Formulation And Testing Of Antioxidant Body Scrub Preparations Papaya Leaf Extract (*Carica papaya* L.) With The Addition Of Oatmeal (*Avena Sativa*)

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Abstrak

This research was carried out as a form of preserving natural ingredients used as body scrub preparations that contain antioxidants, namely the papaya leaf plant (*Carica papaya* L.) which contains the compounds ascorbic acid, β-carotene, α-tocopherol, flavonoids, phenolics, carotenoids and Hydroxynamite acid derivatives are responsible for the highly active antioxidant activity. This research aims to determine the highest antioxidant content found in body scrub preparations of papaya leaf extract (*Carica papaya* L.) with the addition of oatmeal (Avena sativa). This research was conducted at the Pharmacy Laboratory of Muhammadiyah University of Palopo from September to November 2023. This research uses experimental research, taking samples, making body scrub preparations, testing the physical quality of the preparations, and testing antioxidants using a UV-Vis spectrophotometer. This research took 3 months starting from sample processing to testing the body scrub preparation. The best physical quality test results for the preparation were found in formula 1 with an extract concentration of 5% and the antioxidant test results were found to be F1 120,91 µg/mL, F2 51,99 µg/mL, F3 29,179 µg/mL of the three formulations which had the highest antioxidant activity. found in formula three with an IC50 value 29,179 µg / mL.

Keywords: Papaya leaves; Body Scrub; Antioxidant

1. Introduction

In this modern era, physical appearance is considered very important for a woman to look beautiful, youthful and attractive. Various skin problems such as rough, dry, dull, uneven skin color and aging are part of skin protection as an initial defense from external influences [23]. Damage to the skin can disrupt health and appearance, so the skin needs to be protected and kept healthy [14].

Basically, the skin is the outermost part of the body and is the part of the body that is in direct contact with the environment, therefore the skin must be protected and kept healthy so that the skin does not become dull, dry and wrinkled. One treatment that can be done is using a body scrub. Scrubbing is an activity carried out by massaging the entire body to remove dirt or dead skin cells and the results can be seen immediately, namely smoother, firmer, fragrant and healthy glowing skin. Scrub is a cosmetic product that has the main function as an exfoliant for the body or removing dead skin cells on the body which can remove dirt, smooth the skin surface, clean the skin, and improve blood circulation in the body [12]. Papaya leaves (*Carica papaya* L.) are a plant that has effective potential as an antioxidant. Papaya leaves (*Carica papaya* L.) contain flavonoid compounds, α-tocopherol and ascorbic acid which can be used to stop premature aging due to free radicals. Based on research [21], a combination of active components from ethanol extract of papaya leaves (*Carica papaya* L.) which contains ascorbic acid, β-carotene α-tocopherol, flavonoids, phenolics, carotenoids and hydroxynamite acid derivatives is responsible for its highly active antioxidant activity. In accordance with research conducted by [8] it is known that gel mask preparations with a papaya leaf ethanol extract

concentration of 0.178% are the most active in testing antioxidant activity and testing antiaging activity.

Another nutritious plant is oatmeal (Avena sativa). Oatmeal (Avena sativa) apart from being used as an ingredient in making food, can also be useful in maintaining skin health and beauty. Apart from having Vitamin E which can hydrate dry skin, Oatmeal (Avena sativa) contains saponins which can be used as a facial cleanser to remove dirt and dead skin cells [17].

Based on the description above regarding the benefits of papaya leaves (*Carica papaya* L.) and oatmeal (Avena sativa) and the importance of using body scrubs, this research was conducted to determine the formulation and antioxidant activity of body scrub preparations from a combination of papaya leaves (*Carica papaya* L.) and oatmeal (Avena sativa).

2. Methodology

This research was carried out experimentally. In this research, papaya leaf extract (*Carica papaya* L.) was used to make a body scrub preparation with the addition of oatmeal (Avena sativa) and the physical quality of the preparation and the antioxidant activity of the preparation were tested.

a. Sample Collection
   1) The papaya (*Carica papaya* L.) leaf samples obtained were then subjected to wet sorting to separate the leaves from foreign particles
   2) then washed in running water and then chopped.
   3) Papaya leaves (*Carica papaya* L.) are then dried by drying them in the sun and covered with a black cloth
   4) Then dry sorting is carried out to separate the sample from foreign particles.
   5) The dried leaves are blended to become simplicia powder [2].

b. Simplicia Quality Standardization
   1) Drying Shrinkage
      Drying loss is carried out by determining the constant weight of the weighing bottle by heating it at 105% temperature for 30 minutes, then weighing 1-2 grams of simplicia powder and putting it in a porcelain cup, then drying it in the oven at 105% temperature for 30 minutes then weigh it and determine the constant weight [1].
   2) Water content
      Water content is done by determining the constant weight of the weighing bottle by heating it at 105% for 30 minutes, then tareing, then weighing 10 grams of simplicia powder and putting it in a porcelain cup, then drying it in the oven at 105% for 5 minutes, then weighing and determining the weight [1].

c. Sample Extraction
   1) 500g of simplicia was weighed, 70% ethanol solvent (1;7.5) was added and macerated for 3x24 hours.
   2) Then placed at room temperature protected from light.
   3) The maserate is then stirred until a thick extract is obtained [8]

d. Making Body Scrub Preparations
   1) Making body scrub preparations uses the emulsification method. The oil phases of stearic acid, propyl paraben, and cetyl alcohol were melted in a crucible porcelain uses successive water

baths at a temperature of 70^{o}C and stirred continuously until homogeneous.

2) Triethanolamine, methyl paraben, and propylene glycol are dissolved in hot distilled water, then mixed together to make the water phase. The water and oil phases are combined in a mortar and stirred to achieve homogeneity
3) Papaya leaf extract (*Carica papaya* L.) is added little by little while grinding until homogeneous and essential oil is added after it has cooled slightly, granules (Avena sativa) are added [11].

e. Physical Quality Test of Preparations

1) Organoleptic test
   Organoleptic tests are carried out by looking at the shape, color and odor of the preparation to determine the physical appearance of the preparation that has been made [2].
2) Determination of homogeneity of preparations
   A certain amount of preparation must display a homogeneous composition without coarse grains when applied to a piece of glass or other suitable transparent material [2].
3) Determination of the pH of the preparation
   The pH test of the preparation is carried out using universal pH. The method is to dip the pH paper into a preparation that matches the color printed on the appropriate pH paper container and the pH obtained is recorded (Rahmatullah et al., 2020). The pH of the preparation is said to be good when it is between pH 4.5-6.5 [19].
4) Viscosity Test
   The viscosity test uses a viscometer which is carried out by placing the preparation into a glass beaker, then installing the appropriate spindle and after that measuring at the appropriate rpm speed. Where the viscosity of good skin preparations ranges from 2000-50000 cPs [7].
5) Spreadability Test
   For this test, 0.5 g of the preparation is required and then stored in the middle of a scale glass and another transparent glass is placed on top of the body scrub. Given a burden 100 g, left for 1 minute then recorded the diameter. Good spreading power is equivalent to 5-7 cm [19].
6) Adhesion Test
   The preparation was weighed at 0.2 g then smeared on a glass plate and then attached to another plate until the two were combined. Press with a weight weighing 1 kg for 5 minutes. After that the load is released. The duration until the two plates separated from each other was then recorded [7].
7) Likeability test (hedonic test)
   To determine the level of respondents' preference for body scrub preparations, a preference test was carried out. The research panelists numbered 30 people. Testing was carried out visually, and each participant was asked to apply the preparation to the skin of the back of the hand and assess the parameters of aroma, texture, color and stickiness. The panelists' assessments of the preparations were divided into five categories, namely (1) don't like, (2) don't like, (3) like, and (4) like very much. The preference percentage level is then determined [4].
8) Irritation Test
   A total of 14 panelists were selected with the criteria of being 20-35 years old, having no

previous skin problems, and willing to participate in the research. The irritation test is carried out by applying the preparation to the skin of the back of the ear with a diameter of 2 cm, leaving it open for 2 hours and observing what happens. A positive irritation reaction is characterized by redness, itching, or swelling and roughness on the skin behind the treated panelists' ears [22].

9) Determining the Number of Respondents

In this study, the Slovin formula was used to determine the number of respondents that would be used in testing in the form of hedonic tests and irritation tests on preparations. According to [13] the reason for using the Slovin formula is because the research is generalized and the calculations do not require a sample number table but are carried out using a simple calculation formula called the Slovin formula.

f. Antioxidant Activity Test

1) Preparation of DPPH mother liquor

5 mg DPPH was weighed then dissolved in methanol PA up to the limit using a 50 ml volumetric flask, having a concentration of 100 ppm. After that the measuring flask was then wrapped in aluminum foil and homogenized, incubated for 30 minutes [9].

2) Preparation of blank solution

Pipette 1 ml of DPPH solution and 3 ml of methanol PA into a tube and homogenize. Leave it for 30 minutes and the absorbance is measured at a wavelength of 517 nm [9].

3) Preparation of a vitamin C comparison solution

A comparison solution was made by making a mother liquor of vitamin C. Vitamin C was weighed at 1 mg which was then dissolved in 10 ml of methanol and shaken until homogeneous. After that, the test tube was covered with aluminum foil so that no part was exposed to light. Next, vitamin C concentrations were made with various concentrations, namely 0.6 ppm, 1 ppm, 1.3 ppm, 2 ppm and 2.6 ppm. Making the vitamin C series solution is done by pipetting the vitamin C stock solution then adding methanol to a volume of 2250 µl then adding 750 µl DPPH (0.02%) [3].

4) Preparation of test solution

Weighed 5 mg of the sample, dissolved it in a 5 ml volumetric flask and added methanol PA until the limit mark was obtained for the sample mother liquor with a concentration of 100 ppm. Samples were diluted for each formula with concentrations (50 ppm, 100 ppm, 150 ppm, 200 ppm, 250 ppm). 1 ml of each test solution was pipetted, 1 ml DPPH and 2 ml methanol then homogenized and incubated for 30 minutes [9].

5) Measurement of antioxidant activity

Testing antioxidant activity using the DPPH method was carried out by pipetting 1 ml of DPPH solution, 2 mL of methanol PA, and 1 ml of sea sample into a reaction tube that had been closed using aluminum foil. This test is carried out for each of the concentrations that have been made. Then incubate for 0-5 minutes. Absorbance was then measured using a UV-Vis Spectrophotometer at a wavelength of 517 nm [9].

From the absorbance data obtained, the antioxidant power can be calculated by calculating the % inhibition using the formula (Rahmayani et al., 2013)

$$\% \, Penghambatan = \text{Abs.Blanko} - \text{Abs.Sample Abs.Blankox } 100\%$$

The IC50 value is determined by creating a linear curve between the concentration of the test solution (x-axis) and the % inhibition result (y-axis) which is obtained by the equation y = a + bx, in which case the IC50 value can be calculated using the following formula [6] : IC50 = $(50-a)/b$

3. Result and Discussion

3.1. Result

a. Organoleptic Test

Tabel 1. Organoleptic Test

Formula	Week	Organoleptic		
		Form	Smell	Color
Formula 1	1	Semi solid	Green tea	Light green
	2	Semi solid	Green tea	Light green
	3	Semi solid	Green tea	Light green
	4	Semi solid	Green tea	Light green
Formula 2	1	Semi solid	Green tea	Light green
	2	Semi solid	Green tea	Light green
	3	Semi solid	Green tea	Light green
	4	Semi solid	Green tea	Light green
Formula 3	1	Semi solid	Green tea	Dark green
	2	Semi solid	Green tea	Dark green
	3	Semi Solid	Green tea	Dark green
	4	Semi solid	Green tea	Dark green

b. Homogeneity test

Tabel 2. Homogenity Test

Formula	**Homogeneity Observations Of the week**			
	1	**2**	**3**	**4**
Formula 1	Homogen	Homogen	Homogen	Homogen
	Homogen	Homogen	Homogen	Homogen
	Homogen	Homogen	Homogen	Homogen
Formula 2	Homogen	Homogen	Homogen	Homogen
	Homogen	Homogen	Homogen	Homogen
	Homogen	Homogen	Homogen	Homogen
Formula 3	Homogen	Homogen	Homogen	Homogen
	Homogen	Homogen	Homogen	Homogen
	Homogen	Homogen	Homogen	Homogen

c. pH test

Tabel 3. pH Test

Formula	**pH measurement of the week**				**Average**
	1	**2**	**3**	**4**	
1	6	6	6	6	6
2	6	6	6	6	6
3	6	6	6	6	6

d. Viscosity test

Tabel 4. Viscosity Test

Formula	**Viscosity measurement Of the week**				**Average**
	1	**2**	**3**	**4**	
1	3094	3774	3950	2484	3325
2	5256	6672	4846	4818	5398
3	6316	3920	4418	3526	6060

e. Spreadability test

Tabel 5. Spreadability Test

Formula	**Measuring the spreadability of the week**				**Average**
	1	**2**	**3**	**4**	
1	3,8	3	3,6	2,9	3,3
2	3,8	2,8	3	3,1	3,1
3	3	2,7	2,8	2,9	2,3

f. Adhesion test

Tabel 6. Adhesion Test

Formula	Measurement of attachment strength Of the week				Average
	1	2	3	4	
1	02.66	06.33	03.33	05.00	03.08
2	04.00	04.33	06.33	04.66	04.08
3	03.66	05.00	05.00	03.66	04.33

g. Favorite Test

Tabel 7. Favorite Test

Formulasi	Evaluation	Do not like	Do not like it much	Like	Really Like
1	Aroma	-	14,3%	57,1%	28,6%
	Tekstur	-	-	21,4%	78,6%
	Warna	-	7,1	85,7%	7,1%
	Kesan	-	%	78,6%	21,4%
	Lengket		-		
2	Aroma	-	21,4%	64,3%	14,3%
	Tekstur	-	-	71,4%	28,6%
	Warna	-	7,1	14,3%	78,6%
	Kesan	-	%	57,1%	28,6%
	Lengket		14,3%		
3	Aroma	7,1	14,3%	64,3%	14,3%
	Tekstur	%	-	85,7%	14,3%
	Warna	-	7,1	71,4%	7,1%
	Kesan	-	%	71,4%	14,3%
	Lengket	-	14,3%		

h. Irritation Test

Tabel 8. Irritation Test

	F1	F2	F3
1	(-)	(-)	(-)
2	(-)	(-)	(-)
3	(-)	(-)	(-)
4	(-)	(-)	(-)
5	(-)	(-)	(-)
6	(-)	(-)	(-)
7	(-)	(-)	(-)
8	(-)	(-)	(-)
9	(-)	(-)	(-)

10	(-)	(-)	(-)
11	(-)	(-)	(-)
12	(-)	(-)	(-)
13	(-)	(-)	(-)
14	(-)	(-)	(-)

i. Antioksidant Test

Tabel 9. Antioksidant Test

Sample and comparison	Concentration	Absorbance	Blanko	Ic50
F1	50 ppm 100 ppm 150 ppm 200 ppm 250 ppm	0,395 0,419 0,4 0,406 0,429	0,255 0,255 0,255 0,255 0,255	120,91 µg /mL
F2	50 ppm 100 ppm 150 ppm 200 ppm 250 ppm	0,199 0,270 0,269 0,409 0,448	0,255 0,255 0,255 0,255 0,255	51,99 µg /mL
F3	50 ppm 100 ppm 150 ppm 200 ppm 250 ppm	0,476 0,45 0,416 0,455 0,352	0,255 0,255 0,255 0,255 0,255	29,179 µg /mL
Vitamin C	0,66 ppm 1 ppm 1,33 ppm	0,643 0,621 0,602	0,653 0,653 0,653	5,28 µg /mL (Dzaky, 2018)

3.2. Discussion (Font 12, Times New Roman, 1.15 Spacing)

a. Organoleptic Testing

Organoleptic testing aims to see the physical appearance of the preparation by observing the shape, color and odor of the preparation that has been made [4]. Organoleptic observations were carried out for 4 weeks. From the observations made, there was no change in terms of color, odor, shape or consistency of the preparation. Based on research conducted by [2]. one sign of a chemical reaction occurring to the ingredients used in making the preparation is a change in color and the results obtained after observation for 4 weeks did not change color, odor or shape.

The light green color in the F1 and F2 body scrub preparations is caused by the addition of 5% and 7% of papaya (*Carica papaya* L.) leaf extract which is dark green, so that when

combined with other ingredients from the preparation it becomes light green. In Formula 3 the preparation is dark green, this is caused by the addition of papaya leaf extract (*Carica papaya* L.) with a higher concentration than F1 and F2, namely 9% so that with this higher concentration a deeper green color is formed from the two preparations. previously.

The odor of the body scrub preparations from the three formulas that have been observed for 4 weeks is green tea scented. This is obtained from the addition of green tea flavoring ingredients. The addition of this scent aims to cover the smell of the extract with a more fragrant smell and increase consumer interest and comfort when using it.

The dosage form of the three formulas is semi-solid which is obtained from the preparation of the preparation which is carried out by mixing the oil phase and the water phase to form an emulsion preparation in semi-solid form.

The stability of body scrub preparations is caused by the addition of methyl paraben and propyl paraben which function as preservatives. Based on research [20] it is known that methyl Paraben is used as a broad spectrum antimicrobial, while propyl paraben is a preservative against fungi and bacteria but is more active against gram-positive bacteria. So, by combining these two ingredients, a synergistic effect can be created that prevents bacterial or fungal contaminants that cause damage to the stability of the preparation.

b. Homogenity Test

The results of the homogeneity test for body scrub preparations from papaya leaf extract (*Carica papaya* L.) showed that from the three preparation formulas, no coarse grains or lumps were obtained from the extract or from the body scrub ingredients, so all body scrub preparations were declared homogeneous. But there are granules that come from adding oatmeal because it functions as an exfoliant. The homogeneity test is carried out with the aim of finding out that all the ingredients have been mixed evenly or evenly distributed, so that when the preparation is applied, the properties contained in the preparation can penetrate the skin evenly [2]

c. pH Test

pH testing on body scrub preparations is carried out using a pH stick. The pH test is considered very important, especially for preparations used on the skin because preparations that have a pH that is too acidic will cause skin irritation, while preparations that are too alkaline will cause dry skin [4]. The results of pH testing of the three preparation formulations carried out for 4 weeks showed that the pH of the preparation was stable, namely at pH 6, which means it has met the skin pH requirements, namely 4.5-6.5 [19].

d. Viscosity test

Viscosity testing was carried out with the aim of determining the viscosity level of the body scrub preparation. Based on viscosity testing on the preparations, the viscosity results of the three formulas met the requirements, namely the viscosity of good skin preparations ranges from 2000-50000 cPs [7]. The highest viscosity was obtained in formula 3, namely 6060 cPs with variations in the emulsifier stearic acid 20% and TEA 4%. Based on research conducted by [18] it is stated that the higher the concentration of emulsifier (stearic acid and TEA), the greater the viscosity and adhesive power and the smaller the spreadability obtained. This is what causes the 3rd formula preparation to be thicker than formulas 1 and 2

which have a lower concentration of various emulsifiers.

e. Spreadability Test

Based on testing, the spreadability results of the three formulas did not meet the requirements for good spreadability, namely 5-7 cm [2]. This was caused by the concentration of the emulsifier used in the formulation. As explained in research conducted by [18], the higher the concentration of the emulsifier (stearic acid and TEA), the greater the viscosity and adhesive power and the smaller the spreadability obtained. Differences in dosage formulations significantly influence the spreadability values obtained. Apart from that, the spreadability of the preparation is also influenced by the use of scrub ingredients, namely oatmeal (Avena sativa), which easily absorbs water quickly, causing the preparation to become thicker and the spreadability will decrease [10].

f. Adhesion Test

Adhesion testing is carried out to determine the time required for the preparation to adhere to the skin. Good adhesion means that the active substance in the preparation does not come off easily and remains attached or in contact with the skin for longer, so that it can produce a longer and expected effect. The requirement for good adhesion for topical preparations is ≥ 4 seconds, meaning that the adhesion test results of the three dosage formulations that do not meet those in formula 1 are influenced by the emulsifier used in formula 1 being lower. compared to the emulsifier concentration in formula 2 and formula 3. This was also explained by [18] stating that the higher the emulsifier concentration (stearic acid and TEA), the greater the viscosity and adhesive power obtained.

g. Favorite Test

The preference test was carried out to determine the panelists' level of preference for body scrub preparations. This testing plays an important role in product development because it is directly related to acceptability for panelists. This test was carried out on 14 panelists by observing physical quality organoleptically, namely observing aroma, color, texture and sticky impression. There are 4 categories for determining the scale, namely dislike, dislike, like and really like.

Hedonic testing based on aroma showed that respondents really liked body scrub formulations 2 and 3, while observing the texture of respondents preferred formula 3, this was because the texture of formula 3 was thicker than formulas 1 and 2, this was caused by the use of steric acid and TEA. as an emulsifier with a higher concentration in formula 3, namely 20%:4%. Hedonic testing based on color showed that respondents really liked the body scrub formula 1, this was due to the use of the lowest concentration of papaya leaf extract (*Carica papaya* L.), resulting in a lighter color when compared to formulas 2 and 3 which had additional concentrations. higher extract. The hedonic test based on the sticky impression showed that respondents really liked formula 1 compared to formulas 2 and 3. Overall, based on the hedonic test results of the three formulas, observing the aroma, texture, color and sticky impression, the result was that respondents liked formula 1 the most.

h. Irritation Test

The irritation test was carried out on 14 respondents which was obtained from the Slovin formula using an error of 20%. This result is due to the small population used [13]. The

results obtained from body scrub preparations of papaya leaf extract (*Carica papaya* L.) with concentrations of 5%, 7%, 9%, there were no visible side effects in the form of redness, swelling, itching and rough skin resulting from the body scrub preparations of the three formulas. pH 6 is suitable for skin pH, namely 4.5-6.5 [5]. From the results of the irritation test, it can be concluded that the moisturizing lotion prepared is safe to use on the skin.

i. Antioksidant Test

The test data shows that the results of antioxidant testing using the DPPH method, namely in formula 1 with an extract concentration of 5%, obtained an IC50 value of 120.91 µg / mL in the medium category, in formula 2 an IC50 value of 51.99 µg / mL was obtained in the strong category, in formula 3, the IC50 value of F3 was 29.179 µg/mL in the very strong category and in the comparison sample, namely vitamin C, the IC50 value was 5.28 µg/mL. These results show that the body scrub preparation that has the highest antioxidant activity is found in formula 3 compared to formulas 1 and 2. The following are the antioxidant categories according to [16].

4. Conclusion

a. The results of the dosage characteristic test which did not meet the test were found in formula 1 in the adhesion test, this was caused by the concentration of the emulsifier used in formula 1 being lower than formula 2 and formula 3, whereas in observing the spreadability of the three formulas it did not meet the requirements, this was caused by the use The scrub ingredient is oatmeal which easily absorbs water quickly, causing the preparation to become thicker.

b. Antioxidant test results for body scrub preparations from papaya leaf extract (*Carica papaya* L.) with the addition of oatmeal (Avena sativa) from the three formulations which had the highest antioxidant activity were in formula three with an IC50 value of 29.179 µg/mL in the very strong category.

5. Acknowledgement

To my respected supervisor, Mrs. Apt. Ervianingsih, S.Farm., M.Si and Mr. Izal Zahran, S.Farm, M.Si, the author would like to thank him very much for always guiding, helping, providing support and input to the author so that he can become much better from the beginning to the author complete the final assignment.

The author also would like to thank the Palopo City Baznas Scholarship which has funded this research. The Baznas Scholarship is one of the zakat distributions that provides educational funds to ensure the continuity of educational programs as an accountability for the nation's next generation.

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