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Comparative effect of sunflower seed oil (helianthus annus l.) On the characteristics and quality of liquid soap formulations

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ABSTRACT
Sunflower seed oil contains linoleic acid which can moisturize the skin and has high antioxidant activity so it can inhibit free radicals which damage skin cells. The liquid soap made in this research uses VCO (Pure (Virgin Coconut Oil) which contains high levels of lauric acid as a raw material for making soap because it is able to provide very soft foam for soap products. The aim of this research is to determine the characteristics of liquid soap preparations from oil Sunflower seeds (Helianthus annuus L.) with different concentrations of sunflower seed oil of 5% and 10% as the active substance. Physical quality tests were also carried out including organoleptic tests, homogeneity tests, pH tests, free alkali tests, specific gravity tests, stability, and foam height tests. Based on the results of physical quality tests that have been carried out on the sunflower seed oil liquid soap formulation, it has met the requirements of the organoleptic test, homogeneity test, pH test, specific gravity test, and foam height test. Based on the analysis test results, it shows that there is no there is significant difference in the physical quality tests between formula 1 and formula 2.

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INTRODUCTION

Indonesia is a tropical country with sunshine all year round and air temperatures ranging from 25° – 35°C. Ultraviolet radiation is one of the factors that cause skin aging so that skin moisture and elasticity decrease. The presence of several factors causes pigmentation in skin tissue (BPOM, 2009). UV rays have detrimental effects such as carcinogenicity, immunosuppression, burning reactions, skin aging, and can even form free radicals which can affect the skin's antioxidant defenses (Runger, 2019).

Antioxidants are substances that are able to provide exogenous oxidative stress by capturing free radicals and as endogenous protection (LaiCheong & McGrath, 2017). Secondary metabolites from plants such as polyphenols and carotenoids, especially flavonoids found in plants, are compounds that can inhibit the oxidation of other molecules. The presence of secondary metabolites in these plants causes many herbal plants to be formulated into oral and topical preparations as antioxidants which are made into skin care products. One example of a plant that contains flavonoids is sunflower. The contents of

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sunflower seed oil are tannins, saponins, steroids, triterpenoids, and phenolic compounds. (Al-Snafi, 2018). The secondary metabolites contained in sunflower seed oil have a high antioxidant effect so they can inhibit free radicals that damage skin cells and moisturize the skin (Karamae et al, 2012).

Soap is a sodium or potassium compound with fatty acids from vegetable oils or animal fats which is used as a body cleansing agent, in solid, soft, liquid, and foamy form, with or without other additions, and does not cause irritation to the skin (SNI, 1994). The advantages of liquid soap include that it is easy to travel with and is more hygienic because it is usually stored in a tightly closed container (Putra et al, 2017). The quality requirements for liquid soap according to SNI 1996 must meet the criteria for organoleptic testing, pH testing, free alkali testing, specific gravity testing, and microbial contamination testing. The production of liquid soap based on natural ingredients is still rarely found on the market. Most of the soaps in circulation still use synthetic ingredients as their active ingredients. This synthetic active ingredient has a detrimental effect on the skin because it has the potential to cause irritation in users who have sensitive skin. The most common oil sources used in soap formulations include oil from palm oil, coconut, olive, rice bran, and sunflower seed oil. One of the vegetable oils that is known to have a good saponification effect is virgin coconut oil (VCO). VCO is different from ordinary coconut oil, it does not add chemicals and does not use high heat in the manufacturing process. VCO has non-hydrogenated fatty acids like regular coconut oil and is easily saponified (Saponification) (Meizalin, 2021).

In this research, sunflower seed oil was used as the active ingredient and VCO as the soap base. Sunflower seed oil contains vitamin E and ß-sitosterol as an antidote to free radicals, it also contains good unsaturated fats which are useful for moisturizing the skin. As a liquid soap base, VCO is used because VCO has various advantages such as being easy to obtain and containing more lauric acid than other oils. In this study, researchers differentiated the concentration of sunflower seed oil (Helianthus annuus L.) as an active substance, namely 5%. and 10%.

METHODS

This research was carried out experimentally. This research was conducted to determine whether or not there were significant differences in the results of physical quality tests of liquid soap preparations from sunflower seed oil (Helianthus annuus L.) with differences in active substance concentrations of 5% and 10%.

1. Tool
   The tools used are measuring cups, analytical balance, aluminum foil, magnetic stirrer, magnetic stir bar, porcelain cup, parchment paper, horn spoon, beaker glass, mortar, stamper, spatula, 100 ml bottle, object glass, stirring rod, water bath, pH meter, pycnometer, Erlenmeyer 250 ml, burette.
2. Material

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The ingredients used are sunflower seed oil, VCO, KOH, SLS, stearic acid, glycerin, HPMC, BHT, distilled water, 96% ethanol, phenolphthalein indicator, HCl, Mg powder

Table 1. Sunflower Seed Oil (Helianthus annuus L.) Liquid Soap Formulation

Material Name	Function	Range	F1	F2
Sunflower seed oil	Active ingredients	-	5	10
VCO	Soap base	-	25	25
KOH	Emulsifier	-	6.5	6.5
Stearic acid	Emulsifier	1-20	1	1
SLS	Foam forming	≈10	10	10
Glycerin	Emollient	≤ 30	5	5
HPMC	Thickener	2-10	1	1
BHT	Preservative	0.0075-0.1	0.05	0.05
Oleum Citri	Fragrance	-	qs	qs
Aquadest	Additional substances	-	Ad 100	Ad 100

Identification of Flavonoids in Sunflower Seed Oil (Helianthus annuus L.)

Identification of the presence of flavonoids in sunflower seed oil is carried out using a qualitative test, namely by looking at the color change when Mg and HCl metals are added. If it shows a red-to-orange color, it means that sunflower seed oil contains flavonoids (Lestari et al, 2022)

Procedure for Making Sunflower Seed Oil Liquid Soap (Helianthus annuus L.)

All ingredients used are weighed according to the formula. Assembling a magnetic stirrer tool that will be used to make liquid soap. Put 25 ml of VCO into beaker glass 1, then stir using a magnetic stirrer at a temperature of 50ºC, then add 5 ml of active ingredient for formulation 1 and 10 ml for formulation 2 and add stearic acid and BHT while continuing to stir at 230 rpm for 3 minutes. Next, put HPMC in beaker glass 2 followed by SLS and glycerin, stirred at 30ºC. After that, add KOH and distilled water and stir at 40ºC with a speed of 230 rpm for 5-10 minutes. Enter the water phase in the oil phase while continuing to stir at a temperature of 50ºC with a speed of 230 rpm for 3 minutes until homogeneous and add oleum citri after that wait for the preparation to cool and store.

Physical Quality Evaluation

Organoleptic Test

The observation aims to ensure that there are no coarse particles in the preparation and ensure its homogeneity. This test is carried out by visually observing a sample of liquid soap on an object glass and observing whether there are coarse particles in the preparation (Lestari et al, 2022)

Test pH

The pH test observation aims to determine the acidity level of the sunflower seed oil liquid soap preparation by preparing a digital pH meter and a beaker. The electrode was washed using distilled water, the pH meter was then calibrated 3 times by soaking the

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electrode in buffer solutions 4, 7, and 9 until it showed a pH that was in accordance with the calibration. Then rinse the electrode again using distilled water. Then the sunflower seed oil liquid soap is measured by inserting an electrode into the sample until it is read on the pH meter-monitor screen (Rasyadi et al, 2019)

Free Alkali Test

The free alkali test is carried out by weighing a sample of liquid soap of around 5 g and then placing it in a 250 ml Erlenmeyer. Next, 100 ml of 96% alcohol was added, as well as 3 drops of phenolphthalein indicator solution. Then heat in a bath for 30 minutes until boiling. If the solution is purple, then titrate it with a 0.1 N HCl solution in alcohol until the purple color disappears (Hutauruk, HP 2020).

Specific Gravity Test

The specific gravity test is carried out to determine the comparison of sample weight with the weight of water at the same volume and temperature. This test is carried out by drying and weighing the pycnometer. Then put water into the pycnometer. Then the pycnometer is weighed. Do the same thing by using liquid soap samples instead of water (Hutauruk, HP 2020)

Foam Height Test

A 1g sample of liquid soap was put into a tube containing 10 ml of distilled water and then closed. The tube was shaken for 20 seconds and the height of the foam formed was measured (Hutauruk, HP 2020).

Data analysis

The data analysis method used in this research was carried out by comparing two groups of samples that were not related to each other, and then testing was carried out using the unpaired t-test.

RESULTS AND DISCUSSION

Phytochemical Screening of Sunflower Seed Oil

Phytochemical screening functions to determine bioactive compounds, namely by looking at the color when tested with predetermined indicators. The results of phytochemical screening showed that sunflower seed oil (Helianthus annuus L.) was positive for flavonoids.

Organoleptic Test

Organoleptic testing is carried out by observing the physical form of liquid soap preparations using the five senses. This test aims to determine the shape, color, and odor of sunflower seed oil liquid soap preparations. Formula 1 and Formula 2 have a thick liquid form, white color, and a distinctive orange smell and nothing separates or settles. The organoleptic test results can be seen in the picture below.

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Formula 1	Formula 2

Figure 1. Organoleptic Test Results of Sunflower Seed Oil Liquid Soap (Helianthus annuus L.)

Homogeneity Test

This test is carried out to determine whether the mixture is homogeneous or not and does not contain coarse grains. The results of the homogeneity test for formulations 1 and 2 obtained homogeneous results. Differences in the concentration of active substances do not affect the homogeneity test of liquid soap preparations.

Test pH

The test results in Table 2 show that the liquid soap preparation meets SNI requirements where formulas 1 and 2 have an average pH value of 9.82 and 9.87 respectively, so they are still in the 8-11 range. From the results of the t-test for two unpaired samples, the pH sig value was p = 0.631. The sig value shows a p-value> 0.05, which means that there is no significant difference between formula 1 and formula 2 of sunflower seed oil liquid soap preparations with variations in the concentration of the active substance.

Table 2. pH Test Results for Sunflower Seed Oil Liquid Soap (Helianthus annuus L.)

Formulation	R.I	R II	R III	$\bar{X}$±SD
FI	9.87	9.70	9.88	9.8 ±0.101
FII	9.69	9.95	9.98	9.87 ± 0.159

Free Alkali Test

The test results obtained based on Table 2 show that the liquid soap preparation meets SNI requirements where formulas 1 and 2 have an average free alkali value of 0.051% and 0.053% respectively. From the results of the t-test, two unpaired samples obtained a sig value. free alkali is p = 0.834. The sig value shows a p-value> 0.05, which means that there is no significant difference between formula 1 and formula 2 of sunflower seed oil liquid soap preparations with variations in the concentration of the active substance.

Table 3. Free alkali test resultsSunflower Seed Oil Liquid Soap (Helianthus annuus L.)

Formulation	R.I	R II	R III	$\bar{X}$±SD
FI	0.040	0.064	0.048	0.051±0.012
FII	0.048	0.072	0.040	0.053 ± 0.017

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Specific Gravity Test

The test results showed that the liquid soap preparation met SNI requirements where formulas 1 and 2 had an average specific gravity value of 1.016 and 1.012 respectively in accordance with the SNI specific weight test range for liquid soap, namely 1.01 g/ml-1.1 g /ml. Specific gravity is determined by the components in the preparation. The more components there are in the preparation, the higher the weight fraction so the specific gravity is higher. From the results of the t-test for two unpaired samples, the specific gravity sig value was p = 0.466. The sig value shows a p-value> 0.05, which means that there is no significant difference between formula 1 and formula 2 of sunflower seed oil liquid soap preparations with variations in the concentration of the active substance. Specific gravity test results can be seen in Table 4.

Table 4. Specific gravity test results for Sunflower Seed Oil Liquid Soap (Helianthus annuus L.)

Formulation	R.I	R II	R III	$\bar{X}$±SD
FI	1,014	1,015	1,019	1.016 ± 0.003
FII	1,005	1,021	1,010	1.012 ± 0.008

Foam Height Test

The test results are shown in Table 5, that the liquid soap preparation meets SNI requirements where formulas 1 and 2 have an average foam height value of 50.67 mm and 47.67 mm respectively in accordance with the SNI foam height range for liquid soap, namely 13 -220mm. From the results of the t-test for two unpaired samples, the sig value for foam height was p = 0.525. The sig value shows a p-value> 0.05, which means that there is no significant difference between formula 1 and formula 2 of sunflower seed oil liquid soap preparations with variations in the concentration of active substances.

Table 5. High Foam Test for Liquid Soap Sunflower Seed Oil (Helianthus annuus L.)

Formulation	R.I	R II	R III	$\bar{X}$±SD
FI	48	49	55	50.67 ± 3.79
FII	45	43	55	47.67 ± 6.43

CONCLUSION

Based on the research results, the sunflower seed oil liquid soap preparation is in the form of a white, thick liquid with a distinctive orange odor. The pH value is 9.82 and 9.87, the free alkali content is 0.051% and 0.053%, the specific gravity value is 1.016 and 1.012, and the foam height value is 50.67 mm and 47.67 mm, where all tests meet SNI standards. The results of statistical tests using the unpaired two-sample t-test show that there is no significant difference in physical quality between formulation 1 and formulation 2 of sunflower seed oil liquid soap with variations in the concentration of the active substance of 5% and 10%.

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