

Anti Cariogenic Efficacy of Herbal and Conventional Tooth Pastes - A Comparative In-Vitro Study

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ABSTRACT

Background: An upsurge of herbal products in various catalogues of fast moving consumer goods is evident. Dental creams or pastes which have numerous brands since years, have addition of many more herbal tooth pastes. Main claim of these herbal tooth pastes being effective reduction in cavities and plaque control. Proven fact is that proper brushing with a tooth brush and tooth paste brings down the caries incidence, and there is a substantial amount of contribution made by indispensable ingredient i.e, tooth pastes and their antibacterial component.

Aim: To evaluate the antibacterial efficacy of various herbal tooth pastes available in the market and compare it with a conventional tooth paste with known antibacterial effect.

Materials & Methods: The antibacterial efficacy of five herbal tooth pastes and two conventional tooth pastes with different ingredients was evaluated by the zone of inhibition created around the disc on the culture plates against streptococcus mutans and lactobacillus acidophilus.

Results: The herbal tooth pastes showed similar efficacy as that of the conventional tooth pastes. One herbal tooth paste with multiple herbal ingredients had greater zone of inhibition compared to the conventional tooth pastes and other herbal tooth pastes.

Conclusion: Herbal tooth pastes have similar antibacterial effect as conventional tooth pastes. Tooth paste with multiple herbal ingredients is more efficient than the tooth pastes with fewer herbal ingredients in an anticariogenic property.

Key words: Anti-carcinogenicity, Herbal tooth pastes, Plaque Control.

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Introduction

Dental caries is one of the commonest infectious microbial diseases of the world since ages and has an increased incidence in recent past due to drastic changes in lifestyle habits.^{1,2} Though caries

effectively avoidable by simple inexpensive and easy to practice personal hygiene habits.^{3,4} Most effective among them is tooth brushing habit. Of various factors of this practice, antibacterial efficacy of the tooth paste has a major role to play

in the outcome.^{5,6,7}

Considering the overflowing number of the brands of numerous herbal tooth pastes in the market, the efficacy of these tooth pastes in controlling the bacterial count has to be scientifically analyzed. Rising popularity of natural and herbal products, has mandated the dental professionals to evaluate the effectiveness of these products and provide evidence based suggestion to their patients to make a better choice.⁸

Conventional dentifrices have triclosan and fluoride as the chief antibacterial ingredients. These ingredients have been proven effective against cariogenic bacteria.

Sparse knowledge of various indigenous herbs used in dentifrices, the claims of herbal dentifrices though attractive cannot be substantiated by the dental professionals. Thus to fill this lacuna of knowledge, an in vitro study was designed to evaluate the antibacterial efficacy of various herbal dentifrices available on the counter in caries prevention by standard diffusion method.

Methodology:

Pure culture of *Streptococcus mutans* was obtained from carious lesion cultured in selective medium MSB agar and confirmed by cultural characteristics and biochemical tests. *Lactobacillus acidophilus* was obtained from the dental plaque of caries active individual and the serial cultures were done and the pure cultures were obtained and confirmed by cultural characteristics on selective medium rogosa agar and biochemical analysis.

Four natural herbal dentifrices with differing ingredients and two conventional dentifrices were purchased from the chemist. The key ingredients of the dentifrices and the claims of the same are described in the table I & II. Dentifrices were tested at full strength by placing approximately

50 milligrams on sterile filter paper discs. These discs were placed on the MSB agar and rogosa agar plates on which *S. mutans* and *L. acidophilus* were already inoculated respectively. *L. acidophilus* was incubated aerobically and *S. mutans*, anaerobically at 37^o C for two days. The zone of inhibition was noted and the diameter of the same was measured. The zone of inhibition was tabulated against the dentifrices (table III).

Results:

All the dentifrices demonstrated considerable amount of antibacterial activity against both *S. mutans* and *L. acidophilus*. There was variation evident in antibacterial efficacy against both the organisms and also among the various dentifrices.

Antibacterial efficacy against *S. mutans*:

All the dentifrices showed substantial antibacterial activity against *S. mutans*. Of these, dentifrice H4 had highest and H1 and H2 had least. When compared with the conventional dentifrices, C1 and C2, the zone of inhibition of H4 was more. Suggesting the dentifrice H4, had better effect against *S. mutans* than the other herbal and conventional tooth pastes. Other herbal dentifrices also showed substantial antibacterial effect comparable to conventional dentifrices.

Antibacterial efficacy against *L. acidophilus*:

Dentifrices H1, H2 and H3 showed greater zone of inhibition against *L. acidophilus* compared to H4, C2 and C1. C1 had least zone of inhibition of all the dentifrices. The results showed that the dentifrices H1, H2 and H3 were better than the conventional dentifrices.

Discussion:

Dental plaque is key role player in initiation of dental caries. Once colonized the pioneer bacteria adhere and produce acidic environment which in

Results of present study suggest that products evaluated exhibited wide variations in their effectiveness against the test microorganisms, due

Table I: Contents and claims of the conventional dentifrices

Toothpaste	Contents	Claims
C1	PVM/MA copolymer, silica, sodium fluoride, sorbitol, triclosan	Retention and Antibacterial
C2	Calcium carbonate, Sorbitol, Calcium glycerophosphate, Fluoride	Antibacterial

Table II: Contents and claims of the herbal dentifrices

Toothpaste	Contents	Claims
H1	Clove oil, silica, sorbitol	Antiseptic & Anesthetic properties
H2	Pippali, kalimirch, Tumburu, laung ka tail, karpoor, pudina satva	Antibacterial
H3	Neem extract, mint flavor, calcium carbonate	Antibacterial
H4	Dadima, tumburu, babbula, triphala, vidanga, nirgundi, vaikranta bhasma, ajamoda satva, nimba processed in pilu, irimeda, khadira, bakula.	Natural source of Fluorine , which is known antibacterial agent. Antiseptic & antifungal

Table III: Zone of inhibition of various dentifrices against S. mutans and L. acidophilus

Toothpaste	Zone of inhibition with L. acidophilus (cms)	Zone of inhibition with S. mutans (cms)
C1	1.9	1.5
C2	1.8	1.8
H1	1.7	2.0
H2	1.7	2.0
H3	1.8	2.0
H4	2.0	1.8

due course along with series of microenvironment alterations progress to cavitations.⁴ Hence antibacterial efficacy of dentifrices is one of the key factors in selection of the tooth paste. The ingredients of tooth paste with antibacterial properties kill the microbes and reduce their growth and colonization on tooth surface.⁵

to their antimicrobial active ingredients.

Present study aimed to evaluate the anti-cariogenic efficacy of various herbal tooth pastes and compare them with conventional dentifrices of known antibacterial effect. Of various microorganisms, S. mutans, and L. Acidophilus were chosen as test microorganisms as they have

been implicated in the initiation and progression of dental caries respectively. The methodology included diffusion in agar which has been standard method of checking the antibacterial sensitivity.

Other in-vivo studies suggest the no significant difference in efficacy of herbal dentifrices compared to conventional dentifrices in reducing the plaque.¹⁰ These in-vitro studies have other confounding factors like individual variation in

Table IV: Constituent herbs and their medicinal uses

Herbs	Medicinal uses
Clove	Numbing agent. Antiseptic, Antibacterial, Antifungal and Antiviral ¹²
Pippali	Enhances digestion, assimilation and metabolism, soothes the nerves ¹³
Tumburu	Used for bleeding gums and sensitive teeth ¹⁴
Babbula	Acts as Astringent in treating ulcers. Different parts babbula plant are used for treating leprosy, typhoid, tuberculosis, smallpox ¹⁵
Neem	Antiseptic, Antibacterial and Antifungal activity ¹⁶
Dadima	Astringent, Antibacterial and Antioxidant ¹⁷
Triphala	Promote appetite and digestion, Inhibits aggregations of S. Mutans thus acting as Anticariogenic, increase red blood cells, aid in removal of undesirable fat, Used in the treatment of cancers ¹⁸
Vikranta bhasma	Combination of lime with fluorine, prevents dental caries

Results indicate that both herbal dentifrices and conventional dentifrices were effective against both the cariogenic bacteria. The zone of inhibition when compared, the herbal dentifrices were comparatively better than or equal to the conventional tooth pastes.

There is variation in antibacterial efficacy against *S. mutans* and *L. acidophilus* among various herbal and conventional dentifrices, which can be attributed to the effect of various components of the dentifrices and their efficacy to inhibit various organisms. It was observed that the dentifrice with multiple herbal components (H4) is more effective in inhibiting both the organisms.

Though similar studies have been reported in English literature, the studies are comparable as the constituent herbs of the dentifrices used in the present study are different from those of the other published data. Though it has been reported that the herbal dentifrices are inferior in inhibiting cariogenic microbes, the ingredient herbs of these study are different.⁹

food habits and individual brushing technique. But in-vitro study shows pure efficacy of the dentifrices in inhibiting the bacterial growth. Study also states there were no adverse effects on using these herbal dentifrices.^{7, 11}

Our study mainly concentrates in comparing efficacy of herbal dentifrices with conventional ones in inhibiting cariogenic bacteria, suggesting that efficacy of herbal dentifrices is similar and some have superior antibacterial efficacy. Thus provides evidence to the claim of anticariogenicity of herbal dentifrices. The study also showed dentifrice with combination of herbs had better effect in inhibiting cariogenic bacteria compared to the ones with fewer herbal ingredients.

The concentration of herbs in the toothpastes was not specified thus altering the concentration and calculating the minimum inhibitory concentration of these ingredients can improve the outcome of the dentifrice. Our study could not control other factors like the diffusion of the herbal extracts &

the effect of their particle size in diffusion in the agar, data of which were not available. Detergents and abrasives may alter the substantivity or the antimicrobial activity of active ingredients during tooth brushing, which could not be controlled in the study.

Future prospects:

The pure extracts of the herbs have to be assessed in the same way to evaluate the antimicrobial efficacy and the combination of the best herbs against caries and periodontal pathologies have to be derived and formulation of these can improve the overall efficiency of the dentifrice. Even though studies in animals and in-vitro may show the antimicrobial properties of several of these products, randomized clinical trial can provide insight of the overall effect of the dentifrice. The combination of ingredients of the herbal and natural components with the components of the conventional dentifrices can improve the holistic effect of the dentifrice and thus providing better oral health care product.

Conclusion:

The herbal tooth pastes have similar and slightly better antibacterial activity compared to the conventional tooth pastes. The herbal tooth pastes which have combination of herbs have better antimicrobial activity compared to those with single ingredient against certain organisms. Thus turning to nature can be as good as the latest advances. These traditional methods have numerous other claims also which are of great benefit for health. Exploring and harvesting these herbal products and blending the same with the advances may make oral and health care better. Thus the present article also provides insight to the dentists that the herbal dentifrices are equally effective as the conventional dentifrices and can be advised to those who prefer natural products.

References:

1. Niraj G, N Sivakumar, SV Nirmala, M Abinash. Dental Caries and Body Mass Index in Children of Nellore. *Journal of Orofacial Sciences* 2010; 2(2): 4-6
2. Khan AA, Jain SK, Shrivastava A. Prevalence of Dental Caries among the Population of Gwalior (India) in Relation of Different Associated Factors. *Eur J Dent* 2008; 2(2): 81-5.
3. Balakrishnan M, Simmonds RS, Tagg JR. Dental caries is a preventable infectious disease. *Aust Dent* 2000; 45(4): 235-45
4. Newbrun, Ernest in *Cariology*. Ernest Newbrun. 12th chapter Control and prevention of Dental Caries. 3rd ed. Chicago, Quintessence international 1989; 359-60.
5. Prasanth M. Antimicrobial Efficacy of Different Toothpastes and Mouth rinses: An in Vitro Study. *Dent Res J* 2011 Spring; 8(2): 85-94.
6. Menendez A, Li F, Michalek SM, Kirk K, Makhija SK, Childers NK. Comparative analysis of the antibacterial effects of combined mouth rinses on *Streptococcus mutans*. *Oral Microbiol Immunol* 2005; 20(1): 31-4.
7. Fabiana O, Claudio Mendes Pannuti, Ana Vitória Imbronito, Wellington P, Luciana S, Nívea Maria de Freitas, et al. Efficacy of a herbal toothpaste on patients with established gingivitis – a randomized controlled trial. *Braz Oral Res* 2006; 20(2): 172-7
8. Sean SL, WU Zhang, Yiming L. The antimicrobial potential of 14 natural Herbal dentifrices: Results of an in vitro diffusion method study. *J Am Dent Assoc* 2004; 135(8): 1133-41
9. A Maripandi, Arun KT, Ali A Al Salamah. Prevalence of Dental Caries bacterial pathogens and evaluation of inhibitory concentration effect on different tooth pastes

- against Streptococcus spp. African Journal of Microbiology Research 2011; 5(14): 1778-83.
10. Sudha P, K Venkataraghavan, A Anantharaj, Shankargouda P. Comparison of two commercially available toothpastes on the salivary streptococcus mutans count in urban preschool children - An in vivo study. International Dentistry SA 2010; 12(4): 72-82.
 11. Al-Kholani AI. Comparison between the Efficacy of Herbal and Conventional Dentifrices on Established Gingivitis. Dent Res J 2011 Spring; 8(2): 57-63.
 12. Alqareer A, Alyahya A, Andersson L. The effect of clove and benzocaine versus placebo as topical anaesthetics. J Dent. 2006; 34(10): 747-50
 13. P Manoj, EV Soniya, NS Banerjee, P Ravichandran. Recent studies on well-known spice, Piper longum Linn. Natural Product Radiance 2004; 3(4): 222- 7.
 14. Mehta DK, Bhandari A, Satti NK, Das R. Isolation and Characterization of a flavonoid 3', 3-dimethoxy -4', 5,7 trihydroxyflavone from Zanthoxylum armatum D.C. International journal of pharmaceutical science and health care 2012; 5(2): 29-32.
 15. Saurabh R, BP Nagori, GK Singh, BK Dubey, Prashant D, Sanjay J. A review on Acacia Arabica - an Indian medicinal plant. International Journal of Pharmaceutical Sciences and Research (IJPSR) 2012; 3(7): 1995-2005.
 16. Nayak A, N Ranganath, G Sowmya B, B Kishore, K Mithun. Evaluation of antibacterial and anti-candidal efficacy of aqueous and alcoholic extract of neem (Azadirachta Indica) - An in-vitro study. International Journal of Research in Ayurveda and Pharmacy 2010; 2(1): 230-5.
 17. Sharmin S, Vijay L, Dikshit M, Biren S. Phytopharmacology of punica granatum linn. - A review 2012; 3(3): 2222 - 45.
 18. Biju T, Sunaina SY, Agrima V, Veena S. Comparative evaluation of Antimicrobial Activity of Triphala and commercially available Toothpastes: An in-vitro study. International Journal of Public Health Dentistry 2011; 2(1): 8-12.