

The Effect of Red Ginger (*Zingiber Officinale* Var. *Rubrum*) on Salivary Acidity Degree

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ABSTRACT

Background: Dental and oral health is an important part of body health that is interrelated with each other. Among the oral health problems is dental caries. Efforts to prevent dental caries can be done by improving oral health, one of the safer alternatives to maintain salivary pH is to use herbal ingredients. One of the herbal ingredients that can be used is red ginger (*Zingiber officinale var. rubrum*).

Purpose: Provide information about the effect of red ginger water on salivary acidity degree.

Method: This type of research is experimental research with *One Group Pre-Posttest Design*. The population of this study was all preclinical students of the Faculty of Dentistry, Prof. Dr. Moestopo University (Beragama) with a sample of 16 determined by the Federer formula. The sixteen samples were first measured for salivary pH and then treated by gargling with 10 ml of red ginger water for 30 seconds. After leaving it for 5 minutes, a second salivary pH measurement was taken. The data in this study were analyzed using a parametric test (*paired t-test*).

Results: The mean salivary acidity (pH) before treatment was 6.647 and the mean salivary acidity (pH) after treatment was 7.274. The paired t-test results showed a p-value of 0.000 (<0.05), which means that there is a significant difference between salivary pH before and after exposure to red ginger water.

Conclusion: There is a significant effect of red ginger water on salivary acidity (pH).

KEYWORDS: Red ginger (*Zingiber officinale var. rubrum*); salivary acidity (pH); dental; oral health

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INTRODUCTION

The most common oral problem in the community is dental caries.¹ Caries is a disease caused by the interaction between plaque bacteria, diet, dental conditions and time. Plaque is one of the causes of dental caries and periodontal disease. Plaque is dominated by *Streptococcus mutans* and *Lactobacillus* bacteria. Efforts to prevent caries and periodontal disease can be done by improving oral health, one way is to rinse your mouth using herbal plants.²

Herbal plants that can inhibit the growth of *Streptococcus mutans* bacteria are red ginger. Red ginger contains flavonoids, phenols, essential oils, and tannins. Phenol derivative compounds such as gingerol, shogaol, and

resin are the main constituents of red ginger oleoresin. The oleoresin content is what causes the spicy flavor in red ginger. Essential oil is the compound that causes red ginger to have a distinctive fragrant aroma. The chemical content of essential oils from zingiberen and zingiberol substances has a killing power against microorganisms found in the oral cavity.³

Saliva is a complex oral fluid produced by the salivary glands and has a very important role in maintaining the balance of the ecosystem in the oral cavity.⁴ Saliva also has the ability to buffer to maintain pH in the oral cavity to remain neutral.⁵

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Potential of Hydrogen (pH) is a way to measure and determine the acidic or alkaline degree of a liquid with a range of 0-14, pH 7 means neutral pH, pH < 7 means acidic pH and pH > 7 means alkaline. The amount of pH in the mouth is determined by salivary fluid as a buffer to reduce plaque, the formation of acid by bacteria in dental plaque will cause a decrease in pH. the average normal pH of saliva is pH 6.7.7 Factors that cause changes in salivary pH include average salivary velocity, salivary buffer capacity and microorganisms in the mouth.⁶

Utilization of herbal ingredients can be used as a safer alternative material to maintain salivary pH in a normal state and maintain the acidity level of the oral cavity. One of the herbal ingredients used as mouthwash is red ginger (*Zingiber officinale* var. *rubrum*). Red ginger is a type of spice and medicinal plant that has many benefits. The use of red ginger can be brewed and used as a gargle solution that can increase the degree of acidity (pH) of saliva, because one of the contents of red ginger is essential oil which can affect (pH) saliva. Essential oil is the content of ginger, where the essential oil can provide a sharp aroma that can increase the rate of salivary flow. Potential of Hydrogen (pH) is directly proportional to the salivary flow rate, if the salivary flow rate increases, the salivary pH will also increase.⁷

Based on this background, this study aims to further analyze the effect of red ginger water (*Zingiber officinale* var. *rubrum*) on salivary acidity degree.

MATERIAL AND METHODS

This study was conducted at the Laboratory of the Faculty of Dentistry, University of Prof. Dr. Moestopo (Religious) on June 6, 2023. The number of subjects in this study was 16. Measurement of salivary pH was carried out before treatment and then the subject was instructed to gargle red ginger steeping water with a dose of 10 ml for 30 seconds. The research subjects were again instructed to wait for 5 minutes after gargling with red ginger steeping water, and then the measurement of salivary pH was carried out after treatment. The type of research used was experimental research, with a one group pre-posttest design.

This study used the Shapiro-Wilk normality test. Data can be declared normally distributed if the significance value is > 0.05, and not normally distributed if the significance value is < 0.05. Because the data were normally distributed, the statistical analysis used the Paired T-Test test for comparison before and after treatment.

RESULT

The results in this study can be seen in the following table:

Table 1. Descriptive Data Analysis

Variable	Mean	SD	Median (Minimum - Maximum)
Red ginger water pretest	6.647	0.4550	6.63 (5.63 - 7.46)
Red ginger water posttest	7.274	0.4507	7.335 (6.46 - 7.85)

Descriptive data analysis in table 1 shows that salivary pH before gargling with red ginger steeping water has mean, median, minimum, and maximum values of 6.6475, 6.63, 5.63, 7.46 with a standard deviation of 0.45507. The pH values after gargling with red ginger steeped water had mean, median, minimum, and maximum values of 7.2744, 7.335, 6.46, 7.85, respectively, with a standard deviation of 0.45075. The standard deviation of all data has a value smaller than the mean, indicating that the mean value can be used as a representation of the entire data, or it can be interpreted as homogeneous data.

Table 2. Data Normality Test (Shapiro-Wilk)

Treatment Group	Shapiro-Wilk		
	Statistic	df	Sig.
Red ginger water pretest	.968	16	.813
Red ginger water posttest	.919	16	.164

*Shapiro-Wilk, $p > 0,05$

The results of the data normality test with Shapiro-Wilk based on table 2, all data are considered normally distributed because the p value > 0.05, namely the p value of the pretest of red ginger steeping water, the posttest of red ginger steeping water is 0.813 and 0.164, respectively. Based on the results of the data normality test, the pretest and posttest data of red ginger steeping water are normally distributed, so hypothesis testing uses Parametric Test, namely Paired Sample T-Test for paired groups.

Table 1. Paired Sample T-Test Results

	Sig. (2-tailed)
Red ginger water Pretest-posttest	0.000

*t-test, CI 95%, $p < 0.05$ showed a significant difference between salivary pH before and after treatment.

Table 3 shows the value of Asymp. Sig (2-tailed) value for the red ginger steeping water treatment group was found to be 0.000, the value is smaller than 0.05, it can be interpreted that there is a significant difference between salivary pH before and after red ginger steeping water treatment.

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DISCUSSION

This study was conducted to determine the effect of red ginger (*Zingiber officinale* var. *rubrum*) steeping water on the degree of acidity (pH) of saliva. The red ginger used in this study is an instant red ginger product of BPOM (Food and Drug Monitoring Agency) which is produced in a semi-modern way. The use of red ginger in this study was done by brewing using a solvent in the form of water.

The study using red ginger steeping water showed an increase in salivary pH (the average pH value of saliva before 6.647 and after gargling red ginger steeping water is 7.274). The results of this study are in line with research conducted by Harahap et al in 2017 on changes in the potential of hydrogen (pH) of saliva before and after gargling red ginger (*Zingiber Officinale* Var. *Rubrum*) and research by Thioritz et al in 2020 on changes in salivary pH before and after gargling red ginger boiled water found that gargling with red ginger is effective in increasing salivary pH because it contains oleoresin compounds and essential oils that can give a sharp aroma so that it can increase salivary pH.^{7,8}

This study produces a form of mechanical stimulus in the form of gargling and chemical stimulus because red ginger contains essential oils that can give a sharp aroma so that it can increase salivary pH. The results of the study are in line with the research of Yulia et al in 2017 regarding changes in salivary flow rate before and after gargling Red Ginger (*Zingiber officinale* var. *Rubrum*) decoction water found that when gargling with red ginger decoction water there will be chemical stimuli with a spicy taste contained in red ginger so that it can increase the salivary flow rate, in addition to mechanical stimulus, factors that can increase salivary pH in this study are chemical stimuli. Chemical stimuli in the oral cavity are related to the impression of taste and salivary secretion.^{8,9}

CONCLUSIONS

Based on data analysis and the results of research on the effect of red ginger steeping water on the degree of acidity of salivary pH that has been done, it can be concluded that red ginger steeping water can increase salivary pH. Gargling with red ginger steeping water can maintain oral health by maintaining salivary pH in the normal range so as to prevent caries. The results of the research that has been done, gargling using red ginger steeping water can effectively increase salivary pH.

It is recommended to conduct further similar research, but with different duration of exposure. The community also needs to be educated about herbal ingredients, so that they can utilize herbal mouthwash in maintaining oral health. Herbal mouthwash can be used as an alternative mouthwash choice if used according to instructions.

One of the factors that influence pH changes is the rate of salivary secretion. The rate of salivary secretion can be influenced by several factors with stimuli such as sweet, bitter, sour and spicy flavors. When gargling with red ginger steeping water, the oral cavity is stimulated by a spicy taste and aroma. The stimulation from red ginger steeping water can increase the rate of salivary secretion so that the pH of saliva increases.^{7,8}

Based on Sari's research in 2021, it was found that the stimuli caused by substances contained in red ginger are phenols, essential oils, flavonoids and tannins. Phenol-derived compounds such as resin, gingerol, and shogaol are the main constituents of oleoresin in red ginger. The distinctive aroma of red ginger is due to the high content of volatile oil in it. The essential oil content of red ginger is 2.58-2.72%. This figure is higher than the essential oil content in other types of ginger.¹⁰

Increased salivary pH in subjects with red ginger exposure contains substances that cause stimulation in red ginger, namely essential oils, gingerol and shogaol. Gingerol and shogaol are non-essential oil components that play a role in eliciting anti-inflammatory and analgesic effects. High levels of gingerol and shogaol in red ginger cause a spicy flavor.¹¹

The results of statistical tests in this study showed the effect of red ginger steeping water. The effect of red ginger steeping water shows its ability to increase the pH of saliva, so it can minimize acidic conditions in the oral cavity which can increase the risk of plaque on the teeth. Dental plaque can lead to caries. Therefore, maintaining the pH of the oral cavity is very important. One way to maintain the pH of saliva in the mouth is to use mouthwash from herbal ingredients, namely red ginger steeping water.⁸

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