
THE EFFECTIVENESS OF GARGLING DECOCTION OF GREEN BETEL LEAF (*Piper betle* L) AND GUAVA LEAF (*Psidium guajava*) AGAINST PLAQUE INDEX

Vega Roosa Fione, Jeane d'Arc Zavera Adam, Ni Made Ayu Sri Lestari

^{1,2,3}Poltekkes Kemenkes Manado Department of Dental Health

Email: : vegaroosafione@gmail.com

ABSTRACT

*Background: The main cause of dental and oral disease is plaque. Plaque control can be done mechanically, namely by brushing your teeth regularly and chemically by gargling. Plaque control by gargling can use traditional plant materials. It can be made decoctions such as green betel leaves and guava leaves because they contain compounds that are antibacterial. The purpose of this study was to determine the effectiveness of gargling using a decoction of green betel leaves (*Piper betle* Linn) and decoction of guava leaves (*Psidium Guajava*) against plaque index. Method: This is the true experiment method with a two-group pre and post test design. This research was carried out in the last week of March to the second week of April 2023 at the Department of Dental Health, Poltekkes, Ministry of Health, Manado. The number of subjects of this study was 32 people divided into 2 groups, namely 16 people who received gargling treatment of green betel leaf decoction and 16 people who received gargling treatment of guava leaf decoction. The data obtained were then tabulated and analyzed using paired sample t-test. This research instrument uses diagnostic tools and PHP plaque index examination format. Results: The results showed that the average value of plaque index in the group that received gargling treatment using green betel leaf decoction was 3.38 before gargling and 1.33 after gargling. This value has a decreasing difference of 2.05. Furthermore, the average value of plaque index in the group that received gargling treatment using guava leaf decoction was 3.39 before gargling and 2.41 after gargling. This value has a decreasing difference of 0.98. The paired test results of the t-test sample obtained a value of p-value = 0.000. This value indicates that the treatment given provides effective in reducing plaque index. Conclusion: It can be concluded that the gargling a decoction of green betel leaves and guava leaves can reduce the plaque index where the decoction of green betel leaves is more effective in reducing the plaque index.*

KEYWORDS Leaf; Green Betel; Guava; Plaque Index



This work is licensed under a Creative Commons Attribution-ShareAlike 4.0 International

INTRODUCTION

Dental and oral health is important to the general health and well-being of the body and greatly affects the quality of life including speech function, mastication, and self-confidence. In Indonesia, dental and oral diseases, especially caries and periodontal disease, are still suffered by many Indonesians both by children and adults (Putri et al., 2018). The main cause of such dental and oral disease is plaque. Plaque is a soft, sticky coating that adheres to teeth. Plaque consists of proteins and bacteria, bacteria are 70% derived from saliva. This plaque itself is formed after brushing your teeth, if the plaque has hardened caused by calcium, phosphorus and other minerals will become tartar within 48 hours after its formation. Plaque attached to the surface of the teeth is the main source of nutrients for bacteria to grow and colonize and create acidic shades in the oral cavity which can cause enamel to dissolve and cause dental caries (Mumpuni and Erlita, 2013).

Based on the WHO global oral health status report (2022) estimates that oral diseases affect nearly 3.5 billion people worldwide and globally it is estimated that 2 billion people suffer from permanent dental caries and 514 million children suffer from deciduous dental caries (*World Health Organization*, 2022). The results of Basic Health Research (2018), stated that the proportion of dental and oral problems in Indonesia is 57.6%, daily brushing behavior is 94.7% and the proportion of correct brushing behavior is 2.8%, while for the people of North Sulawesi province the proportion of dental and oral problems is 66.5%, daily brushing behavior is 96.3% while correct brushing behavior is 3.5% and especially in Manado city the proportion of health problems teeth and mouth by 56.9%, daily brushing behavior by 98.7% while correct brushing behavior by 5.3% (Ministry of Health, 2018) And there are still many people who have not done the habit of brushing their teeth at the right time.

According to Putri et al., (2018), plaque control with gargle solution can use materials like traditional plants. As for traditional plants that can be made decoction to be mouthwash such as betel leaves and guava leaves where the plant contains compounds that can be antibacterial. According to Yanuar, (2019), betel leaf contains an essential oil consisting of *Bethlephenol*, *Cavikol*, *Sesquiterpenes*, *hydroxycavikol*, *Cavibetol*, *Estragol*, *Eugenol* and *Carvakrol*. It also contains *carotene*, *thiamine*, *riboflavin*, *nicotinic acid*, vitamin C, *Tannin* sugar starch and amino acids. Guava leaves contain *tannins*, *flavonoids*, essential oils and *Alkaloids* (Kartini, 2022). Based on previous research conducted Nurmeida et al., (2020), about the effect of betel leaf cooking water on reducing plaque scores said that betel leaf cooking water can reduce plaque index because of the essential oil content possessed by betel leaves which has antibacterial power that can reduce the formation of dental plaque. Likewise on guava leaves, based on previous research conducted Darsono and Sumantri, (2020), about the antibacterial activity test of ethyl acetate fraction of guava leaves (*Psidium Guajava L*) against the bacteria that cause dental caries *Streptococcus Sanguis* says that compounds *flavonoids* contained in guava leaves has an antibacterial role.

According to Aziz and Ridwan, (2016), a decoction of guava leaves can be used as a mouthwash for wounds inside the mouth and bleeding gums. According to Ifitri and Eriyati (2019), the essential oil present in guava leaves (0.365%)

functions as an anti-bacterial, can inhibit plaque growth. In addition, essential oils contained in guava leaves are also contained *cinol* and *Tritepenic Acids* which is also a nature or has high anti-bacterial activity, not only as an anti-bacterial essential oil can increase secretion and increase the amount of saliva production. Increased speed and decreased viscosity of saliva and inhibited plaque formation.

According to Putri et al., (2018), to measure dental and oral hygiene an index is used. Index is a number that shows the clinical condition obtained at the time of examination, by measuring the area of the tooth surface covered by plaque or calculus, thus the number obtained based on objective assessment. There are several types of indices that can be used to measure a person's plaque, including *Patient Hygiene Performance Index* or PHP Index. This study aims to determine the effectiveness of gargling green betel leaf decoction (*Piper Betle L*) and decoction of guava leaves (*Psidium Guajava*) against plaque index.

RESEARCH METHOD

This study used research *True Experiment* by design *Two Group Pre and Post Test*. This study conducted plaque index examination conducted before and after intervention with 2 intervention groups. This research was carried out in March-April 2023 at the Dental and Oral Health Care Service Laboratory, Department of Dental Health, Poltekkes, Ministry of Health, Manado. The subjects of this study were 32 students of the 1st level of the Department of Dental Health. The study subjects were divided into two groups, namely the gargling group of green betel leaf decoction (16 people) and the guava leaf decoction group (16 people). Research subjects meet the criteria, namely willing to participate in research as evidenced by filling out informed consent, present at the time of the study, have a DMF-T Index ≤ 3 , calculus-free, not under treatment *orthodontics*, and have no history of allergies to herbal plants. A decoction of green betel leaves and guava leaves is made with a concentration of 10% made by boiling 60 gr of green betel leaves in 600 ml of aquadest. Leaves are taken that are young or half old from the shoots of green betel leaf stems, the time of taking in the morning to prevent the color of the leaves from fading. The leaf decoction water is waited for it to boil, then waited for it to cool at room temperature, and then filtered to separate the leaves with a solution (Tandelilin et al., 2020). Gargle the decoction of leaves as much as 20 ml of cooking water and gargle for 30 seconds. Plaque index is the difference between plaque score before gargling and plaque score after gargling green betel leaf decoction and guava leaf decoction measured using PHP plaque index (*Personal Hygiene Performance*) according to *Podshadley* and *Haley*. With criteria Very good 0, Good 0.1-1.7, Medium 1.8-3.4, Bad 3.5-5. The analysis in this study is analysis *univariate* and *bivariate*.

RESULT AND DISCUSSION

Univariate analysis

Univariate analysis was conducted to distribute respondents by age and sex. This can be seen in Table 1.

Table 1. Distribution of research subjects by age and sex

Characteristic	Category	n	(%)
Age (years)	17	2	6
	18	11	34
	19	9	28
	20	10	31
Total		32	100
Gender	Woman	26	81
	Men	6	19
Total		32	100

Table 1 shows that the most study subjects were 18 years old (34%) and female sex was 26 people (81%). Furthermore, the distribution of research subjects based on plaque score categories before and after treatment was given. This can be seen in Table 2.

Table 2. Distribution of Research Subjects by Plaque Score Category

Treatment	Measurement Time	Plaque Score Categories				Total
		Very Good	Good	Fair	Bad	
Gargling decoction of green betel leaves	Before	0	0	6	10	16
	After	0	13	3	0	16
	Total	0	13	9	10	32
Gargling decoction of guava leaves	Before	0	0	7	9	16
	After	0	3	12	1	16
	Total	0	3	19	10	32

Table 2 data shows that the plaque score category of the study subjects showed that before gargling the decoction of green betel leaves in the Bad category as many as 10 people and after the most in the Good category as many as 13 people. Furthermore, in the gargling group, guava leaf decoction before gargling was most in the Bad category as many as 9 people and after gargling in the Medium category as many as 12 people.

Results of bivariate analysis

Bivariate analysis was performed to analyze the effect of treatment on plaque scores. Test selection begins by performing a normality analysis with the Shapiro-Wilk test and obtaining significant values all > 0.05 so that it is stated that all data are normally distributed. Based on the results of this test, a different test was carried out with the Paired Sample t-test. The test results can be seen in Table 3.

Table 3. Paired Sample t-test results

Group	Mean	SD	t count	df	α	p-value
Before – After Gargling Green Betel Leaf Decoction	2.0500	0.5933	13.821	15	0.05	0.000
Before – After Gargling Guava Leaf Decoction	0.9812	0.2994	13.111	15	0.05	0.000

Based on the *Paired Sample T-test* on the effectiveness of gargling green betel leaf decoction and guava leaf decoction on plaque index, a value of $\rho = 0.000$ ($\rho < 0.05$) means that there is a significant difference between before and after gargling green betel leaf decoction and guava leaf decoction on the Plaque Index.

Discussion

The results of this study showed in the group gargling a decoction of green betel leaves (*Piper Betle L*) obtained average results before gargling green betel leaf decoction 3.38 and after gargling green betel leaf decoction 1.33, there was a decrease in plaque index by 2.05 which means gargling with green betel leaf decoction can reduce plaque index. The difference in the average plaque index formed due to gargling decoction of green betel leaves contains essential oils consisting of kavikol and contains antiseptic substances that play a role in killing bacteria. The antiseptic properties of betel leaf are caused by phenol derivatives, namely cavikol, where the antiseptic properties are five times more effective when compared to ordinary phenols work by denaturing proteins in fungi, namely damage to the tertiary structure of proteins that make up the fungal cell wall which can cause weakness in the function of cell wall proteins. In addition, betel leaves also have antibacterial effects against *Streptococcus mutans*, *Streptococcus viridans* and *Streptococcus sanguis*. Betel leaf also contains antioxidants and eugenol which has antifungal properties (Center for Biopharmaceutical and Accomplished Studies, 2014).

The results of this study are in line with previous research conducted by Nurmeida et al., (2020), about the effect of betel leaf cooking water on reducing plaque scores said that betel leaf cooking water can reduce plaque index because of the essential oil content possessed by betel leaves which has antibacterial power that can reduce the formation of dental plaque. Research conducted Owu et al., (2020), It is said that betel leaf ethanol extract contains tannin compounds and effectively inhibits bacteria *Streptococcus mutans* Where these bacteria are the main bacteria that cause caries.

In the group of decoction of guava leaves (*Psidium Guajava L*) obtained average results before gargling guava leaf decoction 3.39 and after gargling guava leaf decoction 2.41, there was a decrease in plaque index by 0.98 which means gargling guava leaf decoction can reduce plaque score. The difference in the average plaque index formed because in guava leaves contains compounds such as *flavonoids* which is very high especially *Quercetin* Useful as an anti-bacterial (Maigoda, 2022). Guava leaves also contain essential oils that function as anti-bacterial to

inhibit plaque formation, besides that essential oils can increase secretion and increase the amount of salivary production (Ifitri and Eriyati, 2019).

On research conducted by Chakraborty et al., (2018) Based on the results of phytochemical tests on guava leaves contain tannins as antibacterial. Tannins have an antibacterial mechanism by contracting cell membranes, enzyme inactivation, and cell walls; (Handarni et al., 2020). Based on research Darsono and Sumantri., (2020) About Antibacterial Activity Test of Ethyl Acetate Fraction of Guava Leaves (*Psidium Guajava L*) against the bacteria that cause dental caries *Streptococcus Sanguis* says that compounds *flavonoids* contained in guava leaves has an antibacterial role contained in plaque formation, especially in the early stages.

The results of the analysis used *the Paired Sample T-test* mean value before and after gargling green betel leaf decoction 2.0500 and p value = 0.000 (<0.05) with t value_{count} = 13.821, then before and after gargling guava leaf decoction mean value 0.9812 and p value = 0.000 (<0.05) with t value_{count} = 13.111, while at t value_{Table} DF (*Degree of Freedom*) is 15, in statistical table value is t_{table} = 1.753. Thus, since t_{counts} > t_{table} it can be concluded that H₀ is rejected and H₁ is accepted. So there is a difference in effectiveness between gargling green betel leaf decoction with guava leaf decoction, where both stews can both reduce plaque score, but gargling green betel leaf decoction is more effective than gargling guava leaf decoction in reducing plaque score, because in the process of making decoction with the same concentration, guava leaf stew results are more concentrated than green betel leaves, The possibility of concentration is one of the causes of betel leaves being more effective than guava leaves against plaque index. In addition, it is also supported by differences in chemical components in essential oils in green betel leaves consisting of kavikol derivatives of phenol. Kavikol has antibacterial power five times stronger than ordinary phenol. These components play an important role in the mechanism of plaque formation because of the strong bactericidal properties that can reduce plaque scores.

The results of this study are in line with previous research conducted by Oktariani et al., (2020), where gargles of green betel leaf boiled water (*Piper betle L*) slightly decreased plaque scores more than guava leaf cooking water (*Psidium guajava L*). Maintaining dental hygiene is very mandatory for us to do many ways to maintain dental and oral hygiene, one of which is by brushing their teeth, but sometimes at certain times many people have not had time to brush their teeth because of rush or laziness, gargling with green betel leaves and guava leaves can be an easy alternative to do (Putri et al., 2018).

CONCLUSION

The conclusion of this study was the average plaque index before gargling green betel leaf decoction of 3.38 and after gargling green betel leaf decoction of 1.33. The average plaque index before gargling guava leaf decoction was 3.39 and after gargling guava leaf decoction was 2.41. The results of statistical tests show that gargling decoction of green betel leaves is more effective in reducing plaque than gargling decoction of guava leaves. Further research is needed, especially the

levels of active substances contained in green betel leaves and guava leaves that can affect the growth of dental plaque.

REFERENCES

- Aziz, S. A., & Ridwan, T. (2016). *Daun Jambu Biji Sebagai Bahan Baku Obat*. IPB Press. Bogor.
- Chakraborty, S., Afaq, N., Singh, N., & Majumdar, S. (2018). Antimicrobial activity of Cannabis sativa, Thuja orientalis and Psidium guajava leaf extracts against methicillin-resistant Staphylococcus aureus. *Journal of Integrative Medicine* 16(5), 352. (diakses pada tanggal 12 Juni 2023). <https://doi.org/10.1016/j.joim.2018.07.005>
- Darsono, O., & Sumantri. (2020). Uji Aktivitas Antibakteri Fraksi Etil Asetat Daun Jambu Biji (*Psidium Guajava L.*) Terhadap Bakteri Penyebab Karies Gigi *Streptococcus Sanguis*. *Indonesia Natural Research Pharmaceutical Journal*. Vol 5, No.1, 87. (diakses Pada Tanggal 14 Desember 2022).
- Fitri, I. & Humairoh, D. (2021). Activity Test Guava Leaf Extract (*Psidium Guajava L.*) On The Growth Of *Streptococcus Sp.* *Jurnal Matematika dan Sains,1*(1). (diakses pada tanggal 1 Februari 2023).
- Handarni, D., Putri, S. H., & Tensiska, T. (2020). Skrining Kualitatif Fitokimia Senyawa Antibakteri pada Ekstrak Daun Jambu Biji (*Psidium guajava L.*). *Jurnal Keteknik Pertanian Tropis dan Biosistem*, Vol. 8, No. 2, 183. (diakses pada tanggal 12 Juni 2023). <https://doi.org/10.21776/ub.jkptb.2020.008.02.08>
- Ifitri, I., & Eriyati. (2019). Pengaruh Berkumur Air Rebusan Daun Jambu Biji Terhadap Indeks Plak Pada Murid Sdn 10 Kubu Ampek Angkek Kabupaten Agam. *Ensiklopedia Of Journal*. Vol. 1, No. 4. (diakses Pada Tanggal 14 Desember 2022).
- Kartini, S. (2022). *Mengenal Tanaman Obat Tradisional Kahedupa*. Nas Media Pustaka. Yogyakarta.
- Kasuma, N. (2016). *Plak Gigi*. Andalas University Press. Padang.
- Kementerian Kesehatan RI. (2018). *Riset Kesehatan Dasar 2018*. Badan Penelitian dan Pengembangan Kesehatan RI. Jakarta.
- Maigoda, T. C. (2022). *Gel Ekstrak Daun Jambu dan Daun Senduduk Dampaknya Terhadap Penanda Inflamasi, Bakteriologis, Diameter Luka, dan Kolagen pada Luka Kaki dengan Diabetes*. PT Nasya Expanding Management. Jawa Tengah.
- Mumpuni, Y., & Erlita, P. (2013). *45 Masalah dan Solusi Penyakit Gigi dan Mulut*. Rapha Publishing. Yogyakarta.
- Notoatmodjo, S. (2014). *Metodologi Penelitian Kesehatan*. Rineka Cipta. Jakarta.
- Nugroho, E. D., & Rahayu, D. A. (2018). *Penuntun Praktikum Bioteknologi*. CV Budi Utama. Yogyakarta.
- Nurmeida, E., Herijulianti, E., Laut, D. M., & Nurnaningsih, H. (2020). Pengaruh Air Rebusan Daun Sirih Terhadap Penurunan Skor Plak. *Jurnal Kesehatan Siliwangi*. Vol.1, No.1, 62. (diakses pada tanggal 31 Januari 2023).
- Oktanauli, P., Taher, P., & Aulia, D. M. (2020). The Effect Of Herbal Mouthwash (Betel Leaf) Against Halitosis In Elderly. *Jurnal Ilmiah Dan Teknologi*

- Kedokteran Gigi Fkg Updm (B). Vol. 16, No. 1, 25.* (diakses Pada Tanggal 31 Januari 2023).
- Oktariani, Z., Deynilisa, S., & Zainur, R. A. (2020). Perbandingan Efektivitas Kumur-Kumur Air Rebusan Daun Sirih Hijau (*Piper Betle L*) Dengan Daun Jambu Biji (*Psidium Guajava L*) Terhadap Penurunan Skor Plak. *Jurusan Kesehatan Gigi Poltekkes Kemenkes Palembang*. Vol. 2, No. 2, 37. (diakses pada tanggal 11 Juni 2023).
- Owu, N. M., Fatimawali, ., & Jayanti, M. (2020). Uji Efektivitas Penghambatan Dari Ekstrak Daun Sirih (*Piper Betle L.*) Terhadap Bakteri *Streptococcus Mutans*. *Jurnal Biomedik*. Vol. 12, No.3. (diakses Pada Tanggal 31 Januari 2023).
- Pusat Studi Biofarmaka, & Ulung, G. (2014). *Sehat Alami dengan Herbal 250 Tanaman Berkhasiat Obat*. Gramedia Pustaka Utama. Jakarta.
- Putri, M. H. (2021). *Mikrobiologi Keperawatan Gigi*. PT. Nasya Expanding Management.
- Putri, M. H., Herijulianti., E & Nurjannah, N. (2018). *Ilmu Pencegahan Penyakit Jaringan Keras dan Jaringan Pendukung Gigi*. Buku Kedokteran EGC. Jakarta.
- Rachmatiah, T., Syafriana, V., & Elfira, L. (2018). Aktivitas Daya Hambat Minyak Atsiri Dan Ekstrak Etanol Daun Sirih Merah (*Piper Crocatum Ruiz & Pav.*) Terhadap *Candida Albicans*. *Sainstech Farma*. Vol. 11, No. 2. (diakses Pada Tanggal 31 Januari 2023).
- Rahayu, C., & Salikun. (2020). Efektivitas Rebusan Daun Sirih Merah (*Piper Betle Crocatum*) Dan Rebusan Daun Sirih Hijau (*Piper Betle Linn*) Terhadap Puberty Gingivitis. *Jurnal Ilmiah Keperawatan Gigi (Jikg)*. Vol. 1, No. 1, 31. (diakses Pada Tanggal 31 Januari 2023).
- Santoso, H. B. (2019). *Seri Mukjizat Daun Daun Sirih Merah*. Pohon Cahaya Semesta. Yogyakarta.
- Setyaningsih, D. (2019). *Menjaga Kesehatan Gigi Dan Mulut*. Loka Aksara. Tangerang.
- Susanto, A. (2018). *Kesehatan Gigi dan Mulut*. PT Sunda Kelapa. Jakarta.
- Tandelilin, R. TC., Sandy, L. P. A., & Hondro, M. J. (2020). Derajat Keasaman (pH) Saliva Meningkatkan Setelah Berkumur Rebusan Daun Sirih Merah (*Piper Crocatum*) Konsentrasi 10% pada Lansia Penderita Diabetes Melitus Tipe 2. *Jurnal Teknosains*, 9(2). (diakses pada tanggal 10 Februari 2023).
- World Health Organization. (2022). *Global Oral Health Status Report*. <https://www.who.int/news-room/fact-sheets/detail/oral-health>. (diakses pada tanggal 1 Februari 2023).
- Yanuar, A. (2019). *Manfaat Daun Sirih*. Mutiara Aksara. Semarang.
- Yulisma, L. (2018). Uji Efektivitas Anti Bakteri Ekstrak Daun Jambu Biji Lokal (*Psidium Guajava L*) Terhadap Pertumbuhan *Staphylococcus Aureus* Dan *Bacilus Subtilis* Secara In Vitro. *Jurnal Pendidikan Dan Biologi*. Vol. 10, No. 2. (diakses Pada Tanggal 14 Desember 2022).