



## Formulation and Evaluation of Herbal Toothpaste

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### ABSTRACT:

In the current landscape of oral dental care, there's a noticeable shift towards herbal toothpaste formulations, which harness natural ingredients. This trend stems from a growing public belief in the safety and efficacy of herbal alternatives over synthetic chemical-based products. This preference is particularly pronounced given the perceived benefits in reducing dental caries and preventing other prevalent dental issues among today's generation.

Our formulation stands out by incorporating a blend of natural ingredients such as clove oil and neem powder, a combination not previously explored in research. These extracts exhibit a spectrum of activities, including anti-ulcer, anti-caries, antibacterial, and wound-healing properties. Additionally, they offer unique attributes such as anti-cancer and anti-fungal properties, further enhancing the potential benefits of our herbal toothpaste. To ensure the success of our formulation, we conducted a comparative study against previously marketed herbal toothpastes. This comparative analysis focused on essential physical parameters like pH, stability, extrudability, spreadability, foamability, and homogeneity. These parameters are crucial for creating toothpaste that is both effective and stable over time.

The primary objective of our study is to formulate and evaluate the performance of our herbal toothpaste. The findings of our research indicate that our herbal-based toothpaste, enriched with natural ingredients, yields results comparable to those of established herbal products. This underscores the potential of our formulation to provide a safe, effective, and stable alternative in oral dental care.

**KEYWORDS:** Neem, Toothpaste, Clove, Evaluation, Herbal Toothpaste etc.

### INTRODUCTION

Toothpaste stands as a cornerstone in oral health care, serving as the primary preventive measure for maintaining oral hygiene. Despite claims by many commercially available toothpaste brands regarding their antimicrobial properties, there's a dearth of research validating these assertions. This study aims to bridge this gap by assessing the efficacy of various toothpaste formulations in reducing oral microbial load. The results indicate that the tested toothpaste formulations effectively control microbial load, thereby promoting good oral hygiene. However, it's essential to underscore that practicing appropriate oral hygiene measures and employing proper brushing techniques are pivotal in sustaining oral health, potentially outweighing the specific ingredients in toothpaste.

Chronic gingivitis, a prevalent oral disease globally, primarily stems from dental plaque buildup. While mechanical methods such as brushing and flossing are fundamental for plaque removal, their limitations necessitate additional measures. Incorporating safe and effective antimicrobial agents into toothpaste serves as a valuable adjunct to mechanical plaque control. Research highlights certain chemicals like chlorhexidine and triclosan, which, when added to toothpaste, directly inhibit plaque formation.

Various chemical agents have been integrated into toothpaste and mouth rinses, demonstrating efficacy in reducing dental plaque formation. Concurrently, with the increasing awareness of indigenous medical practices, there's a rising interest in herbal medicine and alternative therapies for health care promotion. Herbal toothpastes, devoid of synthetic agents like triclosan or fluoride, often leverage natural ingredients such as mineral salts (e.g., sodium fluoride and sodium chloride) and plant extracts like lemon, eucalyptus, rosemary, chamomile, sage, and myrrh.

The primary objective of toothpaste is to reduce oral bacterial flora and deliver fluoride to the teeth, safeguarding them against bacterial attacks. While chemical agents like triclosan are commonly employed in toothpaste for their antibacterial properties, sodium fluoride also exhibits antibacterial qualities. In contrast, natural toothpastes, excluding synthetic ingredients like triclosan and fluoride, aim to offer similar benefits through natural compounds, typically containing minerals and plant extracts with antibacterial and anti-inflammatory properties.

Despite the benefits of chemical agents, self-performed mechanical plaque removal remains the most widely accepted method for controlling plaque and gingivitis. Yet, it's time-consuming, and many individuals may lack the motivation for such procedures. Hence, integrating effective chemical agents in toothpaste can bolster plaque control and support overall oral health.

Traditionally, plants with therapeutic effects have played a pivotal role in oral health across cultures for thousands of years. Traditional medicine often presents advantages and fewer side effects compared to modern treatments, such as allergies. Neem, extensively researched for its therapeutic properties, has been utilized in various forms, including chewing sticks, across regions like the Indian subcontinent, the Middle East, and Africa since ancient times.

Dental caries are escalating in underdeveloped and developing countries, necessitating the promotion of traditional preventive measures that are accessible and cost-effective. Neem, recognized for its antibacterial activity, has been utilized for multiple purposes, including oral hygiene. Its efficacy against dental diseases has been well-documented, and ongoing research explores innovative methods like nanotechnology to enhance herbal medicine's efficacy.

This comparative study delves into the distinction between food debris and dental plaque, emphasizing the importance of natural ingredients in herbal dentifrices. While modern dentifrices continue to evolve, drawing from centuries-old concepts, the integration of natural or Ayurvedic medicines in oral health care remains deeply rooted in tradition. Evaluating the efficacy of natural dentifrices is critical for understanding their impact on oral hygiene and gingival health, contributing to ongoing advancements in oral health care. Medicinal plants and herbs have been utilized since ancient times, harnessing a myriad of active chemical compounds for treating various ailments. Among these, toothpaste plays a pivotal role in maintaining dental health, aiding in the prevention of gingivitis and tooth decay, which can lead to more serious dental issues. Available in numerous flavors, toothpaste not only leaves the mouth and breath feeling fresh but also helps to mask odors from pungent foods like garlic or onions. Gingivitis can often be mitigated through diligent oral hygiene practices such as thorough brushing and flossing, supplemented by antiseptic mouthwash.

However, many synthetic toothpaste formulations contain fluoride or sodium lauryl sulfate, which may have adverse effects on dental health. To circumvent such concerns, herbal-based toothpaste formulations have gained traction among consumers due to their perceived lack of side effects and minimal ingredient lists. In line with this ethos, we have embarked on a project to formulate and evaluate a herbal toothpaste.

Despite the traditional use of neem for dental hygiene purposes, scientific documentation remains scarce. Therefore, we have undertaken the task of developing a herbal toothpaste incorporating this ingredient.

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## **IDEAL PROPERTIES OF TOOTHPASTE**

### **Non-Harmful to Oral Tissues**

The toothpaste should be gentle on the gums, tongue, and other oral tissues, preventing irritation or damage.

### **Non-Staining**

It should not cause any discoloration of the teeth, ensuring the natural whiteness is maintained.

### **Non-Abrasive to Enamel**

The formulation should be non-scratching and safe for the enamel surface of the teeth, preventing erosion and sensitivity.

### **Safe if Ingested**

If accidentally swallowed, the toothpaste should not cause harm to the gastrointestinal tract (GIT).

### **Pleasant Odor and Taste**

- It should have a pleasant flavor and smell, making the brushing experience enjoyable.
- Free from Unnatural Chemicals
- Ideally, the toothpaste should not contain artificial chemicals, dyes, flavors, or preservatives, reducing the risk of adverse reactions.

### **Natural Ingredients Only**

The formulation should be made exclusively with natural ingredients to ensure safety and environmental friendliness.

### **No Growth Hormones, Chemicals, or Pesticides**

Ingredients should be free from growth hormones, chemicals, or pesticides to ensure purity and health safety.

### **Benefits of Toothpaste**

#### **Combat Dental Issues**

Toothpaste helps prevent dental caries, gum disease, bad breath, calculus buildup, erosion, and dentin hypersensitivity.

#### **Abrasives for Cleaning and Whitening**

Contains mild abrasives to effectively clean teeth and remove surface stains, resulting in whiter teeth.

#### **Flavour for Fresh Breath**

Includes flavors that help freshen breath, providing a pleasant aftertaste.

#### **Visual Appeal**

- Dyes are used to give the toothpaste a visually appealing color, enhancing user experience.
- Enamel Strengthening.
- Helps to remineralize and strengthen enamel that has been weakened by acids, protecting against decay.

#### **Germ-Killing Properties**

Contains antibacterial agents to kill germs and prevent infections, promoting overall oral health.

#### **Active Ingredient Delivery**

Delivers active ingredients effectively to help prevent various dental diseases, ensuring targeted oral care.

#### **Relieves Toothache**

Certain formulations can provide relief from toothache, reducing discomfort.

#### **Cavity Prevention and Fresh Breath**

- Fights against cavities and maintains fresh breath, essential for daily oral hygiene.
- Intrinsic Stain Removal
- Helps in removing intrinsic stains from teeth, restoring natural color.

#### **Bacteria Removal**

Effective in removing harmful bacteria from the oral cavity, reducing the risk of infections.

#### **Anti-Inflammatory Effects**

Shows anti-inflammatory effects on gums, reducing swelling and redness.

#### **Advantages of Using Toothpaste**

##### **Ensures Safe Teeth Cleaning**

Provides effective cleaning of teeth without causing harm to the oral tissues or enamel, ensuring a thorough yet gentle cleaning experience.

##### **Calms Throbbing Pain in Gums**

Contains soothing agents that can alleviate gum pain and inflammation, providing relief from discomfort.

##### **Removes Stains Without Damaging Enamel**

Formulated with mild abrasives that effectively remove surface stains while preserving the integrity of the enamel, helping to maintain a bright smile.

##### **Freshens Your Breath**

Includes ingredients that neutralize bad odors, leaving the mouth feeling fresh and clean.

##### **Safe for Children**

Specially designed to be safe if ingested, making it an excellent choice for young children who might accidentally swallow toothpaste.

Stronger Enamel and Better Protection Against Tooth Decay

Enriched with fluoride and other minerals that strengthen enamel, providing enhanced protection against cavities and tooth decay.

##### **No Risk to Children's Health if Swallowed**

Represents a safe alternative to ordinary toothpaste for children, reducing concerns about accidental ingestion.

##### **Disadvantages of Using Toothpaste**

- Ineffective at Removing Major Stains

- While it can handle minor discoloration, toothpaste alone is not sufficient for major stains; professional whitening services may be required for more significant results.

#### **Increased Salivation**

Some formulations may stimulate increased salivation, which can be uncomfortable for some users.

#### **Potential Enamel Erosion**

Overuse of certain abrasive toothpastes can gradually wear down the enamel, leading to enamel erosion over time.

#### **Dentin Abrasion and Increased Tooth Sensitivity**

If the toothpaste is too abrasive, it can cause dentin abrasion, which exposes the sensitive inner layers of the teeth, leading to increased sensitivity and discomfort.

#### **Applications of Toothpaste**

##### **Perfume Your Palms**

**Eliminate Strong Odors:** Cutting onions, cleaning fish, or handling garlic can leave strong odors on your hands. Wash them with toothpaste to effectively remove these smells.

##### **Clean you're Jewellery**

**Polish Metal Jewellery:** Use a soft toothbrush with a small amount of toothpaste to brush dull metal jewellery. Rinse and polish it with a soft cloth to restore its shine. For more tarnished pieces, soak the metal in a cup of water with dissolved toothpaste.

**Caution for Pearls:** Avoid using toothpaste on pearls as it can damage their delicate surface.

##### **Remove Crayon Marks from Painted Walls**

Wipe with Toothpaste: Put a dab of toothpaste on a damp sponge and gently wipe crayon marks off painted walls without damaging the paint.

##### **Defog Goggles**

**Prevent Fogging:** The mild abrasives in toothpaste can help prevent goggles and masks from fogging up. Lightly rub toothpaste inside a diving mask, motorcycle goggles, or a hockey helmet face guard. Wipe and rinse the surface clean.

**Caution for Coatings:** Be aware that toothpaste may remove special coatings like anti-glare treatments, so use it cautiously.

##### **Clear Pimples**

**Overnight Treatment:** Dab a small amount of toothpaste on pimples before bed. In the morning, wash your face clean. This method can also work for bug bites and bee stings—just ensure you remove the stinger first. The toothpaste will dry out and reduce the size of the blemishes.

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## **MATERIALS AND METHODS:**

### **Source and Quality of Materials:**

The materials utilized in the experiment were sourced as pharmaceutical grade or the highest quality laboratory reagents, directly obtained from the manufacturer. Double-distilled water was consistently used as the solvent throughout the experiment to maintain purity and consistency.

### **List of Materials and Functions:**

**Neem:** Recognized as the active ingredient, Neem played a pivotal role in the formulation, contributing to its therapeutic properties.

**Clove:** Functioning as a flavoring agent, Clove imparted a distinct taste to the final product, enhancing its sensory appeal.

**Dicalcium Phosphate:** Served as a leavening agent, Dicalcium Phosphate influenced the texture and consistency of the formulation, ensuring desirable physical properties.

**Calcium Carbonate:** Acting as an oxidation agent, Calcium Carbonate influenced chemical reactions within the experiment, contributing to its stability and efficacy.

**Glycerine:** Functioned as a moisturizing agent, Glycerine ensured the product's smoothness and hydrating properties, enhancing user experience.

**Gum Tragacanth:** Utilized as an emulsifier, Gum Tragacanth facilitated the uniform distribution of ingredients, ensuring homogeneity.

**Saccharin:** As a sweetening agent, Saccharin provided a pleasant taste to the formulation without adding unnecessary calories, enhancing its palatability.

**Sodium Lauryl Sulphate:** Functioned as an additional emulsifier, Sodium Lauryl Sulphate enhanced the stability and consistency of the formulation throughout the experiment, contributing to its overall quality.

#### **Acquisition of Neem and Clove:**

Neem and Clove were acquired from the local market for use in the experiment, ensuring accessibility and freshness.

#### **Utilization of Chemical Reagents:**

In addition to Neem and Clove, a range of chemical reagents were employed in the study, including Dicalcium Phosphate, Calcium Carbonate, Glycerine, Gum Tragacanth, Saccharin, and Sodium Lauryl Sulphate, each contributing to the formulation's efficacy and characteristics.

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## **DRUG PROFILES:**

### **Neem Powder (*Azadirachta indica*)**

Neem, renowned for its health-enhancing properties, owes much of its acclaim to its abundant antioxidant content, rendering it a prized asset in traditional medicinal systems like Chinese, Ayurvedic, and Unani medicine, notably prevalent in the Indian subcontinent. Across centuries, Neem has been extensively harnessed for treating and preventing various ailments, with prior investigations affirming its role, alongside its constituents, in scavenging free radicals and thwarting disease pathogens.

Studies conducted on animal models have provided compelling evidence of Neem's and its primary constituents' pivotal role in managing anticancer strategies. By influencing diverse molecular pathways, Neem exhibits considerable promise in combating cancer, all while maintaining its reputation as a safe medicinal plant known for modulating numerous biological processes sans adverse effects.

Moreover, Neem boasts an impressive array of biological and pharmacological activities, encompassing antibacterial, antifungal, and anti-inflammatory properties. Its multifaceted approach in targeting multiple biological pathways underscores its significance as a therapeutic agent within traditional medicine paradigms, while also shedding light on its potential for contemporary medical applications.

On another front, Neem powder, derived from the *Azadirachta indica* tree, emerges as a powerhouse for oral health benefits. Despite its bitter taste, Neem earns high regard for its potent antibacterial and anti-inflammatory properties. These attributes position it as a formidable ally in oral hygiene, capable of efficiently cleansing teeth and curbing plaque accumulation over time. By specifically targeting harmful bacteria and mitigating oral inflammation, Neem powder contributes significantly to sustaining overall dental well-being. Its natural composition further solidifies its status as a preferred choice among individuals seeking alternative and holistic approaches to oral care.

### **Clove oil (*Syzygium Aromaticum*)**

Clove oil, extracted from the *Syzygium aromaticum* plant, extends its significance far beyond mere culinary and aromatic realms, boasting notable pharmacological prowess. At the heart of this essential oil lies eugenol, a potent phytochemical renowned for its analgesic properties. In cultures like South Korea and India, eugenol derived from clove oil finds traditional application in alleviating toothaches. Whether topically applied to a cavity in a decayed tooth or a post-extraction socket, clove oil or eugenol offers transient relief from dental pain. However, in the United States, the FDA (Food and Drug Administration) has cast doubt on the efficacy of eugenol in managing dental pain, resulting in the reevaluation of clove oil's analgesic status due to insufficient supporting evidence.

Within clove oil lie several crucial phytochemicals, with eugenyl acetate, eugenol, and  $\beta$ -caryophyllene emerging as paramount. These compounds not only confer the distinct aroma and flavor to clove oil but also harbor remarkable pharmacological properties. *Syzygium aromaticum*, the plant yielding clove oil, has been extensively scrutinized pharmacologically for its impact on various pathogenic parasites and microorganisms. These encompass pathogenic bacteria, Plasmodium, Babesia, and Theileria parasites, as well as viruses like Herpes simplex and hepatitis C.

Eugenyl acetate, eugenol, and  $\beta$ -caryophyllene exhibit an array of pharmacological activities, encompassing antimicrobial, antiparasitic, and antiviral effects. Investigations delve into their potential therapeutic applications in combating infectious diseases triggered by bacteria, parasites, and viruses. Additionally, studies delve into their mechanisms of action and interactions with target pathogens.

Moreover, the physicochemical attributes of clove oil, including color, specific gravity, refractive index, optical rotation, and solubility in ethanol, hold significance in pharmacological research. A grasp of these attributes aids in characterizing and standardizing clove oil formulations for medicinal use. Specifically, the concentrations of eugenol and  $\beta$ -caryophyllene within clove oil emerge as pivotal determinants of its pharmacological potency and efficacy against diverse pathogens.



**Figure 1: Clove**

### **Dicalcium phosphate (DCP)**

Dicalcium phosphate (DCP) stands as a ubiquitous calcium supplement widely employed across the food and pharmaceutical sectors, esteemed for its myriad properties and applications. Consisting of calcium ions and phosphate ions, DCP exhibits minimal solubility in water and typically maintains a neutral to slightly basic pH. Its fine white powder form underscores its adaptability across diverse formulations. As a concentrated source of calcium, DCP boasts high bioavailability, bolstering bone health and various physiological functions. Its stability and compatibility with other ingredients render it suitable for an array of applications, serving as a food additive to fortify dairy, baked goods, and beverages, and as a pharmaceutical excipient in tablet formulations. Moreover, DCP plays a pivotal role in dietary supplements, animal feed for livestock and poultry, and industrial processes such as water treatment and ceramics manufacturing, exemplifying its multifaceted contribution to promoting nutrition, health, and industrial efficacy.

### **Calcium carbonate (CaCO<sub>3</sub>)**

Calcium carbonate (CaCO<sub>3</sub>) comprises calcium, carbon, and oxygen, manifesting as either a white powder or colorless crystals and demonstrating limited solubility in water. Possessing a pH exceeding 7, it exhibits basic properties. As a significant source of calcium ions, calcium carbonate plays a pivotal role in various physiological processes. Its utility extends across diverse industries: in pharmaceuticals, it functions as an antacid; in food and beverages, it fortifies products and serves as a coloring agent; in construction, it enhances material strength; in papermaking, it elevates paper quality; in cosmetics, it serves as a bulking agent; and in agriculture, it amends soil composition and fosters plant growth. Evidently, calcium carbonate's versatility and widespread applications render it indispensable across numerous sectors.

### **Sodium lauryl sulfate (SLS)**

Sodium lauryl sulfate (SLS) emerges as a versatile synthetic detergent and surfactant extensively utilized in both personal care and household products due to its multifaceted attributes. As a surfactant, it plays a pivotal role in reducing liquid surface tension, thereby efficiently eliminating dirt and grease. Its remarkable foaming capabilities make it a common inclusion in soaps and shampoos, facilitating ingredient dispersion. Furthermore, SLS's emulsifying prowess stabilizes water and oil mixtures in cosmetic formulations. Beyond this, it acts as a penetration enhancer in skincare products, enabling active ingredients to permeate the skin more effectively. Its mild antimicrobial properties contribute to extending the shelf life of personal care items. SLS finds application across various sectors, ranging from personal care products to household cleaners and industrial processes, owing to its remarkable versatility. However, it's imperative to exercise caution regarding potential skin irritation, particularly when used in high concentrations. Hence, it is advisable to employ SLS in moderation, especially in sensitive areas.

### **Gum Tragacanth**

Gum Tragacanth, extracted from the dried sap of *Astragalus* species, represents a complex polysaccharide mixture, predominantly comprising tragacanthin and bassorin. Its unique hydrocolloid nature endows it with the remarkable ability to absorb and retain water, resulting in the formation of a gel-like consistency. Moreover, its high viscosity and thixotropic behavior further enhance its utility as an efficient thickening agent.

One of the most notable characteristics of Gum Tragacanth is its exceptional stability across a wide range of temperatures and pH levels, rendering it suitable for a plethora of formulations. Additionally, it exhibits remarkable film-forming and emulsifying properties, making it a highly sought-after ingredient in industries spanning from food and pharmaceuticals to cosmetics and textiles.

Due to its reputation as a safe and biodegradable substance, Gum Tragacanth finds widespread applications beyond its primary industries. For instance, it is utilized in art conservation efforts, where its adhesive properties aid in restoration projects. Moreover, in veterinary medicine, it serves as a valuable component in various formulations for addressing gastrointestinal discomfort in animals. Furthermore, in traditional medicine, Gum Tragacanth is recognized for its therapeutic properties, particularly in providing relief from digestive issues.

Overall, the versatility of Gum Tragacanth plays a pivotal role in enhancing the texture, stability, and overall performance of a myriad of products across diverse industries. Its multifaceted nature and compatibility with various formulations make it an indispensable ingredient, contributing to the quality and efficacy of numerous consumer goods and industrial applications.

#### **Method of Formulation for Toothpaste**

##### **Preparation of Base:**

- Solid ingredients such as dicalcium phosphate, calcium carbonate, SLS (Sodium Lauryl Sulfate), sodium saccharine and Gum Tragacanth are accurately weighed as per the formula requirements.
- These ingredients are then sieved with a No. 80 sieve to ensure uniform particle size.
- The sieved chemicals are mixed in a mortar and pestle, and triturated with accurately weighed sorbitol until a semisolid mass is formed.

##### **Addition of Herbal Ingredients:**

- Herbal extracts in powdered form, accurately weighed, are sieved and added to the base mixture.
- Neem known for their therapeutic properties, are incorporated into the formulation.
- Clove is added at the end to provide flavouring, enhancing the overall sensory experience of the toothpaste.

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### **METHOD USED FOR PREPARATION OF NEEM TOOTHPASTE**

Following steps involved in preparation of neem toothpaste

1. Neem leaves in powdered form are used in the formulations.
2. Ensure all glassware is thoroughly cleaned and properly dried.
3. Measure out all powdered ingredients accurately.
4. Grind all powdered ingredients together in a mortar to achieve size reduction and ensure uniform mixing.
5. Gradually add a mixture of glycerin and water while continuously grinding until a smooth paste is obtained.
6. Transfer the prepared formulation into a collapsible tube and seal the lower end using a crimping machine.
7. Evaluate the final preparation, apply the appropriate labeling, and submit for further processing or distribution.

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### **EVALUATION OF TOOTHPASTE**

#### **Physical Examination:**

**Colour:** The formulated toothpaste is evaluated for its color through visual inspection.

**Odour:** The odour of the toothpaste is determined by smelling the product.

**Taste:** The taste of the toothpaste is manually checked by tasting the formulation.

#### **Relative Density:**

The relative density of the toothpaste is determined by weighing the formulation in grams taken in 10 ml of the formulation and 10 ml of distilled water using a relative density (RD) bottle.

#### **Abrasiveness:**

Toothpaste samples are extruded onto butter paper, and the presence of sharp or hard-edged abrasive particles is examined by pressing the contents with fingertips. Toothpaste should not contain such particles.

#### **Spreadability Determination:**

The slip and drag characteristics of the toothpaste are evaluated. A specified amount of formulated paste is placed between glass slides, and the time taken for the upper slide to cover a distance of 7.5 cm under a specified weight is noted. Spreadability is calculated using a formula.

#### **pH Determination:**

- The pH of the formulated herbal toothpaste is determined using a pH meter. Toothpaste is suspended in water, and the pH is measured.

#### **Homogeneity:**

The toothpaste's homogeneity is assessed by extruding a homogeneous mass from the collapsible tube or container and rolling it gradually to ensure bulk extrusion from the crimp.

**Foaming:**

The foamability of the toothpaste is evaluated by measuring the initial and final volumes of foam formed after shaking the formulation with water in a measuring cylinder. The foaming power is determined by the difference in volumes.

**Stability:**

Stability studies are conducted according to ICH guidelines. The formulated paste is stored under different temperature and humidity conditions for three months and examined for appearance, pH, and spreadability.

**Determination of Moisture and Volatile Matter:**

Moisture and volatile matter content of the toothpaste are determined by drying a specified amount of formulation in an oven and calculating the loss of mass.

**Moisture Content:**

Toothpaste is weighed before and after drying in an oven at 105°C to determine the percentage moisture content.

**Foaming Character:**

Two methods are employed to assess the foaming character of the toothpaste using stoppered test tubes and graduated cylinders.

**Organoleptic Evaluation:**

Colour and taste of the toothpaste are evaluated through sensory and visual inspection.

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**CONFLICT OF INTEREST:**

We declare that we have no conflict of interest.

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