



Preparation and Evaluation of Herbal Toothpaste

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Abstract: Toothpaste is commonly used product by all individuals. Toothpaste is generally used for cleaning teeth and mouth. It is also used to treat many teeth disorders. Many dentists recommend using toothpaste to treat disorder like sensitivity, Chronic gingivitis etc. Herbal toothpastes can be prepared using different herbal extract of many crude drugs having antibacterial, antimicrobial activity. Herbal formulation of toothpastes is prepared using herbs like ginger, Cassia simmia, Celastrus paniculata, Vateria indica extracts, Babul leaves extract, Ginger extract, Lemon oil extract, Neem stem & bark, Babul leaves, Guava leaves, Kalmi bark etc. These herbal toothpastes can be evaluated by different tests like Physical Examination, Relative density, Abrasiveness, Determination of spreadability, pH determination, Homogeneity, Foaming, Stability, Determination of moisture and volatile matter, Moisture content, Foaming character, Organoleptic evaluation, pH, Fragrance test, Shape retention, Storage stability, Total flavonoid content estimation of Tooth paste Formulation, Stability study (Storage stability), Antimicrobial activity of toothpaste etc. The main objective of this review article is to compile the available information related to herbal toothpaste like its introduction, different formulations and different parameters on which these herbal toothpastes can be evaluated. This information can be used by many researchers who want to do research in this area.

Keywords: Herbal toothpaste, Ginger, Neem, Kalmi Bark, Guava Leaves

1. Introduction

Since ancient times, toothpastes have been used¹ and are a vital, indispensable part of oral healthcare. From 300 to 500 BC, formulas for toothpaste were developed in China and India. A dentifrice called toothpaste is used to clean, preserve, and enhance the health of teeth. The primary purpose of toothpaste is to encourage oral hygiene.

The term “herbal medicine” refers to the use of any plant material for therapeutic and disease-treating purposes. Herbal remedies have been used extensively throughout human history, and the World Health Organization (WHO) estimates that around 80% of people used herbal remedies as their primary form of healthcare.

Additionally, it has been shown that over 35,000 plant species are employed for medicinal purposes in numerous human societies around the globe². Some of them have strong antibacterial, antiviral, anticancer, and antifungal properties. The most popular preventive method for oral health care is toothpastes.

Many dentifrices sold commercially make claims about having antibacterial characteristics, although little study has been done to verify these claims. As a result, this study was carried out to assess the effectiveness of various toothpaste formulations in lowering the oral microbial burden. The formulas of the chosen toothpastes were successful in reducing the microbial load, which helped to maintain good oral hygiene.



The efficiency of the various chemicals used in the toothpaste, however, is less important for maintaining excellent oral health than using proper oral hygiene practices and brushing techniques. One of the most prevalent oral conditions with a significant incidence worldwide is chronic gingivitis. The primary cause and initiating factor for the onset of gingivitis is dental plaque. However, due to the limitations of mechanical approaches, it is also thought to be a suitable supplement to the control of mechanical plaque to add some safe and effective medications to prevent gingivitis to toothpaste. According to studies, toothpaste additives like triclosan and chlorhexidine directly prevent plaque from forming on teeth.

The major purposes of semisolid toothpaste formulations are oral cavity cleaning and oral hygiene maintenance. Today, toothpaste is seen as a basic human need because cleaning the mouth before bedtime prepares one for the day. Many commercially available toothpaste formulations are made with synthetic excipients; however, some formulations are made with herbal extracts. Some of the chemical ingredients that have been added to toothpaste and mouthwashes have been demonstrated to lessen the development of dental plaque.

The use of “herbal” medicine has generated interest and aided in the establishment of complementary and alternative therapies in the field of health care promotion as a result of a greater understanding of indigenous medicinal traditions in many regions of the world. Reduced oral bacterial flora and fluoride delivery are toothpaste’s primary goals. This is because fluoride, which is naturally present in many commonplace items including food and water, has been shown to protect teeth against bacterial attack.

To promote dental health, toothpaste that effectively decreases oral bacterial flora should be used. Typically, triclosan is found in gum. Because of its antibacterial qualities, it is a component used to prevent gum disease. It is also known that sodium fluoride, the active component, has antimicrobial effects. Natural toothpastes are ones that don’t contain fluoride or triclosan. They typically include natural compounds like lemon, eucalyptus, rosemary, chamomile, sage, and myrrh extracts as well as particular mineral salts like sodium fluoride and sodium chloride. With the aid of excipients found in toothpaste, the mechanical action of the toothbrush performs the majority of the cleaning. 6–8 Because they contain active chemical ingredients like polyphenols, gums, alkaloids, glycosides, and other substances, many herbal formulations are particularly effective. These formulations have also been investigated for various biological activities.

The main purpose of toothpaste is to reduce oral bacterial flora and deliver fluoride to the teeth. This is because fluoride has been proven to protect teeth against attack from bacteria and can be found naturally in many everyday things including food and drinking water.

Toothpaste that efficiently reduces oral bacterial flora should contribute to dental health. Triclosan is usually used in gum. It is a constituent used to avert gum disease because of its antibacterial properties. The active ingredient sodium fluoride is also known to have antibacterial properties. Natural toothpastes are those without triclosan or fluoride. They usually contain natural ingredients such as special mineral salts e.g. Sodium Fluoride and Sodium Chloride, and plant extracts like lemon, eucalyptus, rosemary, chamomile, sage and myrrh.

Objective of Herbal Toothpaste

1. The plant extracted ingredient has antibacterial properties.
2. The formulation of an herbal toothpaste that can satiate every prerequisite for maintaining oral hygiene and preventing bacterial tooth decay.

Ideal Properties of Toothpaste

1. **Strong abrasive action**
2. Non-toxic and non-irritating
3. Leave no stains on the teeth.
4. Maintain a healthy and clean mouth
5. Long-lasting impact
6. Accessible and affordable
7. It shouldn’t hurt the oral fluid and tissue.
8. It shouldn’t discolour teeth.
9. It should taste good and have a pleasant aroma.



10. Should not have any drug resistance that was induced.

Advantages of Herbal Toothpaste

1. Simple to use
2. ADA has approved numerous products.
3. Fluoride may be present to prevent cavities.
4. No one wants their body to be filled with chemicals, and even toothpaste sold in stores contains these harmful substances. To prevent tooth decay, we must use the natural alternatives that are already available. Herbal toothpaste provides a lot of benefits.
5. Sodium laurel sulphate, a component of commercial toothpaste, can irritate and inflame the gums while brushing. But there are no chemical ingredients in herbal toothpaste.
6. Natural oral care products work well to get rid of bacteria and maintain a healthy mouth.
7. Herbal toothpaste contains peppermint and spearmint oils, which aid in killing bacteria.

Disadvantages of Herbal Toothpaste

1. Organically certified herbal toothpaste is the safest option; otherwise, our teeth could potentially be endangered.
2. It shouldn't include cinnamon or any synthetic chemicals or dyes.
3. May originate from producers who aren't honest about their business operations or who don't adequately label substances, including fluoride, which some people find concerning.
4. Long-term use of excessive amounts of fluoridated toothpaste can cause fluorosis. If toothpaste is ingested in any amount continuously, it can be acutely poisonous.
5. of toothpaste has been found to be the real culprit in the development of some conditions, including tooth sensitivity and enamel thinning.
6. Chloroform, a human carcinogen, is created when the active ingredient in many toothpastes, triclosan, combines with the chlorine in tap water.
7. According to some scientists, it can cause brain damage to unborn children.

Formulations: 1

Formulation of Ginger Toothpaste:

Sr. No.	Ingredients(gm)	Quantity(w/w) %
1.	Ginger oil (ACTIVE INGREDIENT)	2 ml
2.	Sodium lauryl sulphate	1.5 gm
3.	Sodium benzoate	0.1 gm
4.	Sodium saccharine	0.2 gm
5.	Glycerin	40 ml
6.	Calcium carbonate	44 gm
7.	Pepper mint oil	QS

Preparation of base

1. The solid ingredients calcium carbonate, sodium lauryl sulphate, glycerin, sodium benzoate, sodium saccharine were weighed accurately as mentioned in the formula and sieved with sieve no.80 so as to maintain the particle size.
2. These ingredients were also mixed in a mortar and pestle, then triturated with precisely weighed glycerin until a semisolid substance was created.
3. Addition of herbal ingredients.
4. Accurately weighed herbal extract in form of ginger oil were added to the base.
5. At the end, peppermint oil was added as a flavor.

Formulation -2

The ingredients for the herbal toothpaste were all dried and ground in a kitchen mixer. The necessary number of components were measured out and put into a mortar. Water was combined with calcium carbonate, sodium lauryl



sulphate, methyl cellulose, honey, and glycerin. The mixture above included acacia. Drop by drop, this solution was put to a mortar together with herbal components, and it was thoroughly triturated to make a paste.

Composition

Sr. No	Ingredients	Quantity
1.	Neem stem and bark	0.5
2.	Babul leaves	0.5
3.	Guava leaves	0.5
4.	Kalmi bark	0.5
5.	Camphor	0.5
6.	Honey	0.5
7.	Calcium carbonate	3.5
8.	Glycerin	2.0
9.	Para hydroxyl benzoic acid	0.3
10.	Sodium lauryl sulfate	0.5
11.	Sodium chloride	0.2
12.	Distilled water	Q.S.

Formulation- 3

Polyherbal Toothpaste:

The poly-herbal toothpaste was prepared using Cassia simmia plant (pods), Celastrus paniculata (leaves), Vateria indica (gum resin) babul (leaves) are acts as possessing antibacterial properties and anti-inflammatory properties. Ginger (rhizome), lemon oil acts as a antiseptic activity, turmeric acts as antimicrobial and anti-inflammatory properties, calcium carbonate acts as a abrasive agent, glycerin acts as humectants sodium lauryl sulphate as detergent, sodium saccharin acts as a sweetening agent, para hydroxyl benzoic acid is used for preservative, menthol used for flavouring agent amaranthacts as a colouring agent and water as aqueous media. All above herbal extract was used to formulate the poly-herbal toothpaste.

Sr. No.	Ingredients	Quantity (%)
1.	Cassia simmia, Celastrus paniculata, Vateria indica extracts	9
2.	Babul leaves extract	3
3.	Ginger extract	4
4.	Lemon oil extract	3
5.	Sodium saccharin	0.25
6.	Turmeric extract	3
7.	Para-hydroxyl benzoic acid	0.1
8.	Amaranth	0.50
9.	Calcium carbonate	35
10.	Glycerin	25
11.	Sodium lauryl sulphate	1
12.	Menthol	1.5
13.	Water	Q.S.

Formulation- 4

Carboxymethyl cellulose was triturated with methyl paraben and propyl paraben by using mortar and pestle. Sodium Lauryl Sulphate was dissolved in 25 ml of demineralized water and added sufficiently along with 5 g of glycerin. The mixture was triturated well. Finally, calcium carbonate and peel extracts of pomegranate, mango, and lemon have added the mixture and triturated to form a paste. Lastly, few drops of mint oil were added to mask the taste.



The composition of herbal toothpaste was shown on the table.

Sr. No.	Components	Amount
1.	Pomegranate peel extract	5 g
2.	Lemon peel extract	5 g
3.	Mango peel extract	5 g
4.	Carboxymethyl cellulose	3 g
5.	Calcium carbonate	20 g
6.	Glycerin	5 ml
7.	Methylparaben	0.5 g
8.	Propylparaben	0.25 g
9.	Sodium Lauryl Sulphate	1 g
10.	Mint oil	0.5 %
11.	Demineralized water	25 ml

2. Evaluation of Toothpaste

1. Physical examination

- Colour- Formulated toothpaste was evaluated for its colour.
- The visually colour was checked.
- Odor- Odor was found by smelling the product.
- Taste- Taste was checked manually by tasting the formulation

2. Relative density- Relative density was determined by weight in gram taken in 10 ml formulation and 10 ml distilled water using RD bottle Evaluation Parameters

3. Abrasiveness- Extrude the content 15-20 cm long on the butter paper, repeat the same process for at least ten collapsible tubes. Press with the contents of the entire length with fingertip for the presence of sharp- and hard-edged abrasive particles. Toothpaste shall not contain such particles.

4. Determination of spreadability- In this method slip and drag characteristic of paste involved. Formulated paste (2g) placed on the ground slide under study. The formulated paste is placed like a sandwich between this slide and another glass slide for 5min to expel air and to provide a uniform film of the paste between slides. Excess of the paste was scrapped off from the edges. The top plate was then subjected to a pull of 80g with the help of string attached to the hook and time (sec) required by the top slide to cover a distance of 7.5cm was noted. A short interval indicated better spreadability.

Formula was used to calculate spreadability:

$$S = M \times L / T$$

Where, S= Spreadability,

M= Weight in the pan (tied to the upper slide)

L= Length moved by the glass slide

T=Time (sec) taken to separate the upper slide from the ground slide.

5. pH determination

The pH of formulated herbal toothpaste was determined by using pH meter. 10g of toothpaste placed in 150ml of beaker. Allow the 10ml of boiled and then cooled water. Stir vigorously to make a suspension.

6. Homogeneity

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



7. Foaming

The foamability of formulated toothpaste evaluated by taking small amount of formulation with water in measuring cylinder initial volume was noted and then shaken for 10 times. Final volume of foam was noted Determination of froth power $\text{Foaming power} = V1 - V2$

V1- Volume in ml of foam with water.

V2- Volume in ml of water only.

8. Stability

The stability study was performed as per ICH guideline. The formulated paste was filled in collapsible tube and stored at different temperature and humidity conditions, $25^{\circ}\text{C} \pm 2^{\circ}\text{C} / 60\% \pm 5\% \text{ RH}$, $30^{\circ}\text{C} \pm 2^{\circ}\text{C} / 65\% \pm 5\% \text{ RH}$, $40^{\circ}\text{C} \pm 2^{\circ}\text{C} / 75\% \pm 5\% \text{ RH}$ for the period of three months and studied for appearance, pH and spreadability.

9. Determination of moisture and volatile matter

5 g of formulation placed in a porcelain dish containing 6-8 cm in diameter and 2-4 cm depth in it. Dry the sample in an oven at 105°C .

Calculation By mass = $100\text{MI}/\text{M}$

MI-Loss of mass (g) on drying

M- Mass (g) of the material taken for the test.

10. Moisture content

Toothpaste (10 gm) weighed in a Porcelain dish and dried it in the oven at 105°C . It was cooled in a desiccater. The loss of weight is recorded as percentage moisture content and calculated by the given formula.

$$\% \text{ Moisture} = \frac{\text{Original sample weight} - \text{dry sample weight}}{\text{Original sample weight}}$$

11. Foaming character

1) 1 gm of toothpaste was poured into the stoppered test tube (height 16 cm. diameter 6 mm) and volume of the liquid was adjusted with the water up to 10 ml. Tube was stopped and shaken length wise, motion for 16 second, two shake/second. Allowed to stand for 15 minutes and the height of the foam produced was measured.

2) 10% solution of toothpaste was prepared. 4ml of this solution was added to 146 ml of water at 30°C . The solution was agitated for 10 seconds. The foam was poured into a 100 ml graduated cylinder to overflow. A rubber stopper was gently dropped into the foam. The time for the rubber stopper to pass two points (40ml/80ml) was measured. Longer time of fall indicates the denser and more stable foam.

12. Organoleptic evaluation

Organoleptic evaluation (colour, taste) was done by sensory and visual inspection.

13. Ph

pH was tested by dissolving 1 gm product in to 9 ml of water and shaken vigorously then aqueous solution and pH is observed by pH meter.

14. Fragrance test

It was based on individual observation for its acceptability. 5 people were asked for acceptability of fragrance and their opinion was taken. And fragrance was evaluated based on the below-described criteria; A) The fragrance was good, as good as the fragrance of reference toothpaste. B) The fragrance was not so good but comparable to the reference toothpaste. C) The fragrance of the toothpaste was poor than the reference toothpaste.

15. Stability condition (Storage stability)

Toothpaste was stored at 40°C and $\text{RH } 75\% \pm 5\%$ for 45 days. Estimation of Flavonoids was performed at zero period and then samples were withdrawn after every 9 days, total 5 samples were withdrawn. Toothpaste (1 gm) was refluxed with distilled water (75 ml) for 30 min. for complete extraction of flavonoids and filtered through sintered glass funnel by vacuum filtration assembly. The filtrate was centrifuged at 2000 rpm for 20 minutes, the supernatant was collected in 100 ml volumetric flask and volume was made up with water. The same procedure was performed for each sample and solutions (100 ml) of their Total flavonoids content were determined



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