

# A Review :Complete Study of Composition, Formulation and Evaluation of Polyherbal Toothpaste

S. S. Hawaldar<sup>1</sup> and S.V. Gujar<sup>2</sup>

Students, Department of Pharmacology<sup>1</sup>

Asst. Professor, Department of Pharmacology<sup>2</sup>

Matoshri Miratai Aher College of Pharmacy, Karjule Harya, Parner, Ahmednagar, India  
gujarsagar.academic.7@gmail.com

**Abstract:** Oral hygiene can be maintained throughout the day by using various dentifrices prepared with herbal and synthetic ingredients. Oral hygiene is maintained to keep the mouth fresh and avoid tooth decay. The largest producer of healthful herbs is India which is known as the botanical garden of the world. The main aim of this work is to formulate and evaluate polyherbal toothpaste and compare it with marketed products of the same category. The toothpaste was prepared by using several herbal ingredients which show antibacterial, antiseptic, and cooling properties. Neem, clove, babool, banyan, amla, and many other natural products are used to formulate ideal herbal toothpaste which satisfies all the required properties to keep the mouth fresh and to prevent tooth decay caused by the bacteria. Dentifrices made from both synthetic and herbal substances can help you maintain good oral hygiene all day long. Maintaining good oral hygiene helps prevent tooth decay and keep the mouth feeling fresh. The world's botanical garden, India, is the world's largest producer of medicinal herbs. This work's primary goal is to create, assess, and contrast a polyherbal toothpaste with commercially available items in the same category. A number of botanical components with antibacterial, antiseptic, and cooling qualities were used to make the toothpaste. The perfect herbal toothpaste is made with neem, clove, babool, banyan, amla, and many other natural ingredients that fulfil all the necessary requirements to keep the mouth fresh and stop bacterial tooth decay. The trituration procedure is the one utilised to formulate the herbal toothpaste. To make sure the prepared toothpaste had every quality needed to combat dental illness, its organoleptic and physical properties—such as colour, odour, taste, stability, foamability due to bacteria, and abrasiveness—were assessed. Because of its negative effects, the herbal toothpaste that was created was therefore superior to the ordinary toothpaste.

**Keywords:** Herbal; Toothpaste; Formulation ; Evaluation ; Dentistry

## I. INTRODUCTION

Paste or gel dentifrice is used in conjunction with a toothbrush to clean and preserve teeth's appearance and health [1]. Dentifrice is defined as a smooth, semisolid, homogenous mass that contains binders, polishing agents, abrasives, humectants, and other elements that are necessary to maintain dental health [8,9]. Maintaining dental hygiene is crucial for one's self-confidence and "GOOD APPEARANCE AND IMPRESSION" [10]. Since non-alcoholic and herbal formulations don't include artificial colour, flavour, or fluorides—all of which have various disadvantages—more and more individuals these days are turning to them [13]. Powdered ashes, eggshells, myrrh, crushed ostrich, crab shell, bones, and animal horn were among the materials employed in ancient times across different parts of the world [17]. They developed a tooth powder around that time that had good abrasive effect and was later turned into toothpaste [19, 20, 21]. Maintaining good oral hygiene is essential to preventing cavities, tooth sensitivity, calculus, and periodontal disease, among other dental issues [33]. Herbal toothpaste is considered a dental hygiene product to keep teeth healthy [22].



( Source : Dental image therapy centre)

It mostly consists of plant components or their derivatives, which are intended to strengthen and protect teeth without having any negative side effects [12]. Since natural or herbal toothpaste mostly consists of plant-based compounds like lemon, eucalyptus, rosemary, chamomile, sage, and myrrh, it avoids negative consequences including carcinogenic action by excluding triclosan, fluorides, and other artificial chemical ingredients [15].



(Source- Dr. paul dental clinic)

## II. MATERIALS AND METHODS

### 2.1 Method-

Homogenization with a mortar and pestle to generate the toothpaste base is one technique utilised in the formulation of herbal toothpaste. Every ingredient needed to make the herbal toothpaste was gathered [5].

↓

Every component was thoroughly dried and ground into a powder [13].

↓

According to requirements, the powdered herbal ingredient was precisely weighed [17].

↓

To create a basis for the preparation, the components were combined with substances such polyethylene glycol, which is utilised as a solvent and humectant [3].

↓

In addition to the foundation components and herbal powder, stevia powder was added to the mortar and pestle as a sweetener [9].

↓

The herbal ingredients undergo thorough trituration until they produce a paste-like consistency [11].

### 2.2 Materials

#### Ingredient & their uses

| Sr. No. | Ingredient       | Uses                           |
|---------|------------------|--------------------------------|
|         | Ginger oil       | Antibacterial                  |
|         | Neem stem & bark | Prevent Cavities & gum disease |
|         | Babul leaves     | Astringent                     |

|  |                            |                                    |
|--|----------------------------|------------------------------------|
|  | Gauva leaves               | Prevent gum disease                |
|  | Camphor                    | Anti- inflammatory property        |
|  | Honey                      | Reduce plaque buildup              |
|  | Pepper mint oil            | Antimicrobial                      |
|  | Cassia simmia,             | Pain Releiver                      |
|  | Celastrus paniculata,      | Antiulcer                          |
|  | Vateria indica extracts    | Anti-inflammatory                  |
|  | Lemon oil extract          | Whiten Teeth & prevent tooth decay |
|  | Turmeric extract           | Anticavities                       |
|  | Para-hydroxyl benzoic acid | Preservative                       |
|  | Amaranth                   | To maintain healthy teeth          |
|  | Mint oil                   | Inhibit biofilm formation          |
|  | Demineralized water        | Vehicle                            |
|  | Sodium Chloride            | Remove Stain                       |
|  | Menthol                    | Strengthen teeth & gums            |
|  | Kambi extract              | For stronger teeth                 |
|  | Pomegranate peel extract   | Prevent teeth & gum diseases       |
|  | Mango peel extract         | Prevent dental caries              |
|  | Carboxymethyl cellulose    | Binding agent                      |
|  | Calcium carbonate          | Opalcifying agent                  |
|  | Glycerine                  | Humectant                          |
|  | Methylparaben              | Preservative                       |
|  | Propylparaben              | Preservative                       |
|  | Sodium lauryl sulphate     | For lower surface tension          |
|  | Sodium benzoate            | Anti-microbial                     |
|  | Sodium saccharine          | Flavoring agent                    |
|  | Mango peel extract         | Prevent dental caries[8,33,35,39.] |

### 2.3 Evaluation of Toothpaste

#### Physical Examination

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

#### Relative density

Relative density was determine by weight in gram taken in 10 ml formulation and 10 ml distilledwater using RD bottle  
Evaluation Parameters

#### 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 andhard edged abrasive particles. Toothpaste shall not contain such particles.

### **Determination of spreadability**

In this method slip and drag characteristic of paste involve. Formulated paste (2g) placed on the ground slide under study. The formulated paste placed like sandwich between this slide and another glass slides 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 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.

### **pH determination**

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

### **Homogeneity**

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

### **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 Foaming power =  $V_1 - V_2$

V1- Volume in ml of foam with water.

V2- Volume in ml of water only.

### **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.

### **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  $105^\circ\text{C}$ . Calculation By mass =  $100M_1/M$  MI-Loss of mass (g) on drying M- Mass (g) of the material taken for the test.

### **Moisture content**

Toothpaste (10 gm) weighted in a Porcelain dish and dried it in the oven at  $105^\circ\text{C}$ . It was cooled in a desiccator. The loss of weight is recorded as percentage moisture content and calculated by the given formula. % Moisture =  $\frac{\text{Original sample weight} - \text{dry sample weight}}{\text{Original sample weight}}$

### **Foaming character**

1) 1 gm of tooth paste was poured into 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 stoppered and shaken length wish, motion for 16 second, two shake/second. Allowed to stand for 15 minutes and height of the foam produced was measured

2) 10% solution of tooth paste was prepared. 4ml of this solution was added to 146 ml of water at 30 o C .The solution was agitated for 10 seconds. The foam was poured in to a 100 ml graduated cylinder to overflowing. A rubber stopper was gently dropped in to 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.

#### **Organoleptic evaluation**

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

#### **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

#### **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

#### **Shape retention**

Tooth paste was squeezed out from the tube and put entirely of a tooth brush and the state of the toothpaste after it was allowed to stand for 10 seconds was evaluated based on the below-described criteria;

- A) Shape just after the toothpaste is squeezed out on the toothbrush is maintained.

#### **Homogeneity**

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

#### **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 Foaming power =  $V_1 - V_2$

V1- Volume in ml of foam with water.

V2- Volume in ml of water only.

#### **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, 25oC± 2oC / 60% ± 5% RH, 30o C ± 2oC / 65% ± 5% RH, 40oC ± 2oC / 75% ±5% RH for the period of three months and studied for appearance, pH and spreadability.

#### **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 105oC. Calculation By mass =  $100 \frac{M_1}{M_2} \frac{M_1 - \text{Loss of mass (g)}}{M_1}$  on drying M- Mass (g) of the material taken for the test.

#### **Moisture content**

Toothpaste (10 gm) weighted in a Porcelain dish and dried it in the oven at 105 o C. It was cooled in a desiccater. The loss of weight is recorded as percentage moisture content and calculated by the given formula. % Moisture = Original sample weight – dry sample weight/ Original sample weight

#### **Foaming character**

1) 1 gm of tooth paste was poured into 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 stoppered and shaken length wish, motion for 16 second, two shake/second. Allowed to stand for 15 minutes and height of the foam produced was measured.

2) 10% solution of tooth paste was prepared. 4ml of this solution was added to 146 ml of water at 30 o C .The solution was agitated for 10 seconds. The foam was poured in to a 100 ml graduated cylinder to overflowing. A rubber stopper was gently dropped in to 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.

#### **Organoleptic evaluation**

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

#### **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

#### **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

#### **Shape retention**

Tooth paste was squeezed out from the tube and put entirely of a tooth brush and the state of the toothpaste after it was allowed to stand for 10 seconds was evaluated based on the below-described criteria;

- A) Shape just after the toothpaste is squeezed out on the toothbrush is maintained.

### **III. CONCLUSION**

Not all herbal and natural toothpaste on the market is made entirely of herbs; some of the chemicals it contains help whiten teeth and prevent foul breath [14,15.]. However, this herbal toothpaste's formulation includes a number of potent herbs that are safe to use for all aspects of dental and oral hygiene. The Bureau of Indians' criteria was followed for conducting evaluation testing on herbal toothpaste formulations [33]. Both samples were found to possess favourable physicochemical features and to be of high quality. It is inexpensive, of high quality, and free of hazardous substances [27].

### **REFERENCES**

- [1]. Priyal G. 1 , Maji Jose 2 , Shruti Nayak 3 , Vidya Pai 4 , Sudeendra Prabhu, Evaluation of efficacy of different tooth paste formulations in reducing the oral microbial load - An in vivo study, Biomedicine: 2021; 41(2) Supplementary issue: 465-471
- [2]. Jinfeng He, Yalan Deng, Fangzhi Zhu, Ting Zhong, Nanyu Luo, Lei Lei, Li Cheng , and Tao Hu, The Efficacy and Safety of a Herbal Toothpaste in Reducing Gingivitis: A Double-Blind, Randomized, Placebo-Controlled, Parallel Allocation Clinical Trial Hindawi Evidence-Based Complementary and Alternative Medicine Volume 2019

- [3]. Chandrashekar Janakiram 1 , Ramanarayanan Venkitachalam 2 , Paul Fontelo 3 , Timothy J. Iafolla 4 and Bruce A. Dye 4\*Effectiveness of herbal oral care products in reducing dental plaque & gingivitis –a systematic review and meta-analysis, Janakiram et al. BMC Complementary Medicine and Therapies (2020) 20:43
- [4]. J Okpalugo, K Ibrahim, US Inyang, Toothpaste formulation efficacy in reducing oral flora, Tropical Journal of Pharmaceutical Research, February 2009; 8 (1): 71-77
- [5]. K.L. Senthilkumar 1, S. Venkateswaran. 1 , A. Vasanthan 1 , P. Chiranjeevi 1 , N Mohamed 1, S. Dinesh 1 , K.L.S. Neshkumar. Formulation development and evaluation of novel herbal toothpaste from natural source International Journal of Pharmaceutical Chemistry and Analysis 2022;9(1):17–21
- [6]. Pavan Deshmukh, Roshan Telrandhe, Mahendra Gunde, Formulation and Evaluation of Herbal Toothpaste: Compared With Marketed Preparation, Roshan T et al; Int J. Pharm. Drug. Anal, Vol: 5, Issue: 10, 2017; 406-410
- [7]. E. N. Gaviraj , C. V. Nagathan , B. S. Hunasagi , Sandeep Chandakavate Preparation and Evaluation of PolyHerbal Toothpaste Suresh Gunaki , International Journal of Recent Advances in Multidisciplinary Topics, VOL. 2, NO. 7, JULY 2021
- [8]. Mahendran Sekar, Muhammad Zuhilmi Abdullah Formulation, Evaluation and Antimicrobial Properties of Polyherbal Toothpaste Int J Curr Pharm Res, Vol 8, Issue 3, 105-107
- [9]. Urmila Nishad 1 , Meraj Ali 2 , Anupama Maurya 3, Formulation and Evaluation of a Polyherbal Toothpaste using Medicinal Plants; Urmila Nishad et al /J. Pharm. Sci. & Res. Vol. 12(1), 2020, 105-111
- [10]. Kavita Varma Shukla, Deepika Kumari\*Formulation Development and Evaluation of Herbal Toothpaste for Treatment of Oral Disease Journal of Drug Delivery & Therapeutics. 2019; 9(4-s):98-104
- [11]. Mahendran Sekar et al. Formulation and evaluation and antimicrobial properties of novel polyherbal toothpaste for oral care; 2016.
- [12]. Simanchal Panda et al. Preparation and evaluation of caffeinated toothpaste with Thyme essence; 2018.
- [13]. Fatima Grace et al. Preparation and evaluation of herbal dentifrice; 2015.
- [14]. Sangaram keshari panta et.al. Formulation and evaluation of the herbal toothpaste and comparison with different market preparation; 2020.
- [15]. Bhagyasri Y et al. Pharmaceutical and biological evaluation of polyherbal toothpaste; 2017.
- [16]. Sethiya Saloni et al. Preparation, and evaluation of herbal toothpaste; 2016.
- [17]. Vasu Naik V et al. Harshodent – Innovative herbal toothpaste; 2016.
- [18]. JOkpalugo et al. Toothpaste formulation efficacy in reducing oral flora; 2017.
- [19]. Robin Davies et al. Dentifrices – an update; 2010.
- [20]. Olutaya Ademola Adeleye et al., Physiochemical evaluation and antibacterial activity of malaria acuminate herbal toothpaste; 2020.
- [21]. Wakanma CN et al. The effect of selected toothpaste and microbial fluoro of the mouth of your student; 2014.
- [22]. Mamatha D et al. Preparation evaluation and comparison of herbal toothpaste with marketing available; 2017.
- [23]. xxx@stetsonhillsdentist.com
- [24]. Ramishetty Sabitha Devi et.al. Roles of herbs and their uses in dentistry; 2013.
- [25]. Pavan Deshmukh et.al. Formulation, and evaluation of herbal toothpaste compared with marketed preparation; 2017
- [26]. Tara Renton et al. Tooth-related pain or not; 2020.
- [27]. watts A, Addy M et al. Tooth discoloration and staining a review; 2001.
- [28]. Mohemmed Kinani et al. Formulation and phytochemical evaluation of toothpaste formulated with Thymus vulgaris essential oil; 2017.
- [29]. Ozgu can karadaglioglu et al. Antibacterial activities of herbal toothpaste combined with essential oil against streptococcus mutant; 2019.
- [30]. Bhargavi Prabhuswamy et al. comparative evaluation of the anticarcinogenic activity of commercially available herbal dentifrices; 2018.
- [31]. Megalaa N et al. Role of herbal leaf extracts in caries prevention; 2014.

- [32]. Olugbenga Oludayo Oluwasina et al. Antimicrobial potential of toothpaste formulated from extracts of syzgium aromatic, Denntetia, Tripetala, and jatropa latex against some oral pathogenic microorganisms; 2019.
- [33]. Davari AR et.al. Dentine hypersensitivity; etiology diagnosis and treatment; literature review; 2013.
- [34]. Birgitta Soder et al. Dental calculus is associated with death from heart infractions; 2013.
- [35]. Kuldeep Singh et al. Comparative studies between herbal toothpaste(dantkanti) and non-herbal toothpaste; 2016.
- [36]. Bhushan S kala et al. Treatment of periodontal disease-A herbal approach; 2015.
- [37]. Abhishek KN et al. Effect of neem containing toothpaste on plaque and gingivitis- A randomized double-blind clinical trials; 2015.
- [38]. Philip D Marsh et al. Dental plaque as a biofilm and a microbial communityimplications for health and disease; 2006.
- [39]. Vini menta et al. Efficacy of herbal dentifrice on the prevention of plaque and gingivitis as compared to conventional dentifrice; A systematic review and metaanalysis