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Natural mouthwash of sarang banua leaves (*Clerodendrum fragrans* Vent Willd) extractas a healthy solution during the covid-19 pandemic

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Abstract: The spread of the COVID-19 virus has shaken the world. The application of Clean and Healthy Living Behavior (CHLB) is the best effort to prevent the transmission of the Covid-19 virus. Maintaining oral and dental hygiene can improve health, especially during the COVID-19 pandemic. Sarang Banua (*Clerodendrum fragrans* Vent Willd) is a local plant of North Sumatra, containing secondary metabolites of alkaloids, steroids, flavonoids, triterpenoids, saponins, tannins, and quinones that have bioactivity such as antibacterial and antioxidant. The preparation of Sarang Banua mouthwash (SABANA) made from the extract of the sarang banua leaves with a concentration of 0.5 grams in 100 ml of preparation (0.5%) has been formulated, evaluated by organoleptic, pH and antibacterial test. The results of organoleptic and pH tests showed that SABANA mouthwash preparations were brown and slightly cloudy, tasted very distinctive, fresh, and eliminated bad breath with a pH of 7 in accordance with quality standards. About 70% of the panelists stated that they really liked the color, aroma, taste and appearance of SABANA mouthwash preparations. The results of antibacterial test against the oral bacteria Streptococcus mutans ATCC (25175) showed that 0.5% and 0.75% of the oral antibacterial mouthwash was found to be effective as oral antibacterial with an average inhibition zone diameter of 16.55 and 16.9 mm. Through the activities of the Student Creativity-Entrepreneurship Program, SABANA mouthwash have been produced and marketed in the local as well as outside the city by online and offline-shop and have the opportunity to develop into a new entrepreneur.

Keywords: Mouthwash, *Clerodenrum fragrans* Vent Willd, antibacterial, streptococcus mutans

1. Introduction

The spread of the COVID-19 virus has shaken all corners of the world. Indonesia, a densely populated country, is one of hundreds of countries affected by the COVID-19 virus. The application of Clean and Healthy Living Behavior (CHLB) is the best effort to prevent the transmission of the Covid-19 virus. CHLB behavior is diligent in washing hands, maintaining a distance of 1-3 meters, avoiding crowds, avoiding touching eyes, nose and mouth (Karuniawati & Putrianti, 2020). The mouth as the entrance of food and drink into the body plays an important role for the body. Maintaining oral and dental hygiene can improve health (Ratih & Yudita, 2019). But sadly, most people think that oral and dental care is not too important even though the benefits are vital in supporting health, especially during the COVID-19 pandemic which spreads through the mouth and nose.

Most of the mouthwashes used by the public contain chlorhexidine which can have a mutagenic effect on the mouth. Mouthwash preparations on the market generally contain a high alcohol content and a 50% risk of developing oral cancer (Suryani et al. 2019).

Based on the research of Simorangkir et al. (2018) confirmed, "The ethanol extract of the leaves of the banua nest plant (*Clerodenrum fragrans* Vent Willd) found in the Simalungun area of North Sumatra, contains secondary metabolites in the form of alkaloids, triterpenoids, flavonoids, saponins, tannins and Quinones which have antibacterial and antioxidant activity and some of these metabolites are used as antibacterial" (Simorangkir et al. 2019a; Simorangkir et al. 2019b; Simorangkir et al. 2019c). Arifin & Ibrahim (2018) stated that flavonoids as antibacterial, antioxidant and anticancer work by damaging the permeability of bacterial cell walls, microsomes and lysosomes.

Natural mouthwash made from the extract of the leaves of the sarang banua has a fairly large business opportunity in entrepreneurship. This SABANA natural mouthwash is an alternative in implementing clean and healthy living behavior, especially during the COVID-19 pandemic which spreads through the nose and mouth and is very suitable for use by teenagers and adults who want to take care of their teeth without fear of harmful chemicals contained therein. The advantages of this natural mouthwash SABANA compared with other mouthwashes on the market are the main ingredients used do not contain harmful chemicals such as alcohol, contain flavonoids that can prevent the risk of oral cancer and are typical medicinal plants from the local area of North Sumatra that are friendly environment in productivity. This product has a wide range of consumers and regions because it is safe for use by all consumers, who are predominantly teenagers and adults. SABANA natural mouthwash product has the opportunity to develop into a new entrepreneur as an alternative healthy solution, especially during the Covid-19 pandemic.

2. Methods

2.1 Materials

The materials used in this study were fresh sarang banua leaves, oral bacteria *S. mutans* (ATCC 25175), Muller Hinton Agar (MHA) media, 96% ethanol, calcium lactate, potassium thiocyanate, benzoic acid, oleum menthe, sodium benzoate, sorbitol 70%, propylene glycol, PEG-40 hydrogenated castor oil and aquadest.

2.2 Sample preparation

Samples of fresh sarang banua leaves were taken from Jl. Sei Siguti 35, Sei Sikambing D Village, Medan Petisah District, Medan City. The sample of sarang banua leaves were washed, air-dried for 1 day, then dried in an oven at 50°C. After drying, the sample was mashed using a blender and obtained simplicia of sarang banua leaf powder.

2.3 Sample extraction

Sample extraction was done by maceration. A total of 300 grams of the sample was immersed in 1 liter of 96% ethanol for 3 days at room temperature with occasional stirring. After 3 days, the sample was filtered using filter paper on a Buchner funnel connected to a vacuum pump which produced the first filtrate and the first dregs. The pulp was repressed for 2 days using 1 liter of 96% ethanol. The sample was filtered and a second filtrate was obtained. The first and second filtrate were mixed, then evaporated using an evaporator to produce a thick extract. The thick extract of the leaves of the sarang banua is weighed and stored in a closed container before being used as an ingredient for making SABANA mouthwash (Kono et al. 2018).

2.4 Mouthwash making

The manufacture of the water-soluble phase is by dissolving the water-soluble ingredients, respectively, such as calcium lactate, potassium thiocyanate, leaf extract of sarang banua. Substances that are less soluble in water such as benzoic acid are dissolved with oleum menthe. Material (b) is then emulsified with PEG-40 Hydrogenated Castor Oil, then propylene glycol is added little by little, stirring until homogeneous. Material (a) is added little by little into the material (c) while stirring until homogeneous. Then 70% sorbitol is added little by little into the preparation, after that it is stirred until homogeneous. Sodium benzoate is dissolved in water until homogeneous, then added to material (d) until it reaches a pH of 6-7 (Table 1) (Kono et al. 2018).

2.5 Evaluation of mouthwash preparations

The results of the SABANA mouthwash formulation from the extract of the leaves of the sarang banua then evaluated to determine the stability of the mouthwash preparations that had been made. This evaluation includes observing the test preparations for 3 weeks of storage at room temperature. Observation of the preparation includes general evaluation, namely organoleptic test, pH test, and antibacterial activity.

Organoleptic and hedonic test. The preparations observed included color, taste, aroma, and appearance. The organoleptic test also uses a hedonic test to 10 panelists at random. The hedonic scale used is 1-5, where the numbers 1 = very much like, 2 = like, 3 = normal, 4 = do not like, and 5 = very much dislike.

pH test. The pH of the SABANA mouthwash from the extract of the leaves of the sarang banua was measured using a universal pH paper. The quality standard of herbal mouthwash, which is pH between 6-7 (Handayani et al. 2018).

Antibacterial activity test. In the antibacterial test of the disc diffusion method, it is necessary to prepare a Mc. Farland turbidity standard which can be made by homogenizing 1% H2SO4 as much as 9.95 ml and 1% BaCl as much as 0.05 ml. Next, make a bacterial suspension by inserting 3 ml of 0.9% physiological NaCl into a closed tube. Into the tube, 3-5

oses of rejuvenated bacteria are inserted and homogenized by vortex. The turbidity level of the bacterial suspension was compared with the Mc. Farland 0.5. A total of 100 µℓ of bacterial suspension was dripped slowly into the MHA medium and leveled slowly using a spreader. Chloramphenicol disc paper was used as a positive control and dimethyl sulfoxide (DMSO) disc paper was used as a negative control (Simorangkir et al. 2019a; Zega et al. 2021). The inhibition zone was measured using a caliper and carried out after an incubation period of 24 hours. A sample is antibacterial if it produces a clear zone around the paper disc.

Table 1
Formulation of SABANA Mouthwash using Sarang Banua Leaf Extract

Material	Formula I (0.25%)	Formula II (0.5%)	Formula III (0.75%)	Function
Sarang Banua Leaf Extract (g)	0.25	0.5	0.75	Active substance
Propylene Glycol (ml)	**5**	5	5	Prevent water loss
PEG-40 Hydrogenated Castor Oil (ml)	1	1	1	Dissolving the flavoring agent, giving a clean effect on the mouth
Oleum Menthe (drops)	10	10	10	Flavoring agent
Benzoic Acid (mg)	5	5	5	Preservative
Sodium Benzoate (g)	**2**	2	2	Prevents the growth of microorganisms
Calcium Lactate (mg)	50	50	50	Promotes tooth enamel remineralization
Potassium Thiocyanate	100	100	100	Anti caries on teeth
Sorbitol 70% (ml)	**15**	15	15	Sweet taste
Aquadest (ml)	ad 100	ad 100	ad 100	Solvent, final volume adjustment of sediment
Material	Formula I (0.25%)	Formula II (0.5%)	Formula III (0.75%)	Function

2.6 Production and marketing of SABANA mouthwash

From the results of the evaluation of 3 types of formulations of SABANA mouthwash product, the best formulation will be obtained. Product packaging was carried out by pre-preparing bottles and hedonic tests on 10 panelists at random. The hedonic test is used to measure the level of public preference for the SABANA mouthwash product packaging. Mouthwash products with the best formulations and packaging will be produced and marketed online and offline.

3. Results and Discussion

Mouthwash stability testing was carried out including organoleptic testing and measurement of pH values. Organoleptic examination of mouthwash preparations included colour, taste, aroma, and appearance. These four parameters are visual characteristics and

characteristics that can be observed directly. The results of the formulation of mouthwash products from the extract of the leaves of the sarang banua are presented in Fig 1.

Fig 1. SABANA mouthwash product

3.1 Organoleptic and hedonic test results

The purpose of this organoleptic test is to determine whether a particular commodity or sensory trait can be accepted by the public. The results of organoleptic observations can be seen in Table 2.

Table 2
Results of organoleptic tests for mouthwash preparations for Sarang banua leaf extract

Formula	Form	Color	Scent	Appearance
Formula I (concentration of 0.25 %)	Liquid	Light green	Less of extract's distinctive aroma	Interest
Formula II (concentration of 0.5 %)	Liquid	Green	Extract's distinctive aroma	Interest
Formula III (concentration of 0.75 %)	Liquid	Dark green	Extract's distinctive aroma is very strong	Less Interest

The results of the organoleptic test showed that formula II (concentration 0.5%) was better than formula I (0.25%) and formula III (0.75%).

The hedonic test is used to measure the level of public preference for SABANA mouthwash products. Hedonic test (liking) was conducted to 10 panelists randomly. The hedonic scale used is 1-5, where 1 = likes very much, 2 = likes, 3 = normal, 4 = does not like, and 5 = dislikes very much. The total results of the hedonic test from 10 panelists can be seen in Table 3.

Table 3
Results of hedonic testing for mouthwash preparations of Sarang banua leaf

Panelists	Color	Taste	Scent	Appearance
Formula I (concentration of 0.25 %)	40	45	45	45
Formula II (concentration of 0.5 %)	40	48	46	45
Formula III (concentration of 0.75 %)	36	35	45	39

The results of the hedonic test showed that the colour, taste, aroma and appearance of the SABANA product formula II (0.5%) were preferred by the panelists than the product formula I (0.5%) and formula III (0.75%).

3.2 pH testing result

pH testing is carried out using universal pH. The standard pH of the mouthwash must be in accordance with the pH of the mouth, which is pH 6-7. The pH test results can be seen in Table 4.

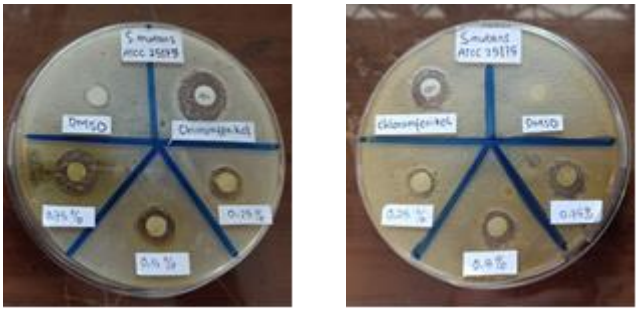
Table 4
The results of testing the pH of the mouthwash preparations of Sarang banua leaf extract

Formula	pH
Formula I (concentration of 0.25 %)	7
Formula II (concentration of 0.5 %)	7
Formula III (concentration of 0.75 %)	7

The pH test results showed that all SABANA products formula I (concentration 0.25%), II (concentration 0.5%) and III (concentration 0.75%) met the standard mouthwash pH of 7, which was in accordance with oral pH, namely pH 6-7.

3.3 Antibacterial activity testing result

Testing the antibacterial activity of *S. mutans* (ATCC 25175) was carried out with a mouthwash formulation using the extract of the leaves of the sarang banua with 3 variations in concentration, namely concentrations of 0.25%, 0.5% and 0.75%. From the mouthwash formulation test, it showed the inhibition zone for each extract. The results of the antibacterial activity test can be seen in Fig 2.



a b

Fig 2. Antibacterial test results with concentration variations 0.25%, 0.5% and 0.75%. (a) experiment I, (b) experiment II

The results of the measurement of the average inhibition zone on the extract with a concentration of 0.25% is 5.55 mm which is weak in inhibiting bacteria, at a concentration of 0.5% the average inhibition zone is 16.5 mm which is strong in inhibiting bacteria, at a concentration of 0.75% the average zone inhibition of 16.9 mm which is considered strong in inhibiting bacteria, and in positive control chloramphenicol with an average inhibition zone of 24.3 mm with a very strong category. In the negative control, dimethyl sulfoxide could not

inhibit the growth of *S. mutans* bacteria (ATCC 25175) because there is no clear zone (Table 5).

Table 5
Antibacterial test measurement results with concentration variations 0.25%, 0.5% and 0.75%

	Sarang Banua Leaf Extract			Positive Control (mm)	Negative Control (mm)
	Concentration 2.5% (mm)	Concentration 5% (mm)	Concentration 7.5% (mm)		
Experiment I	5.6	16.6	17.1	25.4	0
Experiment II	5.5	16.5	16.7	23.2	0
Average	5.55	16.5	16.9	24.3	0

The results of the antibacterial test of the SABANA product formula I (0.25%), II (0.5%) and III (0.75%) against the oral bacteria S. mutans (ATCC 25175) showed that the mouthwash product SABANA extract of the leaves of the sarang banua formula II (0.5% concentration) and formula III (0.75% concentration) was effective as oral antibacterial with an average inhibition zone diameter of 16.45 mm (0.5% concentration) and 16.9 mm (0.75% concentration) compared to formula I (0.25% concentration).

3.4 SABANA Mouthwash production

The results of the evaluation test on SABANA mouthwash formula I (0.25%), II (0.5%) and III (0.75%) showed that formula II (0.5%) showed the best formulation. To produce SABANA mouthwash with a 0.5% extract formulation, every 8 kg of Sarang banua leaves can produce 50 grams of extract. From 50 grams of the extract of the leaves of the Sarang banua obtained can produce 100 mouthwash products.

The hedonic test of mouthwash packaging was carried out by packaging 100 ml of mouthwash product into 3 variations of packaging models. The hedonic scale used is 1-5, where 1 = likes very much, 2 = likes, 3 = normal, 4 = does not like, and 5 = dislikes very much. The variety of mouthwash packaging can be seen in Fig 3.

a b c

Fig 3. Variations of the SABANA mouthwash packaging model. (a) packaging I, (b) packaging II, (c) packaging III

Based on the results of the hedonic test, 50% of the panelists chose the packaging model I, 30% of the panelists chose the packaging model II and 20% of the panelists chose the packaging model III. The results of the hedonic test showed that the packaging that the panelists were most interested in was packaging I. The production of SABANA natural

mouthwash was carried out with extracts according to formula II (0.5% concentration) with packaging I that was attractive to consumers and ready to be marketed.

3.5 *Marketing and profits of SABANA mouthwash product*

Marketing of SABANA natural mouthwash products is carried out online-shop and offline-shop, within the Medan city and outside the Medan city. Product marketing online using the G-Business, Instagram, Shopee, Lazada, Tokopedia and WhatsApp platforms. The strategy used in online marketing is the distribution of advertisements, video testimonials and digital brochures through social media accounts. Online product marketing has reached targets inside and outside the Medan area. Online product marketing can be seen in Fig 4.

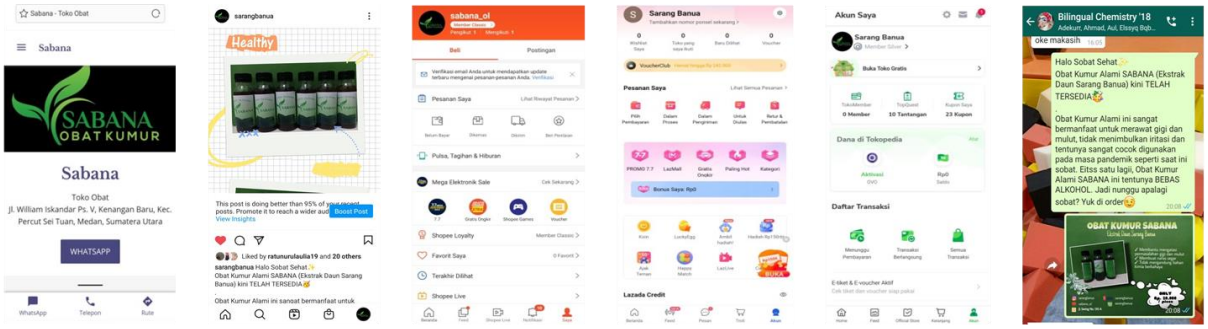


Fig 4. Marketing of SABANA mouthwash online. (a) G-business, (b) instagram, (c) shopee, (d) lazada, (e) tokopedia, (f) whatsapp

Fig 5. Marketing of SABANA mouthwash by offline

Offline product marketing is carried out in accordance with health protocols. SABANA Mouthwash product shop is located on Jl. Sering, Number 135 A, Medan. The strategy used in offline marketing is by making banners and distributing brochures while still complying with health protocols. Offline product marketing has reached the target area of Medan, especially the fishing area and its surroundings. Offline product marketing can be seen in Fig 5.

4. Conclusion

The natural mouthwash of the leaf extract of the sarang banua has a great opportunity to be developed into a new entrepreneur as an alternative healthy solution in implementing clean and healthy living behavior, especially during the Covid-19 pandemic which spreads through the nose and mouth. SABANA natural mouthwash has advantages, including containing quality and tested natural ingredients from local North Sumatran plants that are quite available, well formulated and produced and according to quality standards, packaged in an attractive and practical way, marketed online-shop and offline, has a wide consumer and area coverage because it is safe for all consumers to use, which is more dominantly teenagers and adults.

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