



Comparison between the effect of commercially available chemical teeth whitening paste and teeth whitening paste containing bromelain on streptococcus mutans

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ABSTRACT:

Introduction:Dentistry plays a crucial role in shaping the esthetics of a person and thus boosts the self-esteem of an individual. Whitening of the teeth is the most popular procedure where surface and deep stain removal whitens the teeth. Teeth whitening is achieved by professional application of chemicals and can also be self-administered by numerous products available. The most popular product is teeth whitening paste which is simple in application and easily available. Recently, teeth whitening toothpaste is commercially available where natural ingredients or their derivatives are used instead of chemicals for teeth whitening.

Materials and method:Natural teeth were fixed to acrylic slab.3 teeth per set(10 slabs).Teeth sets were sterilized in autoclave after that a mixture of artificial saliva, sucrose and S.mutants were added just to cover the teeth sample in a petridish. The teeth set were divided into 3 groups Group 1 - Commercially available teeth whitening paste Group2- Teeth whitening paste containing bromelain Group 3 -Control.It was incubated for 48 hours.The sample was collected using sterile swab and was spread on BHI agar.

Results:Teeth whitening paste containing bromaline was more effective than commercially available chemical teeth whitening paste in removal of streptococcus mutans.

Conclusion:According to this study teeth whitening paste containing bromaline was more effective than commercially available chemical teeth whitening paste in removal of streptococcus mutans.Further studies can be done comparing the surface morphology, colour change using teeth whitening paste containing bromelain to assess its teeth whitening and stain removal abilities.

Keywords: bromelain whitening paste, chemical whitening paste, teeth whitening, streptococcus mutans

INTRODUCTION

The simplest and most common oral

hygiene measure is cleansing of the teeth using toothpaste and toothbrush(1) (2). It

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offers basic protection from plaque and dental caries(3). Dentifrices carry the active therapeutic agent for basic protection from dental plaque and caries(4). In addition to this, whitening pastes have formulations with enhanced physical and chemical cleaning ability to remove as well as prevent extrinsic stains(5) (6). Teeth whitening can be achieved either by professional application or can be selfadministered by the use of commercially available products such as toothpaste, mouthwashes, whitening pens, whitening strips and whitening trays; among these, use of whitening toothpaste is the most popular technique. Basically, conventional whitening toothpaste contains abrasives and bleaching agents such as silica, pyrophosphates, hydrogen peroxide or carbamide peroxide, which remove the extrinsic stains, thereby lightening the teeth color(7). The chemical ingredients in whitening toothpaste cause undesired harmful effects not only on the enamel but also on the soft tissues, resulting in mucosal irritation. ulceration and circumoral dermatitis(8).

Bromelain is an enzyme extract with protease activity, which is found mainly in the pineapple plant (Ananas comosus) of the genus Bromeliaceae(9). This extract can be obtained from both the stem and the fruit of the pineapple plant and contains as the main component a mixture of glycosylated proteolytic sulfhydryl enzymes (10) (11). The bromelain strain possesses different biochemical properties and compositions compared to fruit bromelain, the latter containing several thiol endopeptidases and also compounds such as peroxidases, acid phosphatase, glycoproteins, carbohydrates and organic complexed Ca2+ (12) (13). To date, eight

active proteolytic components have been isolated from bromelain (14). Proteinases are considered to be the most active fraction, comprising ~2% of total proteins; occasionally, the term bromelain is also used to describe only the two dominant proteases in this extract (15). Bromelain works in a pH range of 4.5 to 9.5.

Bromelain is one of the most widely investigated proteolytic enzymes/extracts for practical and industrial applications, due to its ease of extraction and low cost given by the relatively affordable raw material. Because of its protease activity, bromelain has been cited for its antiedematous, fibrinolytic, anticancer, antiinflammatory, antimicrobial, anticoagulant, and antithrombotic medical applications—generally due to the ability of bromelain to degrade connective proteins from inflamed tissues or tissues, or circulating proteins in the blood (such as those involved in coagulation), or proteins in pathogens (leading to the death of those agents-hence antimicrobial activity) (16).In addition to the clinical approach, bromelain has been used in various industries, including the food industry, such as breweries, meat processing and tenderizing, textile and cosmetics(17). An advantage for some industrial applications is that the optimum temperature of bromelain is $\sim 50-70$ ° C. Toothpastes based on proteolytic enzymes have proven their effectiveness by removing tooth stains, this being done with reduced roughness (18).

Indeed, for dental applications—such as toothpaste or whitening solutions—the main candidates as alternatives to peroxides are cysteine-protease enzymes, such as papain and bromelain, described as active agents with whitening potential(19).

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Proteases disrupt or remove the portion of protein in the film layer that forms on the surface of the teeth, thus removing the pigments that are bound to them. Thus, the study focused to investigate the effect of commercially available chemical teeth whitening paste and teeth whitening paste containing bromelain on streptococcus mutans.

Our team has extensive knowledge and research experience that has translate into high quality publications (20–29)

MATERIALS AND METHOD:

Natural teeth were fixed to acrylic slab.3 teeth per set(7 slabs).Plaque sample was collected in BHI broth and incubated for 24 hours.160 ml of artificial saliva + sucrose was put in the petri dish just to cover the teeth sample and put it for sterilization. After that in a tray covered with aluminium foil 2 sterile petri dish 5 slabs in each with 80 ml artificial saliva and sucrose in each petri dish we added 2 ml plaque (S.mutans) 1000 microliters in each petri dish and incubated for 48 hours at 37°C to make a biofilm. After that we divided the slabs into 3 groups : Group 1- Commercialy available chemical teeth whitening paste (3 slabs), Group 2 - g teeth whitening paste containing bromalein(3 slabs) and Group 3-Control (1 slab). We used a manual toothbrush to brush the teeth slabs covered in a biofilm for 1 minute. After brushing we used a sterile distilled water to clean the teeth.After that we used the sterile cotton swab to collect the sample from the tooth surface and then we inoculated BHI agar(Brain heart infusion agar).We incubated it for 12-24 hours at 37°C.Next day we checked for the bacterial growth present and obtained the results.

RESULTS:

Material	Set 1	Set 2	Set 3
Chemical whitening paste	2453	1740	1302
Bromelain containing paste	522	270	20
Control	7083		

Table 1-It illustrates the number of colonies of each set in all the 3 groups

In this study we compared the efficacy of commercially available chemical teeth whitening paste and teeth whitening paste containing bromelain on streptococcus mutans. Teeth whitening paste containing bromelain was more efficient in between the two in terms of reduction of streptococcus mutans.



Promega Colony Counter - Apps on ... Figure 14- Colony counter app used to count the number of colonies

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DISCUSSION

The universal method of cleansing teeth till date is achieved with the efficient use of toothbrush. dentifrice and Dentifrice contains various therapeutic agents and thus is the most common and simple method to maintain oral hygiene(8). The ingredients in dentifrice act on dental plaque thereby preventing dental caries and gingivitis(30). In addition to mechanical cleansing, whitening toothpaste offers removal of stain and discolorations. Its use in general population is gaining popularity as it can be self-administered and costeffective, consumes less time and reduces visits to a dental clinic. Hence, there are commercially varieties of available whitening toothpaste available in the market.

In this study we compared the effect of commercially available chemical teeth whitening paste and teeth whitening paste containing bromalein on streptococcus mutans.Teeth whitening paste containing bromaline was more effective than commercially available chemical teeth whitening paste removal of in streptococcus mutans. As early as 1999 [30], bromelain has been shown to act as an antibacterial agent by inhibiting the growth of intestinal bacteria, such as Escherichia coli, by helping to stop the production of enterotoxins by these bacteria(31). In 2014, the antibacterial effect against strong periodontal pathogens was studied, showing that this enzyme also demonstrates an anthelmintic effect against gastrointestinal nematodes. such as Heligmosomoides polygyrus, Trichoderma viride and Trichurismuris(32) (33). In a study by Mazilu et al, Following antimicrobial tests on gels enriched with bromelain, it stated that they have different antimicrobial activity depending on the type of extract and depending on the bacterial strain tested(34). In 2005, Joiner et al. showed that whitening toothpaste makes no significant wear on the enamel and dentin. However, Zimmerman et al. reported that whitening treatments could change the mechanical properties of the enamel. Literature of Joiner and Terezhalmy shows conflicting results on the efficiency of whitening toothpaste. However, in 2007, Terezhalmy et al. concluded that there is no significant difference between the efficacies of different whitening toothpastes in terms of removal of extrinsic stain. However, the chemicals used in the commercial pastes have known to cause undesirable side effects such as irritation, allergies and mucosal ulceration. The chemicals used to achieve bleaching effects in toothpaste are hydrogen peroxide and carbamide peroxide in varying concentrations. However, their use is associated with roughening of enamel surface with cervical root resorption, leading to sensitivity. These adverse effects of chemicals can be minimized or avoided when substituted with herbal products which offer teeth whitening without damage to the enamel.

Brinda et al., 2015 in the past have compared the efficacy of herbal based whitening toothpaste against professional prescribed bleaching agent and found the efficacy of the effects on enamel surface similar in both. They also emphasized that in vitro changes may differ from in vivo changes and thus contribute to changes in the micromorphology of enamel. This is true that as changes in the enamel in vivo is governed by the fact that salivary pH plays a major role in determining the movement of calcium and phosphorus ions in and out of the enamel surface. Khairnar et al. in 2017 noticed that salivary pH increased immediately after brushing with herbal toothpaste. They correlated the increase in salivary pН to increased salivary stimulation produced by salivary stimulants such as cinnamon, licorice, Nimba and Pilu etc., in toothpaste containing ingredients of herbal origin used in their study. It is a wellknown fact that decrease in pH favors mineral loss from enamel surface leading to surface irregularities. More studies should be done comparing commercially available chemical teeth whitening paste and teeth whitening paste containing bromalein on streptococcus mutans as it would not only

CONCLUSION

but also in plaque removal.

According to this study teeth whitening paste containing bromaline was more effective than commercially available chemical teeth whitening paste in removal of streptococcus mutans.Further studies can be done comparing the surface morphology , colour change using teeth whitening paste containing bromalein to assess its teeth whitening and stain removal abilities.

help in teeth whitening and stain removal

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