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## An Approach of Formulation and Evaluation of Herbal Toothpaste by Comparison with Commercial Toothpastes

	
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**Keywords:** Enamel, Dentin, Homogeneity

### ABSTRACT

**Introduction and Need** Toothpaste claim to clean, remove plaque, prevent cavities, whiten teeth. Artificial toothpaste which made from various chemical ingredients harms the sensitive part of teeth like enamel, crown, dentin, roots of teeth, and blood providing nerves of teeth. Herbal toothpaste which made up of herbs that obtained from herbal plants like Babul, Nimb, Haritkari, Babhitaka, Amalaki, Aloe vera extract, Guava leaf extract, Peppermint oil, Eucalyptus oil, etc. This all herbs have a large number of medicinal properties towards various parts of teeth, as compare to artificial toothpaste herbal toothpaste have a direct effect on the problem of teeth. So there is a need to target herbal remedies for preparation of toothpaste. The objective of present work is to prepare and evaluate herbal toothpaste.

**Methodology** The purpose of the study is to prepare herbal toothpaste using herbs like Amlaki, Haritkari, Babhitaka, Babul, Nimb, and eggshell etc. Two different formulations of herbal toothpaste were prepared by using a different concentration of base. The prepared toothpaste was evaluated for different tests like homogeneity, tube inertness, sharp and edge abrasive particles, spreadability, fineness, foaming power, stability, moisture and volatile matter. All these tested parameters were compared with well-known marketed toothpaste.

**Result and Discussion** the herbal toothpaste was successfully prepared with two different formulations. Evaluation tests of toothpaste were carried out according to the standards specified by the Bureau of Indian standards IS 6356-1993 for Herbal toothpaste (Dant Kanti) and Lab made toothpaste sample. All the samples complied with BIS and they found to be of good quality.

**Conclusion** our motto of preparation of herbal toothpaste and evaluation with different tests and comparison with well-known marketed brand of toothpaste is achieved successfully.

## INTRODUCTION

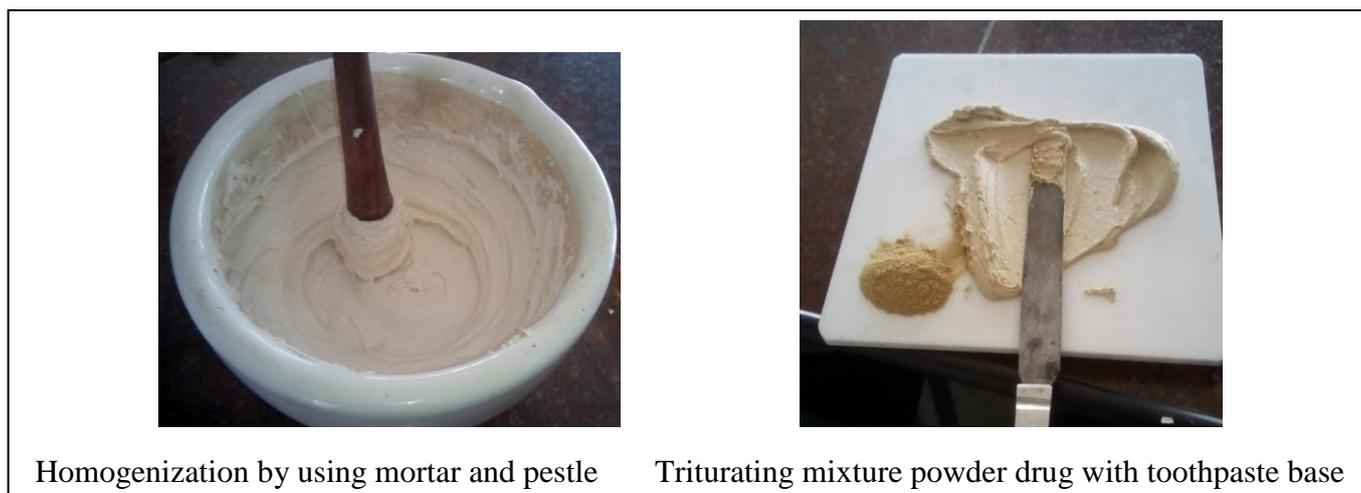
Toothpaste has been used since the ancient past<sup>1</sup> and is one of the main irreplaceable components of oral health care<sup>2</sup>. The design of toothpaste formulations began in China and India, as 300-500 BC. During that period, squashed bone, pulverized egg and clam shells were utilized as abrasives as a part of tooth cleaning<sup>3</sup>. Modern toothpaste formulations were developed in the 19th century. Later on, chalk and soap were incorporated to those formulations. After 1945, several formulation advancements of different detergents had begun, sodium lauryl sulfate had been used as an emulsifying agent<sup>(1-5)</sup>. In recent years, the focus has shifted towards the release of active ingredients during formulation developments to prevent and /or treat oral illness<sup>(1-3)</sup>.

Toothpaste is a dentifrice used to clean, maintain and improve the health of teeth. Toothpaste is mainly used to promote oral cleanliness and also acts as an abrasive that helps to prevent the dental plaque and food particles from the teeth, aids in the removing and/or veiling of halitosis, and releases active ingredients such as fluoride to aid in preventing tooth and gum disease (eg. Gingivitis). The majority of the cleaning is performed by the mechanical utilization of the toothbrush with the help of excipients used in toothpaste<sup>(6-8)</sup>. The polyherbal and herbal formulations are very effective as they contain active chemical ingredients such as polyphenols, gums, alkaloids, glycosides etc. These formulations have also been proven to have different biological activities<sup>(8-9)</sup>. This opens a new door for formulating and evaluating new formulations of herbal toothpaste. The main aim of this investigation is to evaluate the Herbal toothpaste formulations and comparing with three popular commercial toothpastes.

## MATERIALS AND METHODS

We prepared two different formulation of herbal toothpaste by using fine powder of eggshell, this fine powder of eggshell which is used as calcium carbonate source, because one teaspoon of eggshell powder contains 1000-1200 mg of calcium carbonate, another ingredients used in preparation of base was starch powder which is mainly obtained from wheat, potato, maize, rice and cassava, various gum which is used as binder in toothpaste base like Gum tragacanth, Gum acacia, etc, and other ingredients like sorbitol and water. A method used for the formulation of herbal toothpaste is homogenization by using mortar and pestle for formation base of toothpaste.

## Formulation of Herbal Tooth Paste



**Figure 1: Toothpaste formulation Process**

### Formulation- I

**Table 1: Herbal Toothpaste Formulation Ingredients**

Ingredients	Quantity	Role
Amalaki	2.5 gm	Anti-inflammatory
Haritkari	2.5 gm	Anti-bacterial
Babhitaka	2.5 gm	Anti-bacterial
Babul	2.00 gm	Gum tightening agent
Nimb	2.00 gm	Preservative
Peppermint oil	2.00 ml	Flavouring agent
Orange syrup	2.00 ml	Flavouring agent/Sweetener
Toothpaste base	35.00 gm	Base
water	q.s	Vehicle

## Formulation-II

**Table 2: Herbal Toothpaste Formulation Ingredients**

Ingredients	Quantity	Role
Guava leaf extract	5 gm	Antibacterial Agent
Alovera gel	2.5 gm	Whiting Agent
Nimb	2.5 gm	Preservative
Eucalyptus oil	2.5 ml	Flavouring Agent
Clove oil	2.5 ml	Flavouring Agent & Antibacterial Agent
Toothpaste base	35 gm	Base
water	q.s.	Vehicle

## Evaluation of Herbal Toothpaste <sup>(7)</sup>

**Table 3: Evaluation tests for Lab made and commercial Herbal toothpaste**

Sr. No.	Properties	Lab made Formulation i	Lab made Formulation ii	Dant kanti
1.	Hard and sharp-edged abrasive particles	Present	present	present
2.	Spreadability (cm)	5.5	5.2	4.0
3.	Foaming ability	68	60	56
4.	Stability (45±20C for 28days & at 50C for 1 hour)	good	good	good
5.	Tube inertness (at 45±20C for 10 days)	No corrosion	No corrosion	No corrosion
6.	Fineness (% by mass)	0.52	0.48	0.42
7.	Moisture and volatile matter (% by mass)	2.0	2.2	1.8
8.	Abrasiveness	4	3	2

## 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, a bulk of contents shall extrude from the crimp of the container and then rolled it gradually.

### **Tube inertness**

The toothpaste container shall not produce any corrosion or deterioration in normal storage conditions like the heating temperature at  $45\pm 20^{\circ}\text{C}$  for ten days. Tube inertness can be examined by cutting the internal surface, open and observing whether any sign of deterioration or chemical attack occurred in the container.

### **Determination of sharp and edge abrasive particles**

Extrude the contents 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 a fingertip for the presence of sharp and hard-edged abrasive particles. Toothpaste shall not contain such particles.

### **Determination of spreadability**

One gram of toothpaste placed on a glass slide (10 x 10 cm), cover with another glass slide. Then carefully place two kg weight of on covered glass slide (sliding, shall not take place). Measure the spreading (in cm) of the toothpaste after 3 minutes. Repeating the experiment and note the average value of three readings.

### **Determination of fineness**

Weighed accurately about 10 gm of toothpaste placed in a 100 ml beaker. Allowed 50 ml of water, stand for 30 min with stirring until the paste gets completely dispersed. Transferred the solution to 150 micron IS sieve and washed with a slow stream of tap water. Allowed running tap water drained them on a sieve and dry (at  $105\pm 20^{\circ}\text{C}$ ) the sieve by place it in an oven. Transferred any residue particle is present on the sieve to a watch glass and weighed it.

Calculation: i. The material on the sieve % by  $(\text{Retained mass} / \text{Material taken}) \times 100$

ii. Weighed accurately about 10 gm of toothpaste placed in a 100 ml beaker. Allow 50 ml of water, stand for 30 min with stirring until the paste gets completely dispersed. Transferred the solution to 75 micron IS sieve and washed with a slow stream of tap water. Allowed running tap water drained on the sieve and dry (at  $105\pm 20^{\circ}\text{C}$ ) the sieve by placing it in an oven. Transferred any residue particle is present on the sieve to a watch glass and weighed it.

### **Foaming power**

Taken a suspension of the material in measuring cylinder and shake the suspension for 12 times and measured the volume of the foam produced after shaking for 5 minutes.

Procedure: weighed 5 g of toothpaste in a 100 ml glass beaker. Add 10 ml of water, covered the glass beaker with a watch glass and stand for 30 minutes. Stirred the suspension with glass rods and transferred it to 250 ml measuring cylinder. Transferred the residue retained in the beaker to measuring cylinder by adding of 5- 6 ml of water. Then make up the cylinder with 50 ml of water. Stirred the contents with up-down movements to get uniform suspension at 30<sup>0</sup> C. after shaking, keep the cylinder stand for 5 minutes. And final note the volume obtained with foam + water.

### **Stability**

The toothpaste shall be stable, but not to be deteriorating, ferment and segregate during normal storage conditions and usage. Stability of toothpaste can be tested when it exposes to 45±20C for a period of 28 days. After storage, no phase separation, fermentation, and gassing can be observed. Also exposed to cool conditions such as 5<sup>0</sup> C for 1 hour, no obstruction of executable form from the container is observed.

### **Determination of moisture and volatile matter**

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

## **RESULTS AND DISCUSSION**

Evaluation tests of toothpaste were carried out according to the standards specified by the Bureau of Indian standards IS 6356-1993 for Herbal toothpaste samples (Dantkanti) and Lab made toothpaste sample. All the samples complied with BIS and they found to be of good quality. The different ingredient used with their concentrations for a formulation of toothpaste is given in table 1 and 2.

Evaluation tests were carried out to view the different properties of Lab made and commercial toothpaste. All the results of evaluating parameters were given in table 3.

In the present study, comparatively equal and rarely better results have been observed with Lab made formulation than marketed formulations. Increased activity in terms of abrasiveness and spreadability was appeared in Lab made formulation (fig.2). Comparison of the abrasiveness of marketing pastes with Lab made formulation suggests that Lab made formulation has more abrasiveness than marketed pastes. All the toothpastes were having good consistency and smooth texture. Also shown no symptoms for deterioration such as phase separation, gassing, fermentation when all the samples were placed at a temperature of  $45\pm 2^{\circ}\text{C}$  for a period of 10 days. The foaming ability of lab-made formulations is more than commercial (fig.3). All the formulations produced equal fineness (%), but moisture and volatile matter (%) is more in case of formulation than that of marketed (fig.4).

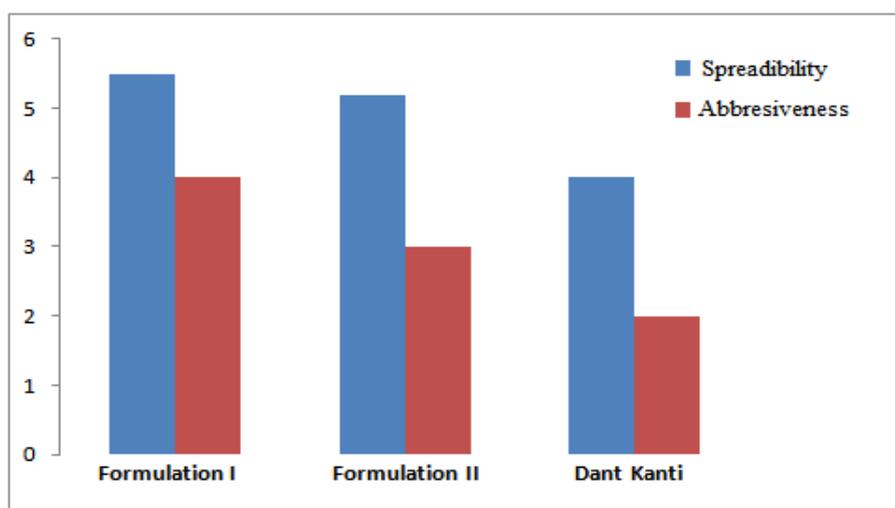


Figure 2: Abrasiveness and Spreadability of Lab made and commercial toothpaste

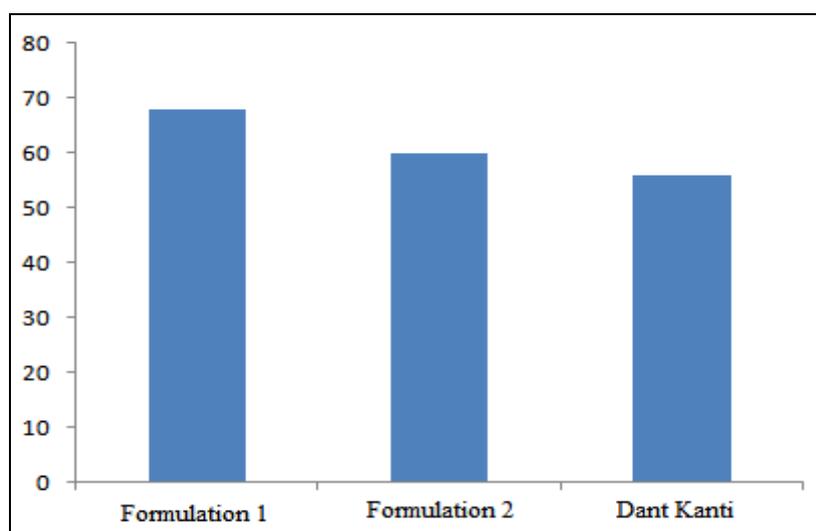
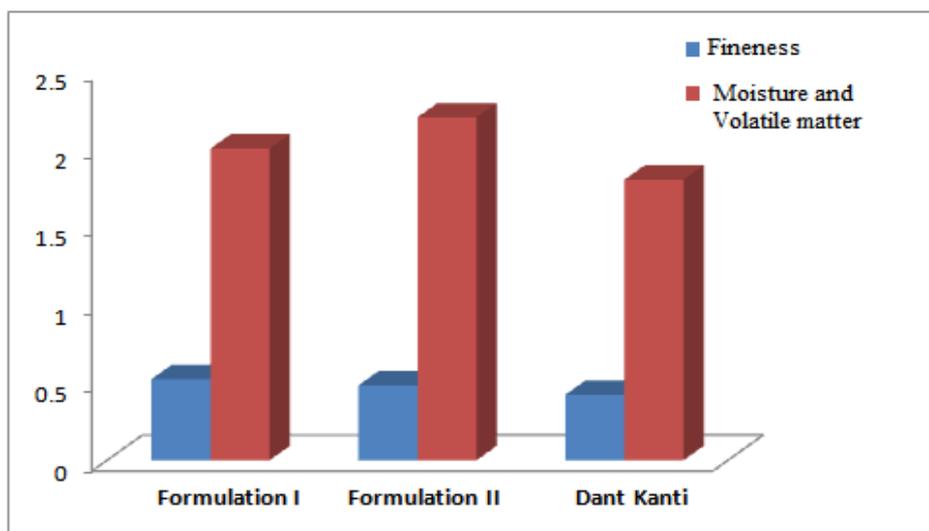


Figure 3: Foaming ability of Lab made and commercial toothpaste



**Figure 4: Fineness (%), moisture and volatile matter (%) of Lab made and commercial toothpaste**

## CONCLUSION

Herbal toothpaste is having an accentuate function in the maintaining the oral hygiene and preventing dental caries. Based on this pattern, lab-made Herbal toothpaste was formulated by selecting suitable ingredients to get the formulation more stable. Evaluation and comparison of results with commercial herbal toothpaste are demonstrated that lab-made toothpaste is having equal superior and gripping zeal over the marketed formulations (Dant Kanti). All the marketed herbal toothpaste and lab-made had been evaluated and compared with the standards specified by Bureau of Indian standards. This preliminary *in-vitro* study demonstrated that lab-made herbal toothpaste was equally efficacious as commercially popular toothpaste in terms of all evaluation properties of toothpaste. Hence, by the evidence of *in-vitro* studies, it is concluded that lab-made herbal toothpaste formulated in a laboratory was found to be of good quality.

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