FORMULATION AND EVALUATION OF TRANSPARENT SOAP EXTRACT OF KENCUR (Kaempferia galanga L.)

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FORMULATION AND EVALUATION OF TRANSPARENT SOAP EXTRACT OF KENCUR (*Kaempferia galanga* L.)

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Abstract

Introduction: Soap is a cosmetic with cleaning power to clean dirt from the skin. The content in kencur has anti-bacterial benefits such as flavonoids, polyphenols and saponins. The research design used was experimental laboratory, then the purpose of this study was to evaluate the physical stability of the transparent solid soap formulation of kencur extract with concentrations of 0.5%, 1%, and 1.5%. The method of making soap is by heating to a final temperature of not more than 70°C. **Result:** Testing the characteristics of transparent solid soap through several tests such as organoleptic test, pH test, water content test, foam strength test, free alkali content test and free fatty acid content test. The results obtained from the three formulas obtained appropriate results for the five tests except that free fatty acid levels were not detected. **Conclusion**: The comparison of the three formulations that got the best results was F3 with an average water content of 5.78%, the most stable average pH range was 9.6, the average foam height was 10cm, and the free alkali content was 0.10%, namely the lowest.

Keywords: transparent solid soap, kencur extract, coconut oil

INTRODUCTION

Solid soap itself is one of the cosmetic and pharmaceutical industry products that are often used by Indonesian people in everyday life to sterilize germs / microbes, dirt attached to the skin of the human body. If the skin is not cleaned, then these germs will trigger skin inflammation and other diseases (Widyasanti et al., 2016) that, the results of testing the chemical properties of transparent soap produced are in accordance with SNI 06-3532-1994, so that the manufacture of transparent solid soap using palm oil base can be applied by the public. Transparent solid soap or glycerin soap is an excellent moisturizing soap and is beneficial for people with dry or flaky skin. This soap dissolves easily so it doesn't leave a film on the skin like other soaps. This glycerin absorbs water and air and is a key factor in keeping skin soft and healthy, and one of the best soaps for delicate and sensitive skin. Based on previous research, Megantara & Soleh, (2019) stated that kencur extract has several compounds such as essential oils, saponins, flavonoids, polyphenols which are known to have many benefits, kencur can also inhibit Streptococcus pyogenes and Staphylococcus aureus bacteria with a concentration of 0.2%, 0.4%, 0.6%, 0.8%, and 1%. The best results were obtained with 1% kencur extract with an inhibition zone of 5.44 mm for Streptococcus pyogenes and 5.56 mm for Staphylococcus aureus (Belgis et al., 2021). Likewise with research from Susanti & Antikasari, (2018) which states that kencur can inhibit the growth of Escherichia coli bacteria in concentrations of 30%, 45%, 60%, 75%, then the results of the largest inhibition zone at 75% concentration are 31 mm. . Based on the research of Imanda et al., (2021) also stated that solid soap with kencur extract successfully passed 3 tests that had been carried out, namely the pH test, high foam test and organoleptic test. In this study the authors used palm oil as a soap-making base to make transparent solid soap with kencur extract, the researchers found that kencur had never been used as an extract from transparent solid soap, so the authors were interested in formulating and evaluating transparent soap preparations from kencur extract with made three concentration variations of 0.5%, 1% and 1.5%.

METHOD

A. Stability Testing of Physical Properties of Transparant Solid Soap

1. Flavonoid Test

   A total of 0.5 g of extract was put in a test tube, add 5 mL of ethanol and then heated for 5 minutes. A total of 10 drops of concentrated HCl was put into a test tube and added 0.2 grams of Mg

powder. The appearance of a brownish red color indicates the presence of flavonoids (Kala'Rante et al., 2020).

2. Saponin Test

A total of 0.5 grams of extract was added with 10 mL of distilled water and then shaken vigorously for about 1 minute. Then let stand for 10 minutes and observe the foam or foam formed. The presence of saponin compounds in the sample was indicated by the formation of a stable foam for 10 minutes with a height of 1-3 cm (Kala'Rante et al., 2020).

3. Polyphenol Test

0.5 grams of extract was put into a test tube. Added 5 drops of 5% FeCl3 solution and shaken vigorously. The formation of a blue-black color after the addition of 5% FeCl3 indicates the presence of phenolic compounds (Mentari, 2018).

B. Transparent Soap Preparation Formula

Tabel 1. Formulasi Pembuatan Sabun Padat Transparan (Widyasanti et al., 2016)

Composition	Replication			Function
	I (g)	II (g)	III (g)	
Kencur Extract	1,5	3	4,5	Active substance
Palm Oil	60	60	60	Oil Phase
Stearic Acid	21	21	21	Emulsifier
NaCl	0,6	0,6	0,6	Tonicity Agent
NaOH 30%	60,9	60,9	60,9	Buffer Agent
Sugar	45	45	45	Humectants
Glycerin	39	39	39	Preservative
Coco-DEA	3	3	3	Foam stability
Fragrance Oil	0,3	0,3	0,3	Deodorizer
Etanol 96%	45	45	45	Solvent
Aquadest	23,7	22,2	20,7	Additives

C. Manufacturing of Transparent Solid Soap

The process of making transparent solid soap uses the hot method using a water bath as the medium. Pure coconut oil which has been placed in a glass beaker is heated in a water bath. The stearic acid is put into a glass beaker containing virgin coconut oil, then mix and shake until homogeneous. After that, add 30% NaOH liquid and add other supporting materials such as 96% ethanol, glycerin, sugar syrup (sugar + distilled water first), coco-DEA, NaCl, and aromatic oil. The mixture is stirred until it is completely mixed, lower the temperature to ±50°C before adding the extract. Stir again until the mixture is completely mixed, then pour it into the soap mold and let it sit for 1 day at room temperature. (Widyasanti et al., 2016)

D. Transparent Solid Soap Characteristic Test

1. Organoleptic observations

Organoleptic tests include observations of shape, color changes, and odor changes (Susanti & Guterres, 2018).

2. pH test

The pH test was tested by weighing 1g of soft soap dissolved in 9ml of distilled water. Then the pH marker is dipped and the pH value of soft soap is observed, sourced from SNI 06-3532-1994 (2016) soap pH is 9-11 (Susanti & Guterres, 2018).

3. The Foam Strenght Test

   The foam strength test was tested by weighing 10g of soft soap dissolved in aquadest. After that, the solution was shaken vigorously and the size of the foam formed after shaking for 30 seconds and 60 seconds was measured (Susanti & Guterres, 2018).

4. Water Contant Test

   The soft soap is weighed 1 gram, after that it is put into a tool called a Moisture analyzer after which it is waited for the results of the water content to be recorded.

5. Fatty Acid Content Test

   5g of solid soap was dissolved with aquadest, then bromthymol blue was added and titration was carried out using 0.1 N NaOH until the color changed from blue to yellow (Susanti & Guterres, 2018).

6. Free Alkali Content Test

   5g of solid soap was weighed into a measuring cup, then aquadest was added and a phenolphthalein marker was added. After the solution turns red, then it is titrated with 0.1 N HCl solution until the red color disappears (Susanti & Guterres, 2018).

RESULTS

A. Qualitative Test of Kencur Rhizome Extract

Tabel 1. Result Of Qualitative Test of Kencur Rhizome Extract

Sample Name	Condition	Parameter	Result	Analysis Techniques
Kencur Extract	Thick Extract	Saponin	Positive	Stable foam is formed
		Flavonoid	Positive	Formation of yellow-orange color
		Polifenol	Negative	No bluish black color is formed

B. Organoleptic Observation Transparent Solid Soap Kencur Extract

Tabel 2. Result of Organoleptic Observation

Replication	Color	Scent	Texture
Formula 1 (Kencur Extract 0,5%)			
1	Transparent brown	Aromatic	Solid
2	Transparent brown	Aromatic	Solid
3	Transparent brown	Aromatic	Solid
Formula 2 (Kencur Extract 1%)			
1	Transparent brown	Aromatic	Solid
2	Transparent brown	Aromatic	Solid
3	Transparent brown	Aromatic	Solid
Formula 3 (Kencur Extract 1,5%)			
1	Brown	Aromatic	Solid
2	Brown	Aromatic	Solid
3	Brown	Aromatic	Solid

Description :

Formula 1 : Transparent solid soap kencur extract with a concentration of 0.5%
Formula 2 : Transparent solid soap kencur extract with a concentration of 1%
Formula 3 : Transparent solid soap kencur extract with a concentration of 1.5%

C. pH Test Transparent Solid Soap Kencur Extract

Tabel 3. Result of pH Test

Replication	Formula 1	Fomula 2	Formula 3
1	9,7	9,5	9,3
2	9,9	9,5	9,7
3	9,8	9,7	9,7
Average ± SD	9,8 ± 0,1	9,6 ± 0,1	9,6 ± 0,2

Description :

Formula 1 : Transparent solid soap kencur extract with a concentration of 0.5%
Formula 2 : Transparent solid soap kencur extract with a concentration of 1%
Formula 3 : Transparent solid soap kencur extract with a concentration of 1.5%

D. Foam Strength Test of Transparent Solid Soap Kencur Extract

Tabel 4. Result of Foam Strength Test

Replication	Formula 1	Fomula 2	Formula 3
1	10,50 cm	11,00 cm	11,00 cm
2	11,00 cm	12,00 cm	9,00 cm
3	10,00 cm	11,50 cm	10,00 cm
Average ± SD	10,50 ± 0,5 cm	11,50 ± 0,5 cm	10,00 ± 1 cm

Description :

Formula 1 : Transparent solid soap kencur extract with a concentration of 0.5%
Formula 2 : Transparent solid soap kencur extract with a concentration of 1%
Formula 3 : Transparent solid soap kencur extract with a concentration of 1.5%

E. Water Content Test Transparent Solid Soap Kencur Extract

Tabel 5. Result of Water Content Test

Replication	Formula 1	Fomula 2	Formula
1	13,48 %	9,44 %	5,68 %
2	12,56 %	9,96 %	5,99 %
3	10,46 %	10,21 %	5,66 %
Average ± SD	12,17 ± 1,55 %	9,87 ± 0,39 %	5,78 ± 0,19 %

Description :

Formula 1 : Transparent solid soap kencur extract with a concentration of 0.5%
Formula 2 : Transparent solid soap kencur extract with a concentration of 1%
Formula 3 : Transparent solid soap kencur extract with a concentration of 1.5%

F. Alkali Free Test Solid Soap Transparent Kencur Extract

Tabel 6. Result of Alkali Free Test

Replication	Formula 1	Fomula 2	Formula 3
1	0,14 %	0,12 %	0,07 %
2	0,11 %	0,09 %	0,09 %
3	0,11 %	0,11 %	0,08 %
Average ± SD	0,12 ± 0,02 %	0,11 ± 0,01 %	0,08 ± 0,01 %

Description :

Formula 1 : Transparent solid soap kencur extract with a concentration of 0.5%
Formula 2 : Transparent solid soap kencur extract with a concentration of 1%
Formula 3 : Transparent solid soap kencur extract with a concentration of 1.5%

G. Fatty Acid Test Solid Soap Transparent Kencur Extract

Tabel 7. Result of Fatty Acid Test

Replication	Formula 1	Fomula 2	Formula 3
1	0%	0%	0%
2	0%	0%	0%
3	0%	0%	0%
Average ± SD	0%	0%	0%

Description :

Formula 1 : Transparent solid soap kencur extract with a concentration of 0.5%
Formula 2 : Transparent solid soap kencur extract with a concentration of 1%
Formula 3 : Transparent solid soap kencur extract with a concentration of 1.5%

DISCUSSION

This research formula makes three variations of the formula, namely the concentration of kencur extract F1 (kencur extract 0.5%), F2 (kencur extract 1%), F3 (kencur extract 1.5%). The existence of three variations in the formula is intended to determine the differences that occur in several test variations such as organoleptic test, pH test, water content test, foam height test, free alcation level test, and free fatty acid content test.

In this study, qualitative tests were carried out, including flavonoid test, polyphenol test and saponin test. The results of the phytochemical screening obtained from the kencur extract that we studied were positive for saponins with the result that a stable foam was formed. The next result obtained was positive for flavonoids with the formation of an orange-orange colored solution, this reaction occurred because flavonoid compounds were reduced with Mg and HCl so as to produce red, yellow or orange colors (Sulistyarini et al., 2020). Furthermore, the researchers conducted a polyphenol test but did not get the results in accordance with the journal, namely positive polyphenols, there was no change in the solution to blackish blue which indicated the absence of polyphenol compounds in kencur. This is presumably because the difference in where the kencur plant grows, including location, soil type, climate, fertility level, and sunlight intensity, affects the number of secondary metabolites contained in plants that grow in a certain area with other areas (Yani & Dirmansyah, 2021). Polyphenols were not detected in this kencur rhizome extract but this did not make the kencur compound non-antibacterial, because kencur also has flavonoids as one of the active chemical substances that are able to form complex compounds with bacterial extracellular proteins that damage bacterial cell membranes. Flavonoids are also able to inhibit nucleic acid synthesis and inhibit the energy metabolism of bacterial cells. Likewise with saponins, saponins are active compounds that have antibacterial activity. Saponins work by interfering with the surface tension of bacterial cells, so that bacterial cells easily leak and lyse, so that in the absence of polyphenolic compounds, kencur remains useful as an anti-bacterial (Hayati et al., 2017).

Organoleptic observations at room temperature, for formulation 1 after making 3 replications with a concentration of 0.5%, the results were transparent solid soap of dark brown color with a distinctive aromatic odor and solid form. At room temperature, for formulation 2 by doing 3 times replication with the formulation of 1% kencur rhizome extract, good results were obtained, namely in a dark brown solid form with a distinctive aromatic odor and transparent results. At room temperature, for formulation 3 by doing 3 times replication with a concentration of 1.5%, the results obtained good solid soap with dark brown color and a distinctive odor but there is no transparency in the solid soap formulation 3 due to the darker kencur extract which causes the more extract or the higher the percentage of the formula causes the soap to become thicker. dark and not transparent.

The pH test was carried out to determine the acidity and basicity of the transparent solid soap preparation. It showed that the pH of the transparent solid soap of kencur extract had different results from formula one replication one to formulation three replications three. For the results obtained by formula one, namely 9.7, 9.9, and 9.8 respectively from replications 1 to 3, the results obtained have entered the pH range of transparent solid soap requirements with an average of 9.8, namely 9-11. For the next formula two results were obtained, namely 9.5, 9.5, 9.7 sequentially from one to three replications, for the data from formula two

also entered the pH range of transparent solid soap with an average of 9.6, namely 9-11. For the last formula three, the results obtained are 9.3, 9.7, 9.7 which have entered the requirements also with an average of 9.6 such as formulations one and two. The high and low pH of soap is influenced by the saponification process during soap making. The high pH value of soap resulted from the hydrolysis reaction in the saponification process. This can be overcome by adding excess fat or oil. However, the addition of fat or oil will reduce the hardness of the soap (Setiawati & Ariani, 2019).

Testing the water content of solid bath soap is something that needs to be done because the water content will affect the quality of the soap that has been made. The amount of water content can affect the solubility of soap in water when used. If the water content in the soap is too high, it will cause the soap to shrink easily and become uncomfortable when used. The results obtained from this water content test are for formula one 13.48%, 12.56%, 10.46% with an average of formulation one, namely 12.17% which has entered the soap water content requirement, then for formulation two namely 9.44%, 9.96%, and 10.21% with an average of 9.87% which have entered the range of water content requirements. Furthermore, the last three formulations obtained results, namely 5.68%, 5.99%, and 5.66% with an average value of 5.78% which had entered the requirements. The higher the water content in the soap causes the soap to be softer, on the contrary if the water content in the soap is getting smaller it can cause the soap to become hard. Soap with levels exceeding 15% if stored in an open state and in contact with air will cause a decrease in the weight and dimensions of the soap (Elmitra & Noviyanti, 2020).

The foam strength test aims to determine the amount of foam and the stability of the foam produced by transparent solid soap in 3 formulations (Elmitra & Noviyanti, 2020). The results obtained in this test varied from formulations of one replication one to formulations of three replications of three, for formulation one the results obtained were 10.50 cm, 11.00 cm, 10.00 cm respectively from one to three replications with an average value of 10, 50 cm which has been included in the requirements, namely the height of the foam ranges from 13-220 mm or 1.3-22 cm. For the second formulation, the results were 11.00 cm, 12.00 cm, and 11.00 cm respectively for one to three replications with an average of 11.50 cm which had entered the requirements. For the last formula, namely formulation three, the results were 11.00 cm, 9.00 cm, and 10.00 cm respectively from one to three replications with an average of 10.00 cm which also entered the requirements of the foam height. The results of the height of the foam may vary due to the strength of the shaking during the test.

Free alkali test is carried out to see the amount of base that is not bound by fatty acids (Dimpudus et al., 2017). Excess free alkali that is not up to standard can cause skin irritation. Excess alkali can be caused by the addition of excess alkali in the soap making process (Sukawaty et al., 2016.) The free alkali test has a requirement that is not more than 0.14%, so to obtain this percentage the researcher is required to calculate the result of milliliters of 0.1N HCL solution used during the titration in 3 replications to be converted into a percentage (Susanti & Guterres, 2018). The results of the calculation of the percentage obtained by the researchers from formula one replication one to three replication formula three, namely, formula one 0.11%, 0.09%, and 0.14% respectively from replication one to three with an average of 0.12% which states that formula one enters the water content test requirements. Furthermore, for formula two, namely 0.12%, 0.13%, 0.13% sequentially from one to three replications with an average of 0.13% which entered the water content test requirements. Furthermore, for formula three, namely 0.08%, 0.14%, and 0.07% respectively, from one to three replications with an average of 0.10% which entered the requirements of the free alkali content test. There was no difference between all the transparent solid soap formulations of kencur rhizome extract from formulations one to three. The free alkali in the transparent solid soap is caused by the excessive amount of NaOH in the saponification process (Susanti & Guterres, 2018). In a perfect saponification reaction, KOH will bind to the oil phase, but if KOH is not completely bound it will form free alkali. It can be seen that the free alkali content of all transparent solid soap formulations of kencur extract entered a good range or entered the requirement of a maximum of 0.14% so that it can be proven that the soap produced by the researchers will not cause skin irritation.

Free fatty acid testing aims to determine the free fatty acid content contained in the oil. A good oil to be used as a raw material for soap is an oil that has a high Free Fatty Acid (FFA) content (Sukawaty et al., 2016.) A good free fatty acid in soap is < 2.5%. This test is carried out by titrating the same as free alkali but using a different solution, namely 0.1 N NaOH and a blue bromthymol indicator or marker with a color change from blue to yellow (Susanti & Guterres, 2018). The requirement for a good free fatty acid test level

is below 2.5%, before obtaining the data, the researcher is required to calculate the number of mL of NaOH used in one titration and then calculate the results in order to obtain the percentage results in accordance with the requirements (Susanti & Guterres, 2018). However, in this experiment the researchers did not detect the presence of free fatty acids in the transparent solid soap that had been made, when testing the three concentrations of the preparation there was no change between the soap solution that had been given the bromthymol blue indicator and 0.1N NaOH solution. This condition occurs because the free fatty acids in the oil have reacted with bases to form soap and glycerol (Hardian et al., 2018).

CONCLUSION

1. Rhizome of kencur *(Kaempferia galanga* L.) can be used as an active ingredient in making transparent solid soap with various concentrations of 0.5%, 1%, and 1.5%. The three formulas are good formulas because they are included in the requirements for evaluating organoleptic tests, pH tests, water content tests, alkaline-base tests, and free fatty acid levels.
2. In this study the best formulation according to the researcher is formulation number 3 because in the water content formula 3 has the best results, namely with an average of 5.78%, foam strength with an average of 10cm, as well as the highest pH. good and stable compared to the other two formulas, namely 9.6 and the free alkali content with an average of 0.10% which is the best result of the three formulations because the smaller the free alkali content, the better the soap, and 0% yield for the free alkali content. free fatty acids because no fatty acids were detected in this formulation.

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