FORMULATION OF LIQUID BATH SOAP WITH PALM LEAF EXTRACT

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ABSTRACT

Among the world's top producers of palm oil are Indonesia (47,000), Malaysia (19000), Thailand (3450), and Colombia (1,800). Because it contains bioactive substances like flavonoids, alkaloids, steroids, tannins, and saponification, palm oil waste—more especially, palm fronds—has antioxidant potential and can be used as a raw material to make liquid soap and other cosmetics. Through testing of Indonesian National Standard (SNI) parameters, including the organoleptic test, pH, moisture content, free fatty acids, viscosity, and specific gravity, this study seeks to ascertain if the formula of palm leaf liquid soap has a good stability concentration. In order to test the SNI parameters on the stability of the liquid soap preparation on days 1, 7, 14, 21, and 28, this study used an experimental method with variations of three concentrations of palm leaf extract, namely F1 2%, F2 4%, and F3 6%. The pH and specific gravity tests were conducted using the One Way ANOVA method because the results were normally and homogeneously distributed. Since the data for the viscosity and free fatty acid tests were not normally distributed, the Kruskal Wallis method was applied. The formulations F1 2%, F2 4%, and F3 6% were reported to have no discernible effects or differences on days 1, 7, 21, and 28. Because the liquid bath soap formulation in this investigation produced fewer than 15% free fatty acids, it was determined that it did not meet the SNI requirements for liquid bath soap. The free fatty acid test did not satisfy the SNI requirements, despite the pH, specific gravity, and viscosity tests meeting the SNI parameters for liquid bath soap.

Keywords: *Leaves; Palm Oil; Liquid Soap Formulation; Stability*

INTRODUCTION

Among the world's top producers of palm oil are Indonesia (47,000), Malaysia (19,000), Thailand (3,450), and Colombia (1,800). Because it contains bioactive substances like flavonoids, alkaloids, steroids, tannins, and saponification, palm oil waste—more especially, palm fronds—has antioxidant potential and can be used as a raw material to make liquid soap and other cosmetics. Through testing of Indonesian National Standard (SNI) parameters, including the organoleptic test, pH, moisture content, free fatty acids, viscosity, and specific gravity, this study seeks to ascertain if the formula of palm leaf liquid soap has a good stability concentration. In order to test the SNI parameters on the stability of the liquid soap preparation on days 1, 7, 14, 21, and 28, this study used an experimental method with variations of three concentrations of palm leaf extract, namely F1 2%, F2 4%, and F3 6%. The pH and specific gravity tests were conducted using the One Way ANOVA method because the results were normally and homogeneously distributed. Since the data for the viscosity and free fatty acid tests were not normally distributed, the Kruskal Wallis method was applied. The formulations F1 2%, F2 4%, and F3 6% were reported to have no discernible effects or differences on days 1, 7, 21, and 28. Because the liquid bath soap formulation in this investigation produced fewer than 15% free fatty acids, it was determined that it did not meet the SNI requirements for liquid bath soap. The free fatty acid test did not satisfy the SNI requirements, despite the pH, specific gravity, and viscosity tests meeting the SNI parameters for liquid bath soap.

METHODS

1. Location & Time

The study is an experimental investigation carried out at STIKes Darul Azhar Batulicin's Pharmacy Technology Laboratory in Tanah Bumbu, South Kalimantan. conducted during April and June of 2024, spanning three months. Purposive sampling was used to gather samples from oil palm leaves that were roughly five years old.

2. Equipment & Material

Test tubes, an oven, a stirrer, a glass beaker, a watch glass, a separating funnel, a burette, a 10 ml volumetric

pipette, a dropper pipette, filter paper, a petri dish, cotton, gauze, a spatula, an evaporating dish, aluminum foil, a water bath, an analytical balance, a pycnometer, a separating funnel, a porcelain dish, a thermometer, and a refrigerator are among the supplies. The components include ice cubes, sulfuric acid, phenolphthalein, HCl, Mg, potassium chloride, ether, filtrate, chloroform, Mayer's reagent, Wagner's reagent, Dragendorff's reagent, glycerin, HPMC, aquadest, KOH, glycerin, and palm leaves.

3. Oil Palm Leaf Extraction

Maceration of Leaves from Palm Oil Five liters of 96% ethanol were used to macerate 500 grams of simplicia palm oil leaves, which were then immersed twice for twenty-four hours. After filtering the material, a rotary evaporator was used to evaporate the resulting macerate, producing a thick extract. After then, the extract's yield was determined.

4. Liquid Bath Soap Formula for Liquid Soap

The following ingredients are used in different concentrations of 2%, 4%, and 6% to make liquid bath soap: The formula for liquid bath soap has the following ingredients and is made in three different concentrations: 2%, 4%, and 6%. (F0) Formulation of soap devoid of active ingredients 2% palm leaf extract soap formulation (F1), 4% palm leaf extract soap formulation (F2), F3: A soap recipe that contains 6% palm leaf extract.

Tabel 1. Liquid Soal Formulation

No.	Materials	Function	Consentrations (%)			
			F0	F1	F2	F3
1.	Palm leaves Extract	Active Ingredient	-	2	4	6
2.	VCO	Soap Base	20	20	20	20
3.	KOH	Alkalizing	9	9	9	9
4.	HPMC	Emulsifying agent	1,5	1,5	1,5	1,5
5.	Glyserin	Humectan	20	20	20	20
6.	Aquadest	Solvent	ad 100	ad 100	ad 100	ad 100

The procedure for processing liquid soap is as follows: all the formulation ingredients for the liquid soap are weighed. VCO 20 grams is heated using a hot plate at a temperature of 70°C. KOH 30 grams is dissolved in 100 ml of aquadest, and 9 ml of KOH is taken. 9 ml of KOH is mixed with VCO and stirred until saponification occurs at a temperature of 80°C until a paste is formed. HPMC 1.5 grams is dissolved in 10 ml of glycerin, and aquadest is added to 100 ml with the sample extract for F1 (2%), F2 (4%), F3 (6%), and none for F0 (0%). The

addition of extract with each of the three replications.

5. Stability Test of Liquid Soap

The stability test of liquid bath soap preparations uses the storage method, where the soap preparations are stored at room temperature and in tightly closed containers. Observations of the liquid bath soap are conducted on days 1, 7, 14, and 28 with SNI parameters, including organoleptic tests, pH, specific gravity, fatty acids, viscosity, and hedonic tests.

a. Organoleptic Test

The organoleptic test was conducted by directly observing on the first day the liquid soap preparation was made, specifically the color, shape, and scent of the liquid bath soap.

b. pH Test

The method for testing pH is very simple, which is to first ensure the pH stick is ready, then prepare the sample to be tested by dipping it into the liquid soap sample. The resulting pH value is read from the color displayed and compared to see if the pH value of the sample meets the quality standards for liquid soap.

c. Density Test

The procedure is to clean the pycnometer with acetone, then dry it, weigh the pycnometer, then fill it with the sample, let it sit in an ice bath until it reaches 25℃. Lift the pycnometer, then let it sit at room temperature and weigh it. Repeat the process by replacing the sample with aquadest. Then recorded and calculated.

d. Fatty acid test

Weigh 0.5 grams of liquid soap in a glass beaker, dissolve it with 400 ml of distilled water, stir evenly, and heat. Add 3 drops of phenolphthalein until it turns pink take 20 ml of the solution, then add 10 ml of petroleum ether, place it in a separating funnel, shake, and add 10 ml of NaCl, shaking until there are two phases: the aqueous phase at the bottom and the petroleum ether (PE) phase at the top. Return the aqueous phase to the separating funnel and repeat once more by adding another 10 ml of PE, and remove the aqueous phase from the bottom. Mix the second PE with the first PE, then add 20 ml of aquadest and 3 drops of PP indicator, shake until the aqueous phase is no longer basic, and remove the aqueous phase. The PE phase is added with 20 ml of ethanol, shaken, then the ethanol phase is removed to be heated and 3 drops of PP indicator are added. After that, it is cooled for a

moment and titrated with 0.005 NaOH until it turns pink, then counted.

e. Viscosity test

Viscosity testing was conducted using a Brookfield DV-l Prime viscometer with spindle 4 at a speed of 30 rpm. The viscosity value represents the fluidity of the liquid soap, indicating the degree of friction within the soap. The standard viscosity for liquid soap preparations is 400-4000 cp. The method is as follows: place the liquid soap preparation into a 100 ml beaker, then insert it into the viscometer. The higher the viscosity of a substance, the more stable it will be because the movement of particles becomes increasingly difficult as the soap thickens.

e. Hedonic test

Hedonic tests, which include the level of preference for the appearance of color, aroma, viscosity, and foam of liquid soap with palm leaf extract, were conducted using a panel of 10 people from the general public. The soap formulations tested in the hedonic test included 4 formulas: F0 (0%), F1 (2%), F2 (4%), F3 (6%).

6. Data Analysis

The evaluation data results from the pH test, specific gravity, moisture content, free fatty acids, and viscosity using the Shapiro-Wilk method because they are normally distributed (>0.05) and homogeneous can use one-way ANOVA followed by the Tukey post hoc test to show significant differences. However, if the data is not normally distributed, the Kruskal-Wallis method is used because (<0.05) indicates that there is no effect or difference in the liquid soap on days 1, 7, 14, 21, 24, and 28.

RESULTS AND DISCUSSIONS

The research aims to determine whether palm oil leaves can be made into liquid bath soap with good stability concentration by testing the Indonesian National Standard (SNI) parameters, namely organoleptic tests, pH, fatty acids, viscosity, and specific gravity.

1. Extraction Processing

The preparation of simplicia from palm leaves (Elaeis guinensis Jacq) involves collecting 4 kg of leaves, cleaning them from dirt by washing with running water, then proceeding to the shredding stage. After that, the drying process is carried out using an oven for 2 hours. Ground with a blender, the final result obtained 500

grams of dry simplicia, which was soaked with 96% ethanol solvent in a ratio of 500:5 L in a closed container for maceration until the simplicia powder was submerged by the solvent. The soaking was carried out for 2 x 24 hours, and the maceration results can be seen in the table below.

Table 2. Result of Palm Leaf Extraction

Weight Simplicia	Solvent	Weight Extract	Yield (%)
500 grams	5 Liters	49,25 grams	9,85 %

Phytochemical screening aims to determine the content of a natural substance. In this phytochemical screening study, it will be conducted using a sample of palm oil leaf extract that has been obtained, which is 9.85%. The sample was taken only as needed for testing the compounds contained in the palm oil leaves. The results of the phytochemical screening of the research can be seen in the table below.

Table 3. Result of Phytochemical Screening

No.	Group	Reagent	Result	Description
1.	Flavonoid	Mg dan HCL Pekat	+	Orange
2.	Alkaloid	HCl 2 N, Aquadest and mayer	+	White and Yellow sediment
3.	Steroid	Klorofom, acetate acid and sulphate acid	+	Bluish green
4	Tanin	Aquadest and FeCl3	+	Bluish-green or dark green
5	Saponin	Aquadest and HCl 2N	+	Foamy

Testing the parameters of liquid soap from the four formulas, namely F0 0%, F1 2%, F2 4%, F3 6%.its stability will be tested from day 1, 7, 14, 21, and 28 with parameter tests including organoleptic test, pH, specific gravity, viscosity, and fatty acids.

a. Organoleptic Test

Organoleptic tests are conducted once a week for a month to observe the shape, color, and aroma of palm oil liquid soap, monitoring changes in the soap by comparing it according to the parameters of liquid soap SNI 06-4085-1996, namely liquid form, characteristic color, and characteristic aroma.

The results show that in all formulas over 28 days, with a liquid form characteristic, the colors were white (F0), brownish green (F1), blackish green (F2), and brownish black (F3). For the overall aroma, the formula has a distinctive smell.

b. pH test

The pH test is conducted to determine

the acidity and alkalinity of the liquid soap formulation, and issues can arise if the pH of the liquid soap does not match the skin. The pH parameters for liquid soap according to SNI 06-4085-1996 are around 8-11. The results show that all formulas over 28 days exhibited a pH of 9.

c. Density test

The specific gravity parameter for SNI 1996 bath soap is 1.01–1.10 grams per milliliter, and the determination of specific gravity is conducted to ensure that the influence of the ingredients on the formula meets the standards.

Table 4. Result of Density test

Days of	Formulation			
	F0 0%	F1 2%	F2 4%	F3 6%
1	1.04	1.05	1.03	1.03
7	1.01	1.02	1.04	1.04
14	1.05	1.01	1.03	1.03
21	1.03	1.04	1.04	1.02
28	1.06	1.03	1.02	1.03
Average	1.04	1.03	1.03	1.03

All the specific gravity test formulas meet the SNI 06-4085-1996 parameter requirements, which are 1.01-1.10 grams/ml.The influence of water as a solvent in the formula, the amount of soap solvent added, and the physical properties of the materials affect the specific gravity value (Muthmainnah, 2020).

d. Viscosity test

The purpose of viskositas uji is to understand Viskositas is the measurement of the tensile strength of a material that is prepared using a viscometer; the higher the viscosity of a material, the more stable that material will be due to the partikel's sulitization.

Table 5. Viscosity test result

Days of	Viscosity test results (cps)			
	F0 0%	F1 2%	F2 4%	F3 6%
1	1360	600	1200	719
7	1560	920	1340	560
14	1840	1080	1460	620
21	939	700	600	660
28	900	800	960	980
Average	1319.8	820	1112	707.8

According to the data collected on all formulas with a viscosity parameter of 400–4000 cps, a decrease was observed on days 21 and 28; this is due to the hygroscopic nature of glycerin, which can absorb water, resulting in an increase in the amount of water in the preparation.

e. Fatty Acid Test

Free fatty acids are present in liquid soap because they are not bound as sodium compounds or triglyceride compounds; this occurs because they do not undergo saponification or soap-making reactions caused by a base, namely NaOH or KOH.The requirement for free fatty acids according to SNI 06-4085-1996 is a

minimum of 15%.

Table 6. Result of Fatty Acid Test

Days of-	Fatty Acid Test			
	F0 0%	F1 2%	F2 4%	F3 6%
1	1,64	1,43	1,23	1,23
7	1,02	1,02	1,23	1,02
14	2,05	1,05	1,02	1,02
21	1,23	1,02	1,02	1,02
28	1,02	1,02	1,02	1,23
Average	1.392	1.108	1.104	1.104

The SNI 06-4085-1996 parameter requirement of at least 15% is not reached by the average findings of the fatty acid test on liquid soap. Because the hydrolysis process takes a long time and can be sped up by heating, the fatty acid content will either grow or decrease, resulting in color and odor changes. Low acid concentration will alter the liquid soap's viscosity, while high levels of free fatty acids might result in offensive smells and skin irritation. Since fats are harder to dissolve in water, soaps with lower fat contents will dissolve more readily because they absorb water more readily.

f. Hedonic test

The hedonic test evaluates which liquid soap formulation is most liked by participants with parameters of 4 for very liked, 3 for liked, 2 for less liked, and 1 for color, viscosity, and aroma.

Table 7. Result of Hedonic Test

Days of	Hedonic test			
	F0 0%	F1 2%	F2 4%	F3 6%
1	4	4	3	4
7	4	4	4	3
14	3	4	3	3
21	4	4	3	4
28	3	3	4	4
Average	4,5	4,75	4,25	4,5

Due to the F1 2% formula's favorable physical characteristics and high panelist preference, the hedonic test, which was based on the average preference test of respondents on days 1, 7, 14, 21, and 28, revealed the greatest preference for it with an average score of 4.75. But one physical characteristic that the panelists didn't like as much was the formula's color, which was too black due to the high extract content. According to earlier studies, formula F2 is more favored because of its unique color and scent, which supports the hedonic data results.

g. Statistical Test

Statistical tests are conducted to determine and ensure that the collected data is normally and homogeneously distributed. This is done using OneWay Anova for pH and specific gravity tests; Kruskal Wallis is used for viscosity and fatty acid

tests.

Table 8. Result of Statistical Test

Parameters	Methods	Sig.
pH Test	*Anova*	0.982
Density Test	*Anova*	0.879
Viscosity Test	*Kruskal Wallis*	0.447
Fatty Acid Test	*Kruskal Wallis*	0.094

Description: Sig value >0.05

CONCLUSION

Phytochemical screening of palm oil leaves reveals the presence of alkaloid, flavonoid, tannin, and saponification chemicals. For formulas F1 2%, F2 4%, and F3 6%, the stability tests conducted on days 1, 7, 14, 21, and 28 revealed inadequate stability. The findings of one of the free fatty acid tests for liquid soap showed less than 15%, but the Indonesian National Standard (SNI) for liquid soap stipulates a minimum requirement of 15%, even if the organoleptic tests, pH, specific gravity, and viscosity all fulfilled the requirements. For future research, the researchers recommend performing a more thorough fatty acid test and first evaluating the extract content in relation to the liquid soap formula's stability.

ACKNOWLEDGEMENTS

Thank you to the STIKes Darul Azhar Batulicin Laboratory and all the people who have helped the researchers with their research.

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