



## Formulation and Evaluation of Herbal Toothpaste

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### ABSTRACT-

Teeth are an integral part of our digestive system, as they help in breaking down of complex food material into smaller particles by chewing action, thus making it easy for the digestion. So, in order to regulate proper chewing activity it is necessary to maintain good dental health. Dental care is the maintenance of healthy teeth which can be done by keeping the mouth and teeth clean in order to prevent all the possible dental defects.

A good dental surrounding and healthy teeth can be achieved well by using toothpaste on a regular basis for cleansing of teeth to prevent teeth disorders. Toothpastes are used for brushing teeth to promote good oral health by removing all the food debris and plaque from the teeth.

In recent years, people are turning towards the herbal and natural products. In this following study we have focused on the preparation of herbal toothpaste from Tamarind seeds and Walnut shell. Tamarind seeds are a source of fatty acids and minerals including potassium, phosphorus and calcium, amongst which calcium constitute a major part and due to the high calcium content tamarind seeds are beneficial for good dental health. Walnuts shells possess with iron, calcium, zinc, vitamins A, B1, B2, B6 and C which can promote teeth health in a good way.

In the following article we have put forward the study on dental care by carrying out formulation and evaluation of herbal toothpaste using clove oil, cinnamon oil, mustard seeds oil, peppermint oil which are beneficial in teeth strengthening along with tamarind seeds and walnuts shells.

The herbal toothpaste was formulated and was further evaluated using all the necessary evaluation parameters including physical examination, spreadability, foamability, pH, extrudability, abrasiveness, smoothness, etc.

**KEYWORDS-** Dental care, oral hygiene, tamarind seeds, walnuts shells, teeth, gums, teeth strengthening, teeth whitening, tooth decay, dental disorders

### INTRODUCTION-

**Dental care** or **Oral health** is an integral part of the overall health. It may be referred as the practice to keep the mouth and teeth clean in order to prevent the dental disorders. To prevent any arising dental problems, people should keep their own oral cavity clean and maintain the oral hygiene as to keep the mouth free of diseases and other common problems, such as bad breath. It is vital to carry out oral hygiene on a regular interval to enable the prevention of dental diseases and bad breath. The most common dental disorders arising are- toothache, tooth decay (cavities, dental caries) and gum diseases such as gingivitis and periodontitis. Cleaning of teeth is the removal of the dental plaque and tartar from the teeth to prevent cavities, gingivitis, gum diseases and tooth decay.

Oral care products are those which are used for the care of teeth and mouth. Some formulations that are used for the purpose of cleaning teeth, gums and mouth are as mentioned- mouth wash, toothpaste, tooth powders, teeth-whiteners, breath fresheners, dental floss, etc. Toothpaste is a semi-solid dosage form available in paste or gel forms which have defensive effect in maintaining health of the teeth. Toothpastes are the most basic cleansing formulations that are used on regular basis to maintain oral/dental hygiene. Toothpaste is an abrasive that helps in removal of dental plaque and food remains from the teeth. Moreover, herbal toothpastes are more beneficial and effective over synthetic toothpastes. Herbal toothpastes are found to be a great choice for those who like to minimize the amount of chemicals that are likely to affect the general health. Herbal toothpastes contain ingredients of natural origin which help to eliminate the unwanted teeth defects and provide strength and shine to the teeth.

***Ideal properties of a HERBAL TOOTHPASTE are:***

1. Provide good abrasive effect
2. Should be non-irritant and non-toxic
3. Should impart no stain in tooth
4. Keep the mouth fresh and clean
5. Provide prolonged action
6. Should be cost effective and easy to approach
7. Provide good breath
8. Should not hurt the oral fluid and tissue
9. It should taste good and have a pleasant aroma
10. It should not cause discoloration of teeth

***Benefits of HERBAL TOOTHPASTE:***

Herbal toothpastes possess many beneficial effects for oral care, few of which are-

1. Herbal toothpaste is found to be useful in fighting tooth decay.
2. It provides protection against cavity and plaque as well.
3. It provides whitening and strengthening effects to the teeth.
4. Helps in reduction of bleeding gums and inflammation.
5. The natural freshener used in herbal toothpaste helps in removing the bad odour and keeps mouth fresh.
6. Herbal toothpastes are safe for use as there are no artificial sweeteners, flavors, colors or fragrances used in their preparation.
7. Natural or herbal toothpaste work well to get rid of bacteria and maintain a healthy mouth.

**OBJECTIVE-**

The motive of preparation and evaluation of herbal toothpaste from tamarind seeds powder and walnuts shells powder was to study the **anti-bacterial, anti-inflammatory, anaesthetic** and **whitening** properties. All the other natural ingredients such as cinnamon oil, clove oil, mustard seed oil and peppermint oil were selected based upon their properties of providing **cleansing, shining, strengthening & cooling** effects. All these ingredients were selected altogether to formulate ideal herbal toothpaste with all the required health benefits for oral and dental care.

**MATERIALS AND METHODS-****01. Collection of INGREDIENTS:**

The tamarind seeds were collected from the campus of L.N.B.C Institute of Pharmacy, Raigaon, Satara and converted into powder for formulation. All other ingredients including walnut shell powder, cinnamon oil, clove oil and mustard seed oil were collected from local market.

**INGREDIENTS:****a) Tamarind seeds powder:**

- Tamarind seeds, also known as *Tamarindus indica* L. seeds are a rich source of essential fatty acids, minerals including calcium, phosphorus and potassium.
- Tamarind seeds are found to have beneficial effects for teeth. Tamarind seeds powder helps in removal of plaque and tartar deposits in people who smoke and consume soft drinks in high amount.
- Tamarind seeds powder helps in the strengthening of teeth, thus reducing the risks of cavity formation and help in lessening of oral infections.

**b) Walnut shell powder:**



- Walnut shells, also known as *Juglans regia* shells constitute of nutrients and vitamins and provide numerous health benefits.
- Walnut shells are extremely enriched with calcium, zinc, iron, and copper.
- Walnut shell powder is found to be very effective in the cleaning of teeth and gums. It turns out to be a very good cleanser as it possesses natural whitening properties.

c) **Cinnamon bark oil:**



- *Cinnamomum verum* oil i.e. cinnamon oil is enriched with several health benefits, due to its anti-bacterial and anti-inflammatory activities.
- Cinnamon oil helps in the healing of mouth ulcers.
- Cinnamon oil is way more beneficial for the treatment of a teeth disorder called as, gingivitis. Cinnamon oil helps in soothing the inflammation in the gums by inhibiting *porphyromonas gingivalis* that causes gingivitis.

d) **Clove bud oil:**



- Clove bud, biologically known as *Syzygium aromaticum* possesses anti-bacterial and analgesic properties.
- Clove bud is rich in manganese, which acts as an anti-oxidant and also helps in maintaining bone health.
- Clove bud oil is a natural analgesic and helps in numbing reducing the pain to ease a toothache.
- It also helps in reducing inflammation and cures various oral problems.

e) **Mustard seeds oil:**



- *Brassica nigra*, i.e. mustard seeds are enriched with various minerals such as copper, calcium, iron, magnesium, phosphorus, potassium and many more.
- Mustard seeds are also rich in various vitamins, including vitamins C and K vitamin B6.
- Mustard seeds oil helps in the strengthening of teeth and favors the removal of plaque from the teeth and also provides shine to the teeth.

f) **Calcium carbonate:**



- Calcium carbonate acts as a mild abrasive that helps in safe removal of plaque from the teeth and also polishes away the surface stains.
- It helps in the neutralization of harmful plaque acids and together liberating calcium.

**g) Sorbitol:**

- Sorbitol helps to hold the toothpaste together.
- It is used as sweetening agent in the formulation of herbal toothpaste. Unlike sugar, sorbitol does not produce cavities.

**h) Sodium Lauryl Sulphate:**

- SLS is an anionic surfactant. It is said to be an ideal detergent due to its amphiphilic properties.
- It is often used as a fat emulsifier, wetting agent, and detergent in many cosmetics, pharmaceuticals as well as toothpastes.
- SLS is used in the formulation of herbal toothpaste as it provides foaming property to the toothpaste.

**i) Sodium benzoate:**

- Sodium benzoate is best known for its preservative action.
- It is used in processed foods, beverages, cosmetics, etc. in order to protect them from contamination and decomposition.

**j) Glycerin:**

- Glycerin is a humectant and helps to hold on the water and prevents the drying of paste from the tube.
- It also prevents dryness in the mouth while brushing the teeth.

**k) Sodium chloride:**

- Sodium chloride, also commonly called as table salt works as a mild abrasive.
- It helps in the removal of stains from the surface of the teeth.

**l) Peppermint oil:**

- Peppermint oil is essential in anti-bacterial, anti-inflammatory and anti-fungal properties.
- It provides protection against plaque, enamel erosion and helps in covering up the bad breath.
- It provides freshness and flavor to the toothpaste.

All the ingredients required for the preparation of herbal toothpaste along with their uses and sufficient quantities are as listed below:

### Formulation of HERBAL TOOTHPASTE:

**02. Formulation of BASE:**

Sr. No.	Ingredients	Quantity	Role in the formulation
01.	Calcium carbonate	10 gm	Abrasive
02.	Sorbitol	2 ml	Sweetening agent
03.	Sodium Lauryl Sulphate	1 gm	Surfactant/foaming agent
04.	Sodium Benzoate	0.5 gm	Preservative
05.	Glycerin	2 ml	Humectant
06.	Sodium Chloride	0.5 gm	Stain removal
07.	Peppermint oil	0.5 ml	Flavoring agent

08.	Distilled water	q.s.	Vehicle
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### 03. Formulation of ACTIVE and ADDITIONAL INGREDIENTS:

Sr. No.	Ingredients	Quantity	Role in the Formulation
01.	Tamarind seeds powder	2 gm	Anti-bacterial and teeth strengthener
02.	Walnut shell powder	2 gm	Cleanser
03.	Cinnamon oil	0.5 ml	Anti-inflammatory
04.	Clove oil	0.5 ml	Anaesthetic and anti-bacterial
05.	Mustard seed oil	0.5 ml	Provide shine and strength

### 04. METHOD OF FORMULATION:

For the formulation of herbal toothpaste we have employed dry gum method. The method of formulation is as mentioned below:

- Tamarind seeds and walnut shell were converted into powder form by triturating in a mortar pestle.
- All the solid ingredients including calcium carbonate, sodium lauryl sulphate, sodium chloride, sodium benzoate were weighed accurately as mentioned in the formulation table. These ingredients were sieved with sieve no. 80 to achieve uniform particle size.
- All the above ingredients were placed in a mortar pestle and then added with glycerin and sorbitol until a semi-solid substance is formed.
- After this, the accurate quantities of the active and other additional ingredients were added to the above semi-solid substance.
- In addition to this, peppermint oil was added to prepared formulation as flavoring agent.



## EVALUATION PARAMETERS-

### 1. Physical examination:

The colour assessment of the toothpaste was made visually. Smelling of the product detected the presence of odour. The taste of the toothpaste was assessed manually. The smoothness and firmness of the toothpaste was demonstrated by rubbing it between the fingers.

### 2. pH:

10 gm of the prepared toothpaste should be kept in a 50 ml beaker, along with freshly boiled & cooled 10 ml of water (at 270°C) to make an aqueous suspension. Make sure to stir properly to achieve a good suspension. Determine the pH of the suspension within 5 minutes using a pH meter.

### 3. Homogeneity and extrudability:

The toothpaste should extrude as a homogeneous/uniform mass from the tube or other appropriate container when normal force is applied at 27°C. Additionally, more of the contents must roll out gradually and extrude from the crimp of the container.

### 4. Sharp and abrasive particles:

The contents were placed on the finger and scratched on the butter paper for about 15-20cm to make sure there were no sharp or abrasive particles present. The same process was carried out for about 8-10 times which detected that there were few traces of small particles of walnut shells powder that were knowingly kept slightly larger than other particles for the good scrubbing of teeth when applied.

#### 5. *Foamability:*

In order to determine the foaming strength of the toothpaste, 2 gm of toothpaste was mixed with water in a measuring cylinder. This mixture was further shaken for about 10 times and the total volume of foam was evaluated.

#### 6. *Determination of moisture content:*

To measure moisture and volatile matter, 5g of herbal toothpaste was put in a porcelain dish that measuring 6-8 cm in diameter and 2-4 cm in depth. It was dried in an oven at 105°C to remove the moisture.

Calculation-

$$\% \text{ by mass} = 100 \text{ ML/M}$$

Where, ML - Loss of mass (g) on drying

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

#### 7. *Determination of spreadability:*

The spreadability technique is determined by looking forward to the slip and drag properties of the paste. About 1-2 gm of the prepared herbal toothpaste was weighed and placed between two glass slides that were positioned on top of one another. The slides are then pushed in the opposite directions. After three minutes the amount of toothpaste that has spread is measured. The experiment is carried out repeatedly and the average of the three readings is calculated.

Calculation-

$$S = M * L / T$$

Where,

S - Spreadability

M - Weight tied to the upper slide

L - Length moved by the glass slide

T - Time (in sec) taken to separate the upper slide from the lower slide.

## RESULTS-

### Physical evaluation:-

Sr. No.	Evaluation Parameters	Observation
01.	Colour	Milky white
02.	Odour	Characteristic
03.	Taste	Sweet
04.	Smoothness	Smooth
05.	Abrasiveness	Slightly abrasive

### Evaluation results:-

Sr. No.	Evaluation Parameters	Observation
01.	pH	8.4
02.	Homogeneity	Good
04.	Foamability	Good
05.	Moisture content	14.8%
06.	Extrudability	Good
07.	Spreadability	4.7 cm/sec



**Fig.:** Prepared Herbal Toothpaste

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## CONCLUSION-

From all the above studies and results we conclude that, as compared to the synthetic toothpastes made of chemicals, this formulated herbal toothpaste is safer and has lesser side effects. This herbal toothpaste plays an important role in prevention of dental caries and maintenance of oral health and cleanliness.

In this experimental study the formulated herbal toothpaste was found to be equally effective as the commercially available toothpastes in all accounts of the evaluation parameters.

The developed herbal toothpaste has a promising future in research and dental care for the general population, society, by making use of a wider range of natural ingredients to develop more and safer natural medicines. The created herbal toothpaste was found to be of high quality.

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