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Original Research Article

The effect of using Laban leaf (*Vitex pinnata*) methanol extract toothpaste on saliva pH in students of SD Negeri I Pagar AIR

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ABSTRACT

Background: Maintaining the pH balance of saliva is one way to prevent dental caries. The pH balance of saliva is influenced by the rate of salivary secretion. The rate of salivary secretion can be stimulated chemically and mechanically. Mechanical stimulation by brushing teeth and chemically by gargling. Indonesia is currently developing natural ingredients as medicinal ingredients that have been scientifically tested for their benefits and safety. Laban leaf (*Vitex pinnata*) is one of the many medicinal plants found in Indonesia. Laban leaves contain alkaloids, flavonoids, saponins, and tannins that can inhibit the growth of Streptococcus mutans so that it can remove dental plaque naturally. Some researchers state that laban leaf extract can affect the pH of saliva. This study aims to see the effect of the use of laban leaf methanol extract toothpaste on salivary pH.
Methods: Experimental research method with pre and post-tests design with proposing sampling technique where 26 people were taken as samples. The sample was divided into 2 groups which received different treatment. Group 1 was instructed to brush their teeth with laban leaf extract toothpaste and group 2 with toothpaste circulating in the market tied their teeth for 3 minutes.
Results: Results based on the comparison of salivary pH before and after brushing teeth, it was found that brushing teeth with methanol extract toothpaste of laban leaves was more effective in increasing salivary pH. Based on the use of toothpaste with laban leaf methanol extract, the significant value is 0.000<(0.05), so it can be concluded that reject H0. This means that there is an average difference before and after using laban leaf methanol extract toothpaste. In conclusion, the use of laban leaf methanol extract toothpaste has more effect on increasing the pH of saliva.
Conclusions: brushing teeth with laban leaf methanol extract toothpaste is more effective in increasing the pH of saliva. We recommend recommending further research to determine the potential of laban leaves to be used as raw material for toothpaste.

Keywords: Saliva pH, Toothpaste, Methane extract

INTRODUCTION

Dental and oral health problems in Indonesia cannot be handled. Based on the survey, it is stated that the incidence of dental and oral disease in Indonesia is still high at 63%.[1,2] In Aceh Province, 47.0% have dental problems, 92.6% of children with dental caries aged 5-9 years, and 96.2% of parents 55-64 years old. This shows that oral and dental health problems are still dominant in our country. So it is necessary to do dental care from an early age. One of the ways to do this is by maintaining the acidity (pH) of saliva.[3] Saliva is an oral fluid secreted by the salivary glands which is secreted in the oral cavity and distributed from the blood circulation. The degree of acidity (pH) of saliva determines the aggregation of

bacteria that cause bacteria to accumulate. inhibits the colonization of microorganisms and activates anti-bacterial thereby inhibiting the growth of bacteria and preventing the accumulation of plaque.

The degree of acidity (pH) of saliva also plays a role in activating enzymes such as amylase, lysozyme, and lingual lipase where these enzymes will work optimally at an acid level (pH) of 7.4, namely in alkaline conditions. The normal acidity (pH) of saliva is between 6.8-7.8, but in general, at rest, the acidity (pH) of saliva is 6.8. The degree of acidity (pH) of this saliva can be measured with litmus paper and pH strips.[4] Normal saliva volume every 24 hours ranges from 1000-1500 ml. During 24 hours, the saliva produced by the three glands is 1000-2500 ml, with the submandibular gland secreting 40% and the parotid gland as much as 26%. At night, there is less salivation. The average pH of saliva ranges between 5.25-8.5 and 6.1-7.7.[5] The amount of saliva that is secreted in an unstimulated state is about 0.32 ml/minute, while in a stimulated state it reaches 3-4 ml/minute.2 The volume and composition of saliva greatly determine the condition of the oral cavity. In secretions less than 0.06 ml/minute (3 ml/hour) complaints of dry mouth (xerostomia) will occur.[6]

Saliva has components that function as antibacterial and antiviral enzymes, namely lysozyme, lactoferrin, myeloperoxidase and lactoperoxidase. The function of the lactoperoxidase enzyme as an antibacterial is more emphasized than other enzymes in saliva. The lactoperoxidase enzyme can be damaged due to the excessive use of SLS (sodium lauryl sulfate) detergent in toothpaste.[5] Many ingredients can stimulate salivary secretion, one of these ingredients is herbal toothpaste.[7] Herbal toothpastes are very effective in reducing acidity and improving the pH of the oral cavity. So it is necessary to choose an alternative antibacterial material that uses herbal ingredients.[8] Herbal toothpaste contains sodium bicarbonate, sodium fluoride and ingredients, herbs. It has natural antiseptic anti-inflammatory properties, is able to stimulate the immune response, and has analgesic properties.[9] Non-herbal toothpaste contains the active ingredient fluoride. If added non-herbal ingredients triclosan and chlorhexidine in toothpaste to prevent plaque and gingivitis, it has an effect, coloration of teeth and altered taste in the oral cavity.[9] This has led to increased attention to the use of natural ingredients in herbal toothpastes.[10] Research on pH acidity herbal toothpaste methanol extract of laban geothermal leaves has a high pH.[11] Measurement of the test based on pH is carried out by dipping the pH meter into the paste preparation until it shows that it is carried out every week for 3 weeks of storage. The pH acidity test results showed toothpaste F1 (1.5%), F2 (3%), and F3 (4.5%), F4 (0%), and had a value of F1 8.76, F2 8.74, F3 8.6 and F4 8.67, but still within the normal limits of toothpaste. The secondary metabolite test of the geothermal laban leaf methanol extract contains, alkaloids, steroids, terpenoids, saponins, flavonoids, phenolics.[12] Antibacterial activity test of laban leaf methanol extract (*Vitex pinnata*) against Streptococcus mutans using the microdilution method has a strong inhibitory effect and has anti-bacterial properties.[13] Based on an initial survey at SD Negeri 1 Pagar AIR, almost 70% of students experience dental caries, even though promotive and preventive measures are often carried out. Based on the foregoing, the author was interested in conducting a study entitled “the effect of using laban leaf methanol extract toothpaste on saliva (pH) in students of SD Negeri 1 Pagar Air Aceh Besar.

METHODS

This study uses an experimental methodology with a pre- and post-test group design to determine the effect of laban leaf methanol extract toothpaste on the pH of the oral cavity saliva of the students of SDN 1 Pagar Air Aceh Besar. The research site for making toothpaste is carried out in the pharmaceutical laboratory of the Health Poltekkes of the Ministry of Health in Aceh. The degree of acidity of the pH of the saliva before and after brushing teeth was carried out at SD Negeri 1 Pagar AIR Aceh Besar. Research time is June to September 2021. The treatments given in this study were: the sample was obliged to brush their teeth using laban leaf methanol extract toothpaste and toothpaste on the market. Saliva pH was measured before and after toothpaste application. The population in this study were students of SDN 1 Pagar Air Aceh Besar. The sample was selected based on purposive sampling, with inclusion criteria. Inclusion criteria were the duration of saliva collection should not be more than 10 minutes, no medication should be taken, dental condition in good condition, oral cavity condition in good condition.

The number of samples in this study were 26 people, where each group consisted of 13 people. The tools used in this study include diagnostic tools, dappen glass, masks, gloves, glass, digital scales, petri dishes, saliva pH measurement paper and informed consent, bed linen bottles. The materials used are, CaCO3, Na CMC, saccharin, menthol, glycerin, sodium benzoate, sterile distilled water. Toothpaste was made in the Pharmacy Laboratory of the Health Polytechnic of Aceh, with the following stages: First, fresh laban leaves (1 kg) collected from the geothermal area, Aceh Besar, were identified at the Microbiology Laboratory of Syiah Kuala University. Leaves are allowed to dry (direct sunlight is avoided to prevent chemical damage) for 14 days. Furthermore, the laban leaves are mashed to get the simplicia. The procedure is followed by preparation: the manufacture of toothpaste starts from, ministering the equipment, preparing the materials and tools, weighing all the ingredients of the toothpaste formula as desired. Prepare a toothpaste formula with a concentration of 4%. Weigh each ingredient in the toothpaste formula, add 1.5 grams of sodium carboxymethylcellulose (Na CMC) as a binder, add 4 grams of laban leaf methanol extract diluted with 7 ml of glycerin, add 0.5 grams of saccharin sweetener and benzozat preservative. 1 gram, add 50 grams of calcium

carbon, into the mixer until homogeneous, enter 1 gram of menthol flavoring and mix, paste put in a tube.

Samples were identified according to the specified inclusion criteria. The samples that met the inclusion criteria were then divided into two groups. The first group received toothpaste with methanol extract of laban leaves, while the second control group received toothpaste on the market. All samples were initially checked for salivary pH using a universal indicator. The criteria for measuring salivary pH are as follows: Red color-saliva pH (5.0-5.8) is acid criteria, Yellow color-saliva pH (6.0-6.6) is neutral criteria, Green color-saliva pH (6.8-7.8) is the basic criterion. Samples were then instructed to brush their teeth using laban leaf methanol extract toothpaste and market toothpaste for 3 minutes. The final examination was carried out after the treatment was given, through an examination of salivary pH. The data were analysed descriptively and the effect of the toothpaste formula was statistically processed using the One-Way ANOVA method at a confidence level of 0.05 if there was a difference followed by Duncan's test using the SPSS program.

RESULTS

Data collection was carried out from June to September 2021 at SD Negeri 1 Pagar Air Aceh Besar. Based on the results of data processing is presented in the form of tables and narration.

Gender

Based on (Table 1), it can be seen that of the 26 students, most of the sexes were male as many as 14 people (54%).

Table 1: Frequency distribution of respondents by gender in SD Negeri 1 Pagar Air.

Gender	N	%
Male	14	54
Female	12	46
Total	26	100

Age

Based on (Table 1), it can be seen that of the 26 students, most of them are 12 years old (46%).

The degree of acidity (pH) of saliva in the treatment of brushing teeth using market paste. The distribution of salivary pH before treatment (pre-test) in the treatment group before brushing teeth using market paste 69.23% was in the acid category and 53.85% saliva pH after treatment (post-test) was in the acidic category (Table 3). Degree of acidity (pH) of Saliva in Treatment of brushing teeth using methanol extract of laban leaf toothpaste. The distribution of salivary pH before treatment (pre-test) in the treatment group before brushing using laban leaf methanol extract paste 84,62% was in the acid category and the salivary pH after treatment (post-test) was in the normal category (Table 4).

Table 2: Frequency distribution of respondents by age at SD Negeri 1 Pagar Air.

Age percentage	N	%
8	8	31
9	6	23
10	12	46
Total	26	100

Table 3: Distribution of salivary pH before and after brushing using commercial toothpaste.

pH saliva	Before		After	
Market toothpaste	**N**	**%**	**N**	**%**
Normal	4	30.77	6	46.15
Acid	9	69.23	7	53.85

Table 4: Distribution of salivary pH before and after using Laban leaf extract toothpaste.

PH saliva	Before		After	
(Toothpaste methanol extract of Laban leaves)	N	%	N	%
Normal	2	15.38	13	100
Acid	11	84.62	0	0.00

DISCUSSION

Characteristics are one of the predisposing factors that can affect changes in the degree of acidity (pH) of saliva. Factors that influence the success of quasi-experimental design research are having the same characteristics, initial conditions and abilities between the two treatment groups. Characteristics. Children based on sex male 14 and female 12. The treatment group showed that the pH of saliva before using the market toothpaste was 69.23% in the acid category and the salivary pH after treatment (post-test) 53.85% was in the acid category.

Based on (Table 4) which shows that the distribution of salivary pH before treatment (pre-test) brushing teeth using laban leaf methanol extract paste 84.62% was in the acid category and saliva pH after treatment (post-test) was in the 100% normal category. Maintaining the pH balance of saliva is one way to prevent caries. The pH balance of saliva is influenced by the rate of salivary secretion. The rate of salivary secretion can be stimulated chemically by gargling and mechanically by brushing the teeth. Mechanical stimulation can be done by brushing your teeth using natural ingredients toothpaste. Indonesia is currently developing natural ingredients as medicinal ingredients that have been scientifically tested for their benefits and safety. Laban (*Vitex pinnata)* leaf extract is one of the many medicinal plants found in Indonesia. Some researchers state that laban leaf extract can affect the pH of saliva. This is supported by previous research,

laban leaf methanol extract toothpaste was able to increase the salivary pH the higher the extract was given and the longer the storage. the salivary pH increased but was still within normal limits.[14]

Based on the results of the analysis showed that there was no significant difference in the degree of salivary acidity (pH) before and after the intervention (pre-test) between the treatment groups brushing teeth using market toothpaste. Based on the results of the analysis showed that there was a significant difference in the degree of salivary acidity (pH) before and after the intervention (pre-test) between the treatment groups brushing their teeth using toothpaste with methanol extract of laban leaves. The degree of acidity (pH) was dominated by the value (pH) 7 which was acidic before brushing teeth with regular toothpaste as many as 11 people (84.62%) and after brushing teeth using toothpaste with methanol extract of laban leaves was in the category 13 people as much as 100%. Based on the independent T-Test of the use of market toothpaste above, it can be seen that the significant value is 0.440>(0.05), so it can be concluded that accept H0. This means that there is no difference in the average before and after using the market toothpaste. So in table 3 using ordinary toothpaste there is no difference. The degree of acidity (pH) before and after use is still in the acid category. Based on (Table 4), the Independent T-Test of using toothpaste with methanol extract of laban leaf extract above, it can be seen that the significant value is 0.000 < (0.05) so it can be concluded that H0 is rejected. This means that there is an average difference before and after using laban leaf methanol extract toothpaste.

At normal (pH) saliva, there is a fairly high salivary secretion in children, so that it has an impact on high saliva volume. One of the functions of saliva is to act as a buffer that helps neutralize (pH) saliva, so that if the volume of saliva increases, there will be a balance (pH) of saliva and reduce the occurrence of dental caries.[14] The causes of caries include four factors, namely, microorganisms, substrate (dietary carbohydrates), host (teeth and saliva) and time. The process of caries begins with the adhesion process of bacteria which is characterized by the interaction between bacteria and salivary components. S. mutans has bacterial cell surface proteins called adhesion molecules which will be accepted by receptors in saliva called pellicle.[6] Through this pellicle, bacteria will make initial colonization on the tooth surface and form a base layer for biofilm formation, known as dental plaque.[15] When exposed to carbohydrates (sucrose) on the tooth surface for a long time, S. mutans will synthesize glucans with the help of glycosyltransferase enzymes through the process of anaerobic glycolysis.[16] The end result of the glycolysis process is lactic acid, which will create extra acidity. Along with the increasing number of S. mutans colonies in the oral cavity, it will cause the degree of acidity (pH) of the oral cavity to decrease and the pH of saliva to become acidic.[17] If the decrease in pH reaches a critical pH (5.2-5.5), the high acid concentration on the enamel surface can destroy the lime phosphate in the enamel so that it demineralizes and triggers dental caries. This study showed that the change in salivary pH after treatment using laban leaf extract toothpaste was in normal pH where the average normal salivary pH was around 6.8-7.2. This is because the results of the phytochemical analysis showed that laban leaf extract contains saponins, alkaloids, flavonoids, tannins, has anti-caries effect because it is bactericidal.[18] Some of the limitations in the study are the number of respondents who are only 26 people, of course, is still not enough to describe the actual situation and the limitations of extracting tools in Unsyiah Banda Aceh.

CONCLUSION

Brushing teeth with laban leaf methanol extract toothpaste was proven to be more effective in increasing the salivary pH observed in SDN 1 Pagar Air students, before and after brushing teeth using laban leaf methanol extract toothpaste where it was seen that the significant value was 0.000<(0.05). This gives the conclusion that there is a difference Significant saliva pH based on calculations before and after brushing teeth using methanol extract of laban leaves.

Recommendations

Further research is encouraged to examine the potential of laban leaves as an ingredient in toothpaste.

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