Formulation and Activity Test of Liquid Lemongrass Oil Liquid Soap as an Anti-Bacterial Agent (*Staphylococcus aureus)*

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Abstract

Background: Lemongrass essential oil in liquid bath soap preparations as an antibacterial agent can increase the effectiveness of soap in its function as a skin cleanser.
Objective: This study aims to make a citronella dishwashing liquid soap formulation and test its quality, namely homogeneity, organoleptic, pH, foam stability, viscosity. and anti-bacterial activity.
Methodology: This type of research is an experimental study using a completely randomized design (CRD) consisting of one factor and three repetitions. The sample in this study was Lemongrass essential oil resulting from steam distillation in the Staphylococcus Aureus anti-bacterial liquid wash formulation. The measurement parameters were homogeneity, PH, viscosity, organoleptic, foam stability and bacterial inhibition. Data analysis was carried out descriptively, presented in the form of tables and graphs.
Results: The results of the formulation research were F1: 1%, F2: 1.5%, F3: 2%. The organoleptic test results obtained soap with a distinctive lemongrass smell, clear purple in color, in the form of a viscous liquid. Test the homogeneity of all homogeneous formulations. The pH test results are 8.67-9. The height test results and foam stability ranged from 85.38%, - 88.70 %, the viscosity test results ranged from 1,574–51,274. Bacterial inhibition range: 0.03 – 8.70 mm.
Conclusion: The lemongrass liquid soap formula that has been made concludes that the formulation meets SNI standards

Key words: Liquid soap, lemongrass, anti-bacterial

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Introduction:

Soap is a salt of a fatty acid, obtained by a strong alkaline reaction with animal or vegetable fats (Coiffard and Couteau, 2020) Soap, an essential household cleaning agent, is defined as an ionic surfactant that is used with water for washing and cleaning purposes (Azonkpin *et al.*, 2019) Soap is an everyday product that has benefits for personal needs, product variations include opaque soap, liquid soap and transparent soap (Febriani *et al.*, 2020)

The use of solid soap tends to decrease, liquid soap is more in demand by the public, because its use is more convenient, more practical, more economical, not contaminated with bacteria, easy to carry and easy to store (Siegel *et al.*, 2018). Liquid bath soap is a liquid skin cleansing preparation in liquid form made from soap or detergent base ingredients with the addition of other permitted ingredients and used for bathing without causing irritation to the skin(Dewan Standardisasi Nasional Indonesia, 1996).

The skin functions not only to protect the body but serves as a site for excretion of fatty substances, water, ions and sweat. Excretion results mixed with dirt, causing a lot of bacteria in the skin and can cause infection if there is a vulnus on the skin (Legi, Edy and Abdullah, 2021). *Staphylococcus aureus* and *Escherichia coli* are bacteria found on the skin and can be pathogenic (Tranggono Retno Iswari, 2007). The use of antibacterial from natural ingredients is used as an alternative to avoid the side effects caused by triclocarban. The use of natural materials aims to replace synthetic materials, such as dyes, perfumes, bleaches, anti-bacterial, and others (Epstein, 2009).

Indonesia is very rich in natural plant materials. One example of a natural plant with many benefits is the citronella plant. The Lemongrass plant produces essential oil obtained through the steam distillation method which has natural active substances. Lemongrass oil is also widely used in fragrances and personal care products. Due to the antiseptic properties of citronella oil, it is used in soaps, household cleaners and detergents, as mosquito repellants. In addition, Lemongrass oil is added as a food and beverage flavoring. The main components of Lemongrass essential oil are monoterpene hydrocarbons and alcohols such as geraniol (18-20%), citronellal (5-15%), citronellol (6.4-8.4%), limonene (9-11%) and geranyl acetate (2%)(Ranasinghe, Arambewela L., 2018). (Halim, Lesmana and Sitepu, 2021), (Halim and Fitri, 2020)

Phytochemical examination revealed that lemongrass extract contains several constituents such as essential oils, saponins, tannins, alkaloids, and flavonoids which indicate that lemongrass has antibacterial activity(Rita, Vinapriliani and Gunawan, 2018)(Retno Atun Khasanah, 2011). Protection of the skin from bacterial infections and preventing skin infections. The use of antibacterial liquid body soap, citronella essential oil, is one way to prevent and control skin diseases.

Methods

This type of research is an experimental study using a completely randomized design (CRD) consisting of one factor and three repetitions. making soap formulations, organoleptic tests, pH, homogeneity, viscosity, and antibacterial activity.

Materials and Research Tools

The materials used in this study were Lemongrass oil, *Staphylococcus aureus* bacteria, 70% ethanol, distilled water, myristic acid, stearic acid, Texapon N70, Cocomid DEA, KOH, propilon glycol, glycerin, EDTA Na. The tools used in this study were rotary evaporator (IKA), mortar, stamfer, measuring cup (Pyrex®), beaker (Pyrex®), Erlenmeyer (IWAKI®), spatula, stirring rod, analytical balance (KERN), evaporating dish, crucible, parchment, spatula, magnetic stirrer, transparent plastic, test tube (IWAKI®), test tube rack, porcelain crucible. Analytical scales, label paper, Whatman filter paper, sterile bottles, micropipette, micropipette tips, petri dish, sterile cotton buds, hands-coon, tissue, hot plate, Eppendor tube, incubator, loop needle, sterile gauze, sterile cotton, glass preparations, Oswald viscometer, Universal pH.

Research procedure

The work procedures in this study include the following stages:

Preparation and Extraction of Citronella Essential Oil

The method used by Distillation is the steaming strategy, the fabric is put on a empty press plate like a sifter which is found some centimeters over the surface of the water. In guideline, this strategy employments low-pressure steam, compared to the water refining strategy, the distinction lies within the partition of the fixings and water. But the situation of the two is still in one pot. Water is put into the pot up to 1/3 portion. At that point the fabric goes into the pot and is compacted and tightly closed. in bubbling water bubbles into steam. The fundamental oil within the fabric will come with the hot steam through the pipe to the condenser kettle pipe. At that point the oil will swell and can be put away within the tank. The advantage of this strategy is that the approaching steam happens equitably into the fabric arrange and the temperature can be kept up to 100°C. This strategy, when compared to water refining, yields greater/much more oil, with superior quality and shorter time (Anwar, et al, 2016).

Formulation and Procedure for Making Liquid Body Wash

Table 1
Liquid Bodywash Formula Design

Material		Unit	Formula			
			F0	F1	F2	F3
nponent 1	nongrass essential oil	%	0	1	1,5	2
nponent 2	ristic acid	G	3	3	3	3
	aric acid	G	3	3	3	3
	:apon N70	G	40	40	40	40
	:amid DEA	mL	2	2	2	2
nponent 3	H	G	1,2	1,2	1,2	1,2
	uadest	mL	4	4	4	4
nponent 4	uadest	mL	100	100	100	100
	pylene glycol	G	5	5	5	5
	serin	G	10	10	10	10
	TA Na	G	0,2	0,2	0,2	0,2
nponent 5	ric Acid 25%	mL	10	10	10	10

Procedure for making Lemongrass essential oil liquid bath soap:

The procedure for making soap includes the components in the liquid bath soap formula table with the following steps: (1) Component one is weighed and put into a heat-resistant container, then heated at 60 degrees C. (2) Component three is weighed and stirred, 50% The third component is put into the container containing the one component and stirred until it dissolves. (3). KOH is dissolved in 4 mL of aquadest (component two) and added to the mixture at the second point, stir until smooth. (4) The remaining three components are added to the three-point mixture and stir until smooth. (5) The fifth component is added and the pH is measured. (6). Add component four to the pH according to the pH range of bath soap according to SNI. (7) Store in a closed container.

Organoleptic Test

Organoleptic tests were carried out aiming to see how the physical appearance of a preparation which includes shape, color, and smell (Moningka *et al.*, 2020) (Dewan Standardisasi Nasional Indonesia, 1996)

pH test

Checking the pH of Lemongrass liquid soap was carried out using the Universal pH method. Add 1 mL of liquid soap sample to 10 mL of distilled water, then dip the pH paper into the liquid soap for a few moments, then remove and match the color of the indicator. (Noviyanto, Nuriyah and Susilo, 2020)

Foam Height and stability test

The foam height test was carried out by putting 1 gram of soap in a test tube containing 10 ml of distilled water and then shaking it with a vortex for 30 minutes. The foam height formed was measured using a ruler (initial foam height). The foam height is measured again after a few minutes (final foam height).

Foam Stability = 100% - % Foam Loss

% Foam loss = (High initial foam - High final foam)/ (High initial foam) x 100%

(Febriani *et al.*, 2020)

Viscosity Test

The viscosity test was carried out using the Ostwald viscometer method. A sample of 50 ml is put into tube B, then sucked until the liquid passes through section A and passes the "a" line. The liquid is then allowed to flow from the "a" line to the "b" line. The time required for the preparation to flow is calculated using a timer. Furthermore, the viscosity measurement was repeated three times for each sample. The time required for the preparation to scroll was calculated for its viscosity value (Lestari *et*

al., 2020)

Homogeneity

The homogeneity test was carried out by smearing each preparation on a transparent glass slide and then covering it again with a slide. Pressure is placed on top of it, observations are made on each formula preparation. The sample is said to be homogeneous if there is no visible coarse grain (Dimpudus, Yamlean and Yudistira, 2017)

Anti-Bacteria

Antibacterial activity test was carried out by well diffusion method. One of the advantages of choosing the well method is that it is easier to calculate and measure the area of the clear zone formed around the wells, because the bacterial isolates move to the bottom of the NA (Nutrient agar) media.

Antibacterial activity is seen based on the inhibition zone with the category less than 5 mm the weak category, 5 – 10 mm the moderate category, 11 – 20 mm the strong category, more than 20 mm the very strong category (Noviyanto, Nuriyah and Susilo, 2020)

Data analysis

Primary data is processed using MS. Excel and SPSS. To get the correct information, data processing is carried out according to the stages, namely editing, coding, entry, and cleaning data. Data from the preparation evaluation results, namely the organoleptic test, homogeneity test, PH test, foam height test and viscosity test were analyzed descriptively and presented in tables and graphs.

Result and Discussion

Increasing Creativity Through Learning Medical Surgical Nursing Clinics with Digital Literacy

The study focuses on increasing student creativity through the application of the Learning Medical Surgical Nursing Clinic with Digital Literacy, using product performance data as the research data. Table 12 provides an overview of the results of the students' creativity product performance in both the intervention and control groups.

Organoleptic Test Results

Table 2
Dis-washing Liquid Organoleptic Parameter Test Results

Sample	Organoleptic Parameters		
	Form	Color	Aroma
F0	Liquid	Transparent purple	-
F1	Liquid	Transparent purple	Typical
F2	Liquid	Transparent purple	Typical
F3	Liquid	Transparent purple	Typical

Based on table 2 the results of the evaluation of the organoleptic test are by visually observing liquid soap including shape, color, and aroma. Organoleptic observations resulted in a liquid soap preparation in the form of a viscous liquid, transparent purple, with a distinctive aroma from citronella liquid soap formulations. The results of the evaluation of the Organoleptic Test met the Indonesian National Standard, namely a homogeneous liquid texture, a transparent purple color and a distinctive aroma of citronella(Dewan Standardisasi Nasional Indonesia, 1996)

Homogeneity

Table 3
Sample Homogeneity Test

Sample	Homogeneity

F0	Homogeneous
F1	Homogenous
F2	Homogenous
F3	Homogenous

Based on Table 3, The homogeneity test aims to find out that all substances are evenly distributed in the sample preparation. The results of the homogeneity test showed that the formulations F0 – F4 liquid bath soap Lemongrass essential oil showed homogeneous results. This liquid soap preparation complies with the Indonesian national standard, namely the liquid is homogeneous.

pH test

Table 4
Sample pH test results

Sample	pH
F0	9.00
F1	8.67
F2	8.67
F3	8.67

Based on Table 4, the evaluation results to determine the stability of the physical quality that qualifies as a liquid soap preparation is the pH value. The pH test is a requirement for the quality of liquid soap, this is because the liquid soap comes in direct contact with the skin and can cause problems if the pH does not comply with Indonesian national standards. The results of sample examination obtained a pH value: 8.67 – 9 meeting SNI standards (pH: 8 – 11)(Dewan Standardisasi Nasional Indonesia, 1996) .

Foam Stability Test

Table 5
Foam Stability Test Results

Sample	Foam Stability
F0	88.70 %
F1	88.33%
F2	85.38 %
F3	86.67 %

Based on Table 5, Foam formation is not necessary and has little effect on the cleaning process, but is more likely to result in patient acceptance of the product (Dewi and Mardhiyani, 2021). Foam height and stability tests are used to determine foam-producing power and its stability in liquid soap. Foam can also help clean and distribute a fragrant smell to the skin. The high requirements for liquid soap foam are 13-220 mm and good foam stability is above 70% (Lailiyah and Rahayu, 2019).

Lemongrass essential oil liquid soap has respective foam stability with a percentage of 78.4 – 83.12% which is calculated from the difference in the height of the initial and final foam for 5 minutes. All of the pH stability soap formulations meet the requirements

Viscosity testing

Table 6
Foam Viscosity Test Results

Sample	Viscosity
F0	1.574
F1	6.391
F2	23.956
F3	51.274

Based on Table 6, the viscosity test aims to determine the resistance value of the liquid to flow, the less water content in the soap, the higher the viscosity value (Rosmainar, 2021). The results showed that the viscosity values F0 - F4 (1.554 - 54.305) showed that the higher the value, the higher the viscosity value. The research results obtained that the viscosity level is still within the specified standard(Wiyono *et al.*, 2020)

Anti-Bacteria

Table 7
Anti-Bacterial Test Results

Sample	Obstacles-zone (mm)
F0	0.03
F1	6.33
F2	7.60
F3	8.53

Based on Table 7, the results of the antibacterial test of Lemongrass essential oil liquid bath soap showed the effectiveness of *Staphylococcus aureus* bacteria. The inhibition zone obtained in all treatments F1–F3 (6.27mm–8.60 mm). The criteria for the strength of anti-bacterial power are categorized based on the inhibition zone: the inhibition zone <5 mm is weak, the inhibition zone is 5-10 mm, the category is moderate, the inhibition zone is 10-20 mm, the category is strong, and the inhibition zone is 20 mm or more, the category is very strong. (Dimpudus, Yamlean and Yudistira, 2017).

The test results on all samples F1 - F4 obtained the activity of the bacteria in the medium category. While the F0 sample has a low level of inhibition of 0.03 mm. The greater the concentration of Lemongrass essential oil in liquid soap, the greater the inhibition of bacterial growth. Increasing the concentration of lime essential oil has an effect on the inhibition zone produced by *Staphylococcus aureus* (APRIYANI, 2013)

Conclusion

Lemongrass liquid soap formulation has anti-bacterial activity and the use of Lemongrass liquid soap formulation can be used as an alternative to the community for community needs.

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