency and application of the toothpaste. Assess moisture levels using a moisture analyzer.

Oxidation: Keep track of any oxidation occurring in natural oils or herbal extracts, as this can influence efficacy and result in rancidity or color changes.

3. Microbiological Stability

Microbial Contamination: Herbal formulations lacking synthetic preservatives are more susceptible to microbial contamination. Conduct regular microbiological assessments (e.g., total viable count, tests for *Escherichia coli*).

Procedure for Conducting Stability Testing

1. Sample Preparation:

Organize the toothpaste samples into distinct batches and place them in suitable containers.

Assign labels to each sample indicating the specific storage conditions (e.g., 25°C/60% RH, 40°C/75% RH).

2. Storage:

Maintain the samples in stability chambers that provide regulated temperature and humidity.

Standard evaluation intervals for long-term testing are 0, 1, 3, 6, 9, and 12 months, while accelerated testing typically involves 0, 1, 3, and 6 months.

3. Periodic Evaluation:

At each designated time point, assess the samples according to specified parameters (appearance, pH, potency of active ingredients, etc.).

Record all observations, measurements, and results from the tests.

4. Data Analysis:

Analyze the results across various time points to detect trends in product stability. If notable changes are observed (e.g., color alteration, separation), it may indicate a reduced shelf life for the product.

Utilize the findings to ascertain the product's shelf life under both standard and extreme conditions.

Acceptance Criteria:

Physical stability: There should be no significant alterations in color, consistency, or odor over time. - Chemical stability: The concentration of active ingredients must remain within 90-110% of the original concentration.

Microbial stability: The total viable count should stay within acceptable limits, with no presence of harmful pathogens.

Packaging integrity: There should be no evidence of leakage, deformation, or adverse interaction with the product.

RESULT AND DISCUSSION:

The evaluation tests for the developed herbal toothpaste were carried out in accordance with the guidelines set forth by the Bureau of Indian Standards IS 6356-1993, encompassing various herbal toothpaste samples such as Vedshakti, Dabur Red, Patanjali, Dantakanti, Meswak, and the newly formulated toothpaste. All samples complied with the BIS standards and were assessed to be of high quality.

The objective of evaluating the developed herbal toothpaste was to compare its attributes with those of commercially available alternatives. The results of the assessed parameters were systematically arranged in a tabular format. The study indicated that the formulated herbal toothpaste exhibited comparable, and in some instances, superior performance relative to existing herbal toothpastes on the market.

A visual examination of the formulated herbal toothpaste indicated a yellowish-brown coloration. The product's fragrance was characterized as aromatic and distinctive, as determined through sensory analysis.

CONCLUSION:

The current formulation demonstrates favorable organoleptic characteristics, along with effective spreading, foaming, abrasive properties, and in vitro antimicrobial activity. Additionally, it is free from harmful chemicals and incorporates herbal powders that contain a range of natural compounds beneficial for dental health and oral hygiene, distinguishing it from conventional toothpastes. This formulation holds considerable promise for future development and wider application.

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