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Evaluation Of Physical Properties Of Liquid Soap Preparations From Virgin Coconut Oil (VCO) And Coconut Oil (CO)

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ABSTRACT

Soap is a compound of sodium or potassium and fatty acids from animal oils and vegetable fats which is obtained by the oil hydrolysis process which is then followed by a saponification process under alkaline conditions. Making liquid soap products uses the oil phase, namely virgin coconut oil (VCO) and coconut oil (CO).used as raw material for making surfactants. Surfactants are able to reduce surface tension and interfacial tension by producing foam. The characteristic that influences the quality of liquid soap foam is the fatty acid content. The fatty acid content can affect the physical properties of liquid soap products. The different types of coconut oil used cause the fatty acids contained to be different.Physical properties testing is carried out to find outWhich liquid soap formulation from (VCO) and (CO) formula has the best physical properties.The procedure for making this liquid soap uses the Hot Process method. This method is used because it adapts to the heat- resistant characteristics of coconut oil. The results of the research showed that liquid soap preparations from (VCO) and (CO) were evaluated for their physical properties in terms of organoleptic and stability parameters such as foam height test, pH test, homogeneity test, viscosity test and specific gravity test, which obtained a significant value of <0.05. meaning they both have good physical characteristics. As well as respondents' acceptance of the physical properties of liquid soap preparations from (VCO) and (CO) where the results show that respondents have the same satisfaction regarding the quality of liquid soap.

Keywords : Coconut Oil, Liquid Soap, Physical Properties of Liquid Soap, Virgin Coconut oil

INTRODUCTION

Soap is a compound of sodium or potassium and fatty acids from animal oils and vegetable fats which is obtained by the oil hydrolysis process which is then followed by a saponification process under alkaline conditions. Saponification is a saponification process that reacts a fat or glyceride with a base. The base conditions commonly used are sodium hydroxide (NaOH) and potassium hydroxide (KOH). If the base used is NaOH then the product is hard (solid) soap, while the base used is KOH then the reaction product is liquid soap(Bidilah et al., 2017).

The saponification reaction is a reaction that initially runs slowly because the oil and alkali solution are solutions that are not mutually soluble (immiscible). After soap is formed, the reaction speed will increase, so that the saponification reaction is an autocatalytic reaction, where in the end the reaction speed will decrease again because the amount of oil has decreased. The characteristic of soap that stands out is its low surface tension so it can wet better than water(Bidilah et al., 2017). The combination of the emulsifying power and surface action of the soap solution makes it possible to remove dirt, grease and oil particles from the surface being cleaned and emulsify them so that the dirt is washed away with water.(Febrina and Sirlyana, 2019). Based on its shape, soap is divided into two types, namely solid soap and liquid soap(Widyasanti et al., 2017). Soap can be used to treat skin diseases such as those caused by bacteria and fungi, which means soap can be used as medicine because it can cleanse the body of bacteria and fungi, so it is likely that the risk of developing skin diseases will be reduced. All types of soap require the same basic ingredients, namely oil or triglycerides. Soap is a type of surfactant made from natural oils or fats. Surfactant has a bipolar structure, the head is hydrophilic and the tail is hydrophobic. Because of this property, soap is able to remove dirt (usually fat) from the body(Sukeksi et al., 2017).

Liquid soap is a liquid preparation intended for cleaning the skin, made from soap base ingredients with added surfactants, preservatives, foam stabilizers, fragrances and dyes which are permitted and can be used for bathing without causing irritation to the skin.(Irmayanti et al., 2014). Liquid soap has an attractive shape and is more practical than soap in solid form. The advantages of liquid soap are that it is practical, dissolves easily in water, foams easily using a cloth sponge, is more hygienic or can avoid germs and contains more moisturizer for the skin, easier and more efficient to use. Meanwhile, the weakness of liquid soap is that it is wasteful to use and not economical(Kii and Hadiwibowo, 2018).

Making liquid soap products using the oil phase, namely pure coconut oil or commonly called (VCO) and (CO)used as a raw material for making surfactants in liquid soap preparations. The characteristic of VCO and CO that influences the physical properties of liquid soap preparations is the content of saturated fatty acids, namely lauric fatty acid. Lauric fatty acid is a saturated fatty acid which is capable of providing excellent foaming properties, hardening or solidifying soap and lauric acid has natural antimicrobial properties (antiviral, antibacterial and antifungal). Lauric acid in pure coconut oil is 49.48%(Sukandar et al., 2009). Meanwhile, in ordinary coconut oil there is around 46% lauric acid.(Wibawa, 2016). Lauric acid is very necessary in soap making because it can provide excellent and gentle foaming properties for soap products. From its saturated fatty acid content, VCO can be used as raw material for cosmetics such as lotions, lip balm, hair conditioner and bath soap. The small molecular structure of VCO makes it easier for skin and hair to absorb. VCO, which is routinely used orally and topically, will help keep skin youthful, one way by helping remove dead skin cells.(Widyasanti et al., 2017).

Based on the background above, researchers are interested in developing research into the formulation of liquid soap products using different types of coconut oil. Then an evaluation test is carried out which includes a test of the physical properties of the liquid soap preparation, namely organoleptic test, foam height stability test, pH test, homogeneity test, viscosity test and specific gravity test.The aim of this research is to determine the physical properties of liquid soap preparations from (VCO), determine the physical properties ofliquid soap preparations from (CO), find out in the formulation of liquid soap preparations from (VCO) and (CO) which formula has the best physical properties. and knowing the response of consumer acceptance to the physical properties of liquid soap preparations from (VCO) and (CO).

METHODS

This research is experimental research because it compares the physical properties of the research results with different formulas, namely coconut oil. The samples used in this research were 4 liquid soap products, each product was replicated three times in each test of two formulas. Data analysis of liquid soap preparations was obtained from measuring the physical properties of liquid soap preparations. Data resulting from research on the physical properties of soap products will be grouped according to evaluation based on the appropriate soap product requirements. Then proceed with computerized one way ANOVA analysis of variance using the SPSS application. The purpose of analyzing this data is to see where there are significant differences in the physical properties of liquid soap preparation formulas that use (VCO) and (CO).

This research instrument is all the tools and materials used in observing the physical properties of liquid soap products. The tools and materials used in conducting this research are as follows:

1. Tool
   Beaker glass, measuring cup, pan, measuring pipette, scales, thermometer, mask, gloves, stirring rod/spatula, liquid soap container, spatula, hot plate, caliper and pH meter, pignometer, pH paper.
2. Material
   The materials used in this research were virgin coconut oil (VCO), coconiut oil (CO), potassium hydroxide (KOH) 30%, glycerin, propylene glycol, distilled water, coco-diethanolamide, citric acid and ethanol 96%.
3. Vco And Co Liquid Soap Formula

Table 1. VCO and CO liquid soap formulas

Material	**FI**	**FII**	**Negative Control**
	Amount (g)	**Amount (g)**	**Amount (g)**
VCO and CO	80	80	-
Potassium hydroxide 30%	52.5	52.5	52.5
Propylene glycol	24.01	24.01	24.01
Ethanol 96%	20.01	20.01	20.01
Citric acid	3	3	3
Glycerin	20.06	20.06	20.06
Coco-DEA	11.32	11.32	11.32
Aquadest	150.01	150.01	150.01
Pragrance oil	0.5	0.5	0.5
Dye	0.05	0.05	0.05

RESULTS AND DISCUSSION

The organoleptic test results on liquid soap preparations are as follows:

Table. 2 Organoleptic Test Results

Parameter	VCO Soap	CO Soap	Positive Control	Negative Control
Texture	Liquid	Liquid	Liquid	Liquid
Smell	Typical rose	Typical rose	Typical	Typical rose
Color	Purple	Purple	yellow ish white	Purple

Based on the results of organoleptic tests, the manufactured liquid soap products produced are the same in each formula, including color, smell and shape. However, the preparation of liquid soap products from (VCO) and (CO) during the curing process which lasted for two weeks showed that each liquid soap product formula made had a color that tended to change. This is caused by the presence of glycerin which functions in forming a transparent structure. This is in accordance with previous research conducted byFachmi (2008).

Table 3. Ph test results

Replication	PH				Standard
	FI VCO	FII CO	Positive Control	Negative Control	
1	10.19	10.5	8.84	13.34	
2	10.19	10.5	8.81	13.38	8-11
3	10.19	10.5	8.85	13.43	Dewi et., al
Average	10.19	10.5	8.83	13.38	2021

Based on table 3, it shows that the pH test results for FI and FII liquid soap have a pH value of 10.19 and pH 10.5. so that FI and FII can be compared with the positive control formula with a pH value of 8.84 which is smaller. This shows that the liquid soap preparations FI, FII and the positive control meet the pH requirements, namely 8-11 (Dewi et., al 2021). Meanwhile, FI and FII are compared with the negative control with a greater pH, namely 13.34, so it can be concluded that the negative control does not in accordance with the requirements because it exceeds the standard value, namely pH 8-11 (Dewi et.,al 2021).

Based on these results it can be concluded that FI,FII and Positive control are eligible. Meanwhile, the negative control did not meet the requirements.

Table 4. Foam Height Test Results

Replication	Foam height (cm)				Standard
	FI VCO	FII CO	Positive Control	Negative Control	
1	13	1	14.4	8.2	
2	13.2	3	14.9	8.4	
3	13	1	14.7	8.6	
		3			
		1			
		3			1.3-22cm
Average	13.06	1 3	14.46	8.4	Dewi et., al 2021

Based on Table 4, the foam height test results show that the average value of foam height in FI is 13.06 cm. FII is 13 cm. The positive control formula is 14.46 cm and the negative control formula is 8.4 cm. These results show that FI, FII, positive control and negative control meet the standard, namely 1.3- 22 cm Dewi et., al 2021.

The results of the One Way ANOVA analysis showed a significant value of 0.000 and a value of 0.000 α (0.05) so it is known that the significance value is <αthen the hypothesis is accepted, meaning that there is a significant difference in the foam height of each formula.

Table 5. Specific Gravity Test Results

Replication	Specific gravity (g/ml)				Standard
	FI VCO	FII CO	Positive Control	Negative Control	
1	1.0676	1.0752	1.0912	0.9172	
2	1.0676	1.0756	1.0832	0.7904	1,010-1,100 g/ml (Murti., ddk, 2017)
3	1.0718	1.0756	1.0888	0.6592	
Average	1.0689	1.0754	1.0877	0.7889	

Based on the results of the specific gravity test in table 5, the average specific gravity value for FI is 1.0689 g/ml, FII is 1.0754 g/ml, positive control is 1.0877 g/ml and negative control is 0.7889 g/ml. From these results, FI, FII and the positive control met the standard, namely 1.01-1.1 g/ml, while the negative control formula did not meet the standard because the specific gravity was less than 1.01g/ml.

The results of the One Way ANOVA analysis showed a significant value of 0.000 and a value of 0.000α(0.05) so it is known that the significance value is <αthen the hypothesis is accepted, meaning that there is a significant difference in the specific weight of each formula.

Table 6. Viscosity Test Results

Replication	Viscosity (centipoise)				Standard
	FI VCO	FII CO	Positive Control	Negative Control	
1	70.6	69.0	83.3	53.8	60-90 centipoise s (Dewi et al., 2021 Apgar, 2010)
2	70.6	70.1	85.2	52.6	
3	70.5	69.0	84.2	50.2	
Average	70.56	69.36	84.23	52.2	

Based on the average viscosity test results in table 6 FI with an average viscosity result of 70.56 centipoise FII with an average viscosity result of 69.36 centipoise and a positive control formula with an average viscosity result of 84.23 centipoise according to with a standard of between 60 – 90 centipoise (Dewi et al., 2021). Meanwhile, the negative control formula did not meet the standard because the average viscosity was less than the standard, namely 52.2 centipoise.

CONCLUSION

A. Organoleptic Test

TestorganolepticThe aim is to determine the shape, color and odor of liquid soap preparations. The results of the organoleptic test show that organoleptically the manufactured liquid soap products are the same in each formula including color, smell and shape. However, the preparation of liquid soap products from (VCO) and (CO) during the curing process which lasted for two weeks showed that each liquid soap product formula made had a color that tended to change. This is caused by the presence of glycerin which functions in forming a transparent structure. This is in accordance with previous research conducted byFachmi (2008).

B. Ph Test

The high or low Ph value is influenced by the amount of alkali in the soap. The more alkali in the soap, the higher the pH value of the soap. The large amount of alkali in soap is due to the presence of alkali which does not react with fatty acids in the saponification process. The high Ph value results from the hydrolysis reaction in the saponification process.

C. Foam Height Test

The foam height test results obtained were compared with the positive control and negative control because there are no Indonesian National Standard (SNI) requirements that determine the range of foam stability values. The characteristics of soap foam are influenced by several factors, namely the presence of surfactants, foam stabilizers and other ingredients that make up liquid soap. Soap products on the market generally contain a surfactant, namely Sodium Lauryl Sulfate (SLS), which functions as a foam enhancer. SLS is often used in soap making, but in large doses it can irritate the skin. The soap making in this study did not use Sodium Lauryl Sulfate (SLS) so it is hoped that it can minimize skin irritation.

D. Specific Gravity Test

Testing Specific gravity is used to determine the specific gravity of the liquid soap preparation that has been made. The test is carried out using a pycnometer, by means ofweighpycnometer clean and dry. Then weigh the pycnometer containing distilled water. The pycnometer is cleaned, then dried again, then filled with liquid bath soap, then weighed and calculated the specific gravity.

AfterObtain data on specific gravity results, then the data is analyzed using statisticsoneway ANOVA with a confidence level of 95%, the results of which can be seen in the table with the test criteria. If F count > F table / significance value <□(0.05) then the hypothesis is accepted otherwise if F count > F table / significance value >□(0.05) then the hypothesis is rejected.

The specific gravity test was carried out to determine the effect of the ingredients used in liquid soap formulation on the specific gravity of the soap produced. The specific gravity value is influenced by the constituent materials and their physical properties. The decrease in specific gravity is caused by the presence of fat or ethanol in the solution.

E. Viscosity Test

After obtaining the specific weight data, the data was analyzed statistically using one way ANOVA with a confidence level of 95%, the results of which can be seen in the table with the test criteria. If calculated F > F table / significance value <□(0.05) then the hypothesis is accepted otherwise if F count > F table / significance value >□(0.05) then the hypothesis is rejected.

Based on the table in Appendix This shows that viscosity is directly proportional to specific gravity, the higher the specific gravity, the higher the viscosity.

F. Respondent Satisfaction

Measuring the level of user satisfaction was carried out by distributing questionnaires to see consumer acceptance of the physical properties of liquid soap preparations from (VCO) and (CO). Determination of the number of respondents was obtained from sampling 20% for a small population. The population used in this research were students of the Strada Indonesia Institute of Health Sciences Kediri and the sample used was 30 respondents.

After obtaining data on respondent satisfaction results, the data was analyzed using one way ANOVA statistics with a confidence level of 95% which can be seen in the table with test criteria. If F count > F table /marksignificance <□(0.05) then the hypothesis is accepted otherwise if F count > F table / significance value >□(0.05) then the hypothesis is rejected.

Based on the results of the One Way ANOVA analysis in Appendix XII, it is known thatmarksignificance (sig) 1,000 >□: 0.05, then the respondents both have the same criteria for liking liquid soap from VCO and CO, both in terms of aroma, shape, sensation of softness, foam and level of viscosity.

LevelRespondents' satisfaction with the foam when used from the VCO formula obtained a liking score with the criteria of really liking with a percentage of 97%, while the criteria for liking with a percentage of 3%. In the CO liquid soap formula, the respondent's preference for liquid soap foam was obtained with the criteria of really liking it with a percentage of 97%, while the criteria for liking it was with a percentage of 3%.

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