

Formulation and Evaluation of Body Scrub Using Flour-based Fruits of Indramayu variety of Cengkir Mango (*Mangifera indica* L)

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Abstract

The Cengkir Mango (*Mangifera indica* L) is a variety of mango known in the northern part of West Java and widely used as food, beverage, and natural-based pharmaceutical product. This fruit is potentially used as a body scrub ingredient due to its richness in polyphenols. This study aims to formulate natural-based body scrub using the Cengkir mango as active ingredients. The formulation was divided into 3 groups with different concentrations of mango fruit flour, respectively 35, 46, and 50 grams (F₁, F₂, and F₃). The product evaluation used were homogeneity, stability, pH, and hedonic test. The organoleptic of body scrub indicated mango scent and light brownish-darker colors, responding to an increase of concentration for each formulation. The homogeneity test showed that the body scrub had no granulation of mango flour. The evaluation of pH showed the product had pH respectively at 7.5, 7.5, and 7.0 (F₁, F₂, and F₃). These results indicated that the body scrub had good physical properties. An investigation of body scrub stability was applied to evaluate the fragrance, color, and consistency of the formulation in storage for three weeks at room temperature. The results showed no change in color and consistency but a loss of mango fragrance after three weeks. The hedonic test indicated that most participants favored F₁ (35 grams of mango flour). Based on these results, the flour of Cengkir mango had a good performance as an active ingredient in a natural-based body scrub.

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INTRODUCTION

The body scrub is one of the most popular skin cosmetics for men and women. This product is mainly used to exfoliate dead skin and open pores, resulting in clearer and more healthy skin.¹ Recently, natural compounds have been widely used as active ingredients due to better results on skin and safety. One of the species of

mangoes in West Java is the Cengkir mango. The mango was commonly found in Indramayu, The northern part of west java.² It is often used for food, beverage, and active ingredients for natural product-based cosmetics.³ This fruit is rich in phytochemicals such as polyphenols.⁴ The compound can be used as a keratolytic agent to remove dead skin cells. It could weaken the bonds of dead skin tissue;

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hence, the skin becomes easier to apart from the body skin.^{4,5}

The natural-based body scrub used flour from various parts of plants. This study aims to formulate a body scrub with the active ingredient from the flour of Cengkir mango material with good physical evaluation.

METHOD

The tools included formulation set instruments (mortar, stamper, laboratory glassware, etc), digital scale instrument (Ohaus), pH meter instrument, water bath, and oven (Incucell). The used materials were Cengkir mango obtained from the traditional markets in Indramayu, methylparaben, stearic acid, triethanolamine, cetyl alcohol (Brataco), propylene glycol (Brataco), aquadest, vitamin E, fragrance, Methanol (Brataco), chloroform (Brataco), ethyl acetate (Brataco) and FeCl₃.

The flour extraction of The Cengkir Mango

The Cengkir mango was obtained from the Indramayu Traditional Market. The mango was sorted, peeled, and cleaned, followed by chopping the mango flesh. The chopped mangoes were cleaned with running water. After that, the sample was hydrated for 2x24 hours at a temperature of 50°C. The dried mango was powdered and sieved with a 40 mesh sieve.^{6,7} The percentage of mango fruit flour was calculated using the formula below:

$$\frac{\text{mango cengkir Indramayu flour}}{\text{mango cengkir Indramayu fresh}} \times 100$$

Body Scrub Formulation of Cengkir Mango flour

This study used a modified natural-based body scrub formulation from previous studies.⁸ The formulation used in this study is shown in table 1 below:

Table 1. Formulation of the Body Scrub

Formulation Reference	Formulation Modification		
	Formulation 1	Formulation 2	Formulation 3
Cengkir mango Flour	35 gr	46 gr	50 gr
Cetyl alcohol	1	1	1
Triethanolamine	2	2	2
Propylene glycol	5	5	5
Methylparaben	0.075	0.075	0.075
Stearic acid	15	15	15
Parfum	3 drops	3 drops	3 drops
Vitamin E	0.3	0.3	0.3
Aquadest ad	50 mL	50 mL	50 mL

The oil phase consisted of cetyl alcohol and stearic acid mixed in a water bath at a temperature of 70°C. The other phase comprised propylene glycol, triethanolamine, and methylparaben, mixed with hot aquadest. After that, the two phases were mixed until the soft cream mass was obtained, then mango

fruit flour was added to the mixture until homogeneous. The vitamin E and the fragrance were added to the solution and stirred until homogeneous.

Physical Evaluation of Cengkir Mango Body Scrub

Organoleptic Test of Body Scrub

Tests were carried out by observing changes in color, odor, and shape (consistency) of body scrub preparations. Organoleptic tests such as color, aroma, and consistencies can use as qualitative indicators of the physical instability of arrangements which are directly related to the convenience of the preparation by consumers and the quality of the arrangements.⁹

pH Test of Body Scrub

Tests were carried out using a pH meter. A total of 1 gram of each preparation was put in a beaker and diluted in 100 mL of distilled water. The pH of preparation was measured using a pH meter. The pH that met the requirements of SNI 16-4399-1996 was around 4.5 to 8.0.¹⁰

Homogeneity Test of Body Scrub

A total of 0.5 grams of body scrub preparations were smeared on a slide, then observed for coarse particles by palpating and observing the preparation's texture. The homogeneity was indicated by the absence of coarse particles in the preparation and the uniform color of the preparation.⁸ Furthermore, the phase dilution was carried out by diluting 0.5 grams of the preparation with 25 mL of water in a glass beaker.

Stability Test of Body Scrub

The stability of the body scrub formulation was used to investigate the product's storage stability. Observations were conducted to evaluate body scrubs' scent, color, and consistency. This study was performed in a temperature room for three weeks.¹¹

Hedonic Test

Valuation of preference for body scrub formulation (keratolytic effectiveness) of Cengkir mango consisted of scent, color, and comfortability on the skin of 25 respondents. The hedonic scale test assessment applied the highest value of 5 (very liked) and the lowest value of 1 (very disliking).¹²

Data Analysis

Data analysis was performed using the chi-square method with a 95% confidence level.

RESULTS AND DISCUSSION

The natural-based body scrub was one of the green cosmetics popular in public due to its safety and effectiveness on the skin. It uses many natural ingredients, such as phytochemicals, amyllum, flour, and many more. This product can smooth the skin and lift damaged skin cells.¹³ The natural-based pumpkin (*Cucurbita moschata*) in the form of a body scrub cream can improve the condition of rough skin for a better result. The body scrub did not change after stability testing with the cycling test method and had a pH value that met skin pH requirements. Furthermore, it did not cause skin irritation.⁸ The previous study showed that Mango Cengkir is rich in phenol and flour. Therefore, It was used as a flour-based ingredient on a pharmaceutical product.

The active ingredient used in this formulation was the flour of Cengkir Mango. The fresh mango fruit was dehydrated at 50°C and then processed to make crude flour of Cengkir mango. The flour obtained was 173 grams from 2 kg of fresh mango fruit (8.65% W/W). A previous study conducted by Paramita (2012) obtained mango fruit flour weighing 54 grams from 500 grams of Arumanis

mango with a percentage of 10.8% flour.^{14,15} It indicates that the Cengkir

mango had less flour than the other mango variety.



Figure 1. The flour of Cengkir mango process. The flour is made through a series of processes, including chopping, drying, and flouring. The drying temperature was adjusted to 50°C for two days. (A) the fresh Cengkir mango; (B) the dry Cengkir mango; (C) The flour of Cengkir Mango

The body scrub formulations consisted of formulation 1 (35 grams of flour), formulation 2 (46 grams of flour), and formulation 3 (50 grams of flour). The components of the formulation were divided into two phases; active and non-

active excipients. In this formulation, several excipients were cetyl alcohol, methylparaben, triethanolamine, propylene glycol, stearic acid, and aquadest. Meanwhile, the flour of Cengkir mango was used as an active component in body scrub formulation.

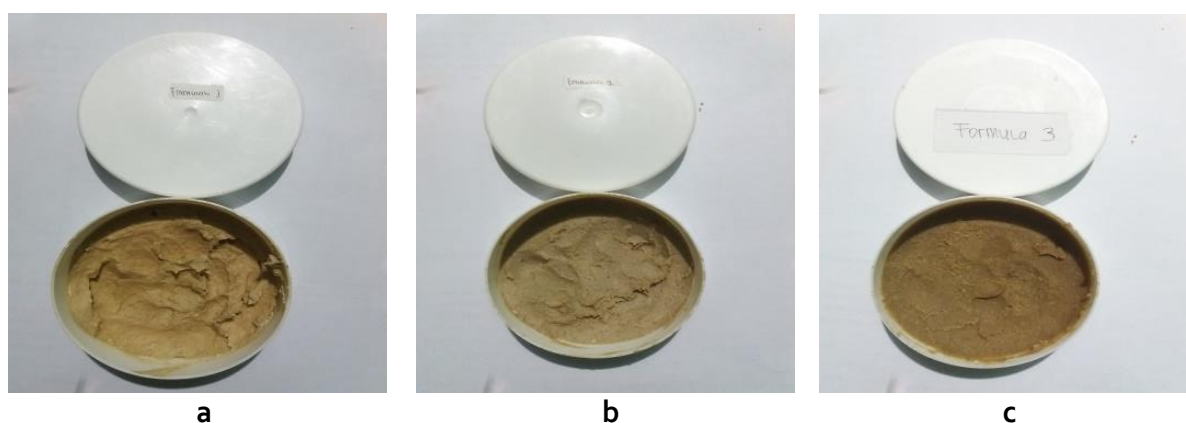


Figure 2. The formulation of body scrub. (A), formulation 1 (35 grams of mango flour) (B), formulation 2 (46 grams of mango flour) (C), formulation 3 (50 grams of mango flour)

The evaluation of body scrub was used to determine the product's safety, quality, and efficacy. This study used organoleptic, pH, homogeneity, and stability tests to evaluate the physical and stability

properties of the product. Meanwhile, the hedonic test was used to measure the favorability level of the product. The organoleptic body scrub

showed that all formulations had a mango scent. Color and consistency increased to darker and hard texture corresponded to increase active ingredients. Furthermore,

the stability test indicated that only fragrance decreased over time (3 weeks). The results are shown in table 2:

Table 2. The organoleptic and stability of body scrub after three weeks at room temperature

Formula	Parameter	Time (Weekly)		
		0	1	2
F1	Fragrance	Mango scent	Mango scent	Less mango scent
	Color	Brownish-light	Brownish-light	Brownish-light
	Consistency	soft	Soft	Soft
F2	Fragrance	Mango scent	Mango scent	Less mango scent
	Color	Brown	Brown	Brown
	Consistency	Soft with a more solid texture	Soft with a more solid texture	Soft with a more solid texture
F3	Fragrance	Mango scent	Mango scent	Less mango scent
	Color	brownish-darker	brownish-darker	brownish-darker
	Consistency	Slightly hard	Slightly hard	Slightly hard

The acidity value of the product was used to ensure a non-irritant body scrub product. The evaluation showed a pH value of 7.5 (F1), 7.5 (F2), and 7.0 (F3). These results indicated that the pH value of the formulation was within the normal range for the product's acidity.¹¹ Test results showed the body scrub's pH according to the body scrub's normal pH criteria in table 3.

The sampling in the homogeneity evaluation was carried out with random samples from the four sides of the body scrub; the surface, right side, left side, and bottom side of the product. The homogeneity was measured with the consistency of granules in the product. The evaluation showed no granules, indicating good product homogeneity (Table 4).

Table 3. pH Evaluation of the Body Scrub

Formula	pH value	Normal value
Formula 1	7.5	pH between 4.5 to 8.0
Formula 2	7.5	
Formula 3	7.0	

Table 4. Homogeneity Evaluation of the Body Scrub

No	Formula	Homogeneity test			
		Surface	Right side	Left side	Bottom side
1	F1	No granule	No granule	No granule	No granule
2	F2	No granule	No granule	No granule	No granule
3	F3	No granule	No granule	No granule	No granule

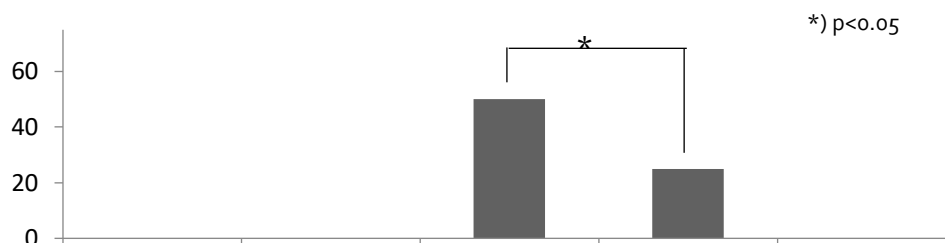
This study also evaluates the product favorability in several people using the hedonic test. It determines the favorability

of color, scent, and comfortability of body scrubs. The results of the hedonic test showed that the favorability of

respondents for color and comfortability in formula 1 was higher than in the others. Moreover, the scent was less favorable to respondents. The results indicated that

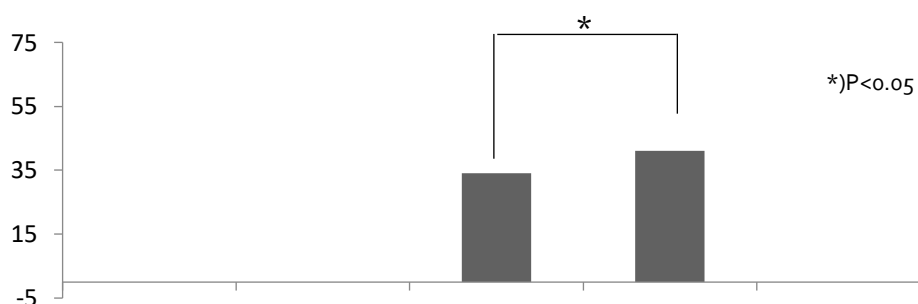
the F₁ and F₂ were more favorable than the F₃ (Figure 3).

A. Favorability Test of Body Scrub's Scent



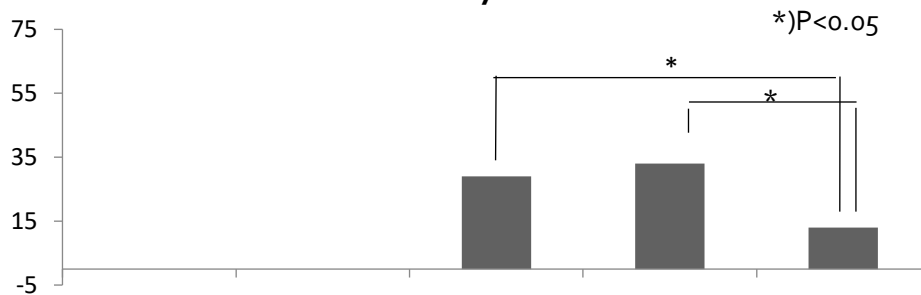
Very unfavorable	0	-	-	-	-
Unfavorable	-	0	-	-	-
Rather favorable	-	-	50	-	-
Favorable	-	-	-	25	-
Very favorable	-	-	-	-	0

B. Favorability Test of Body Scrub's Color



Very unfavorable	0	-	-	-	-
Unfavorable	-	0	-	-	-
Rather favorable	-	-	34	-	-
Favorable	-	-	-	41	-
Very favorable	-	-	-	-	0

C. Favorability Test of Body Scrub's Comfortability



Very unfavorable	0	-	-	-	-
Unfavorable	-	0	-	-	-
Rather favorable	-	-	29	-	-
Favorable	-	-	-	33	-
Very favorable	-	-	-	-	13

CONCLUSION

Based on the result of this study, it can be concluded that formula 1 was the best formula for natural-based body scrub of Cengkir Mango flour with good physical properties and favorability.

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