Formulation and Physical Evaluation of Body Lotion Preparation of Kacip Fatimah (Labisia pumila) Ethanolic Extracts as Antioxidant

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Abstract. Kacip Fatimah (Labisia pumila) believed to have the antioxidant that played an important role in protecting against some diseases and delay the aging process. But, no research on kacip fatimah in his cosmetics formulation and efficacy to the skin. One form of cosmetic preparation is body lotion. Purpose: To determine the antioxidant activity of Kacip Fatimah ethanolic extract and to determine whether the concentration of Kacip Fatimah ethanolic extract affects the physical properties of the body lotion preparation. The body lotion is made in the form of an oil in water (m/a) and made in 4 formulas the concentration of the extract 0.5 %, 1%, and 2%. The physical test of body lotion extract of Labisia pumila is organoleptic, homogeneity, pH, viscosity, the spread, and the attaching, the results of testing in analysis using SPSS with Kruskal-Wallis and Mann-Whitney. The result showed that extract ethanol of Labisia pumila having strong antioxidant activity it is 87,752 ppm, and it can be concluded that variations concentration extract ethanol of Labisia pumila 0,5 %, 1%, 2 % affects the physical properties of body lotion. The greater concentration of extract, decrease the viscosity value with FI = 2863 cPs, FII = 1974 cPs, FIII = 1514 cPs, decrease the pH with FI = 6,72; FII = 6,37; FIII = 6,23, increase the spreadability with FI = 7 cm, FII = 7,93 cm, FIII = 8,03 cm, and decrease the attachability with FI = 1,33 sec, FII = 1,3 sec, and FIII = 1,01 sec.

1. Introduction
The skin is an organ system that covers the entire human body which has a function as body protection against exposure to foreign objects, so skin health needs to be maintained and protected. The skin is said to be damaged if it has signs in the form of wrinkles, cracks, dryness, dullness, and scaly. Skin damage can be caused by free radicals. A free radical is a molecule that is relatively unstable with the atom in its outer orbit having one or more unpaired electrons. Free radicals become stable when they bind to electrons from other molecules. Antioxidants are chemical compounds that can provide electrons for free radicals, so free radicals cannot cause skin damage because they are successfully suppressed. Humans do not produce more antioxidants for reserves in their bodies, so if there is excessive exposure to radicals, the body needs antioxidants obtained from outside the body [1].

Kacip Fatimah or Labisia pumila is a traditional herbal medicine that has been used by many generations of Malay women to facilitate childbirth and as a postpartum medicine. Kacip Fatimah is also commercially available as a health supplement that is claimed to prevent and treat diseases, especially those related to the stability of female hormones. Many studies have been conducted to identify bioactive or phytochemical compounds in Kacip Fatimah that have pharmacological activities [2]. The antioxidant content in Kacip Fatimah is believed to play an important role in protecting...
against several diseases and delaying the aging process. From a cosmetic point of view, research has shown Kacip Fatimah's ability to specifically protect the skin against photoaging based on its high antioxidant activity [3].

Besides, the water-soluble Kacip Fatimah (*Labisia pumila*) leaf extract has identified phenolic compounds in the form of gallic acid. Gallic acid (GA) is a natural antioxidant phenolic compound extracted from plants that are widely used in food, medicine, and cosmetics [4]. However, there has been no research on Kacip Fatimah in cosmetic formulations and its efficacy for the skin. One form of cosmetic dosage is Body Lotion. Body Lotion is a practical preparation, easy and fast to apply to the whole body. For skin that needs protection from free radicals by utilizing natural ingredients, namely, Kacip Fatimah which contains high antioxidants, a Physical Evaluation, and Formulation of Kacip Fatimah Extract Body Lotion (*Labisia pumila*) is made as an antioxidant, as a development of previous research results.

2. Material and Methods

2.1 Material

The materials used are Kacip Fatimah (*Labisia pumila*) ethanol extract, stearic acid, glyceryl monostearate, glycerin, triethanolamine (TEA), methyl paraben, propyl paraben, Oleum rosae, Aquadest, DPPH p.a, Vitamin C.

2.2 Methods

Body Lotion preparations are made in the type of oil in water (M / A), with the procedure that the ingredients of the oil phase (stearic acid, glyceryl monostearate, liquid paraffin, and propylparaben) are mixed accompanied by heating at 70°C with a hot plate until homogeneous to form preparation A. In different containers, the aqueous phase (TEA, methylparaben, glycerin, and aquadest) is mixed at the same temperature until homogeneous to form preparation B. After being homogeneous, the two preparations are mixed at 70°C to form preparation C. At temperature space or about 30-35°C is added with Kacip Fatimah ethanol extract, stirring until homogeneous, then added with fragrance, namely oleum rosae, and stirring continuously for 1 minute to form Body Lotion.

Table 1. Formulation of Body Lotion Ethanol Extract of Kacip Fatimah (*Labisia pumila*)

| Material                      | Concentration (% b/v) | Function     | Level of Use (%) |
|-------------------------------|-----------------------|--------------|------------------|
| Ethanol Extract of Kacip Fatimah | 0.5, 1, 2             | API’s        |                  |
| Asam Stearat                  | 4, 4, 4               | Emulgator    | 1-20%            |
| Gliceril Monostearat          | 3, 3, 3               | Co-emulsifier|                  |
| Trietanolamine (TEA)          | 0.5, 0.5, 0.5         | Alkalizing   | 2-4%             |
| Glicerin                      | 5, 5, 5               | Humectan     | ≤ 30%            |
| Parafin Liquid                | 2, 2, 2               | Stabilizer   |                  |
| Metil Paraben                 | 0.1, 0.1, 0.1         | Preservative | 0.02-0.3%        |
| Propil Paraben                | 0.05, 0.05, 0.05      | Preservative | 0.01-0.6%        |
| Oleum rosae                   | q.s, q.s, q.s         | Fragrance    |                  |
| Aquadest                      | Ad, Ad, Ad            | Solvent      |                  |
a. Organoleptic Test
The organoleptic test was carried out by observing the body lotion of Kacip Fatimah ethanol extract, which included the color, odor, and texture of the body lotion when applied to the skin.

b. Homogeneity Test
The homogeneity of the lotion is observed using a magnifying glass or visually, and observing the presence or absence of coarse or inhomogeneous particles on the preparation.

c. Viscosity Test
The instrument used for the viscosity test was the Lammy viscometer with spindle No. 6 and a speed of 100 rpm.

d. pH Test
The pH of the preparation is adjusted to the pH of the skin, which ranges from 4.5 to 7 and is determined using a pH meter [5].

e. Spreadability Test
The body lotion preparation of Kacip Fatimah extract was weighed as much as 0.5 g, placed in the middle of round glass with a scale, on top of the preparation another round glass that had been weighed was placed then left for 1 minute and the diameter of the spread was recorded. A load of 50 g is added to the cover glass and left to stand for 1 minute and then the diameter of the spread is recorded. The weight is added in multiples of 50 g to reach 200 g, then the diameter of the spread is measured.

f. Adhesion Test
Body Lotion with Kacip Fatima extract weighed as much as 0.1 g, placed in the middle of the object-glass, and covered with another object-glass. The 50 g weights are placed on the lid for 5 minutes. The end of the cover slide and the lower end of the slide is attached to the clamp on the adhesion tester, then the load support is removed. The length of time the two slides were separated from the test instrument was recorded as the attachment time for the preparation.

g. Test the Antioxidant Activity of Kacip Fatimah Extract
The antioxidant activity test in this study was determined by the diphenyl picryl hydrazyl (DPPH) method by making a sample solution of kacip fatimah extract with methanol solvent with a concentration of 20 ppm, 40 ppm, 60 ppm, 80 ppm, and 100 ppm, the solution is taken as much as 2 mL and added with 2 mL of DPPH solution. The mixture is then homogenized and left for 30 minutes. The next step is measuring the absorbance at a wavelength of 517 nm and measuring the blank. The results of the antiradical determination were compared with vitamin C. The absorption value of the DPPH solution was calculated as percent inhibition (% inhibition) calculated by the formula [6]:

\[
\% I = \frac{Abs \, control - Abs \, sample}{Abs \, control} \times 100\%
\]

Information:
\( I \) = Inhibisi
Abs control = Absorbance control
Abs sample = Absorbance sample

3. Result and Discussion

3.1. Antioxidant Activity Test
The absorbance measurement of the sample was carried out at a concentration of 20 ppm; 40 ppm; 60 ppm; 80 ppm; and 100 ppm calculated after 30 minutes of incubation. The absorbance measurement was calculated at a wavelength of 517 nm. From the absorbance results, the inhibition-concentration relationship curve is obtained as shown in the following figure.
Figure 1. Relation of concentration (ppm) of sample with % inhibition

The IC\textsubscript{50} value from the calculation when the % inhibition is 50% with the equation y = ax + b is 87.752 ppm. After knowing the IC\textsubscript{50} value of the ethanol extract of Labisia pumila, the IC\textsubscript{50} Vitamin C was measured with the following results.

Figure 2. The relationship between vitamin C concentration and % inhibition

The IC\textsubscript{50} value of vitamin C from the linear regression calculation resulted in 1.595 ppm. This shows that the antioxidant activity of positive control (Vitamin C) is still greater than Kacip Fatimah (\textit{Labisia pumila}), but both are still categorized as very strong antioxidants because of the value of IC\textsubscript{50} < 50 ppm [6].

a. Preparation of Ethanol Extract of Kacip Fatimah Body Lotion and Physical Evaluation of the Preparation

The results of the 3 formulations of the ethanol extract of Kacip Fatimah Body Lotion can be seen in the following figure:

Figure 3. Ethanol Extract Body Lotion Kacip Fatimah Formula I
The preparation of Body Lotion with active substances was carried out using the ethanol extract of the leaves of kacip fatimah (Labisia pumila). In the preparation of this Body Lotion, the first step is to make an ethanol extract from the leaves of kacip fatimah using the maceration method, then three formulas are made with various extract concentrations, namely 0.5%, 1%, and 2%. The difference of the formula lies in the variation of the extract concentration without any difference in additives because the aim of this study is to see the effect of extract concentration on the physical properties of the preparation. The 3rd result is the formulation of Body Lotion with the ethanol extract of Kacip Fatimah.

b. Physical Evaluation of Preparations
Physical evaluation of body lotion preparations includes testing of physical properties, namely organoleptic, homogeneity test, pH test, viscosity test, spreadability test, and adhesion test. The physical evaluation of body lotion preparations from kacip fatimah extract organoleptically aims to see to what extent a product is acceptable for quality using human senses. The results showed that the preparation formed a body lotion with a distinctive odor of kacip fatimah and a thick texture in formula 1 which was slightly thick in formula 2 and slightly thick in formula 3, this was due to differences in the concentration of the ethanol extract of kacip fatimah used which made the texture of the preparation thicker with each increase in concentration. The results show that the color of the body lotion preparation is light brown in formulas 1 and 2, while formula 3 is dark brown, this is due to the different concentrations used which make the color of the preparation darker with each increase in concentration. The brown color is obtained because the Kacip Fatimah extract is brown so that it affects the color of the preparation.
Table 2. Homogeneity Test

| Test | Criteria | Results |
|------|----------|---------|
| F1   | Homogeneous |         |
| F2   | Homogeneous |         |
| F3   | Homogeneous |         |

An emulsion is said to be homogeneous if there is no visible separation between the components that make up the emulsion. The results of the homogeneity test are based on table 4.6 that the body lotion preparations for kacip fatimah extract show homogeneous results because there is no visible separation of the components of the body lotion, and there are no coarse grains [7].

Table 3. pH Test Results

| Test | Criteria | Results |
|------|----------|---------|
| F1   | pH       | 6.23 ± 0.15 |
| F2   | pH       | 6.37 ± 0.078 |
| F3   | pH       | 6.72 ± 0.078 |

Normal skin pH is between 4.5-7 [8]. Lotions that have a too alkaline pH can cause the skin to become dry, whereas if the pH is too acidic it will cause irritation [9]. The test results of the body lotion for Kacip Fatimah (Labisia pumila) extract showed that the pH of the preparation was in the range of skin pH with results from 6.23 to 6.72. Based on table 3, the higher the concentration of the extract, the more acidic the pH is, this is because the pH of Kacip Fatimah extract is acidic as indicated by changing the blue litmus paper to red after being reacted with the extract. To stabilize the pH of the preparation, Triethanolamine (TEA) was used because it is alkaline, which has a pH of 10.5 [10]. In addition, the pH of the preparation is influenced by the concentration of stearic acid. Stearic acid reacts with TEA to produce a salt, namely triethanolamine stearate.

Table 4. Viscosity Test Results

| Test   | Criteria     | Results |
|--------|--------------|---------|
| F1     | Viskosity    | 2863 ± 42.71 |
| F2     | Viskosity    | 1974 ± 21.38 |
| F3     | Viskosity    | 1514 ± 31.97 |

Viscosity is the resistance to fluid flow that experiences friction between liquid molecules with one another [11]. The greater the viscosity of the fluid, the more difficult it is for a fluid to flow and it also shows that it is increasingly difficult for an object to move in the fluid [12]. The viscosity requirement of a skin moisturizer is 2000-50000 cPs. Table 4 shows that the viscosity of the preparations for formulation I met SNI standards, while formulations 2 and 3 did not meet standards. This is because the concentration of the extract can affect the viscosity, the acidic nature of the extract will decrease the consistency of the preparation because the emulsifying value of glyceryl monostearate will decrease if it is in an acidic atmosphere. In this study, a combination of 4% stearic acid and 0.2% triethanolamine was used as an surfactant and glyceryl monostearate as a co-emulsifier. The combination of stearic acid and triethanolamine will form an anionic surfactant by forming an alkaline stearic salt [13].

Table 5. Spreadability Test Results

| Test   | Criteria (cm) | Results |
|--------|---------------|---------|
| F1     | Spreadability | 7±0.58  |
| F2     | Spreadability | 7.93±0.12 |
| F3     | Spreadability | 8.03±0.15 |
The spreadability of the lotion indicates the ability of the lotion to spread to the location of use when applied to the skin. The requirements for the spreadability of the lotion are 5 - 7 cm \[14\]. The results show that the dispersion power that meets the requirements is only formula I, while formulas 1 and 3 do not meet the requirements.

![Figure 6. Spreadability Test Results](image)

![Figure 7. Graph of the Relationship of Increase in Load and Spread Power](image)

The graph shows that the heavier the load added, the greater the diameter of the resulting dispersive power so that the increase in the diameter of the spreading power is directly proportional to the addition of the load. The preparation which has a high viscosity, namely formula I, has a diameter of dispersion in accordance with the test parameters. This is because the viscosity of the preparation affects the diameter of the spreadability of preparation is the viscosity. The lower the consistency of the lotion with the lower adhesion time, the easier it is to spread the lotion \[15\].
Table 6. Adhesion Test Results

| Test   | Criteria     | Hasil       |
|--------|--------------|-------------|
|        |              | F1          | F2          | F3          |
| Adhesion | > 1 second   | 1.33 ± 0.079 | 1.30 ± 0.02 | 1.01 ± 0.053 |

Based on the results shown in Table 6, the adhesion power of each preparation meets the adhesion requirements, namely > 1 second. The adhesion of preparation is influenced by the viscosity of the preparation itself. If the viscosity value is large, the adhesion will be high and if the viscosity is low, the adhesion will be smaller. Based on the results shown in Table 6, the adhesion power of each preparation meets the adhesion requirements, namely > 1 second. The adhesion of preparation is influenced by the viscosity of the preparation itself. If the viscosity value is large, the adhesion will be high and if the viscosity is low, the adhesion will be smaller. Based on the statistical analysis that has been carried out, the results of the Correlate test show a significance value of 0.395 > 0.05, there is no correlation between viscosity and adhesion.

4. Conclusion
a. The ethanol extract of kacip fatimah (Labisia pumila) has a strong antioxidant activity, namely 87.752 ppm
b. Based on the research that has been done, the concentration of Kacip Fatimah (Labisia pumila) extract affects the physical properties of body lotion which includes organoleptic, pH, viscosity, dispersibility, and adhesion. Of the three formulas, Formula 1 with an extract concentration of 0.5% produced the preparation that had the best physical properties because it fulfilled all the body lotion requirements, namely with a pH of 6.72, a viscosity of 2863 cPs, a spreadability of 7 cm, and adhesion of 1.33 seconds.

References
[1] Mardikasari, S. A. et al. 2017. *Formulasi dan uji stabilitas lotion dari ekstrak etanol daun jambu biji (Psidium guajava L.) sebagai antioksidan*, Jurnal Farmasi, Sains, dan Kesehatan, 3(2), pp. 28–32.
[2] Chua, L. S., Lee., S.Y., Abdullah, N., Sarmidi, M.R. 2012. *Review on Labisia pumila (Kacip Fatimah): Bioactive phytochemicals and skin collagen synthesis promoting herb*, Fitoterapia. Elsevier B.V., 83(8), pp. 1322–1335. doi: 10.1016/j.fitote.2012.04.002.
[3] Choi, H.K., Kim, D.H., Kim, J.W., Park, C.S., Sulaiman, N., Sarmidi, M.R. 2010. *Labisia pumila extract protects skin cells from photoaging caused by UVB irradiation*, Journal of Bioscience and Bioengineering. Elsevier B.V., 109(3), pp. 291–296. doi: 10.1016/j.jbiosc.2009.08.478.
[4] Iwansyah, A. C. and Yusoff, M. 2013. *Identifikasi Dan Kuantifikasi Asam Galat Sebagai Sumber Antioksidan Pada Ekstrak Daun Kacip Fatimah (Labisia pumila) Larut Air*, Jurnal Aplikasi Teknologi Pangan, 2(3), pp.133–138.
[5] Swastika, A, Mufrodi, Purwanto., 2013, *Aktivitas Antioksidan Krim Ekstrak Sari Tomat (Solanum lycopersicum L.)*. Trad Med Journal, 18(3),132-140.
[6] Zuhra, C. F., Tarigan, J. B., Sihotang, H. 2008. *Aktivitas Antioksidan Senyawa Flavonoid Dari Daun Katuk (Sauropus androgynus (L) Merr.)*, Jurnal Biologi Sumatra, 3(1), pp. 10–13.
[7] Erungan, A. C., Purwaningsih, S., Anita, S.B. 2009. *Aplikasi Karaginan dalam pembuatan skin lotion*. Jurnal Teknologi Hasil Perikanan Indonesia. 12 (2), pp.128-143.
[8] Barel, A.O., Paye, M., Maibach, H.I. 2001, *Handbook of Cosmetic Science and Technology*. Marcel Dekker, Inc. New York.
[9] Goskonda S. R., 2009, *Handbook of Pharmaceutical Excipients, Sixth Edition*, Rowe R. C., Sheskey, P. J., Queen, M. E. (Editor), London, Pharmaceutical Press and American Pharmacists Association, 754-755.
[10] Febrianto T., Edi, S.S., Sunarno. 2013. Rancang Bangun Alat Uji Kelayakan Pelumas Kendaraan Bermotor Berbasis Mikrokontroler. Unnes Physics Journal, 2 (1), pp.30-34.
[11] Mutmainnah, Siti. 2008. Pembuatan Counter waktu pada percobaan viskositas berbasis mikrokontroler HRS8000. Skripsi. Universitas Islam Negeri Malang.
[12] Hendrawati, T. Y., Ambarwati, H., Nugrahani, R.A., Hasyim, U.H., Susanty, S. 2018. The effects of adding aloe Chinensis baker gel extract on the formulation of lotion as a cosmetic product, ARPN Journal of Engineering and Applied Sciences, 13(23), pp. 9291–9297.
[13] Rowe, R. C., Sheskey, P. J., and Owen, S. C. 2006. Handbook of Pharmaceutical Excipient. Ed. 5. Pharmaceutical Press and American Pharmacist Association. New York.
[14] Dominica, D., and Handayani, D. 2019. Formulasi dan Evaluasi Sediaan Lotion dari Ekstrak Daun Lengkeng (Dimocarpus Longan) sebagai Antioksidan. Jurnal Farmasi dan Ilmu Kefarmasian Indonesia, 6(1), pp. 1–7.
[15] Ansel, H. C., Popovich., Allen, L. V. 1989. Pharmaceutical Dosage Forms and Drug Delivery System (Sixth Edition). Lippincott Williams & Wilkins. Philadelphia.