

# Formulation and Evaluation of Herbal Toothpaste Containing Aloe vera, Clove, Neem Bark

Sathe Abhishika Sushil and Prasad Ghugarkar

Dr. N. J. Paulbudhe College of Pharmacy, Ahilyanagar

**Abstract:** Herbal toothpaste formulations have gained significant attention as natural alternatives to conventional oral care products. This study focuses on the formulation and evaluation of a toothpaste containing Aloe Vera, Clove, and Neem Bark, three well-known medicinal ingredients with proven oral health benefits. Aloe Vera possesses anti-inflammatory and healing properties, Clove provides analgesic and antibacterial effects, and Neem Bark acts as a natural antimicrobial agent to prevent plaque and gum infections.

The toothpaste was formulated using calcium carbonate as an abrasive, glycerin and sorbitol as humectants, xanthan gum as a thickening agent, and menthol for freshness. The formulation was evaluated for organoleptic properties (color, taste, odor, and consistency), pH, spreadability, abrasiveness, foaming ability, microbial contamination, and stability. The results demonstrated that the herbal toothpaste had an acceptable pH (6.5–7.5), moderate foaming, effective plaque removal properties, and was free from microbial contamination, making it a safe and effective alternative for oral care.

The study concludes that a herbal toothpaste containing Aloe Vera, Clove, and Neem Bark provides a natural, chemical-free solution for maintaining healthy teeth and gums, offering antibacterial protection, cavity prevention, and fresh breath. Future studies can focus on optimizing the formulation for large-scale production and consumer acceptability.

**Keywords:** Herbal toothpaste

## I. INTRODUCTION

Toothpaste is a formulation used to maintain teeth's attractiveness and health. It is primarily used for cleaning teeth with a toothbrush, delivering preventive and therapeutic agents like fluoride, metal salts, and pyrophosphate. These agents can inhibit calcium, reduce plaque growth, and treat dentine hypersensitivity. Toothpaste also provides refreshing breath, food particle removal, superficial plaque reduction, and polishing. It also has therapeutic and cosmetic functions like whitening, bleaching, desensitizing, plaque inhibition, and protection against periodontal problems. Common ingredients include active pharmaceutical ingredients, abrasives, humectants, detergents, binders, sweeteners, preservatives, antioxidants, and flavors. However, these materials can damage teeth and gums, necessitating the development of safe, effective, and well-formulated dentifrices. To achieve this, present work deals with formulation and evaluation of toothpaste containing Aloe vera, Clove, Neem Bark and Sodium chloride.

Aloe vera, the oldest known medicinal plant, has antimicrobial properties due to its natural anthraquinones. These compounds, including aloe emodin, aloetic acid, aloin, anthracene, anthranol, barbaloin, chrysophanic acid, ethereal oil, an ester of cinnamonic acid, isobarbaloin, and resistanol, help fight against bacteria that cause tooth problems like gum, dental cavity, and gingivitis. A paste with high sodium chloride content can prevent the formation of a Leptotrichae coating around teeth, which can be difficult to remove and may cause enamel damage. Aloe vera is used in dental practice for dental implants, periodontal surgery, gum tissue scratches, chemical burns, extraction sockets, periodontal surgery sites, and controlling inflammation caused by bacterial contamination.

There are several uses of Aloe vera in dental practice some uses are enlisted as below:

1. In dental implants
2. In periodontal surgery



3. Can be applied on gum tissues when they are scratched by toothbrush, sharp foods or by toothpick injuries.
4. Chemical burns from aspirin.
5. Application in extraction sockets.
6. It can be directly applied at the site of periodontal surgery.
7. Its application around the dental implants to control inflammation caused by bacterial contamination.
8. Acute mouth lesion is known as a hepatic viral lesion, aphthous ulcers, cancer cracks and cracks arising at the corners of our lips. <sup>1</sup>

Clove, a spice derived from the dried flower buds of the clove tree, is a key ingredient in herbal medicine and Ayurveda due to its antiseptic, analgesic, and anti-inflammatory properties. It has a long history of use across different civilizations, including Ancient China, Ancient Egypt, Indian Ayurveda, and European trade. Clove's primary active compound, eugenol, provides potent medicinal effects, making it valuable in oral care, pain relief, digestion, and respiratory health. It has numerous health benefits, including dental and oral health, digestive health, anti-inflammatory and pain relief, immunity booster, cardiovascular and blood sugar control, skin and hair health, and aphrodisiac and stress relief.

Clove, a natural ingredient, is a key component in oral care products like toothpaste due to its antibacterial, analgesic, and antiseptic properties. Eugenol, its primary active compound, has pain-relieving and antimicrobial effects, soothing toothaches, reducing gum inflammation, and fighting cavity-causing bacteria. Clove toothpaste provides natural protection against oral infections, promotes fresh breath, and strengthens teeth and gums. Eugenol acts as a natural anesthetic, soothing sensitive teeth. It fights bacteria, reducing plaque buildup and tooth decay. It reduces gum inflammation and bleeding, prevents bad breath, and strengthens teeth. Clove-based toothpaste is a natural, chemical-free alternative to synthetic toothpaste, providing long-lasting freshness, effective for sensitive teeth and gums, and supporting overall oral hygiene by preventing infections and promoting gum health. <sup>2</sup>

Neem bark, also known as the "Village Pharmacy," is a medicinal plant with antibacterial, antifungal, and anti-inflammatory properties. It has been used in traditional medicine and oral care for centuries, particularly in Ayurveda, to maintain healthy teeth and gums. Neem bark contains bioactive compounds like nimbidin, nimbin, and azadirachtin, which help fight harmful bacteria, plaque, and gum diseases. It is an essential ingredient in herbal toothpaste, providing a chemical-free alternative to commercial oral care products. Neem bark's benefits include fighting plaque and cavities, preventing gum disease, eliminating bad breath, strengthening teeth and enamel, removing stains, and healing mouth ulcers and wounds. Neem bark-based toothpaste is 100% natural, safe for daily use, and an eco-friendly and sustainable alternative to synthetic oral care products. <sup>3</sup>

## **II. LITERATURE REVIEW**

### **1.K. Singh, P. Singh, G Oberoi -Int J Dent Res,2016**

The approach is to make use of naturally available herbs such as Akarkara (anacyclus pyrethrum), Neem (azadirachta indica), Babool (acacia arabica), Haldi (curcuma longa) etc to make herbal paste.

### **2. T Mangilal, M Ravikumar -Journal of Ayurvedic and Herba, 2016**

The main aim of the present work is to prepare, evaluate and compare Lab Made Herbal toothpaste with commercial Herbal toothpastes. In the present study, commercial Herbal toothpastes such as Himalaya, Meswak and Dent country have been evaluated for their quality.

### **3. D Gautam, P Palkar, K Maule, S Singh - Asian Journal of 2020**

In current scenario in oral dental care with use of herbal toothpaste containing natural ingredients are more acceptable in public belief than chemical based synthetic formulations due to their safety and efficacy in reducing dental caries, and preventing other dental issues to which this generation is prone to. In this formulation we utilizes aloe vera gel, clove oil, neem powder, pomegranate peel powder and trikatu which are not yet used by any other research work.

### **4.F Ozaki, CM Pannuti, AV Imbronito, W Pessotti- Brazilian oral , 2006**

The aim of this randomised, double blind controlled trial was to verify the efficacy of a herbal dentifrice on the reduction of plaque and gingivitis. Forty eight volunteers with established gingivitis were randomly assigned to either a test group (herbal dentifrice) or positive control group (dentifrice with triclosan and fluoride).



**5. P Deshmukh, R Telrandhe - International Journal of , 2017**

The aimed of current research to formulate herbal toothpaste utilizing plant extract like Neem leaves, Guava leaves, Cinnamon bark other ingredient are Camphor, Honey. The plant extract ingredient posses the anti-bacterial. The herbal toothpaste formulated which can satisfy all the required condition to keep the mouth fresh and prevent tooth decay by bacteria. The formulated herbal toothpaste compared with marketed preparation.

**6.R Hosadurga, VA Boloor, SN Rao - Journal of traditional and , 2018**

Both herbal based dentifrices reduce plaque levels and gingival inflammation. But, it did not alter the pH of the saliva. However, there were no additional benefits of the Parodontax® toothpaste over Colgate® Herbal toothpaste. There was no evidence of nicotine or related compounds in both herbal toothpaste.

**7.S Jayashankar, GJ Panagoda - Ceylon Medical , 2011**

The beneficial effects of this herbal toothpaste (Sudantha®) on oral hygiene and gingival health variables when compared with the placebo. Further clinical trials using patients with gingivitis are necessary to confirm the therapeutic benefits of this herbal toothpaste.

**8. BR Chowdhury, A Garai, M Deb - Journal of natural , 2013**

Toothpaste is a paste or gel dentifrice used with a toothbrush as an accessory to clean and maintain the aesthetics and health of our teeth promoting oral hygiene. Now a day we use commercial toothpaste which contains many chemical compounds like sodium lauryl sulfate, which is harmful to our gum.

**9. OO Oluwasina, SO Idris, CO Ogidi, FO Igbe - Heliyon, 2023**

The study provides information on the production of human health-friendly dental antimicrobial toothpaste from plant materials.

**10. A Tatikonda, S Debnath, VS Chauhan - Society of Preventive , 2014**

After 30 days of trial, both test and control groups showed effective reduction of plaque and gingivitis, which was statistically significant. No adverse reactions to dentifrices products were observed during the trial. It was concluded that herbal dentifrice was as effective as non-herbal dentifrices in the control of plaque

### III. METHODOLOGY

#### CHEMICALS:

Sodium Chloride, Dicalcium Phosphate, Calcium Carbonate, Glycerine, Gum Tragacanth, Saccharine, Sodium Lauryl Sulphate, Methyl Paraben, Distilled Water.

#### PREPARATION OF ALOEVERA JUICE <sup>4</sup>

Take the 1-2 large aloe vera leaf .Wash the Leaf. Rinse the Aloe Vera leaves well under running water to get rid of germs and dirt. Cut off the spiny edges on both sides of the leaves with a sharp knife. Cut the leaf lengthwise to reveal the clear, jelly-like inner gel. Collect the transparent Aloe Vera gel with a spoon. Put the extracted gel in a mortar and pestle to blend it smoothly. Then, use muslin cloth to filter out the fibers and contaminants OR to remove the unwanted debris.



Fig 1: Aloe vera juice

DOI: 10.48175/568



## 2. PREPATION OF NEEM BARK EXTRACT: <sup>5</sup>

Keep up the Weigh 10–20 grams of dried Neem bark .To improve extraction, crush or grind them into a coarse powder to increase surface area. Fill a filter paper thimble with the powdered Neem bark .Place the thimble inside the chamber of the Soxhlet extractor. Fill the round-bottom flask with ethanol .Attach the condenser to the flask after connecting the Soxhlet chamber above it. Make sure that every joint is securely sealed. Use a water bath or heating mantle to warm the solvent. The solvent drips into the thimble holding the Neem bark powder after evaporating and condensing in the condenser. The dissolved compounds are carried by the solvent as it drains back into the flask after reaching the siphon level in the chamber. This cycle continues automatically. Until the solvent in the siphon is almost colorless, indicating thorough extraction, continue the extraction for another 4–6 hours. After the extraction, allow the apparatus to cool .Remove the solvent from the round-bottom flask with caution. and cooled using water from the tap. Collect the concentrated extract of neem bark. Keep it at a cool temperature in an airtight bottle.

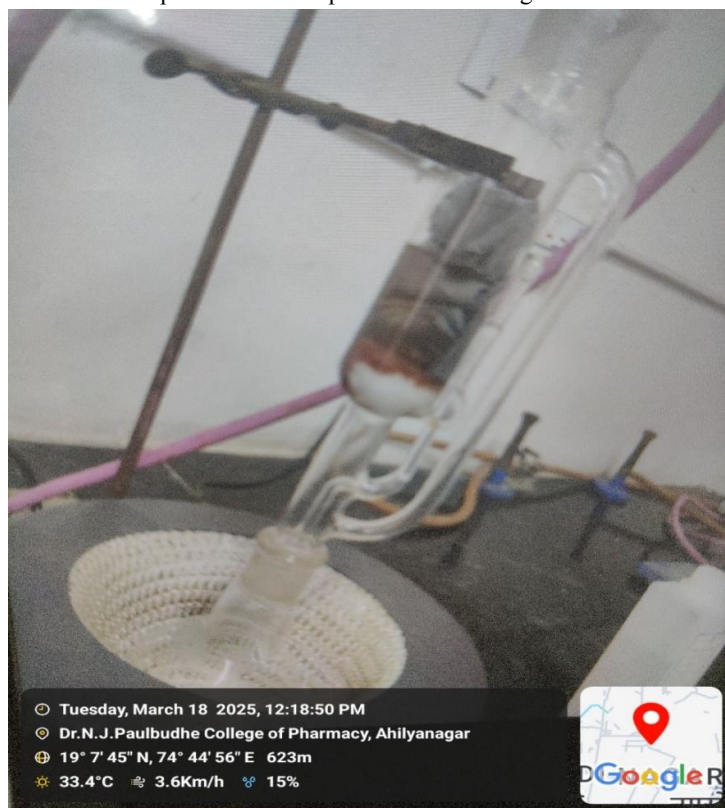


Fig 2 :Neem bark Extraction

## 3. PREPARATION OF CLOVE EXTRACT: <sup>6</sup>

Keep up the Weigh 10–20 grams of dried cloves .To improve extraction, crush or grind them into a coarse powder to increase surface area. Fill a filter paper thimble with the powdered clove .Place the thimble inside the chamber of the Soxhlet extractor. Fill the round-bottom flask with ethanol .Attach the condenser to the flask after connecting the Soxhlet chamber above it. Make sure that every joint is securely sealed. Use a water bath or heating mantle to warm the solvent. The solvent drips into the thimble holding the clove powder after evaporating and condensing in the condenser. The dissolved compounds are carried by the solvent as it drains back into the flask after reaching the siphon level in the chamber. This cycle continues automatically. Until the solvent in the siphon is almost colorless, indicating thorough extraction, continue the extraction for another 4–6 hours.





After the extraction, allow the apparatus to cool. Remove the solvent from the round-bottom flask with caution, and cooled using water from the tap. Collect the concentrated extract of cloves. Keep it at a cool temperature in an airtight bottle.



Fig 3 :Clove Extraction

#### PREPARATION OF HERBAL TOOTHPASTE: <sup>7</sup>

All the powder materials were passed through sieve 60. Ingredients like sodium chloride, saccharine, methylparaben, Di-calcium phosphate, calcium carbonate, sodium lauryl sulphate, and Gum, Glycerine, Distilled water, were geometrically mixed and then transferred to clean Mortar Pestle. Then to this mixture fresh juice of aloe, Clove extract, Neem bark extract, was added and paste was prepared by slowly adding above ingredients. paste is prepared.



Fig 4 : Prepared Toothpaste



## MAIN ACTIVE INGREDIENTS <sup>8</sup>

### 1. ALOEVERA



Fig 5 : Aloe vera

**Synonym :** Aloe

**Biological Source :** Aloe is dried juice collected by incision from the bases of leaves of various species of Aloe barbadensis

**Family :** Liliaceae

**Description :**

1.colur – Yellow brown ,Green.

2.Odour -Strong Odour

3.Taste -Bitter

**Chemical Constituent:**

Aloe vera contains a many chemical constituents, including polysaccharides, vitamins, minerals, enzymes, and amino acids. The main components include acemannan, a key polysaccharide, and anthraquinones like aloin.

**Uses :** Aloe vera is used in some toothpastes due to its potential benefits for oral health, such as reducing inflammation, protecting gums, and freshening breath.

Anti-inflammatory

Antibacterial

Soothing and Healing

### 2.CLOVE <sup>9</sup>



Fig 6 : Clove



**Common name:**

Marathi –Lavang

Hindi -Laung

**Synonym** : Syzygium aromaticum

**Biological Source** : Dried flower buds of Eugenia caryophyllus

**Family** : Myrtaceae

**Chemical Constituent** : Clove Contains 14-21% of volatile oil.

The other constituents present are eugenol, acetyleugenol, gallotannic acid, and two crystalline principles: a- and B-caryophyllenes, gum, resin and Fibre.

**Use** : Clove toothpaste can help protect against cavities, soothe sensitive teeth, freshen breath, and promote overall oral hygiene.

Cavity Protection

Sensitivity Relief

**3. NEEM BARK** <sup>10</sup>



Fig 7 : Neem bark

**Synonym** : Melia azadirachta

**Biological Source** : Neem consist of leaves and other aerial part of Azadirachta Indica.

**Chemical Constituent** : Neem (Azadirachta indica) contains many chemical constituents, including:

The Azadirachatin main active constituent in neem.

**Leaves** : Nimbin, , nimbolide found in leaves.

**Seeds** : Gedunin found in seeds.

**Bark** : Nimbidin, nimboesterol, margosine found in Barks.

Other constituents of neem include:

Ascorbic acid

Amino acids

Carotenoids

Steroids

Triterpenes

Protein

Carbohydrates

Minerals, such as calcium and phosphorus.

**Uses** : neem is commonly used in toothpaste due to its natural antibacterial and anti-inflammatory properties .

Neem bark and Leaf extract is used to preventing cavities and gum disease.

Antibacterial properties

Anti-inflammatory effect

Fresh breath

Home remedies



**FORMULATION TABLE:** <sup>11,12</sup>

Table 1

Sr. No.	Ingredients	All quantities are expressed in 100gm									Category
		F1	F2	F3	F4	F5	F6	F7	F8	F9	
1	Aloe vera extract	4ml	4ml	5ml	4 ml	5 ml	5 ml	3 ml	3 ml	3 ml	Moisturizer
2	Clove extract	4ml	4ml	5ml	4ml	5 ml	5 ml	3 ml	3 ml	3 ml	Antibacterial
3	Neem bark Extract	4ml	4ml	5ml	4ml	5 ml	5 ml	3 ml	3 ml	3 ml	Antibacterial
4	Sodium Chloride	1gm	1gm	1gm	1gm	1 ml	1 ml	1 ml	1 ml	1 ml	Preservatives
5	Dicalcium Phosphate	23 gm	24 gm	23 gm	25 gm	22 gm	24 gm	26 gm	25 gm	24 gm	Abrasive
6	Calcium Carbonate	21 gm	20 gm	20 gm	20 gm	21 gm	20 gm	20 gm	20 gm	21 gm	Abrasive
7	Glycerine	30ml	30ml	30ml	30ml	30	30ml	30ml	30ml	30ml	Humectant
8	Gum tragacanth	1.2 gm	1.2 gm	1.2 gm	1.2gm	1.2 gm	1.2 gm	1.2 gm	1.2 gm	1.2 gm	Binding agent
9	Sodium lauryl sulphate	2 gm	1.5 gm	1.5 gm	1 gm	2 gm	1 gm	1 gm	1.5 gm	2 gm	Foaming agent
10	Saccharine	0.75 gm	0.75gm	0.75 gm	0.75gm	0.75 gm	0.75 gm	0.75 gm	0.75 gm	0.75 gm	Sweetening agent
11	Methyl Paraben	0.25 gm	0.25gm	0.25 gm	0.25gm	0.25 gm	0.25 gm	0.25 gm	0.25 gm	0.25 gm	Preservatives
12	Water	16.3ml	16.8ml	16.8ml	16.3ml	16.3ml	16.3ml	16.3 ml	16.8ml	16.3ml	Vehicle

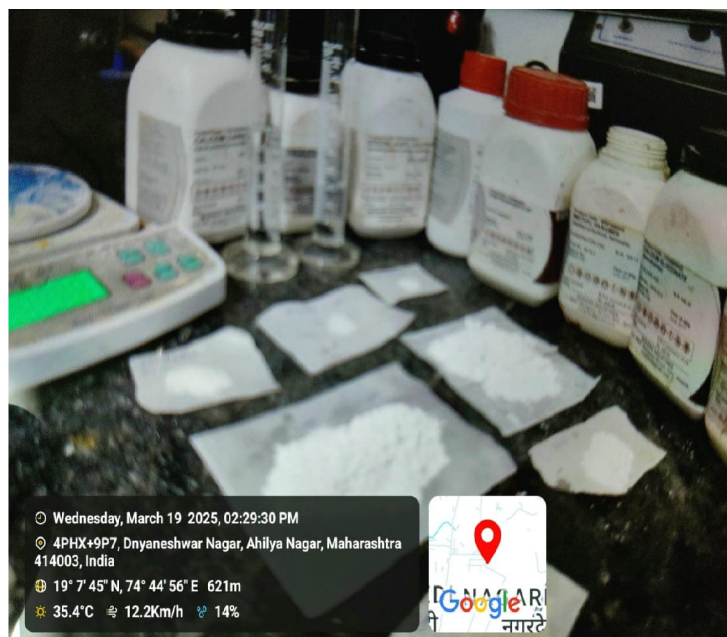


Fig 8 : Ingredients





### EXCIPIENTS: <sup>13</sup>

#### FORMULATION EXCIPENTS USED IN TOOTHPASTE

##### 1.Abrasives :

Ex : Dicalcium phosphate, calcium carbonate

The tooth surface is polished and food particles and stains are removed.

##### 2.Humectants :

Ex: Glycerine

Provide moisture content

##### 3.Binding agents :

Ex: Gum tragacanth

Stability and consistency of the toothpaste can be maintained.

##### 4.Preservatives :

Ex: Methyl Parabens

Prevents growth of microorganisms and provide stability

##### 5.Foaming agents :

Ex: Sodium lauryl sulphate

Assist in penetration of plaque deposition and enables

##### 6.Sweeteners :

Ex: Saccharine

Mask palatable taste

#### HERBS USED IN TOOTHPASTE:

##### 1.Neem :

Antibacterial, Anti inflammatory, Antiviral, Toothache reliever

##### 2:Aloe vera :

Antiviral, Antifungal, treatment of mouth ulcer, and gingivitis.

##### 3.Clove :

Antiseptic, Control of gingivitis, halitosis, plaque.

### EVALUATION PARAMETER: <sup>14</sup>

#### 1.PHYSICAL EXAMINATION

Colour- The colour of the toothpaste was visually examined.

Taste - The taste of the toothpaste was examined orally.

Odour - The formulation evaluated for its odour by smelling it.

Smoothness - By rubbing the formulation between the fingers, the paste's smoothness was evaluated.

#### 2.DETERMINATION OF GRITTINESS

By Pressing paste from a collapsible tube of each sample into butter paper, then pressing it with the finger along its whole length. The hard, sharp -edged abrasive particles was evaluated.

#### 3.DETERMINATION OF PH PAPER

Dip the edge of a pH paper strip into the paste.

Then wait for 5 min.

Compare the colour of the paper strip to pH colour to determine the approximate pH.

#### 4.DETERMINATION OF FOAMING POWER <sup>15</sup>

About 2 grams of the sample were taken in a 50 ml glass beaker. Water was added to this 20 ml, and the beaker was covered with a watch glass to allow the toothpaste to dissolve in the water for 30 minutes. Then the content was stirred with glass rod and slurry was transferred to a measuring cylinder.

Foaming power = V1 – V2

Where,

Copyright to IJAR SCT  
[www.ijarsct.co.in](http://www.ijarsct.co.in)



DOI: 10.48175/568



V1= Volume in ml of foam with water

V2= Volume in ml of water only.

## 5. DRYING TEST <sup>16</sup>

After a week at room temperature, the drying test of sample was evaluated.

## 6. TUBE EXTRUCIBILITY

In the present study, the method adopted for evaluating Toothpaste formulation for extrudability was based upon the quantity in percentage Toothpaste extruded from tube on the application of finger pressure. More quantity extruded better the extrudability. The formulations under study were filled in a clean, aluminum collapsible 20 grams tube with a nasal tip of 5 mm opening. The pressure was applied on the tube by holding it in between the thumb and index finger for 1 sec. Tube extrudability was then determined by measuring the amount of cream extruded through the tip when the pressure was applied.

## 6. MICROBIAL STUDY

The antimicrobial activity of the formulation was assessed using a modified agar well diffusion method, in which 0.2 ml of a 24-hour broth culture of *S. aureus* was seeded onto nutrient agar plates. After that, the plates were incubated for 24 hours at 37 °C. Zones of inhibition is evaluated.

## IV. RESULT AND DISCUSSION

### 1. PHYSICAL EXAMINATION

SR.NO	PARAMETER	OBSERVATION
1	Colour	Off white
2	Odor	Aromatic
3	Taste	Spicy and sweet
4	Smoothness	Good

### 2. DETERMINATION OF GRITTIENESS



Fig 9 :Determination of Grittiness

SR.NO	PARAMETER	OBSERVATION
1	Grittiness	No Grittiness



### 3.DETERMINATION OF PH PAPER



Fig 10 : Determination of pH Paper

SR.NO	PARAMETER	OBSERVATION
1	pH paper	6

### 4. DETERMINATION OF FOAMING POWER



Fig 11 :Determination of Foaming Power

$$\text{Foaming power} = V_1 - V_2$$

$$\text{Foaming power} = 25-20$$

$$= 5$$

### 5 DRYING TEST



Fig 12 : Drying Test



SR.NO	PARAMETER	OBSERVATION
1	Drying	Not Dried

## 6. TUBE EXTRUCIBILITY



Fig 13 : Tube extrucibility

## 7. MICROBIAL STUDY



Fig 13 : Microbial study

## V. CONCLUSION

The creation of an herbal toothpaste containing Aloe vera, Clove, and Neem has shown potential as a safe, natural, and effective alternative to chemical-based dental products. These ingredients have unique therapeutic properties that contribute to maintaining and improving oral health. Aloe vera is known for its soothing, anti-inflammatory, and healing properties, while Clove is known for its strong antimicrobial and analgesic properties. Neem, also known as the "toothbrush tree," has antibacterial, antifungal, and anti-inflammatory properties, controlling plaque formation, preventing cavities, strengthening gums, and combating bad breath. This formulation not only cleanses teeth and gums but also offers therapeutic benefits without the side effects of synthetic ingredients.

## REFERENCES

- [1]. Phalke PL, Rukari TG and Jadhav AS: Formulation and evaluation of toothpaste containing combination of aloe and sodium chloride. Int J Pharm Sci & Res 2019; 10(3): 1462-67. doi: 10.13040/IJPSR.0975-8232.10(3).1462-67
- [2]. Mr. Kadam Rahul Vishnu , Mr. Waghmare K. P , Dr. Garje S. Y, Dr.Sayyed. G.A4International Journal of Research Publication and Reviews, Vol 5, no 5, pp 12384-12391 May 2024
- [3]. John, N. C. V., Pawane, N. S. S., Marchande, N. S. S., Shinde, N. N.S., Patil, N. a. C., Machale, N. R. D., & Patil, N. S. D. (2024). Formulation and evaluation of moringa and neem herbal toothpaste for comprehensive





- oral care. World Journal of Advanced Research and Reviews, 23(1),649-661  
<https://doi.org/10.30574/wjarr.2024.23.1.2034>
- [4]. Phalke PL, Rukari TG and Jadhav AS: Formulation and evaluation of toothpaste containing combination of aloe and sodium chloride. Int J Pharm Sci & Res 2019; 10(3): 1462-67. doi: 10.13040/IJPSR.0975-8232.10(3).1462-67
- [5]. Tesfaye, B., & Tefera, T. (2017). Extraction of Essential Oil from Neem Seed by Using Soxhlet Extraction Methods. International Journal of Advanced Engineering Management and Science, 3(6), 646–650.  
<https://doi.org/10.24001/ijaems.3.6.5>
- [6]. Muwaffaq, M. A., & Supriyo, E. (2021). Optimization of clove flower oil extraction (Syzgium aromaticum L.) With Factorial Design Method. Journal of Vocational Studies on Applied Research, 3(2), 38–41.  
<https://doi.org/10.14710/jvsar.v3i2.12182>
- [7]. Phalke PL, Rukari TG and Jadhav AS: Formulation and evaluation of toothpaste containing combination of aloe and sodium chloride. Int J Pharm Sci & Res 2019; 10(3): 1462-67. doi: 10.13040/IJPSR.0975-8232.10(3).1462-67
- [8]. ZAHID JAMAL KHAN, ARTI KORI, Dr. S.M. PATIL© 2023 IJNRD | Volume 8, Issue 5 May 2023 | ISSN: 2456-4184 |
- [9]. Mr. Kadam Rahul Vishnu ,Mr. Waghmare K. P , Dr. Garje S. Y, Dr. Sayyed. G.A4International Journal of Research Publication and Reviews, Vol 5, no 5, pp 12384-12391 May 2024
- [10]. ZAHID JAMAL KHAN, ARTI KORI, Dr. S.M. PATIL© 2023 IJNRD | Volume 8, Issue 5 May 2023 | ISSN: 2456-4184
- [11]. Phalke PL, Rukari TG and Jadhav AS: Formulation and evaluation of toothpaste containing combination of aloe and sodium chloride. Int J Pharm Sci & Res 2019; 10(3): 1462-67. doi: 10.13040/IJPSR.0975-8232.10(3).1462-67
- [12]. Jagtap, A. M., Kaulage, S. R., Kanse, S. S., Shelke, V. D., Gavade, A. S., Vambhurkar, G. B., Todkar, R. R., & Dange, V. N. (2018b). Preparation and evaluation of toothpaste. Asian Journal of Pharmaceutical Analysis, 8(4), 191. <https://doi.org/10.5958/2231-5675.2018.00035.2>
- [13]. Dr. Shahidulla, Nazneen Begum, Nishath Sultana 2022 IJNRD | Volume 7, Issue 11 November 2022 | ISSN: 2456-4184 | IJNRD.ORG
- [14]. Asha M. Jagtap, Sudhir R. Kaulage, Shivam S. Kanse, Vishal D. Shelke, Akshata S. Gavade, Ganesh B. Vambhurkar, Rohit R. Todkar, Vidya N. Dange. Preparation and Evaluation of Toothpaste. Asian J. Pharm. Ana. 2018; 8(4): 191-194. doi: 10.5958/2231-5675.2018.00035.2
- [15]. Senthilkumar, K., Venkateswaran, S., Vasanthan, A., Chiranjeevi, P., Mohamed, N., Dinesh, S., & Neshkumar, K. (2022c). Formulation development and evaluation of novel herbal toothpaste from natural source. International Journal of Pharmaceutical Chemistry and Analysis, 9(1), 17–21.  
<https://doi.org/10.18231/j.ijpca.2022.003>
- [16]. Phalke PL, Rukari TG and Jadhav AS: Formulation and evaluation of toothpaste containing combination of aloe and sodium chloride. Int J Pharm Sci & Res 2019; 10(3): 1462-67. doi: 10.13040/IJPSR.0975-8232.10(3).1462-67

