

THE FORMULATION OF TOOTHPASTE FROM COMBINATION OF TORCH GINGER FLOWERS (*Etlingera elatior* JACK) AND BANANA PEELS

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ABSTRACT

Currently, many toothpastes are sold in the market for cleaning and dental care, but they contain synthetic chemicals which can cause health problems, such as fluoride and sodium lauryl sulfate (SLS). These ingredients can irritate the gums and mouth, cause a burning sensation in the gums, tooth sensitivity, and tongue discomfort. Traditionally, the inner part of ripe banana peels has been used for teeth whitening, by rubbing it on the teeth for about 10 minutes. Kepok banana peels were collected from fried banana sellers along Jalan Gatot Subroto, Medan, and fresh torch ginger flowers were purchased from the traditional Petisah market in Medan city. They were then pulverized and dried on a water bath at a temperature of approximately until a dry powder was obtained. The toothpaste preparation was formulated using a combination of torch ginger flower at concentrations of , , and and dried banana peel replacing calcium carbonate with ratios of (75:25); (50:50); and (25:75). The preparation was evaluated for organoleptic properties using a preference test (hedonic test), homogeneity, pH, stability, cleaning power, and irritation test on volunteers' skin. The results of the phytochemical screening showed that the fresh torch ginger flower, fresh banana peel, and the dried product at contained the same chemical groups, namely flavonoids, tannins, steroids, saponins, glycosides, and essential oils. The toothpaste preparation containing the combination of dried torch ginger flower and banana peel powder was favored by the panelists, was stable upon storage, possessed good cleaning power, and caused no irritation. The best formula was the one containing a 75:25 ratio of torch ginger flower and banana peel, which produced a toothpaste that provides benefits for cleaning and dental care, is safe, and is economical.

Keywords : Torch ginger, Banana peels, Toothpaste

INTRODUCTION

Currently, many toothpastes are sold in the market for cleaning and dental care, but they contain synthetic chemicals that can also pose health problems. For example, fluoride is very dangerous because it can cause health issues. According to Raymond George Sr., DMD, President of the American Association of Orthodontists, in children under the age of 8, ingesting large amounts of fluoride can lead to a condition called fluorosis, which initially appears as white spots and eventually turns brownish. Furthermore, it can also potentially cause cancer and thyroid disease. In addition, toothpastes on the market also contain Sodium Lauryl Sulfate (SLS), known as a foaming agent and still classified as a type of pesticide. This substance can irritate the gums and mouth, and can also have long-term adverse health effects such as a burning sensation in the gums, sensitive teeth, and a feeling of discomfort on the tongue (Tarigan, 2023).

Traditionally, banana peels have been widely used for teeth whitening, by taking the inner part of a ripe, non-blackened banana peel and rubbing it on the teeth for approximately 10 minutes, then rinsing with clean water. This is possibly due to the content of magnesium, manganese, and potassium in the banana peel, which can fade stains on tooth enamel. In addition, banana peel is non-abrasive, unlike the effect that can be caused by synthetic teeth whitening agents (Indah, 2013). Therefore, banana peel, which is widely available as a waste product, has great potential to be formulated into a toothpaste that is relatively safer and more economical.

In addition to a whitening agent, a material with antibacterial properties is also needed for dental care to eliminate the bacteria that cause tooth damage. One natural ingredient that has been proven to have antibacterial activity and has been frequently used to treat various infectious diseases, such as eliminating bad breath and body odor, is the torch ginger flower (*Etilingera elatior* Jack) (Gemilang, 2012; Arief, 2017).

The torch ginger plant is commonly found in Indonesia, including North Sumatra. The torch ginger flower contains various active substances that have the potential to inhibit bacterial growth, namely saponins, flavonoids, and essential oils, and it has a pleasant/distinctive and pungent aroma. Therefore, it has great potential to be formulated into a toothpaste (Dalimartha, 2019).

The direct use of natural ingredients in a formula would require a large volume or concentration to obtain an effective antibacterial effect. Thus, an effort to reduce the volume,

such as by drying, needs to be carried out. The drying process by sun exposure or heating at high temperatures is feared to damage the active compounds contained in it, especially those with antibacterial potential. Therefore, drying is performed using a water bath at a temperature of approximately 60 °C

The objective of this research is to obtain a toothpaste preparation containing natural ingredients from the combination of torch ginger flower and banana peel, which is rational for maintaining dental hygiene and care.

Picture 1 Torch Ginger (*Etlingera elatior* Jack)



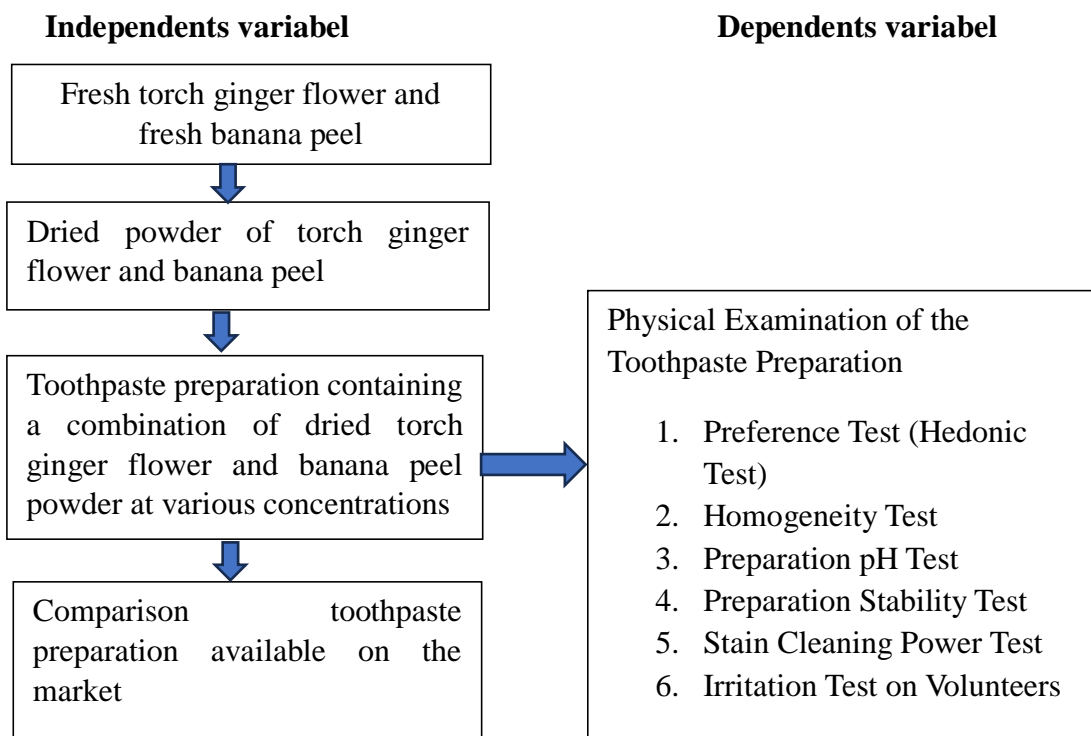
Picture 2 Kepok Banana



METHOD

This research is an experimental study in the laboratory. The study involves the variation of the concentrations of torch ginger flower and banana peel within the toothpaste formulation as the independent variables, and the quality parameters of cleaning power test and the antibacterial effectiveness of the preparation as the dependent variables.

Physical tests (quality of the preparation) are carried out on the preparation, including a preference test (hedonic test) through organoleptic testing, homogeneity test, emulsion type test, preparation pH test, and preparation stability test. To determine the safety of the preparation during use on the skin of volunteers, an irritation test on volunteers is conducted.



Tools and Materials

1. Tools The tools used in this research are: pasting tools, autoclave (Fisons), blender (Miyako), incubator (Fiber Scientific), gas stove (Rinnai), electric balance (Vibra AJ), refrigerator (Toshiba), oven (Fiber Scientific), water bath (Yenako).
2. Materials The plants used are: torch ginger flower, purchased purposefully through simple random selection at the traditional Petisah market in Medan without comparing it to other markets. Kepok banana peel, obtained purposefully from fried banana sellers

around Jalan Gatot Subroto. The chemical materials used include: aquadest (distilled water), glycerol, saccharin, calcium carbonate, saccharin, sodium benzoate.

3. Volunteers Female volunteers aged 20-30 years who are physically and mentally healthy.
4. Preparation of Plant Materials 1 kg of torch ginger flower was cut into pieces, and 3 kg of Kepok banana peel (the inner part was taken). Subsequently, both materials were cleaned from dirt, washed with clean water, drained, and then weighed to determine the wet weight. They were then pulverized and dried at the lowest possible temperature and weighed again.
5. **Preparation of Toothpaste Formulation**

a. Basic Toothpaste Formula

The preparation is made based on the following basic toothpaste formula:

Ingredient	Amount
Saccharin	1,50 grams
Calcium Carbonate	72,0 grams
Sodium Lauryl Sulfate	12,0 grams
Glycerin	12,5 grams
Sodium Benzoate	0,10 grams
Peppermint Oil	2,00 ml

b. Formulated Toothpaste

The toothpaste is formulated by substituting Calcium Carbonate with a mixture of dried banana peel and torch ginger flower. These two ingredients are added with various percentage ratio variations: (75:25)%; (50:50)%, and (25:75)%, so the calculation of the torch ginger flower and banana peel ratios is obtained as follows:

1. Formula 1:
Ratio of torch ginger flower and banana peel : (75 : 25 %)
Torch ginger $= \frac{75}{100} \times 72 \text{ g} = 55,50 \text{ g}$
Banana peel $= \frac{25}{100} \times 72 \text{ g} = 18,50 \text{ g}$

2. Formula II (50 : 50 %)
- Torch ginger = $\frac{50}{100} \times 72 \text{ g} = 37,00 \text{ g}$
- Banana peel = $\frac{50}{100} \times 72 \text{ g} = 37,00 \text{ g}$
3. Formula III (25 : 75 %)
- Torch ginger = $\frac{25}{100} \times 72 \text{ g} = 18,00 \text{ g}$
- Banana peel = $\frac{75}{100} \times 72 \text{ g} = 55,00 \text{ g}$

Table 1 Composition of the Basic Toothpaste Formula

No.	Tooth paste Formula	Torch ginger (g)	Banana peel (g)	Saka rin (g)	Natrium lauril sulfat (g)	Glise rin (g)	Natrium benzoat (g)	Pepermint oil (ml)
1	75:25	54,00	13,00	1,20	12,00	12,50	0,100	2,00
2	50:50	37,00	37,00	1,20	12,00	12,00	0,100	2,00
3	25:75	13,00	55,00	1,20	12,00	12,00	0,100	2,00

it appears the previous calculation for a 500 mg batch had a slight error in the total percentage

Table 2 calculation for a 500 mg

No	Tooth paste Formula	Torch ginger (g)	Banana peel (g)	Saka rin (g)	Natrium lauril sulfat (g)	Glise rin (g)	Natrium benzoat (g)	Pepermint oil (ml)
1	75:25	270,0	65,0	6,0	60,0	62,5	0,5	10,0
2	50:50	180,0	180,0	6,0	62,0	62,0	0,5	10,0
3	25:75	65,0	272,0	6,0	62,0	62,0	0,5	10,0

6. Preparation

The ingredients were weighed according to the weight of each respective formula.

1. Preparation of Mass I (Powder Mixture): Into a sterilized porcelain mortar, the torch ginger flower powder was added, mixed with the banana peel powder, and ground until homogeneous. This mixture was then set aside and obtained as Mass I.

2. Preparation of Mass II (Wetting Agent): Into the mortar, sodium lauryl sulfate and saccharin were added, followed by glycerin which was added little by little while grinding until homogeneous. This was obtained as Mass II.
3. Final Mixing: Mass I was then combined with Mass II in the mortar and stirred. Finally, the peppermint oil was added to obtain the finished toothpaste.

7. Evaluation

Several tests were carried out on the combination toothpaste of torch ginger flower and banana peel, including : a. Organoleptic Testing b. Homogeneity Testing c. Determination of Preparation pH d. Observation of Preparation Stability e. Cleaning Power Test f. Irritation Test on Volunteers

RESULTS AND DISCUSSION

1. Results of Plant Material Processing

The 1 kg of fresh, wet-sorted torch ginger flower was pulverized and dried at a low temperature of approximately 50⁰ C yielding 150 g of dry powder with a light pink color.

The 3 kg of fresh, wet-sorted Kepok banana peel was pulverized and dried at a low temperature of approximately 50⁰ C , yielding 270 g of dry powder with a light text reddish brown color.

2. Table 3 Results of Chemical Compound Group Screening

No	Examination	Fresh torch ginger flower	Dry powder torch ginger flower	Fresh Kepok banana peel	Dry powder Kepok banana peel
1	Alcaloid	-	-	+	+
2	Flavonoid	+	+	+	+
3	Glycosid	+	+	+	+
4	Glikosida	+	+	+	+
	Antraquinon				
5	Essential Oil	+	+	+	+
6	Saponin	+	+	+	+
7	Steroid/Triterpenoid	+	+	+	+

3. Results of Organoleptic and Preference Testing

Organoleptic testing was conducted to assess the quality of the prepared paste preparation. The testing utilized the sensitivity of the five senses to measure the preference level (hedonic test) for the physical appearance of the paste preparation, including color and odor (aroma), form, and ease of spreading.

The test was performed on 20 untrained panelists who were asked to evaluate the form, aroma, color, and consistency by filling out a provided questionnaire.

The assessment of the preference level was conducted using the following criteria:

Highly Preferred 5, Preferred 4, Slightly Preferred 3, Dislike 2, Least Preferred 1

4. Table 4 Result of the Measurement of Preparation Spreadability

No	Formula	Spreadability (cm)			
		I	II	III	Average
1	75 : 25	5,10	5,15	5,10	5,12
2	50 : 50	5,15	5,20	5,15	5,16
3	25 : 75	5,15	5,15	5,15	5,18

5. Table 5 Results of the Cleaning Power Test

No	Formula	Number of strokes for stain disappearance (times)			
		I	II	III	Average
1	75 : 25	14	15	14	14
2	50 : 50	12	12	11	12
3	25 : 75	10	11	12	11

6. Table 6 Irritation Test Results

No	Formula	Volunteer				
		I	II	III	IV	V
1	Redness on the skin	-	-	-	-	-
2	Itching on the skin	-	-	-	-	-
3	Skin becomes rough	-	-	-	-	-

CONCLUSION

- a. The fresh torch ginger flower (*Etilingera elatior* Jack) and the one that has been dried at a temperature of approximately 60 ° C contain the same groups of chemical compounds, namely: flavonoids, glycosides, anthraquinones, saponins, and tannins.
- b. The combination of torch ginger flower and banana peel that has been dried at a temperature of approximately 60 ° C can be formulated into a toothpaste preparation that is homogeneous, has a pH of approximately 5, possesses a good odor and color, and has a good consistency.
- c. The toothpaste preparation containing the combination of dried torch ginger flower and banana peel possesses good cleaning power, capable of removing stains with 10 to 14 brush strokes.

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