



FORMULATION AND EVALUATION OF TOOTHPASTE WITH BROMELAIN AND TULSI EXTRACT FOR DENTAL CARIES

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Article Received on 08/07/2020

Article Revised on 28/07/2020

Article Accepted on 18/08/2020

ABSTRACT

In India, remarkable dental problems are due to microbial infections. Dental problems are classified in to three types, formation of dental plaques, dental caries and periodontal diseases. When plaque accumulates on tooth surface due to biochemical reactivity of complex micro-organisms leads to dental caries. The perpetual and most common disease today is Dental caries also known as tooth decay. The prime application of toothpaste is elimination of bacteria in mouth and to promote oral cleanliness. The essential criteria being the toothpaste should impart abrasive action and good breath. Herbal toothpaste must ascertain oral hygiene at reliable low cost and it freshen our breath by preventing various gum diseases. Herbal toothpaste is entirely destitute of harmful chemical substances liable for tooth staining and altered taste. Plaque formation begins with the formation of a glycoproteinaceous pellicle layer, constituted from components of saliva, crevicular fluid, host and bacterial cells. Though the pellicle layer primarily serves as a protective barrier, it also acts as a substrate for bacterial accumulation which invariably forms dental plaque. Hence considerable attention turned on natural ingredients used for the treatment of dental plaque. Pineapple is the common name of *Ananascomosus* (*syns. A. sativus, Ananassa sativa, Bromeliaananas, B. comosa*). Pineapple is the leading edible member of the family Bromeliaceae, Bromelain is a chief protease enzymes found in pineapple plant (*Ananascomosus*). Hence the main aim is to formulate and evaluate herbal toothpaste containing Bromelain and Tulsi extract that removes plaque and promotes the oral hygiene.

KEYWORDS: Dental carries, Tooth Paste, Bromelain, Tulsi.

INTRODUCTION

Dental caries is one of the major infectious microbial disease, leads to localized dissolution and impairment of the calcified tissues of the teeth. If proper attention is not paid means it contributes to pain, tooth loss, infection and even death in severe cases.^[1] Nowadays, Dental caries is the most prevalent and exist as common diseases throughout the world. In maintenance of oral care toothpaste hold the attention in entire oral health care. The practice of toothpaste formulations set about in China and India, as 300-500 BC.^[2] In ancient days, to combat caries, most commonly used abrasives were squashed bone, pulverized egg and clam shells. The food we eat has been acted by bacteria and produces acid which cause serious consequences like damage to tissues of teeth. Due to poor maintenance of tooth, the bacteria act on the left over food in mouth and transform in to acid which in turn is converted to waste product. The secreted acid demineralizes the enamel of tooth which is the prime stage for dental caries. Due to demineralization, tooth unable to strengthen calcium and phosphate eventually drives to sepsis and formation of

pus around the tooth. An untreated cavity causes infection in tooth called as tooth abscess. Since herbal tooth paste is devoid of fluoride it cleans the teeth safely and refresh our breath. The pineapple (*Ananuscomosus*) is a multiple fruit belongs to Bromeliaceae family. Bromelain is a mixture of proteases derived from various parts of Pine apple are correlated to its proteolytic activity. Tulsi (*Ocimum sanctum*) the Queen of Herbs belongs to family: Lamiaceae effective in the treating dental caries.

MATERIALS AND METHODS

Extraction of bromelain from pineapple

Bromelain is the plant protease enzyme extracted from various parts of pineapple such as pulp, stem, peel and the leaves. The pineapple was purchased from a local market. The peel, pulp, stem and leaves were separated and cut in to small pieces and weighed separately. Pineapple with leaves and stem washed with 250 ml of 0.1 % H₂O₂ solution. The juice obtained from the stem, leaves were blended with sodium acetate buffer subjected to filtration followed by centrifugation of the

filtrates at 10,000 rpm. The supernatant were subjected to refrigeration at 4°C with the addition of 0.05% sodium azide.^[3] The formulation of Herbal toothpaste was shown in Table: 1.

Tulsi leaves extract

Tulsi leaves were collected from local market in Thiruninravur. The specimens were identified by a botanist and a pharmacognosist for their authenticity.



Fig 1: Bromelain extract.



Fig 2: Tulsi extract.

Formulation of Herbal toothpaste.^[4]

Table 1: Formulation of Herbal toothpaste.

Sl No	Name of the Ingredient	Qty for 100 gm
1.	Bromelain extract	2 ml
2	Tulsi leaves extract	2 gm
3	Clove oil	0.2 ml
4	Calcium carbonate	50 g
5	Glycerin	40 ml
6	Soap nut powder	2.5 g
7	Titanium dioxide	0.5 g
8.	Menthol	0.2 g
9	Honey	2 ml
10	Sodium chloride	2 g
11.	Methyl paraben	0.02 g

Procedure^[5,6]

50g of Calcium carbonate is was taken in mortar and pestle. To this added 2ml Bromelain extract and Tulsi extract. The mixture was triturated in clockwise direction. Then added 2.5 gm of soap nut powder, 0.5gm of Titanium dioxide followed by 2gm of Sodium chloride which was already sieved and triturated. All the ingredient, which was selected, sieved and then triturated

were added by continuous mixing with 0.2gm of powdered Menthol crystals and 2ml of Honey. Then 40ml of Glycerine was added and triturated well to achieve desire consistency. To impart analgesic action, 0.2ml of Clove oil was added and mixed well. Finally add 2gm of methyl paraben were added and mixed well to form uniform mixture.



Fig 3: Preparation of tooth paste.

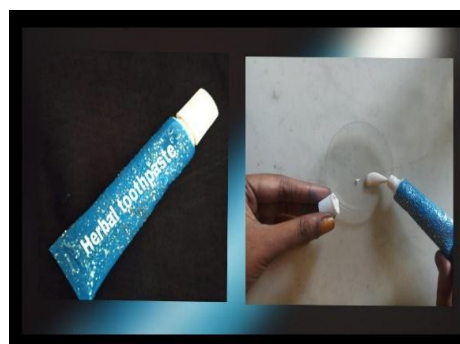


Fig 4: Formulated toothpaste.

RESULTS

Characterization of tooth paste

Organoleptic evaluation

Colour: The colour was checked visually.

Odour: The odor of tooth paste determined by smelling it.

Taste: The taste of tooth paste checked manually by tasting the product.

Smoothness: The smoothness was tested by rubbing the toothpaste between the fingers.

pH determination^[7]

10 gm of toothpaste was taken in 150 ml beaker. Then 10 ml of freshly boiled & cooled water (at 27⁰C) was added and stirred well to formulate as suspension. The pH was determined within 5 minutes using pH meter and the results were listed in Table 2.

Determination of grittiness^[8]

To find out the presence of hard sharp edged abrasive particles by extruding about 15 to 20 mm length paste from a collapsible tube of each sample on butter paper. It was pressed along its entire length by finger and the results were listed in Table 2.

Determination of spreadability^[9]

1 gram of toothpaste was placed on a glass slide (10 x 10 cm), covered with another glass slide. Then carefully placed 2 kg weight of on covered glass slide (Sliding is not allowed). The spreading (in cm) of the toothpaste was determined after 3 minutes. The experiment was repeated in triplicate and the average value is determined and the results were listed in Table 2.

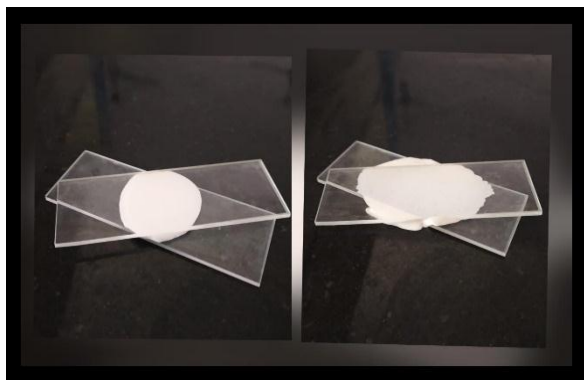


Fig 5: Test for spreadability.

Test for extrudability

Formulated toothpaste was filled in standard capped collapsible aluminium tube and sealed by crimping method. Initially the weight of toothpaste tube was noted and it placed between two glass slides and clamped. 500 g was placed over the tube and then cap was removed. The tooth paste extruded from the tube was collected and weighed. The percent of extruded paste was calculated and the results were listed in Table 2.

Foaming power^[10]

The toothpaste was transferred in to an measuring cylinder and shakes the suspension for 12times. Finally the measured the volume of the foam produced is noted after shaking for 5 minutes and the results were listed in Table 2.



Fig 6: Test for foamability.

Determination of moisture and volatile matter^[11]

Accurately 5 g of a sample was weighed and placed in a porcelain dish with 6-8 cm in diameter and 2-4 cm depth in it. The sample is subjected to drying in an oven at 105⁰C and the results were listed in Table 2.



Fig 7: Test for moisture and volatile matter.

Microbiology study^[12]

To determine the antibacterial activity microorganism such as *E.coli*, *candida albicans*, and *staphylococcus aureus* were taken and Agar-well diffusion standard cup plate technique was used. The melted media were seeded with the suspension of micro-organisms and permitted to solidify state. Sterile forceps was used for the aseptic transfer of Himedia in to petridish aseptically. Formulated herbal tooth paste was kept for diffusion in an incubator at 30⁰C for 5-7 days. The antimicrobial activity was determined based on zone of inhibition measurement.

Table 2 : Evaluation of herbal toothpaste.

Sl No	Name of the Test	Results
1.	Colour	White
2	Odour	Mint
3	Taste	Sweet
4	Smoothness	Smooth
5	pH	5.5
6	Grittiness	No gritty particle found
7	Spreadability (cm)	4.5
8	Extrudability amount percentage	89.37
9	Foaming ability	54
10	Moisture and volatile matter (% by mass)	2

Antimicrobial activity of Herbal toothpaste

Antimicrobial activity of Herbal tooth paste was determined by disc diffusion method. The Herbal tooth

paste exhibited significant antibacterial activity against all the microorganisms studied and the results are given in table 3.

Table 3. Antimicrobial activity of herbal toothpaste.

Sl.No	Organism	50 µg/ml	100 µg/ml	50 µg/ml	100 µg/ml
1	<i>E.coli</i>	+	+	+	++
2	<i>Staphylococcus aureus</i>	++	++	++	+++
3	<i>Candida albicans</i>	++	++	++	+++

CONCLUSION

Every individual owes to have attractive teeth to promote their beauty. Most commercially available toothpaste contains harmful chemicals, hence herbal toothpaste plays prominent role in maintaining the oral hygiene and preventing dental caries. A splendid set of teeth depicts health and youthfulness, and has influence on career prospects too.^[13] Bromelain enzyme derived from stem of pine apple acts as plaque remover and general cleaner. Tulsi used for maintaining good dental health by counteracting bad breathe and provide massage action to gums. Sodium chloride content used to prevent the formation of Leptotrichae coating hence it prevents the harm to enamel. The findings of the study revealed that effective herbal toothpaste can be made with our traditional plants to combat dental caries and impart shine and good holistic appearance to teeth. Hence the lab made herbal toothpaste meets all the ideal requirements of economic value.^[14]

ACKNOWLEDGEMENT

We are thankful to Prof.A.Maheswaran, Principal, Jaya College of Paramedical Sciences, College of Pharmacy, for his support and motivation towards during our work.

Conflicts of interest: We declare no conflict of interest of any kind with anybody.

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