

# Formulation and Evaluation of Herbal Toothpaste

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**Abstract:** *In the current context in oral dental care the use of herbal toothpaste containing natural ingredients is more widely accepted in public belief than chemical-based formulations for safety and efficacy in reducing tooth decay, and preventing other dental problems that this generation is prone to. In this building we use aloe vera gel, clove oil, neem powder, pomegranate leaf powder and trikatu that have not been used by any other research work. These quotes have many functions such as anti-ulcer, anti-caries, anti-bacterial, wound healing including many other special features such as anti-cancer and fungal. Along with this herbal-based formulation, a comparative study of pre-marketed herbal toothpaste was performed to obtain an overview of the body's key parameters namely pH, stability, elasticity, spread, rowing, homogeneity similarity to create a more effective formulation and stable performance. The purpose of this study was to compare and evaluate toothpaste with a commercial toothpaste. This study suggests that our composition of herbal based toothpaste with natural ingredients is as good as in terms of results compared to the composition of herbal medicines.*

**Keywords:** Herbal toothpaste, marketed herbal toothpaste, Antimicrobial activity, comparison and evaluation

## I. INTRODUCTION

**Herbal Toothpaste-** Herbal-based toothpaste has been used since ancient times in ancient life and is one of the most important parts of oral health care. The production and development of toothpaste production began in China and India, from 300-500 BC. At that time, crushed bones, crushed eggs, and mussel shells were used as abrasives as part of tooth cleaning. Modern toothbrushes were developed in the 19th century.

After advances in medicine, chalk and soap were added to these forms. Soon after independence, several developments in the formulation of various solvents had begun, sodium lauryl sulfate was used as an emulsifying agent. At present, the focus has shifted to the release of active ingredients during the development of the formulation to prevent and / or treat oral disease.

**Ayurvedic Concept of Teeth-** The dentist was not a special branch of Ayurveda, included in the Shalaky Tantra (surgical program). In Ayurveda, dental health (dantaswasthya in Sanskrit) is considered an individual choice, differing in the individual constitution (prakriti), and climate change caused by the effects of the sun, moon and planet (kala-parinama). The constitution of the body is divided based on the assembly of one or more doshas of three, vata, pitta and kapha. Dosha dominance in the individual and the environment determines health care in Ayurveda, which includes dental health.

### Benefits of Applying Herbal Toothpaste

1. It helps to prevent any dental disease.
2. It cleans teeth.
3. It stimulates the air.
4. Prevents gum disease.
5. Herbal Toothpaste is made from natural ingredients of ayurvedic, natural oils, minerals, and herbal extracts.
6. Regular use of Herbal Toothpaste helps with dental problems.
7. No side effects of herbal toothpaste.

## II. MATERIALS AND METHODS

### 1. Fenugreek Powder (*Trigonella Foenum-graecum*)-

Fenugreek has benefits for lowering blood sugar levels, boosting testosterone, Fenugreek may also reduce cholesterol levels, lower inflammation, and help with appetite control, Reduce inflammation, and Pain relief

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

Oil of clove, also known as clove oil, is an essential oil extracted from the clove plant, *Syzygium aromaticum*. Clove oil is commonly used in aromatherapy and for flavoring food and some medicines. Particularly in South Korea and India, eugenol, a phytochemical extracted from clove oil, is used to relieve Toothache Applied to a cavity in a decayed tooth or tooth socket remaining after extraction, eugenol or clove oil may relieve toothache temporarily. In the United States, the FDA considers eugenol ineffective for treating dental pain, and has downgraded clove oil as an analgesic due to insufficient evidence to rate its effectiveness.

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

Neem is awesome for teeth. This bitter-tasting herb is considered very important. Since it is antibacterial and anti-inflammatory in nature, it can actually help in cleaning your teeth better and reduce plaque buildup in the long-term.

### 4. Aloe Vera gel (*Aloe barbadensis miller*)

Aloe Vera is a succulent plant known for being a rich source of antioxidants and vitamins. It heals burns and thin cuts, improves digestive function, and reduces arthritis pain with its anti-inflammatory and soothing properties. The aloe gel from the plant is a featured ingredient in cosmetics, food supplements, and even oral care products.

### 5. Trikatu Powder

It is a blend of equal parts of Pippali or long pepper (*Piper Longum L*), black pepper (*Piper nigrum L*) and dry ginger or saunthi (rhizomes of *Zingiber officinalis*). All the three herbs work together to stimulate Agni or digestive fire. Trikatu chiefly works by stimulating 'Agni', i.e. the digestive fire, improves the assimilation of nutrients in the body and reduces Kapha. It is also famed as a rejuvenator and tonic which helps pacify the aggravated Kapha in the respiratory and digestive tract and also regulates the path for the Vata, thus reducing bloating and abdominal distension.

### 6. Pomegranate peel (*Punicagranatum*)

High in vitamin C and powerful antioxidants. Pomegranate peel Powder with sweet taste contains almost double the amount of anti-oxidants than the pulp or juice, improves digestion. It can also be used as Natural moisturizer; Helps with pimples or acne. Pomegranate peel extracts have been used to help hair loss. Good For Teeth Pomegranate is one of the most essential ingredients in various toothpastes and toothpastes.

### 7. Calcium Carbonate ( $\text{CaCO}_3$ )

Calcium carbonate is a dietary supplement used when the amount of calcium taken in the diet is not enough. Calcium is needed by the body for healthy bones, muscles, nervous system, and heart. Calcium carbonate also is used as an antacid to relieve heartburn, acid indigestion, and upset stomach.

### 8. Sodium Fluoride (NaF)

Sodium fluoride is another type of fluoride you might see in oral health products, such as some toothpastes. It can help fight cavities while strengthening your enamel. However, it can't fight gingivitis, prevent tooth decay, and freshen your breath.

### 9. Sorbitol ( $\text{C}_6\text{H}_{14}\text{O}_6$ )

Sorbitol is an example of a humectant, an ingredient that prevents loss of water in the toothpaste. A humectant traps water in the toothpaste so that when you squeeze the tube, you get a nice, smooth substance. Along with sorbitol, other examples of humectants include glycol and glycerol.

**10. Sodiumlauryl Sulphate (CH<sub>3</sub>(CH<sub>2</sub>)<sub>10</sub>CH<sub>2</sub>(OCH<sub>2</sub>CH<sub>2</sub>)<sub>n</sub>OSO<sub>3</sub>Na)**

Sodium lauryl sulfate is one of the most widely used synthetic detergents in toothpaste. Generally, surface active agents lower the surface tension, penetrate and loosen surface deposits and emulsify or suspend the debris which the dentifrice removes from the tooth.

**11. Sodium CMC (C<sub>8</sub>H<sub>15</sub>NaO<sub>8</sub>)**

Sodium Carboxymethyl Cellulose (CMC) is an anionic polymer with a clarified solution dissolved in cold or hot water. It functions as a thickening rheology modifier, moisture retention agent, texture/body building agent, suspension agent, and binding agent in personal products and toothpaste.

**12. Methyl paraben (C<sub>8</sub>H<sub>8</sub>O<sub>3</sub>)**

They preserve products to increase their shelf life, which proponents say is essential for consumer health and safety. Methylparaben, with its water solubility, is, therefore, the ideal paraben to use in things like mouthwash or toothpaste.

**13. Sodium benzoate (C<sub>7</sub>H<sub>5</sub>NaO<sub>2</sub>)**

Sodium benzoate is commonly used as a preservative in cosmetics and personal care items, such as hair products, baby wipes, toothpaste, and mouthwash. It also has industrial uses.

**14. Sodium saccharine (C<sub>7</sub>H<sub>5</sub>NO<sub>3</sub>S)**

Sodium saccharin is extremely sweet, so small amounts make toothpaste palatable and better tasting. Still, sodium saccharin is not linked to any benefits for oral health, so it's only function in toothpaste is to improve flavor.

**15. Peppermint oil (C<sub>6</sub>H<sub>10</sub>O<sub>7</sub>)**

Mixing peppermint oil with toothpaste while brushing can help clean the teeth and gums better which improve your oral health. While using peppermint oil can help hide bad breath, relieve the pain of minor toothaches and can help with gum inflammation, it does not make other problems go away forever.

**2.1 Method of Preparation**

There are two types of methods for formulation of toothpastes, viz.

1. Dry gum method
2. Wet gum method

**A. Dry Gum Method-**

**(a) Preparation of Base**

- The solid ingredients calcium carbonate, sodium fluoride, SLS, sodium CMC, methyl paraben, sodium benzoate, sodium saccharine was weighed accurately.
- Sieved with sieve no.80.
- Mixing in mortar and pestle.
- Triturated with accurately weighed sorbitol until semisolid mass formed.

**(b) Addition of Herbal Ingredients**

- Accurate weigh herbal extract in form of powders.
- Sieved with sieve no.80.
- Added to the base along with Aloe Vera gel and clove oil.
- Peppermint oil was added as a flavoring at the end.

**Table 1: Active Ingredients**

Sr. No	Ingredients	Quantity	Uses
1.	Fenugreek Powder	2.5gm	Anti-inflammatory
2.	Clove oil	0.02 gm	Dental Analgesic
3.	Neem Powder	0.05gm	Antimicrobial
4.	Aloe Vera gel	6gm	Antifungal, Anti-Viral, Anti-inflammatory,
5.	Trikatu Powder	0.03 gm	Anti-caries, Anti-Microbial
6.	Pomegranate Peel	1.6 gm	Antifungal, Anti-inflammatory

**Table 2: Composition of Herbal Toothpaste**

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

### III. EVALUATION OF HERBAL TOOTHPASTE

#### 3.1 Physical Examination (Colour, odour, taste, smoothness, relative density)

Formulated toothpaste was evaluated for its colour, visually colour was checked. Odour was found by smelling the product. Taste was checked manually by tasting the formulation. The Smoothness was tested by rubbing the paste formulation between the fingers.

#### 3.2 Inertness of tube

The container used for herbal toothpaste was not produce any corrosion or deterioration in normal storage conditions like heating temperature at  $45 \pm 2$  0C for ten days. Inertness of tube was observed by cutting the internal surface, open it and observing whether any sign of deterioration or chemical reactions occurred in the container.

#### 3.3 Ph

Dispense 10 gm of the toothpaste from the container in a 50 ml beaker and add 10 ml of freshly boiled and cooled water (at 270°C) to make 50 percent aqueous suspension. Stir well to make a thorough suspension. Determine the pH of the suspension within 5 min, using a pH meter.

#### 3.4 Homogeneity

The toothpaste shall extrude a homogenous mass from the collapsible tube or any suitable container by applying of normal force at  $27 \pm 20$ C. In addition bulk of contents shall extrude from the crimp of container and then rolled it gradually.

#### 3.5 Determination of Sharp And Edge Abrasive Particles

The contents on to the finger and scratched on the butter paper for 15- 20cm long to check for the presence of any sharp or abrasive particles. Repeated the same process for at ten times. No sharp or edge abrasive particles were found.

#### 3.6 Foamability

The foaming power (Foamability) of herbal toothpaste was determined by taking 2gm of toothpaste with 5ml water in

measuring cylinder initial volume was noted and then shaken for 10 times. Final volume of foam was noted.

### 3.7 Determination of Moisture and Volatile Matter

Moisture and volatile matter was determined by using 5gm of herbal toothpaste was placed in a porcelain dish of about 6-8cm in diameter and 2-4cm in depth. Dried in an oven at 105°C.

### 3.8 Determination of Spreadability

For determination of Spreadability method slip and drag characteristic of paste involve. The about 1-2g of herbal toothpaste was weighed and placed between two glass slides (10 x 10cm) one over each other (sliding, shall not take place), and the slides were pulled in opposite direction. Measure the spreading (in cm) of the toothpaste after 3 minutes. Repeating the experiment and noted the average value of three readings.

### 3.9 Anti-Microbial Activity

In-vitro anti-bacterial study of formulated paste was performed by disc diffusion method against a pathogenic bacterial strain *S. aureus*. *S. aureus* was initially cultured cells were tend to multiple in the agar plates. Initially plates were streaked with inoculum, bores were made with 5mm diameter into the medium using a sterile cork borer. The surface of the agar plate was rotated to ensure an equal distribution of inoculums present around the bore. Then the formulated paste and marketed formulations were placed in the bores on the cultured plates. The plates were wrapped with paraffin, labelled, and incubated at 37°C for the 24 hour. Each plate was examined after incubation for 24 hrs. The diameter of zone of inhibition (ZOI) was measured in millimeters (mm) with a ruler.

## IV. RESULT & DISCUSSION

In the present scenario, people need a cure for various teeth problems without side effects. Herbal ingredients opened the way to formulate cosmetics without any harmful effects. Herbal Toothpaste is considered as a good way of tooth cleaning. We found good properties for the herbal Toothpaste as a cosmetic product. Herbal Toothpaste is used to clean the teeth and kill the bacteria's. The advantage of herbal cosmetics is their nontoxic nature, reduction of allergic reactions, and time tested usefulness of many ingredients. This formulated Herbal Toothpaste was good quality and passed in all evaluation parameters.

### 4.1 Physical Examination (Color, odour, taste, smoothness, relative density)

Formulated herbal toothpaste was evaluated visually for its colour i.e. Yellowish Brown. Odour was found by smelling the product i.e. Aromatic and Characteristic. Taste was checked manually by testing the formulation.

**Table 3:** Visual inspection

Test	Result
a)Color	Yellowish brown
b)Odor	Aromatic and characteristic
c)Taste	Sweet
d)Smoothness	Good consistency & smooth texture

### 4.2 Inertness of Tube

The internal parts of all collapsible tubes have given no sign of corrosion or damage during normal storage conditions at a temperature of 45±20C for 10 days. So it was confirmed that the containers of formulated herbal toothpaste have shown good tube inertness.

**Table 4:** Inertness of tube

Sr. No.	Parameter	Observation
1.	Inertness of tube	No sign of corrosion or damage

### 4.3 Ph

The pH of formulated herbal toothpaste was found to be 9.10 and its ranges from 7-10.

**Table 5: pH**

Sr. No.	Parameter	Observation
1.	PH	9.10

#### 4.4 Homogeneity

In the homogeneity test of herbal Toothpaste it was observed that Toothpaste is homogeneous.

**Table 6: Homogeneity**

Sr. No.	Parameter	Observation
1.	Homogeneity	Toothpaste is homogeneous.

#### 4.5. Determination of sharp and edge abrasive particles

No sharp or edge abrasive particles were found.

**Table 7: Particle Evaluation**

Sr. No.	Parameter	Observation
1.	Particle evaluation	No sharp or edge abrasive particles were found.

#### 4.6 Foamability

Foam Increase in 1.5cm to compared with initial volume.

**Table 8: Foam Test**

Sr. No.	Parameter	Observation
1.	Foam test	1.5cm

#### 4.7 Determination of loss of drying

The weight of 10gm of herbal toothpaste weight was decrease in 2gm

**Table 9: Loss of drying**

Sr. No.	Parameter	Observation
1.	Loss of drying	2gm

#### 4.8 Determination of Spreadability

1 gm of herbal toothpaste spread in 3 cm.

**Table 10: Spreadability**

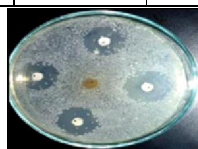
Sr. No.	Parameter	Observation
1.	Spreadability	3cm

#### 4.9 Anti-Microbial Activity

Formulated herbal toothpaste has good antimicrobial activity. Zone of inhibition(ZOI) was found to be 15mm.

**Table 11: Anti-Microbial Activity**

Sr. No.	Bacteria	Observation
1.	<i>S. aureus</i>	15mm



### V. CONCLUSION

Following conclusion can be drawn from the results obtained in the present work of investigation. This herbal toothpaste is maintaining the oral hygiene and safer with minimum side effect than chemical based synthetic toothpaste.

Formulated toothpaste is capable to maintain the tooth and oral hygiene and shows antimicrobial activity against microbes like *S. aureus*. Evaluation and comparison of results with commercial Herbal toothpaste are demonstrated that formulated herbal toothpaste. The formulated herbal toothpaste has good scope in the future by increasing natural ingredients for manufacturing more and safer natural remedies, in the research and health of dental care of public, society and nation. It is concluded that formulated Herbal toothpaste was found to be of good quality.

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