

# The Formulation Of Herbal Mouthwash From *Bangun-Bangun* Leaves (*Coleus amboinicus* Lour) To Prevent The Occurrence Of Dental Plaque

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## Abstract.

Herbs utilization spare new opportunities to handle dental health issues. *Bangun-bangun* leaves have chemical components which are strongly related to the prevention of the occurrence of dental plaque. The current research aimed to observe the effect of using mouthwash made from *bangun-bangun* leaves extract with the concentration of 40% and 80% towards the occurrence of dental plaque on the students of III A and III B classes in Private *Madrasah Ibtidaiyah Annur* Medan, North Sumatera. The research used quasi-experimental method through the Pre-Post Test with Control Group design. Analysis of this research was conducted initially through normality and homogeneity tests on the variants. If the variable is normally distributed then it means that the variable is not homogenous, leading to the testing of Difference between Two Means (t test) through two parties' test of t'-test which was independent sample t-test. Through this research, researcher obtained t count of (57.20) > t table (1.987). Therefore, based on the basic of decision making through distinguishing t count and t table, then H<sub>0</sub> was rejected and H<sub>1</sub> was accepted. It means that there was difference on the treatment results between before and after using the 80% *bangun-bangun* leaves solution. Furthermore, the t count value (45.73) > t table (1.987), which based on the basis of decision making through distinguishing the t count and t table values was that H<sub>0</sub> was rejected and H<sub>1</sub> was accepted. It means that there was difference on the treatment results between the use of 40% and 80% of *bangun-bangun* leaves solution. It can be concluded that both of the uses of 40% and 80% of *bangun-bangun* leaves solution affected significantly on the prevention of students' dental plaque occurrence.

**Keywords:** *Coleus amboinicus* Lour leaves, mouthwash, dental plaque

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## I. INTRODUCTION

Oral health becomes an indicator of the overall body health, since it supports the welfare and life quality of human being. WHO reported data in 2018 estimating that there were 2.4 billion people suffering from permanent dental caries and 486 million children suffering from primary dental caries. WHO also recorded that 60-90% of dental caries are suffered by students [1].

Increased oral health issues percentage and the decreased awareness on the oral health are the main factors disturbing the oral health on children. *Riset Kesehatan*

*Dasar (Risksedar)* in 2013 reported that the percentage of population suffering from oral issues increase from 23.2% in 2007 to 25.9% in 2013. The highest dental caries percentage occurred during teeth changes phase (at the age of 10-12 years old), therefore special concern should be given at these ages [2]. However, preventive actions are certainly prioritized in handling the causes of dental caries.

There are many causes of caries and periodontal disease, one of them is the occurrence of dental plaque. Esawy *et al* [3] stated that dental plaque is considered as the most common disease throughout the world. Such disease is caused by pathogenic microorganism and leftovers on the teeth. Bacteria which produce acidic, especially *Streptococcus mutans*, colonize on the teeth surface and cause dental damage due to the fermentation activities of the foods containing sucrose and fructose [4].

Traditional herbal mouthwash are considered safer to be explored and formulated than using chemicals. In addition to the use of natural ingredients for the mouthwash, the other requirements are cheap, efficient and minimal side effects. WHO estimated that around 80% of people in the world still utilize herbal and traditional medicine because of its cheap price, easy accessibility and the absence of side effect compared to allopathy medicine [5,6,7].

North Sumatera is popular for its herbal *bangun-bangun* plants (*Coleus amboinicus* Lour.). Wadikar [8] reported that *bangun-bangun* leaves contain calcium, magnesium, potassium, phosphorus, and sodium. Meanwhile, Selvakumar *et al* [9] mentioned that the chemical compounds of *bangun-bangun* leaves are  $\beta$ -caryophyllene, carvacrol, thymol, methyl eugenol, terpinolene, 1,8-cineole,  $\beta$ -pinene, and  $\alpha$ -pinene.

The chemicals components of *bangun-bangun* leaves are correlated with its utilization in preventing the occurrence of dental plaque. Previous research emphasized that the chemical components of *bangun-bangun* leaves are similar with *Thymus vulgaris* and *Thymus vulgaris* which are effective in preventing the growth of *Streptococcus mutans* [10] as the main cause of dental plaque occurrence. These data became the initial insight in making herbal mouthwash from *bangun-bangun* leaves and informing that the review on the treatment of giving *bangun-bangun* leaves for oral health has been done before.

## II. METHODS

### 2.1 Research Design

Experimental design has various designs. The use of those designs is adjusted to the research aspect and the main issue discussed. Based on those explanation, this research employed quasi-experimental through the pre-post test with control group design. The pre-posttest design was referred to the patterns of observation and examination. The examination was done twice, those were the examination of plaque of pre-index and post-index using mouthwash from *bangun-bangun* extract solution.

### 2.2 Population and Sample

Sugiyono [11] argued that population is the generalization area consists of object/subject which has certain quality and characteristics that has been determined by the researcher to be studied and summed up. Furthermore, the population of this research was the students of III A and III B classes of Private *Madrasah Ibtidaiyah Annur* Medan, North Sumatera. Sample is part of total and characteristics owned by certain population [11]. In determining the sample, researcher used systematic random sampling technique. Each group contained at least 16 samples. The researcher chose to use 20 samples for each of three groups so that the total research subjects were 60 samples.

### 2.3 Experimental Mapping

Research population chosen used the criteria of 9-10 years old children in Private *Madrasah Ibtidaiyah Annur* Medan, North Sumatera. As many as 48 students of III A and III B classes in Private *Madrasah Ibtidaiyah Annur* Medan, North Sumatera were divided into three groups. Group I used the mouthwash containing 40% of *bangun-bangun* leaves solution (20 students), group II used mouthwash containing 80% of *bangun-bangun* leaves extract (20 students) and Group III (control) used mouthwash containing aquadest (20 students).

### 2.4 Data Analysis Design

Before conducting similarity test on two means, prerequisite test were conducted, which were normality and homogeneity tests of variants using SPSS version 19 software. The normality was tested using shapiro-wilk test because the number of sample used was little (less than 50 samples). In order to know the homogeneity of variants before and after the provision of *bangun-bangun* leaves solution (40% and 80% concentration), Levene’s test for equality variances was used.

When variable is normally distributed but not homogenous, then difference test of two means would be done (T-test) through test of two parties using T’-test which is independent sample T-test with the assumption that the two variants are not homogenous or known as equal variances not assumed. Meanwhile, when one or both of them are not normally distributed, then difference test on two means (T-test) was done through test of two parties using non-parametric statistical test which is Mann-Whitney u-test.

## III. RESULT AND DISCUSSION

Based on Table 1, it is known that there was difference in the OHI-S criteria result on each treatment. The treatment using 80% solution was the best treatment with good OHI-S status.

**Table 1.** The distribution of OHI-S criteria on treatment

Groups	OHI-S Value	OHI-S Criteria	N
Solution 40%	2.67	Medium	20
Solution 80%	0.76	Good	20

### 3.1 Normality test on group before and after the treatment of 40% bangun-bangun leaves solution

Normality test was done to know whether the data obtained is normally distributed or not. Statistical normality test was done using zero hypothesis and its alternative hypothesis as follow:

H0= the data of value before and after treatment comes from sample which is not normally distributed

H1= the data of value before and after treatment comes from sample which is normally distributed

The test has criteria that H1 is accepted if the significance value is more than or equals to  $\alpha=0.05$ , and H1 is rejected if the significance value is less than  $\alpha=0.05$ . Table 2 presents the result obtained.

**Table 2.** Data normality test before and after the 40% bangun-bangun leaves solution

	<i>Tests of Normality</i>					
	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
Before 40%	0.126	20	0.200*	0.973	20	0.818
After 40%	0.105	20	0.200*	0.958	20	0.500

a. Lilliefors Significance Correction

\*. This is a lower bound of the true significance.

P-value (sig.) used was shapiro-wilk, because the total sample used was little (less than 50 samples) Based on Table 5, it is known that the data normality test result of the group before obtaining 40% *bangun-bangun* leaves extract had P-value of 0.818. The normality test (shapiro-wilk) of group before using 40% *bangun-bangun* leaves solution obtained value more than  $\alpha=0.05$ . Therefore, the group data before using 40% *bangun-bangun* leaves solution was normally distributed.

Meanwhile, the data normality test result of the group after using 40% *bangun-bangun* extract solution obtained P-value (sig.) of 0.500. Therefore, the normality test (shapiro-wilk) of group after obtaining 40% *bangun-bangun* extract solution was obtained value more than  $\alpha=0.05$ . Thus, the data after the group obtaining 40% *bangun-bangun* leaves extract was normally distributed.

### 3.2 Normality test before and after the treatment of 80% bangun-bangun leaves solution

**Table 3.** Data normality test before and after the treatment of 80% bangun-bangun leaves solution

	<i>Tests of Normality</i>					
	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.

Before 80%	0.167	20	0.146	0.922	20	0.110
After 80%	0.153	20	0.200*	0.942	20	0.263

a. Lilliefors Significance Correction

\*. This is a lower bound of the true significance.

Based on Table 3, it is known that the result of data normality test of the group before obtaining 80% *bangun-bangun* leaves solution obtained P-value of 0.110. Therefore, the normality test (shapiro-wilk) of the group before obtaining 80% *bangun-bangun* leaves solution had higher value than  $\alpha=0.05$ . Therefore, the data of the group before obtaining 80% *bangun-bangun* leaves solution was normally distributed.

Meanwhile, the data normality test result for the group after obtaining 80% *bangun-bangun* leaves solution had P-value (sig.) of 0.263. Therefore, the normality test (shapiro-wilk) of the group after obtaining 80% *bangun-bangun* leaves solution had higher value than  $\alpha=0.05$ . Therefore, the data of the group before obtaining 80% *bangun-bangun* leaves solution was normally distributed. It can be concluded that the normality test (shapiro-wilk) result of the group before and after obtaining the solution was more than  $\alpha=0.05$ , so that the data of the two groups were normal.

### 3.3 Homogeneity test of the group before and after the treatment of 40% *bangun-bangun* leaves solution

Homogeneity test was done aiming to know whether the data of each group come from the same or different population. Since the two samples were normally distributed, then homogeneity test was done using Levene test, with the significance level of  $\alpha=0.05$ . The hypotheses used are a follow:

H0: If the significance value of the test  $< 0.05$ , then the variable has different variants (not homogenous).

H1: If the significance value of the test  $\geq 0.05$ , then the variable has the same variants (homogenous).

Therefore, the calculation results of the homogeneity test by using Levene’s test is shown in Table 4.

**Table 4.** Homogeneity test of the data before and after the 40% *bangun-bangun* leaves solution treatment

Test of homogeneity of variances

	Levene Statistic	df1	df2	Sig.
Before 40%	0.712	1	38	0.404
After 40%	4.019	1	38	0.052

Based on Table 4, the data homogeneity test results of the group before the treatment of 40% *bangun-bangun* leaves solution had P-value (Sig.) of 0.404, while for the group after the treatment of 40% *bangun-bangun* leaves solution had P-value (Sig.) of 0.052. It means H1 was accepted, while for the Levene’s test homogeneity test result was more than  $\alpha=0.05$ , so that there was no different variants between the two groups.

### 3.4 Homogeneity test of the group before and after the treatment of 80% bangun-bangun leaves solution

The data of the calculation result of homogeneity test by using Levene’s test is presented in Table 5.

**Table 5.** Data homogeneity test before and after the treatment of 40% bangun-bangun leaves solution

Test of homogeneity of variances

	Levene Statistic	df1	df2	Sig.
Before 80%	1.042	1	38	0.314
After 80%	7.008	1	38	0.012

Based on Table 5, it is known that the result of data homogeneity test of the group before and after the treatment of 80% bangun-bangun leaves solution had P-value (Sig.) of 0.314, while for the group after the treatment of 80% bangun-bangun leaves solution obtained P-value (Sig.) of 0.012. It means H1 was rejected, while for the Levene’s Test homogeneity test result was less than  $\alpha=0.05$ , so there was variance (not homogenous) between the two groups. If the variable is normally distributed but not homogenous, then difference test of two means (T-test) was conducted through test of two parties using T’-test which is independent sample T-test.

**Table 6.** Statistical table before and after the treatment of 80% bangun-bangun leaves solution

Group Statistics

Groups	N	Mean	Std. Deviation	Std. Error Mean
Solution Percentage Before 80%	20	4.3565	0.25836	0.05777
After 80%	20	0.7590	0.11116	0.02486

**Table 6.** shows that the mean value of the percentage before the treatment of 80% solution was 4.36, while after the treatment of 80% solution was 0.76. Therefore, it can be concluded descriptively and statistically that the mean difference before and after the treatment of 80% bangun-bangun leaves solution.

**Table 7.** Levene’s test for equality of variances before and after the treatment of 80% bangun-bangun leaves solution

Independent Samples Test

Levene's Test for Equality of Variances		t-test for Equality of Means							
F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference		
						Lower	Upper		

Solution Percentage	Equal variances assumed	15.585	0.000	57.20	38	0.000	3.59750	0.06289	3.4701	3.725
	Equal variances not assumed			57.20	25.80	0.000	3.59750	0.06289	3.4681	3.727

Based on the output of Table 7, it is known that the sig. value of Levene’s test for equality of variances was  $0.000 < 0.05$ , so it means that the data variants between the groups before and after the treatment of 80% solution was not homogenous. Based on the data in the part of “equal variances assumed”, it is known that the sig. (2-tailed) value was  $0.00 < 0.05$ , then based on the basic of decision making in independent sample t test, it can be summed up that  $H_0$  is rejected and  $H_1$  is accepted. Thus, it can summed up that there was significant difference before and after the treatment of 80% solution.

3.5 Comparing T count and T table in independent sample T-test

This research obtained T count by 57.20. T table value was obtained using the formulation of  $(a/2)$ ; (df) equals to  $(0.05/2)$ ; (38) equals to 0.025; 38. Then, T table was obtained as 1.987, while T count was  $57.20 > T$  table 1.987. Therefore, based on the basis of decision making through the comparison of T count and T table value, it can be concluded that  $H_0$  is rejected and  $H_1$  is accepted. It means that there was difference of the means result before and after the treatment of 80% *bangun-bangun* leaves solution.

3.6 T'-test (independent sample T-test) after the treatment of 40% and 80% *bangun-bangun* leaves solution

**Table 8.** Statistical table before and after the treatment of 40% *bangun-bangun* leaves solution

		Group Statistics			
	Groups	N	Mean	Std. Deviation	Std. Error Mean
Solution Percentage	After 40%	20	2.670	0.1501	0.0336
	After 80%	20	0.759	0.1111	0.0248

The mean value of the 40% solution percentage was 2.67, while 80% solution was 0.76. Therefore, it can be summed up statistically and descriptively that there was difference in percentage means of 40% and 80% *bangun-bangun* leaves solution.

**Table 9.** Levene’s test for equality of variances before and after the treatment of 40% *bangun-bangun* leaves solution

		Independent Samples Test	
	Levene's Test for Equality of Variances		t-test for Equality of Means

		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Solution Percentage	Equal variances assumed	0.990	0.326	45.737	38	0.000	1.91100	0.04178	1.826	1.996
	Equal variances not assumed			45.737	35.011	0.000	1.91100	0.04178	1.826	1.996

Based on the output of Table 9, it is known that the sig. value of Levene's test for Equality of Variances was  $0.326 > 0.0$ . It means that the data variants of 40% and 80% solution group was homogenous. Based on the data in the part of "equal variances assumed", it is known that the sig. value (2-tailed) was  $0.00 < 0.05$ , then based on the basic of decision making in independent sample T-test, it can be summed up that  $H_0$  is rejected and  $H_1$  is accepted. Therefore, there was significant difference between the percentage means of 40% and 80% solution.

### 3.7 Comparing T count and T table in independent sample T-test

T count obtained in this stage was 45.73. The T table value was obtained through the formulation of  $(\alpha/2)$ ; (df) equals to  $(0.05/2)$ ; (38) equals to 0.025; 38. T table obtained was 1.987. Then, based on the basis of decision making through the comparison of T count and T table value, it can be summed up that  $H_0$  is rejected and  $H_1$  is accepted. It means that there was difference in the means of the treatments of 40% and 80% solution.

Herbal mouthwash resulted in the formulation result of *bangun-bangun* leaves was performed in two concentrations of 40% and 80%, while the control was using aquadest. The two treatments were observed before and after using the *bangun-bangun* leaves solution mouthwash. Data was obtained from OHI-S result, in which the OHI-S value was calculated by summing up Debris Index and Calculus Index values. Table 1 shows that there was difference in OHI-S value before and after using 40% and 80% *bangun-bangun* leaves solution mouthwash. The total samples of each treatment (n) was 20 students, so that the treatment was given to total of 40 students.

The decrease of OHI-S value after using 40% and 80% *bangun-bangun* leaves solution mouthwash occurred because *bangun-bangun* contains compound of  $\beta$ -caryophyllene, carvacrol, thymol, methyl eugenol, terpinolene, 1,8-cineole,  $\beta$ -pinene, and  $\alpha$ -pinene. The chemical compounds of *bangun-bangun* leaves are correlated with its utilization in preventing dental plaque occurrence. This is emphasized by the previous research that the chemical compounds of *bangun-bangun* leaves have similarities with *Thymus vulgaris* and *Thymus vulgaris* which are effective in preventing the growth of *Streptococcus mutans* [10] as the main cause of dental plaque occurrence.



This research was performed by initially focusing on the sample determination. Sample used must fulfill the requirement of being homogenous or equal among the treatment groups. This is proven on the calculation of data homogeneity before and after the treatments of 40% *bangun-bangun* leaves solution as presented in Table 4.

#### IV. CONCLUSION

Current research has been conducted on the formulation of herbal mouthwash using *bangun-bangun* leaves (*Coleus amboinicus* Lour.) to prevent the dental plaque occurrence on the students of III A and III B classes in private *Madrasah Ibtidaiyah Annur* Medan, North Sumatera, obtaining that 80% *bangun-bangun* leaves solution is the best treatment with OHI-S value of 0.76 (good criteria). The T count (57.20) > T table (1.987), thus based on the basis of decision making by comparing t count and t table value obtained that H<sub>0</sub> is rejected and H<sub>1</sub> is accepted. It means that there was difference on the treatment result before and after using 80% *bangun-bangun* leaves solution. Furthermore, T count value (45.73) > T table (1.987). Based on the basis of decision making by comparing T count and T table value obtained that H<sub>0</sub> is rejected and H<sub>1</sub> is accepted. It means that there was difference on the treatment result before and after using 80% *bangun-bangun* leaves solution, which means that there was difference in treatment results of using both 40% and 80% *bangun-bangun* leaves solution.

#### V. ACKNOWLEDGMENTS

The authors would like to appreciate Poltekkes Kemenkes Medan for supporting this project. This research was funded by DIPA of the Ministry of Health, Republic of Indonesia under Medan of Health Polytechnic No. LB.01.02/01/0104/2020.

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