



FORMULATION AND EVALUATION OF HERBAL TOOTHPASTE

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ABSTRACT

Toothpaste is frequently employed. Typically, toothpaste is used to clean the mouth. Additionally, it is utilised to treat conditions including sensitivity and chronic gingivitis. Herbal extracts of numerous crude medications with antibacterial and antimicrobial properties can be used to make herbal toothpaste. Teeth Herbs such as ginger, clove, and peppermint are used in commercial herbal toothpaste formulations. Commercial herbal toothpastes including Himalaya, Meswak, and Dent County have all had their quality assessed in the current study. The goal of the current research is to create herbal. Toothpaste using plant extracts such as Neem, Tulshi Leaves, and Guava Leaves as well as Camphor, Honey Leaves Extract, Ginger, Lemon Oil Extract, Neem Stem & Bark, Babul Leaves, and other substances.

1. INTRODUCTION

Since ancient times, toothpastes have been used and are a vital component of oral healthcare. 300–500 BC saw the design of toothpaste formulation 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 medicines" refers to the utilisation of any plant material for therapeutic and disease-treating reasons. Throughout human history, there has been extensive usage of herbal remedies, and the World Health Organization (WHO) estimates that 80% of people utilise herbal medicine as their primary form of treatment. Additionally, it has been shown that over 35,000 plant species are employed for medicinal purposes in numerous human societies around the globe. Some of them have strong antibacterial, antiviral, anticancer, and antifungal properties.^[1]

Toothpaste is one of the popular preventive techniques in dental treatment. 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 in the toothpastes used, however, is less important for maintaining excellent oral health than using the proper oral hygiene practices and brushing technique. One of the most prevalent oral conditions is chronic gingivitis illnesses with a significant global prevalence.^[2] 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 with toothpaste. The use of "herbal" medicine has sparked interest because of a greater understanding of traditional medical procedures used throughout the world. It also facilitated fluoride to be delivered to the teeth by toothpaste while also reducing the amount of oral germs.^[3]

This is due to the fact that fluoride, which is naturally present in many items found in daily life like food and water, has been shown to protect teeth from bacterial attack. To improve dental health, toothpaste that effectively decreases oral bacterial flora should be used. Gum typically uses triclosan. Because of its antibacterial qualities, it is a component that is used to prevent gum disease. Natural toothpaste is that which doesn't contain fluoride or triclosan. Typically, they include natural substances like specific mineral salts like sodium fluoride and sodium chloride. Plant extracts such as lemon eucalyptus, rosemary, chamomile, sage, and myrrh are also used, as is sodium chloride.^[4]



1.2. BENEFITS OF HERBAL TOOTHPASTE

Safely cleans your teeth.
Effectively makes your breath fresh.
Reduces and prevents gum discomfort.
Removes stains^[5]

- **OBJECTIVE OF HERBAL TOOTHPASTE**

1. The plant extract 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]

- **ADVANTAGES OF HERBAL TOOTHPASTE**

1. No one wants their body to be filled with chemicals, and even commercial toothpaste contains these harmful substances. To prevent tooth decay, we must use the natural alternatives that are already available. Herbal toothpastes provide a lot of benefits.
2. Sodium laurel sulphate, an ingredient in commercial toothpaste, can irritate and inflame^[7]

- **DISADVANTAGES OF HERBAL TOOTHPASTE**

1. The organically certified herbal toothpaste is the safest option because other options could harm our teeth.
2. 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^{[15] [8]}

2. TYPE OF HERBAL TOOTHPASTE

Himalaya, Amar, Ayurvedic, Neem, Meswak, Vicco, Dabur

3. MATERIAL AND METHOD:- Herbal Extract

The herbs employed in the formulations of the present were shown in Table 1 together with their normal function in toothpaste. The botanical ingredients that went into creating multi-herbal toothpaste formulations.

Table 1: Information on Herbs used in toothpaste Formulations.

Sr no.	HERBS	SCIENTIFIC NAME	EFFECT
1	Neem	Azadirachta indica	Anti-inflammatory
2	Clove	Eugenia caryophyllus	Analgesic, Anticancer effects
3	Pippermint	Mentha piperita.	Antiviral, antiseptic effect
4	Betel	Piper betle	Antiulcer, Anti-diabetic
5	Turmeric	Curcuma Longa Linn	Antioxidant, Antimicrobial



Collection of herbs

1. Neem stem and bark.



Fig. 1: Neem and bark.

Neem is a special medicinal plant in that all of its parts, including its leaves, flowers, seeds, fruit, roots, and bark, can be used. This is why it is sometimes referred to as "the village pharmacy."^[9]

2. Clove



Fig 2: clove

Syzygium aromaticum, a tree in the Myrtaceae family, produces cloves as its aromatic flower buds. Synonyms include *caryophyllum*, *laung*, and *clove buds*.

Uses

To aid in the destruction of microorganisms as an antibacterial.

As a painkiller for ailments like toothaches and muscular pain.

As an expectorant and treatment for unsettled stomach, clove is utilised.

For stomach distress, nausea, and intestinal gas, clove and clove oil are utilised.^[10]

3. Peppermint



Fig. no. 3: Peppermint.



A mix of spearmint and watermint, peppermint (*Mentha pipefitter*) is a species of mint. Red gum, menthol, peppermint gum, liquorice are all synonyms.

Uses

The common cold, sinus infections, headaches, irritable bowel syndrome (IBS), and other digestive issues^[10]

4. Betel



Fig. no. 4: Betel.

A member of the Piperaceae family, which also contains pepper and kava, the betel (*Piper betle*) is a vine. Betel plants are grown for their leaves, which are most frequently used to flavour areca nut eating. Betel-pepper, piper betel are synonyms^[16]

Uses

An antibacterial, a stimulant, and a breath refresher It benefits diabetics.
It eases asthma symptoms.
It promotes wound healing.
It enhances dental health^[11]

3. Turmeric



Fig. no. 5: Turmeric.

A member of the Piperaceae family, which also contains pepper and kava, the betel (*Piper betle*) is a vine. Betel plants are grown for their leaves, which are most frequently used to flavour areca nut eating. Betel-pepper, piper betel are synonyms.

Uses

an antibacterial, a stimulant, and a breath refresher It benefits diabetics.
It eases asthma symptoms.
It alleviates depression.
It works against cancer^[12]



4. Glycerine



Fig. no. 7: Glycerin.

Glycerol is another name for glycerin.

It is a sweet-tasting, colourless, odourless, viscous liquid that is non-toxic. Glycerides, a class of lipids, contain the glycerol backbone^[17]

Uses

Laxative hyperosmotic

Transport for a variety of pharmaceutical formulations.

Preservative^[13]

13.Honey



Fig. no. 14: Honey

An alternative to sugar that is healthy is called madhu. In drinking, cooking, and baking, honey can take the place of sugar.

- Attending to wounds and burns. Burns and wounds can be treated with honey.
- Acne treatment.
- Resistance to allergies to pollen.
- Organic cough medicine^[14]



4. Method of preparation of toothpaste

Trituration Method

All the herbal extracts (powders) were collected and Used to prepare the multi herbal toothpaste. The exact Quantities of ingredients were weighed using a digital Weighing balance (FB 600 Essae, Teroka). Then the Weighed herbal powders of Neem, Clove, Turmeric, Peppermint, and Betel were added to the mortar in Increasing order of their proportion. Then properly Triturated with the help of pestle. Then sodium lauryl Sulfate, calcium carbonate, and sorbitol are added and Properly mixed. Further glycerine, tragacanth gum,

FORMULATION TABLE

SR.NO	Excipients	BatchF1	BatchF2	BatchF3
1	Neem extract	1	1.5	1
2	Clove	0.5	1	1
3	Peppermint	1.5	1	1
4	Betel	1	0.5	1
5	Turmeric	1	1	1
6	Calcium carbonate	12.5	12.5	12.5
7	Glycerine	2.5	2.5	2.5
8	Sodium lauryl sulfate	0.5	0.5	0.5
9	Tragacanth gum	0.25	0.25	0.25
10	Sodium chloride	0.25	0.25	0.25
11	Sorbitol	0.25	0.25	0.25
12	Propylparabean	0.5	0.5	0.5
13	Carboxy methyl cellulose	0.25	0.25	0.25
14	Distilled water	10 -20	10-20	10-20

5. EVALUATION OF HERBAL TOOTHPASTE

Physical examination: - The formulations for multi-herbal toothpaste were created. and the results were reported. Were tested for organoleptic parameters like colour, taste, and odour.

(1) pH determination

Using pH paper, the formulation's pH was determined. 100 ml of distilled water were used to dilute 1 gm of produced herbal toothpaste, and one drop of the diluted paste was added. The regular colour strip is compared with the pH paper that was poured and the colour shift. The formulation's pH is then noted.

Viscosity

Using a Brookfield viscometer, the viscosity of each toothpaste formulation was determined (LVDVE Brookfield Engineering Labs, USA) First, the created toothpaste formulation was stored in a narrow mouth container, and the spindle of the Brookfield viscometer was submerged inside of it for two minutes. Using a Brookfield viscometer with a number 64 spindle and 100 rotations per minute, the viscosity of all the manufactured Multi herbaltoothpaste was measured. To determine the average viscosity of the formulations, dial readings were taken three times. The results were then reported.

• Foamability

1. In a test tube with a stopper (height 16 cm, diameter 6 mm), 1 g of toothpaste was added. The liquid's volume was then increased by 10 ml with water. The tube was stopped and shaken for the desired length of time at a rate of two shakes per second. 15 minutes of standing time was given, and the height of the foam created was measured.

• Fragrance test

It was evaluated for acceptability based on personal observation. The opinions of five people on the acceptability of the fragrance were taken. The following criteria were used to evaluate scent:

- The aroma was good, on par with the fragrance of the toothpaste used as a reference.
- The aroma wasn't great, but it was equivalent to the toothpaste used as a reference.
- The toothpaste's aroma was inferior to that of the standard toothpaste.



- **Homogeneity**

By applying normal force at 2720C, toothpaste must extrude a homogenous mass from the collapsible tube or any other suitable container. Additionally, the bulk of the contents must protrude from the container's crimp before being gradually rolled

- **Stability**

The stability study was conducted in accordance with ICH guidelines.

The prepared paste was placed within a collapsible tube and stored for three months at various temperatures and humidity levels, including 25°C, 2°C, and 60%, 65%, and 5%, respectively. Moreover, spread ability, pH, and appearance were examined

- **Determination of Abrasiveness**

Extrude the material onto the butter paper until it is about 15-20 cm long. Repeat this process to create at least ten collapsible tubes. Check the length of the contents with the tip of your finger for any sharp or hard-edged abrasive particles. Such particles are not permitted in toothpaste.

- **Shape Retention**

The toothpaste was completely applied to a toothbrush after being squeezed out of the tube, and its condition was assessed after being let to stand for 10 seconds using the following criteria:

A). The toothbrush retains its shape after the toothpaste has been squeezed upon it.

B). After applying toothpaste, the toothbrush practically retains its original shape.

- **Moisture content**

Weighted toothpaste (10 gramme) was placed in a porcelain plate and dried in a 105°C oven. It was desiccated to chill it. The percentage moisture content loss is calculated using the provided formula.

% Moisture = $\frac{\text{Dry sample weight} - \text{Original sample weight}}{\text{Original sample weight}} \times 100$

Original sample weight and weight.

- **Extrudability**

In this technique, the prepared paste was placed inside a collapsible aluminium tube with a standard cap and sealed by crimping the end. It was noted what tubes weighed. The tubes were clamped after being positioned between two glass slides. After adding 500g, the cover was taken off the slides. The extruded paste's volume was gathered and weighed. It was determined what percentage of the paste was extruded.



- **Determination of Spreadability**

The spreadability of the product is assessed using the following procedure:

Place a product on the glass plate in the centre.

Next, carefully instal a second plate on top of it and add 1 kg of weight to the setup's highest point. Remove the after some time has passed, then gauge the diameter in cm.



6. RESULT AND DISCUSSION

The trituration process was used to develop the multi-herbal toothpaste formulations, which were then tested for various in vitro parameters. The in vitro Characteristic results were also contrasted with commercially available Toothpaste formulations. Comparatively equivalent and occasionally greater results have been seen in the current investigation with the designed herbal toothpaste compared to the marketed herbal toothpaste. The discovered multi-herbal toothpaste formulations exhibit a mud green hue, a nice odour, smoothness, and sweetness, according to organoleptic assessments. Table.3 presented the outcomes. In comparison to commercial formulations, laboratory-made formulations have the normal physical qualities of a toothpaste composition. Organoleptic evaluations of Toothpaste.

Formulations

Sr .no	Evaluation parameter	Batch F1	Batch F2	Batch F3
1	Colour	Mud green	Mud green	Mud green
2	Odour	Pleasant	Pleasant	Pleasant
3	Taste	Sweet	Sweet	Sweet
4	Smoothness	Smooth	Smooth	Smooth

The created formulations' pH values were determined to be between 6.7 and 6.8, which is suitable with formulating a standard toothpaste formulation. The range of developed formulations' viscosity was determined to be between 5633 and 6345 cps. This feature of viscousness indicates a thick paste consistency.

Sr no	Parameter	F1	F2	F3
1	PH	6.8	6.9	6.9
2	Viscosity	5634	5638	5647
3	Extrudability	85	91	92
4	Foambility			
5	Spreadability	51	56	55
6	Abresiveness			
7	Homogenicity			
8	Stability			
9	Shape Retention			
10	Moisture content			

The toothpaste formulation's good abrasion capabilities are confirmed by the abrasiveness test. The particular formulation's homogeneous particles, which are responsible for the whitening of teeth following abrasion, are indicated by the good abrasive Property. The current composition is well-absorbent.

7. CONCLUSION

All commercially available herbal toothpaste and lab-made versions were assessed and compared to Bureau of Indian Norms Standards. Toothpaste that has been specially formulated Is capable of maintaining tooth and oral hygiene and has antibacterial activity against microorganisms such as E. By expanding natural ingredients for making more and Safer natural medicines, the designed herbal



toothpaste has a bright future in research and dental care for the public, Society, and nation. It was determined that the developed herbal toothpaste was of good grade. Multi herbal toothpaste containing neem, peppermint, Clove, turmeric, and betel was prepared using the Trituration method. The 3 formulations coded with F1, F2, and F3 were prepared and compared with Commercially marketed products. All these three formulations showed good evaluation Results when compared with marketed products those are Meswak, Patanjali, and Babool

8. REFERENCE

1. Review on formulation and evaluation on Herbal Toothpaste by Prabhu K. Halakatti¹, Anita Desai¹, Mahantesh Moogi², Mahantesh Patted², Ashok Guntaj², Pallavi Jakati.
2. Review on Formulation and evaluation on Herbal Toothpaste by Nikita M. Rathi, Shital V. Sirsat, Sanket S. Toshniwal, Nikita T. Zagare, Shaikh Fazil Shaikh Mahamad
3. Review on Formulation and evaluation on Herbal Toothpaste by T.Mangilal 1 M.Ravikuma.
4. Review on formulation and evaluation on Herbal Toothpaste by Mr. Sable Kundan 1, Mr. Bhati Deepak 2, Mr. Havelikar Ujwal 3 Mr. Ghuge Saurabh Dr. Thorat Rajendra.
5. Review on formulation and evaluation on Herbal Toothpaste by Urmila Nishad¹, Meraj Ali², Anupama Maurya³.
6. Review on formulation and evaluation on Herbal Toothpaste by Kavita Varma Shukla, Deepika Kumari
7. Chowdhury BR, Garai A, Deb M, Bhattacharya S Herbal toothpaste-A possible remedy for oral cancer. *Journal of Natural Products* 2013; 6:44-55
8. Mohan Kumar KP, Priya N K. Madhushankari GS. Anti-cariogenic efficacy of herbal and conventional tooth pastes a comparative in-vitro study. *J Int Oral Health*. 2013;5(2):8-13.
9. Varma SR, Sherif H, Serafi A, Fanas SA, Desai V. Abuhijleh E, Al Radaidah A. The antiplaque efficacy of two herbal-based toothpastes: A clinical intervention. *J Int Soc Prevent Communit Dent* 2018; 8:21-7
10. Fabiana Ozaki, et al Efficacy of a herbal toothpaste on patients when established gingivitis-a randomized controlled trial *Braz Oral Res*. 2006;20(2):172-7,
11. Mullaly BH, James JA, Coulter WA, Linden GJ. The efficacy of an herbal based toothpaste on the control of plaque and gingivitis. *J Clin Periodontol* 1995;22(9):686-9
12. Karadaglioglu Ol, et al. Antibacterial activities of herbal toothpaste combined with essential oils against *S. mutans*. *Pathogens*. 2019 Feb 1:8(1).pii: E20
13. Lippert F (2013). "An Introduction to Toothpaste – Its Purpose, History and Ingredients". In van Loveren C (ed.). *Monographs in Oral Science*. Vol. 23. Basel: S. Karger AG. Pp. 1–14. Doi:10.1159/000350456. ISBN 978-3-318-02206-3. PMID 23817056.
14. Aspinall SR, Parker JK, Khutoryanskiy VV (April 2021). "Oral care product formulations, properties and challenges" (PDF). *Colloids and Surfaces. B, Biointerfaces*. 200: 111567. Doi:10.1016/j.colsurfb.2021.111567. PMID 33454623. S2CID 231634828.
15. van der Weijden F, Slot DE (February 2011). "Oral hygiene in the prevention of periodontal diseases: the evidence". *Periodontology* 2000. 55 (1): 104–23. Doi:10.1111/j.1600-0757.2009.00337.x. PMID 21134231.
16. Davies R, Scully C and Preston AJ. Dentifrices- an update. *Medicina Oral Patologia Oral y Cirugia Bucal*. 2010; 15: 976-982.
17. Ersoy M, Tanalp J, Ozel E, Cengizlier R and Soyman M. The allergy of toothpaste: a case report. *Allergol Immunopathol*. 2008; 36: 368-370.