



## TITRIMETRIC ANALYSIS OF CALCIUM CARBONATE IN DIFFERENT BRANDS OF TOOTHPASTE AVAILABLE IN MARKET

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Article Received on  
30 October 2018,

Revised on 20 Nov. 2018,  
Accepted on 10 Dec. 2018,

DOI: 10.20959/wjpps20191-12918

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### ABSTRACT

Amount of calcium carbonate present in the toothpaste available in Kerala was determined by the titrimetric estimation. Here we adopt acid base and complexometric titration for the determination of calcium carbonate. In acid base titration 0.1N sodium hydroxide is used as titrant and indicator is phenolphthalein, and in complexometric titration sample was titrated against 0.05M EDTA using mordant black 2 as indicator where ammonium-ammonium chloride buffer is to maintain pH. Generally a toothpaste contain 20% of calcium carbonate as abrasive after the experiment we identified that amount of calcium carbonate in different toothpaste are different, some may contain more amount of calcium carbonate while other contain less amount than the standard value.

**KEYWORDS:** Calcium carbonate, Tooth paste, Acid base titration, Complexometric titration.

### INTRODUCTION

Dentifrices are those materials used for cleaning tooth and adjacent gums. Calcium carbonate is the most significant agent used in toothpaste and its effectiveness in toothpaste has confirmed as dentifrices as well as abrasive. Most of the abrasives used in toothpaste are not harmful, and it constitutes atleast 50% in it. These agents help to remove plaques from the teeth, the removal of plaque and calculus help to minimize cavities and even cause small amount of enamel erosion. Calcium carbonate is good cleaning agent which can remove stains from teeth and this action depends upon rubbing force and abrasive property. Over

dose of abrasiveness in toothpaste may cause dental health problems such as enamel erosion, sensitivity and discoloration. Therefore the amount of abrasiveness in a toothpaste are significant for consumers.<sup>[1,2,3,4]</sup>

Calcium carbonate is an ingredient we've been using in our toothpaste since 1975. It represents a safe and natural choice for providing mild abrasivity in our toothpastes. Some alternatives include hydrated silica gels, hydrated aluminum oxides, magnesium carbonate, phosphate salts and silicates. The effects of a calcium carbonate-based toothpaste with added 0.3% triclosan on the pH of human dental plaque after a cariogenic challenge with 10% sucrose solution was investigated against a calcium carbonate-based toothpaste without triclosan and an alumina-based toothpaste.

Calcium carbonate is commonly found in antacids (for heartburn), some dietary supplements and used as dentifrices. Calcium carbonate overdose occurs when someone takes more than the normal or recommended amount of a product containing this substance. This can be by accident or on purpose. Calcium carbonate can be dangerous in large amounts

## **METHODS**

There are different method to measure the amount of Calcium carbonate in toothpaste. Commonly used simplest methods are acid base titration and complexometric titration.<sup>[5,6]</sup>

### **Materials used**

- Colgate
- Close up
- Sensodyne
- Anchor
- K.P Namboothiri's
- Ajay

### **Chemicals used**

- Calcium carbonate
- 0.1N NaOH
- 0.1M HCl & 1M HCl
- Phenolphthalein
- 0.05N Disodium EDTA

- Ammonium-Ammonium chloride buffer
- Erichrome black T mixture



**Fig. 1: Different branded toothpaste available in market.**

**Preparation of Erichrome black T mixture:-** A mixture of 1 part of erichrome black T and 99 part of sodium chloride are triturated using mortar and pestle.<sup>[7]</sup>

**Preparation of Ammonium-Ammonium chloride buffer :-** dissolve 67.5 gm of ammonium chloride in 200 ml of distilled water and 570ml of strong Ammonia solution and dilute to 1000 ml with water.<sup>[8]</sup>

#### **Acid - Base titration (Procedure)**

Weigh an accurate amount of toothpaste sample to a conical flask. To this add 10 ml distilled water and add 10ml 0.1M HCl, and stir well, then heat it for 5 minutes and then cool. The solution titrate against 0.1N

NaOH using phenolphthalein as indicator. End point is the appearance of pale pink colour.<sup>[9]</sup>

#### **Complexometric titration (Procedure)**

Weigh an accurate amount of toothpaste sample to a conical flask and add a mixture of 20 ml water and 5 ml 1M hydrochloric acid. Stir well by using a magnetic stirrer To this add 10 ml Ammonium-Ammonium chloride buffer and add a pinch of erichrome black T mixture then titrate against 0.05M disodium.

**EDTA**<sup>[10,11]</sup>

$$\text{Amount} = \frac{\text{Titre volume} \times \text{Equivalent weight factor} \times \text{Actual Molarity}}{\text{Required Molarity}}$$

$$\text{Percentage purity} = \frac{\text{Titre volume} \times \text{Equivalent weight factor} \times \text{Actual Molarity} \times 100}{\text{Weight of sample} \times \text{Required Molarity}}$$

**RESULTS AND DISCUSSION**

Acid base titration and complexometric titration is a quantitative chemical analysis, in both the titration end point is determined in basis medium.<sup>[12]</sup>

Five samples of each toothpaste were analysed and average weight of sample and titre volume also calculated. End point is the appearance of pale pink color in acid base titration and appearance of emerald blue color in complexometry.

**Table 1: Acid Base titration data.**

Sl. No.	Sample	Weight (gm)	Titre volume (ml)	Amount (gm)	Percentage purity
1	Close up	0.426	06.40	0.0632	14.83%
2	Colgate	0.419	09.00	0.0929	22.13%
3	Sensodyne	0.436	11.60	0.1146	26.26%
4	Anchor	0.448	04.70	0.0464	10.36%
5	K.P Namboothiris	0.343	03.60	0.3550	08.00%
6	Ajay	0.415	06.30	0.0627	15.00%

**Table 2: Complexometric titration data.**

Sl. No.	Sample	Weight (gm)	Titre volume (ml)	Amount (gm)	Percentage purity
1	Close up	1.572	49.60	0.2400	15.30%
2	Colgate	1.535	77.10	0.3730	24.30%
3	Sensodyne	1.544	91.50	0.4430	28.73%
4	Anchor	1.556	29.90	0.1450	09.32%
5	K.P Namboothiris	1.553	24.40	0.1180	07.62%
6	Ajay	1.577	43.90	0.2130	13.50%

From the table given above we can find the amount of CaCO<sub>3</sub> present in the toothpaste, Amount of CaCO<sub>3</sub> in each tooth paste varies. And from our experiment, we found that colgate contains optimum amount of calcium carbonate and therefor it is found to be the best toothpaste, where as sensodyne contains more than average amount, and other paste such as K.P Namboothiri's, Anchor contains lesser than the average amount.

## CONCLUSION

In summary, simple, environment friendly, cost-effective, and convenient method for the estimation of  $\text{CaCO}_3$  present in the toothpaste are determined. In this work a variety of toothpaste was taken and determined the amount of  $\text{CaCO}_3$  present in each tooth paste by acid base titration and complexometric titration. The average amount of  $\text{CaCO}_3$  in a toothpaste is 20% and it was observed that amount of calcium carbonate varies in each toothpaste and we found that comparatively colgate is the best one since it contain standard amount of calcium carbonate. Where as sensodyne contain more amount and K.P Namboothiri's contain lesser amount than stated value.

## ACKNOWLEDGEMENT

We are thankful to management of DM WIMS college of pharmacy, Meppadi, wayanad. And I would like to extend my heartfelt thanks to the Principal, colleagues and my friends.

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