

## COMPARATIVE STUDY ON VARIOUS TOOTH PASTES REGARDING VARIOUS PARAMETERS LIKE APPEARANCE, PH, SPREADABILITY, HOMOGENEITY, MOISTURE CONTENT, HEAVY METALS, ANTI-MICROBIAL ACTIVITY

### Pharmaceutical

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### ABSTRACT

Toothpaste aids in removing dental plaque and food from the teeth, assists in suppressing halitosis, help prevent tooth decay (dental caries) and gum disease (gingivitis), to promote oral hygiene. Multiple toothpastes have become available, which contain all the ingredients that would take care over gingivitis, tartar control and whitening of teeth. Tooth whitening is an important criteria for many of us. Toothpaste remove plaque, stains for which whitening abrasive particles on the toothpaste plays an important role. Currently the advances in the ingredients and additives to toothpastes offers some good clinical choices. In the present study ten different marketed brands of toothpastes were evaluated for various parameters like appearance, pH, spreadability, homogeneity, moisture content, heavy metals, anti-microbial activity and the results are in compliance with the standards of BIS. Lastly all the brands of toothpastes taken for the study possess anti-microbial activity, the better activity was seen in Sensocheck-F and Enshine when compared with the other brands, Sensocheck-F being a medicated toothpaste and it possess good anti-microbial effect to maintain oral hygiene. Even the herbal toothpastes like Vedshakti and Himalaya also have anti-microbial activity but it was less compared to medicated toothpastes.

### KEYWORDS

Tooth Paste, Antimicrobial Activity, Oral Hygiene

#### INTRODUCTION:

Toothpaste aids in removing dental plaque and food from the teeth, assists in suppressing halitosis, help prevent tooth decay (dental caries) and gum disease (gingivitis)<sup>[1]</sup>, to promote oral hygiene. Multiple toothpastes have become available, which contain all the ingredients that would take care over gingivitis, tartar control and whitening of teeth.<sup>[2]</sup> Tooth whitening is an important criteria for many of us. Toothpaste remove plaque, stains for which whitening abrasive particles on the toothpaste plays an important role<sup>[3]</sup>. Currently the advances in the ingredients and additives to toothpastes offer some good clinical choices. The present study aimed at evaluation of ten different marketed brands of toothpastes for various parameters like appearance, pH, spreadability, homogeneity, moisture content, heavy metals, anti-microbial activity and the results are in compliance with the standards of BIS.

#### AIM and objective:

Compare various Tooth pastes regarding parameters like appearance, pH, spreadability, homogeneity, moisture content, heavy metals, anti-microbial activity

#### REVIEW OF LITERATURE:

Fatima Grace et.al.<sup>[4]</sup> reported a method on the oral hygiene which can be maintained throughout the day by using various dentifrices prepared by herbal and synthetic ingredients. This work was carried out to prepare a tooth paste which can be used as a tool for proper oral hygiene and to overcome the side effects of the conventional toothpaste prepared by synthetic ingredients. The toothpaste was prepared by using various herbal ingredients which possess the antibacterial, antiseptic and cooling properties. Clove, Ginger, Neem, Banyan, Tulsi and Acacia are the herbal ingredients were used in this work to formulate ideal toothpaste which can satisfy all the required properties to keep the mouth fresh and to prevent tooth decay caused by bacteria.

Satish Kumar, et.al;<sup>[5]</sup> reported a method to evaluate and compare experimental toothpaste with commercial toothpastes. In the study, many commercial toothpastes have been used. The formulations were subjected to various evaluation tests for their quality. All the marketed tooth pastes and experimental toothpaste which had been evaluated the complied with the standards specified by the Bureau of Indian Standards.

Mohammad Kiani et.al;<sup>[6]</sup> reported a method on formulation and

physicochemical evaluation of toothpaste formulated with Thymus vulgaris essential oil. Thymus vulgaris essential oil has profound antimicrobial activity against a wide range of species like Streptococcus mutans which was the most common cause of tooth decay.

Mahendran sekar et.al; reported a method on the demand of herbal based toothpaste. Consumers believed that herbal based toothpaste are safe, effective and less toxic, because less and only safe chemicals are used as compared to the synthetically produced toothpaste. The herbal toothpaste used three herbal extracts namely Musa acuminata, Psidium guajava, Citrus arranticum and tested against Staphylococcus aureus, Bacillus cereus, Escherichia coli and Pseudomonas aeruginosa with different concentrations varying from 100mg/ml, 250mg/ml, and 500mg/ml the significant inhibition has seen against Staphylococcus aureus (12-18mm) followed by Bacillus cereus (11-15mm) and there is no inhibition for both Escherichia coli and Pseudomonas aeruginosa. The formulated toothpaste were also evaluated with the standard parameters along with the microbial activity.

M.Ravi kumar et.al;<sup>[7]</sup> reported a method to prepare, evaluate and compare Lab Made Herbal toothpaste with commercial Herbal toothpastes. In the study, commercial Herbal toothpastes such as Himalaya, Meswak and Dant kanthi have been evaluated for their quality. All the marketed Herbal tooth pastes and Lab Made Herbal toothpaste which had been evaluated complied with the standards specified by the Bureau of Indian Standards.

Jaroslava Svarc-Gajic et.al;<sup>[8]</sup> reported a work on determination of fluorides in pharmaceutical products for oral hygiene. Fluorides were the common ingredients in pharmaceutical products for oral hygiene due to their recognized effect in the prevention of tooth decay

Ji-Yoon Kim et.al;<sup>[9]</sup> reported a method for the Descriptive Analysis of Toothpaste Flavor Using Novel Sample Preparation. It was difficult to conduct a sensory (flavor) evaluation of toothpastes because toothbrushing can cause oral pain and memory loss.

Bart Vande Vannet et.al;<sup>[10]</sup> reported a method on the evaluation of Sodium Lauryl Sulphate in Toothpaste on Toxicity on Human Gingiva and Mucosa

Tubonimi J. K. Ideriah et.al;<sup>[11]</sup> reported a method on assessment of

Submitted : 14<sup>th</sup> April, 2019

Accepted : 07<sup>th</sup> July, 2019

Publication : 01<sup>st</sup> September, 2019

Fluoride and Heavy Metals Concentrations in Toothpastes Marketed in Port Harcourt Nigeria. The concentrations of fluoride and heavy metals were measured using Ion-Selective Electrode method and Atomic Absorption Spectrophotometer respectively.

Docimo R et.al;<sup>[12]</sup> reported a method on comparative evaluation of the efficacy of three commercially available toothpastes on dentin hypersensitivity reduction: an eight-week clinical study. The objective was to evaluate the dentin hypersensitivity reduction efficacy of three commercially available toothpastes: (1) Colgate Sensitive Pro-Relief Toothpaste (2) Sensodyne Rapid Relief Toothpaste; and (3) Crest Cavity Protection .Colgate Sensitive Pro-Relief Toothpaste, used twice daily, was more effective than other formulations.

#### MATERIALS AND METHODS:

BRANDS		MANUFACTURER
Colgate	--	Colgate-palmolive (India) Ltd.
Pepsodent	--	Hindustan Unilever Ltd
Close up	--	Hindustan Unilever Ltd
Colgate kid	--	Colgate-palmolive(India) Ltd.
Pepsodent kid	--	Hindustan Unilever Ltd
Himalaya	--	The Himalaya Drug Company
Vedshakti	--	Colgate-palmolive(India) Ltd.
Dabar red	--	Dabar India Ltd.
Enshine	--	Allkind healthcare unit-III
Sensocheck-F	--	Scott-Edil Pharmacia Ltd.

Name of the equipment	Name of the manufacturer
Autoclave	REMI instruments Ltd., Mumbai
Incubator maintained at 37 ° C	REMI instruments Ltd., Mumbai
Analytical weighing balance	Shimadzu (aux220), Japan
Microtips (200---1000µL)	ANM products Pvt Ltd., Kolkata
Micropipette (10 – 1000 µL)	ANM products Pvt Ltd., Kolkata
Hot air oven	Kumars laboratory
Laminar air flow unit	AIRCON-1

Contents	Examples
Organisms	Gram positive organisms:- a) <i>Staphylococcus aureus</i> b) <i>Bacillus subtilis</i> Gram negative organisms:- a) <i>Escherichia coli</i> b) <i>Pseudomonas aeruginosa</i>
Chemicals	<ul style="list-style-type: none"> <li>Standard Arsenic solution</li> <li>Standard Lead solution</li> <li>Nutrient agar</li> <li>Nutrient broth</li> <li>Distilled water</li> </ul>

#### EVALUATION PARAMETERS:

##### 1.APEARANCE:

It is one of the organoleptic property and it is done by visual inspection. The paste is extruded from the collapsible tube and it is visualized for its colour.

##### 2.pH:

10gms of sample was weighed by using electronic balance and transferred into a beaker. To the sample containing beaker small amount of distilled water was added and stirred well until a uniform suspension was obtained. The obtained suspension was evaluated for pH within 5minutes of preparation by using pH meter.

##### 3.SPREADABILITY:

1gm of sample was weighed and placed at the center of the glass plate(10×10cm). The another glass plate same dimensions was placed over it,care to be taken that glass slide should not slide. Now 2kg weight was placed on it and allow it to stand for 3minutes and measure the diameter. This procedure was repeated thrice and the average value was taken for it accuracy.

##### 4.FINENESS:

10gm of toothpaste was weighed and taken in a beaker to it 50ml of distilled water was added and stirred well .Now the obtained suspension was passed through 80 and 100µS sieve. Then it was washed under slow stream running tap water, the sieve was later dried if any residue was retained on the sieve which is placed in an hot air oven. The weight of the residue that is retained was calculated.

##### 5.FOAMING POWER:

5gm of toothpaste was weighed and taken into a beaker and 10ml of distilled water was added to it. Now the beaker was covered with a watch glass and allow it to stand for 30minutes and stirred well and transferred into a graduated cylinder(250ml). Now 12 complete shakes were given and the volume was measured.

Foaming power= V1 - V2

V1- Volume in ml of foam with water, V2- Volume in ml of water only

##### 6.DETERMINATION OF SHARP, EDGE AND ABRASIVE PARTICLES:

Extrude the paste on to a butter paper and press it along the entire length by a finger. The sample should be free from sharp, edge or abrasive particles.

##### 7.DETERMINATION OF HOMOGENEITY:

Take about 10 collapsible tubes of same type and from different parts of the collapsible tubes and sample should be uniformly distributed along the length of the collapsible tubes.

##### 8.DETERMINATION OF MOISTURE CONTENT:

10gm of sample was weighed and dried it in hot air oven at 105oc. Allow it to cool and the loss of weight was calculated. The difference in the weight was recorded as %moisture content.

It is calculated by the formula-

(Original sample weight-Dry sample weight)/(Original sample weight)×100

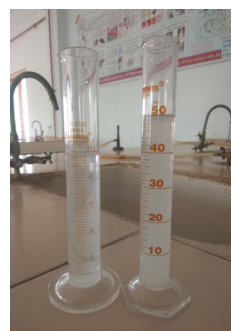
##### 9.DETERMINATION OF ARSENIC:

Preparation standard arsenic solution:0.330gm of arsenic trioxide was taken and dissolved in 5ml of 2M sodium hydroxide and dilute to 250ml with water. Now dilute 1ml of the solution to 100ml with water immediately before use.

Principle: Arsenic present in the sample is reduced to arsine by diluting with sodium hydroxide solution now it is made react with mercuric bromide paper. the strain produced is compared with the standard strain.



a) arsenic apparatus



b) lead apparatus

##### 10.DETERMINATION OF LEAD:

Preparation of standard lead solution: 0.1599 gm of lead nitrate was weighed and dissolved in 10ml of diluted nitric acid and water is added to make 1000ml of solution. Now dilute 1ml of the solution to 100ml with distilled water only before use.

Principle: The colour produced by the test solution was matched against the standard lead solution

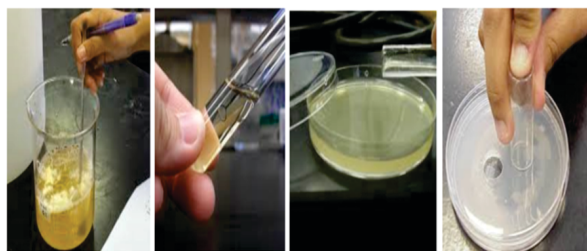
**11.ANTI MICROBIALACTIVITY**

Preparation of nutrient agar medium:

Suspend 3gm of nutrient agar medium in 50ml of distilled water. Heat the mixture with continuous stirring to fully dissolve the agar powder. To it 1.2gm of nutrient broth was added and the mixture was heated with continuous stirring by slowly adding water to it until the 100ml solution was obtained with a required consistency. Now the prepared medium was transferred into boiling tubes and was sterilized by using autoclave (121oc for 15 minutes).

**Procedure:**

The prepared nutrient agar medium which was autoclaved was cooled but not allowed for solidification. After the medium has lightly cooled, add 1ml of the inoculum (required microorganism). Now pour the medium into sterile petri plates and leave a side until the medium has solidified. Now keep the wells with the help the sterile borer. To the well the required quantity of sample is poured by using the micropipettes. All the procedure should be done in a laminar air flow unit which was sterile. Now replace the lid of each petri dish and store the plates in a refrigerator for diffusion for about 15minutes and then replace all the petri plates into the incubator and allow it to incubate for 24hours and observe the results for the zone of inhibition.



**RESULTSAND DISCUSSIONS**

**Table 1 : Results of Appearance, pH, Spreadability of different brands of toothpastes**

S.no	Brands	Appearance	pH	Spreadability
1	Colgate	White	7.21	9.2
2	Pepsodent	Pale pink	6.91	8.8
3	Close up	Red	6.45	9.5
4	Colgate Kid	Blue	5.08	9.45
5	Pepsodent Kid	Baby pink	7.21	9.7
6	Himalaya	Gray	6.66	10
7	Vedshakti	Gray	7.21	9.35
8	Dabar red	Brown	6.64	8.15
9	Enshine	Blue	6.82	9.25
10	Sensocheck-F	Red	7.46	10.9

**Note:** From the above table values the pH and Spread ability were found to be limits, the pH and Spread ability values were found to be high for Sensocheck-F when compared with other brands of toothpastes.

**Table 2: Results of fineness, foaming power ,sharp, edge and abrasive particles**

S.no	Brands	Fineness	Foaming power(ml)	Sharp, edge and abrasive particles
1	Colgate	-	52	Absent
2	Pepsodent	-	55	Absent
3	Close up	-	57	Absent
4	Colgate Kid	-	54	Absent
5	Pepsodent kid	-	51	Absent
6	Himalaya	0.39	60	Present
7	Vedshakti	0.42	61	Present
8	Dabar red	-	54	Absent
9	Enshine	-	54	Absent
10	Sensocheck -F	-	51	Absent

**Note:** From the above table values the fineness,foaming power,sharp ,edge and abrasive particles were found to be limits ,the fineness,foaming power,sharp ,edge and abrasive particles values were found in Himalaya and Vedshakti when compared with other brands of toothpastes.

**Table 3: Results of homogeneity, moisture content ,heavy metals**

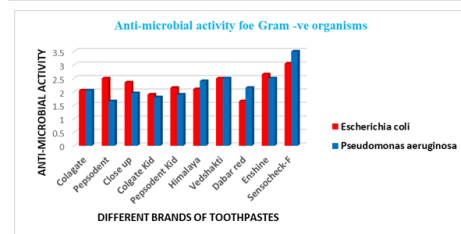
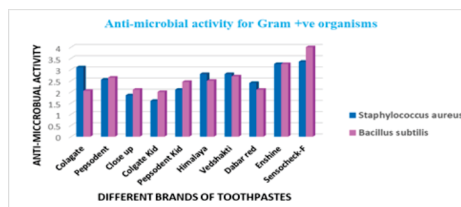
S.no	Brands	Homogeneity	Moisture content	Heavy metals Arsenic & Lead
1	Colgate	Pass	1.8	Within limits
2	Pepsodent	Pass	1.6	Within limits
3	Close up	Pass	1.3	Within limits
4	Colgate kid	Pass	1.5	Within limits
5	Pepsodent kid	Pass	1.9	Within limits
6	Himalaya	Pass	2.0	Within limits
7	Vedshakti	Pass	2.3	Within limits
8	Dabar red	Pass	1.8	Within limits
9	Enshine	Pass	1.5	Within limits
10	Sensocheck -F	Pass	1.7	Within limits

**Note:** From the above table all the brands of toothpastes passed the tests for homogeneity and heavy metal. The moisture content values were found to be high in Himalaya and Vedshakti when compared with other brands of toothpastes.

**Table 4 : Results of Anti- microbial activity**

S.no	Brands	Anti – microbial activity			
		Gram +ve		Gram –ve	
		S.A	B.S	E-coli	P.A
1	Colagate	3.1	2.05	2.05	2.05
2	Pepsodent	2.55	2.64	2.5	1.65
3	Close up	1.85	2.1	2.35	1.95
4	Colgate Kid	1.6	2.0	1.9	1.8
5	Pepsodent Kid	2.1	2.45	2.15	1.9
6	Himalaya	2.8	2.5	2.1	2.4
7	Vedshakti	2.8	2.7	2.5	2.5
8	Dabar red	2.4	2.1	1.65	2.15
9	Enshine	3.25	3.25	2.65	2.5
10	Sensocheck-F	3.35	4.0	3.05	3.5

**Note:** From the above table all the brands of toothpastes passed the tests for Anti-microbial activity. The best anti-microbial activity was seen for Sensocheck-F for the Gram +ve and Gram -ve organisms when compared with other brands of toothpastes. Even the herbal toothpastes like Vedshakti and Himalaya have also shown better activity over the Gram +ve and Gram -ve organisms next to Sensocheck-F.



**Statistical analysis** – was done after recording all the data under IBM SPSS , version 20 statistical programme.

**RESULTS:**

- In the present study ten different marketed brands of toothpastes were evaluated for various parameters like appearance, pH, spreadability, homogeneity, moisture content, heavy metals, anti-microbial activity and the results are in compliance with the standards of BIS.
- Lastly all the brands of toothpastes taken for the study possess anti-microbial activity, the better activity was seen in Sensocheck-F and Enshine when compared with the other brands, Sensocheck-F being a medicated toothpaste and it possess good anti-microbial effect to maintain oral hygiene.
- Even the herbal toothpastes like Vedshakti and Himalaya also have

anti-microbial activity but it was less compared to medicated toothpastes.

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