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Antibacterial activity test of liquid soap with the addition of ylang ylang flower essential oil (cananga odorata) against the growth of escherichia coli and staphylococcus aureus bacteria

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ABSTRACT

Liquid soap with the addition of Ylang ylang flower (Cananga odorata) flower essential oil offers the potential to be an effective antibacterial product. This research aims to evaluate the quality of liquid soap formulated with Ylang ylang flower essential oil and conduct trials on its effectiveness regarding Escherichia coli and Staphylococcus aureus. This research applies quantitative experimental methods, which were chosen because the research was carried out in a laboratory setting with an experimental approach. This method aims to assess the suitability of the products tested by researchers. Next, the results of observations regarding the inhibition zone will be analyzed using a table to evaluate the effectiveness of the product. The research results showed that all liquid soap formulations met SNI standards in terms of organoleptics, pH, homogeneity, viscosity and foam height. The activity of Ylang ylang flower essential oil concentrations of 5% and 10% has antibacterial activity in the medium category, while at a concentration of 15% it shows strong antibacterial activity with the highest inhibition zone diameter, namely 11.9 mm against Escherichia coli and 12.7 mm against Staphylococcus aureus. Thus, liquid soap containing Ylang ylang flower essential oil has been proven to be effective in increasing antibacterial activity, especially at a concentration of 15%, and meets all quality standards in accordance with SNI.

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INTRODUCTION

Plants in Indonesia have abundant diversity and richness, which are increasingly being used as medicinal ingredients(Baderan et al., 2021)(Adriadi et al., 2022). The development of medicinal plants continues to be carried out as part of innovation efforts in the pharmaceutical field. One type of plant that is famous for its essential oil content is the kenanga flower or commonly called (Cananga odorata (L.) Hook.F. & Thoms), which has antimicrobial properties(Agus & Maimunah, 2023).

Cananga is a type of tree or shrub known for its flowers which are used to produce essential oils. Worldwide, there are several species of cananga, including Cananga odorata, Cananga latifolia, Cananga scortechinii King, and Cananga brandisanum Safford. In Indonesia, the dominant species is Cananga odorata. Cananga has two main forms Cananga odorata forma macrophylla, often referred to as common cananga, and Cananga odorata forma genuina, or Philippine cananga. This plant belongs to the Anonaceae family and is able to reproduce well in various regions of the Indonesian region with an altitude range of 1,200 meters above sea level(Istikana et al., 2019)(Noviyanti, 2021)(Aifa, 2024). The flowers are star-shaped and when they are young they have green leaves and when they are ripe they will turn yellow, and have a fragrant aroma. These flowers can grow singly or in clusters on a stalk. To produce essential oil, the yellowed flowers are selected and distilled. In the kenanga plant, the flower part is used for essential oil extraction(Pujiarti et al., 2015). Essential oil is defined as oil that has a distinctive aroma, especially ylang-ylang oil, has various benefits such as treating skin diseases, asthma, as well as being a mosquito repellent, antimicrobial, and antioxidant(Andarwulan, 2021). This oil contains various chemical compounds that are tested using the Gas Chromatography and Mass Spectrometry (GC-MS) method which is usually applied(Anggia et al., 2014)(Habibah, 2024). Essential oils are now increasingly popular because they are considered safe, have various benefits, and are widely accepted by the public(Slamet, 2021)(Amilia et al., 2024). The effectiveness and benefits of essential oils depend greatly on the chemical components contained in them. Ylang-ylang oil, which is one type of essential oil produced in Indonesia, contains various complex chemical compounds and offers various valuable natural benefits(Prastiwi, 2018)(AN, 2022). Ylang-ylang oil is also known for its ability as an antioxidant, thanks to its benzyl benzoate content. This compound functions effectively in fighting free radicals, providing additional protection against cell damage and the aging process(Pala, 2021). Essential oils obtained from ylang-ylang flowers are known for their antibacterial properties, especially thanks to the presence of an active compound called caryophyllene. Caryophyllene, which is a type of sesquiterpene, is known to have anti-inflammatory and antibacterial properties, thus providing additional benefits in fighting infection and inflammation(Aisyah et al., 2016).

Antibacterial Substances that function to stop or inhibit the growth of bacteria work by disrupting the metabolic processes that are detrimental(Tilarso et al., 2021)(Pelu & Djarami, 2022)(Guli et al., 2024). Some essential oils, including ylang-ylang oil, have the ability to effectively suppress bacterial growth. To prevent skin infections, antibacterial soap can be a solution, but it often contains triclocarban, a chemical that the FDA says can cause resistance if used continuously. Therefore, the use of natural antibacterial alternatives such as oil from ylang-ylang flowers (Cananga odorata) is considered safer. Essential oil from ylang-ylang flowers has been shown to be effective against bacteria such as Escherichia coli and Staphylococcus aureus(Gamas et al., 2023).

Escherichia coli and Staphylococcus aureus are bacteria that are often found in the human body and can cause various infections. Food contamination by unclean hands can spread pathogenic bacteria and trigger diseases(Hutasoit, 2020)(Nasution, 2020)(Fatimah et al., 2022). Infections caused by Staphylococcus aureus include boils, impetigo, and pneumonia, while Escherichia coli can cause urinary tract infections, sinusitis, and gastroenteritis. This study used concentrations of ylang-ylang essential oil of 5%, 10%, and 15%, as well as negative controls (DMSO 10%) and positive controls (Dettol 9%) to measure their effectiveness against both bacteria by the disc diffusion method. The diameter of the inhibition zone was measured and compared to assess the antibacterial potential of the essential oil. To prevent infection, washing hands with antibacterial soap is a crucial component of a clean and healthy lifestyle, in accordance with the provisions of the SNI 06-4085-1996 standard concerning liquid soap(Semadhi et al., 2022).

This study focuses on the essential oil of ylang-ylang flower (Cananga odorata) and antibacterial liquid soap containing the oil. The first objective of this study was to evaluate the extent to which ylang-ylang essential oil can inhibit the growth of Escherichia coli bacteria. In addition, this study also aims to measure the effectiveness of essential oils against Staphylococcus aureus bacteria. In addition, this study will explore the ability of antibacterial liquid soap enriched with ylang-ylang essential oil in controlling the growth of both types of bacteria. Thus, this study will provide insight into the potential use of ylang-ylang essential oil in cleaning and antibacterial products.

Soap that is effective in killing bacteria is soap that contains antibacterial liquid soap agents that function to reduce the number of harmful bacteria on the skin without damaging the skin layer. This is an effective choice to prevent the development of bacteria such as Escherichia coli and Staphylococcus aureus. Based on this explanation, researchers are interested in exploring the title. "Antibacterial Activity Test of Liquid Soap with the Addition of Cananga Flower Essential Oil (Cananga odorata) Against the Growth of Escherichia coli and Staphylococcus aureus Bacteria".

RESEARCH METHOD

Materials and Equipment

In this study, the materials used include Escherichia coli and Staphylococcus aureus bacteria, as well as Nutrient Agar (NA) and Mueller Hinton Agar (MHA) media.), CMC, stearic acid, distilled water. aluminum foil, olive oil, essential oil of ylang-ylang flowers (Cananga odorata), pH meter, spirits, propylene glycol, DMSO, Dettol, NaCl, 96% ethanol, plastic wrap, Mac Farland solution, anhydrous sodium sulfate, cotton swab, disc paper, Phenoxyethanol. In this study, the equipment used includes beaker glass, laminar air flow, oven, micropipette, incubator, autoclave, analytical balance, tube clamp, test tube, test tube rack, spatula, stirrer, petri dish, loop needle, scissors, dropper pipette, bunsen, measuring cup, tweezers, microscope, glass object, cover glass, Erlenmeyer flask, gauze wire, pycnometer, hot plate, distillation apparatus, vernier caliper, syringe.

Identification of Cananga Flower Plants (Cananga odorata)

Plant identification aims to determine the name and place of the plant in the classification system. This process begins with the observation of morphological characteristics In various parts of the plant such as roots, stems, leaves, and so on, determining the name or classification for unknown plants must follow the guidelines listed in KITT (International Code of Plant Nomenclature). The identification process can be assisted by botanists, specimens, herbarium collections, flora books, or identification keys(Qomah et al., 2017).

Making Essential Oil

The process of making ylang-ylang essential oil begins by putting fresh ylang-ylang flowers that have been cut into small pieces and weighed as much as 5 kg into a distillation flask. Then, add water until it reaches about two-thirds of the volume of the flask to soak the ingredients. Cover the mouth of the distillation tube with Vaseline to prevent evaporation and carry out steam distillation at a temperature of about 100°C for 4 hours. After the distillation is complete, separate the essential oil from the water and add anhydrous sodium sulfate to remove any remaining water in the essential oil.

Organoleptic Observation

Organoleptic testing involves visual assessment of the color, aroma, and shape of the ylang-ylang essential oil. The color of the essential oil is light yellow, has the aroma of ylang-ylang flowers and has a gel texture.

Determination of Essential Oil Mass

The density of essential oil is measured by heating the oil at a temperature of 25°C. The empty pycnometer is weighed and recorded, then the pycnometer containing water and essential oil is weighed. The density of essential oil is calculated using the formula:

$$\text{Massa jenis } (\rho) = \frac{M2-M1}{V} \quad (1)$$

where:
- M2 = Mass of pycnometer + essential oil
- V = Volume of essential oil
- M1 = Mass of empty pycnometer

GC-MS (Gas Chromatography-Mass Spectrometry) Test

Essential oils are analyzed using GC-MS to determine the components and mixtures of compounds. Essential oils are injected into a column at a temperature of 280°C with helium gas. Then, the essential oils move through a 30-meter thermo TG-5MS capillary column at a temperature of 330°C. Separation of compound components occurs in the column, and the mass spectrometry detector records the results in a chromatogram. The chromatogram produces data on the detected molecules, which are then analyzed to determine the ratio of each analyte.

Determination of Ethanol Solubility

The solubility of 96% ethanol used as much as 1 ml of ylang-ylang essential oil was put into a beaker glass then 96% ethanol was added drop by drop, then homogenized on a hot plate at a temperature of 200C until it dissolved and became clear. This aims to ensure that the essential oil obtained is pure and does not mix with distilled water.

Sterilization of Tools and Materials

Tools and media must be sterilized using an autoclave to kill bacteria. Autoclaves use high temperatures and pressures of around 15 Psi or 121°C for effective sterilization. This method is ideal because it can kill bacteria with hot steam without damaging the tools and materials.

Preparation of Media

Nutrient Agar (NA) and Mueller Hinton Agar (MHA) media were prepared by dissolving 5 grams of media in 100 ml of distilled water. This mixture was heated evenly at 180°C for 30 minutes, then cooled and autoclaved at 121°C for 30 minutes.

Rejuvenation of Escherichia coli and Staphylococcus aureus Bacteria

Bacterial rejuvenation is carried out by streaking the bacterial culture on NA slant medium and incubating at 37°C for 24 hours.

Gram Staining of Escherichia coli and Staphylococcus aureus Bacteria

Gram staining is done to identify bacteria by dripping crystal violet, lugol, 98% alcohol, and safranin on bacterial cells, followed by washing and observation under a microscope.

Preparation of Mac Farland Turbidity Standard 0.5

The preparation of Mac Farland turbidity standard 0.5 is done by mixing 9.95 ml of 1% H2SO4 and 0.05 ml of 1% BaCl2 2H2O in a test tube until homogeneous.

Preparation of Bacterial Suspension for Escherichia coli and Staphylococcus aureus Test

The suspension is made by adding pure bacterial colonies into a test tube containing 10 ml of distilled water. Then the Mac Farland turbidity is compared with the bacterial suspension. This aims to make the standard bacterial suspension with Mac Farland and the bacteria used as standards in the laboratory for planting bacterial inoculations on a product.

Antibacterial Activity Test of Cananga Flower Essential Oil (Cananga odorata)

MHA media was poured into a sterile petri dish and left to solidify. The test bacteria were placed evenly on the media, then disc paper dipped in essential oil solutions with different concentrations and controls were placed on the media. Incubation was carried out at 37°C for 24 hours, then the diameter of the inhibition zone was measured using a ruler.

Making Antibacterial Liquid Soap with the Addition of Cananga Flower Essential Oil (Cananga odorata)

Table 1. Design for making liquid soap with the addition of cananga flower essential oil (cananga odorata) based on SNI 06-4085-1996

No	Material	Utility	F0	F1	F2	F3
1.	Cananga Flower Essential Oil	Active Ingredients	0%	5%	10%	15%
2.	Olive oil	Moisturizer	5%	5%	5%	5%
3.	Sodium Lauryl Sulfate	Surfactant	2,5%	2,5%	2,5%	2,5%
4.	CMC	Thickener	2%	2%	2%	2%
5.	Propylene Glycol	Thickener	0,18%	0,18%	0,18%	0,18%
6.	Stearic Acid	Foam stabilizer	0,25%	0,25%	0,25%	0,25%
7.	Phenoxyethanol	Preservative	0,02%	0,02%	0,02%	0,02%
8.	Aquadest	Solvent	100ml	100ml	100ml	100ml

Making liquid soap is done by mixing the ingredients according to the formula table, including ylang-ylang essential oil at various concentrations and stirring until homogeneous. Antibacterial Liquid Soap Ability Test, the ability test is carried out by attaching a paper disc that has been dipped in a liquid soap solution to the surface of the NA medium that has been inoculated with bacteria, then incubating at 37°C for 24 hours and measuring the diameter of the inhibition zone using a vernier caliper.

Characterization of Liquid Soap Testing

The physical characteristics of antibacterial liquid soap were tested through organoleptic, pH, viscosity, homogeneity, and foam height stability tests. Organoleptic Test. Organoleptic test is done by observing the shape, smell, and color of liquid soap. The essential oil of ylang-ylang flower is light yellow with a distinctive aroma of ylang-ylang flower and a gel texture.

pH Test

The pH of liquid soap is measured by dissolving 10 grams of soap in 100 ml of distilled water using a pH meter. Liquid soap that meets the requirements must have a pH between 8 - 11 according to SNI 06 - 4085 - 1996.

Homogeneity Test

Liquid soap is tested for homogeneity by applying 0.5 grams of soap to a petri dish. The soap must show a homogeneous composition without coarse grains.

Viscosity Test

The viscosity of liquid soap is measured using a Brokfield Spindel 63 viscometer at a speed of 200 RPM. The viscosity of liquid soap must be in the range of 400 - 4000 cPs according to SNI 06 - 4085 - 1996.

Foam Height Stability Test

The foam height is measured by shaking a 10% liquid soap solution 10 times and recording the volume of foam height formed. The desired foam height is between 1.3 – 22 cm.

Observation Results Table

The research results data obtained are presented using an observation results table.

RESULTS AND DISCUSSIONS

Result

Based on the results of the research that has been done, identification of the kenanga flower plant (Cananga odorata) found that the plant used is the type of plant (Cananga odorata). The manufacture of essential oil of the kenanga flower type (Cananga odorata) obtained using steam distillation is as much as 30 ml with 5 kg of kenanga flowers. The results of making essential oil of kenanga flowers (Cananga odorata) are as follows:

Mass of oil = Density x Volume of oil
= 0.99754 gr/ml x 30 ml

Yield = $\frac{29{,}9262 \text{ gr}}{300 \text{ gr}} \times 100\%$
= 0,099754

Table 2. Physical characteristics of ylang ylang flower essential oil (cananga odorata)

No	Parameter	Steam and water distillation results
1.	Color	Light yellow
2.	Shape	Oil
3.	Smell	Typical of ylang-ylang oil

Based on the physical properties of the essential oil of ylang-ylang flowers in table 2, it can be concluded that the essential oil of ylang-ylang flowers from steam and water distillation has good quality because it has met the oil quality standards according to SNI 06-3949-1995, namely by having a light yellow color and having an oil-like shape and producing a distinctive odor of ylang-ylang oil.

The results of the GC-MS (Gas Chromatography-Mass Spectrometry) test obtained 5 compounds with high concentrations, namely 2-Propanol I-Bromo, Benzene (CAS), Acetic Acid Phenylmethyl ester (CAS), Trans-Caryophllene. These compounds are the highest compounds found in the essential oil of ylang-ylang flowers (Cananga odorata). In the Trans-caryophyllene compound, this compound is included in the sesquiterpene group. The number of carbon atoms it has is 15 carbon atoms and this is what makes this compound included in the sesquiterpene group. Sesquiterpene is a terpenoid compound built by 3 isoprene units. This compound has a calming effect. Usually this compound is found in many essential oils(El Syahas, 2018). Gram staining of Escherichia coli and Staphylococcus aureus bacteria

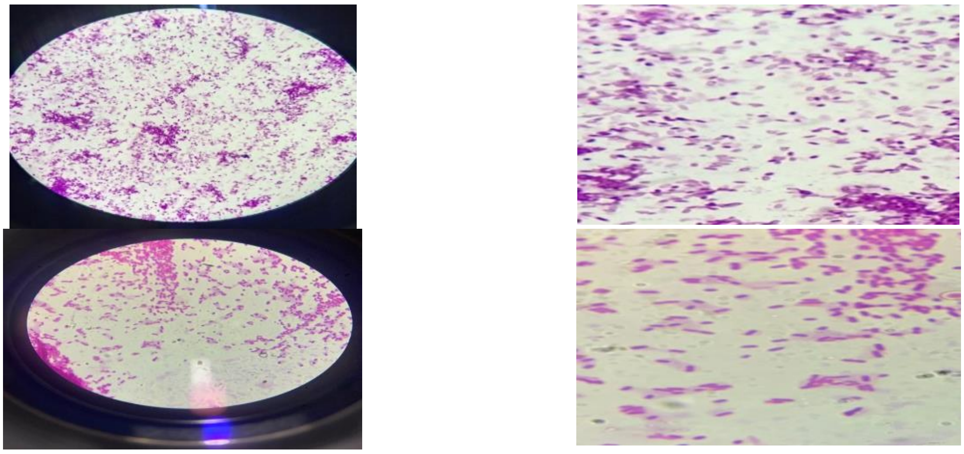

Figure 3. Escherichia coli bacteria

Antibacterial activity test of ylang-ylang essential oil (Cananga odorata) against Escherichia coli and Staphylococcus aureus bacteria

Table 3. Results of the test of the ability of ylang-ylang essential oil (cananga odorata) against escherichia coli and staphylococcus aureus bacteria

No	Preparation	Escherichia coli bacteria	Staphylococcus aureus bacteria	Information
1.	K+ Aquadest	7,28 mm	7,33 mm	Medium
2.	K- DMSO	7,11	7,25 mm	Medium
3.	F1 5%	10,38 mm	7,85 mm	Medium
4.	F2 10%	6,51 mm	9,58 mm	Strong
5.	F3 15%	12,4 mm	11,5 mm	Strong

Description: K+ Aquadest 5% (Escherichia coli and Staphylococcus aureus bacteria)
K- DMSO 10% (Escherichia coli and Staphylococcus aureus bacteria)
- <5 mm Weak - 11 - 19 mm Strong
- 5 - 10 mm Medium - > 20 mm Strong

Based on the test results that have been carried out, the essential oil of kenanga flower (Cananga odorata) can inhibit Escherichia coli and Staphylococcus aureus bacteria with each different concentration. The highest concentration to inhibit Escherichia coli and Staphylococcus aureus bacteria is at a concentration of 15% F3, which is 12.4 mm on Escherichia coli bacteria and 11.5 mm on Staphylococcus aureus bacteria.

Test the activity ability of liquid soap with the addition of essential oil of kenanga flower (Cananga odorata) against Escherichia coli and Staphylococcus aureus bacteria.

Table 4. The results of the ability test of liquid soap with the addition of essential oil of kenanga flower (cananga odorata) against escherichia coli and staphylococcus aureus bacteria.

No	Preparation	Escherichia coli bacteria	Bacteria Staphylococcus aureus	Description
1.	K+ Dettol	7 mm	7,91 mm	Medium
2.	K- Aquadest	6,55 mm	7,11 mm	Medium
3.	F0 0%	0 mm	0 mm	None
4.	F1 5%	6,58 mm	9,50 mm	Medium
5.	F2 10%	8,9 mm	9,7 mm	Medium
6.	F3 15%	11,9 mm	12,7 mm	Strong

Description: K+ Dettol 9% (Escherichia coli and Staphylococcus aureus bacteria)
K- Aquadest 10% (Escherichia coli and Staphylococcus aureus bacteria)
F0 0% No addition of essential oil of kenanga flower (Cananga odorata)
- <5 mm Weak - 11 - 19 mm Strong
- 5 - 10 mm Medium - > 20 mm Strong

Based on the test results that have been carried out, the positive control can inhibit Escherichia coli and Staphylococcus aureus bacteria while being 7.91 mm. In the negative control, the inhibition zone result is 6.55 mm. In F0 there is no strong inhibition where in the inhibition zone there is no clear zone formed. In F1 and F2 there is a clear zone or medium inhibition zone, with a clear zone growing on a Petri dish that has been incubated for 1 x 24 hours. In F3 there is a clear zone or strong inhibition zone, the clear zone formed is wide so that it produces a strong inhibition zone and can be used as an antibacterial liquid soap product with the addition of essential oil of kenanga flowers (Cananga odorata).

Table 5. Organoleptic test results of liquid soap preparations with the addition of cananga flower essential oil (cananga odorata)

No	Preparation	Form	Form	Smell
1.	K+	Liquid soap gel	Pure white	Fragrance of ylang-ylang
2.	K-	Liquid soap gel	Pure white	Fragrance of ylang-ylang
3.	F0	Liquid soap gel	Pure white	Fragrance of olive oil
4.	F1 5%	Liquid soap gel	Pure white	Fragrance of ylang-ylang
5.	F2 10%	Liquid soap gel	Pure white	Fragrance of ylang-ylang
6.	F3 15%	Liquid soap gel	Pure white	Fragrance of ylang-ylang

Description: F0 0% without the addition of Cananga odorata essential oil

Table 6. Results of the homogeneity test of liquid soap preparations with the addition of cananga odorata essential oil

No	Preparation	Texture	Homogeneity
1.	K+	No details	Homogeneous
2.	K-	No details	Homogeneous
3.	F0	No details	Homogeneous
4.	F1 5%	No details	Homogeneous
5.	F2 10%	No details	Homogeneous

No	Preparation	Texture	Homogeneity
6.	F3 15%	No details	Homogeneous

Table 7. Viscosity test results for liquid soap preparations with the addition of ylang ylang flower essential oil (cananga odorata)

No	Preparation	Liquid Soap Viscosity
1.	F0	No details
2.	F1 5%	No details
3.	F2 10%	No details
4.	F3 15%	No details

Table 8. Results of pH tests on liquid soap preparations with the addition of ylang-ylang essential oil (cananga odorata)

No	Preparation	pH	Information
1.	F0	8,4	Base
2.	F1 5%	8,8	Base
3.	F2 10%	8,8	Base
4.	F3 15%	8,8	Base

Note: the pH of SNI 06-4085-1996 liquid soap is 8-11.

Table 9. Foam height test results of liquid soap preparations with the addition of essential oil of kenanga flower (cananga odorata)

No	Preparation	Foam Height	Standard
1.	K+	18 mm	13-220 mm
2.	K-	16 mm	13-220 mm
3.	F0	15 mm	13-220 mm
4.	F1 5%	16 mm	13-220 mm
5.	F2 10%	19 mm	13-220 mm
6.	F3 15%	18 mm	13-220 mm

Discussion

Soap is an ingredient used to wash hands, with the high human activity of most people who want soap that is more practical and easy to carry everywhere. Among the kinds of soap such as liquid soap because it is more practical to carry everywhere and more hygienic than bar soap. Some quality tests have been carried out on the preparations made, including the test of essential oil of kenanga flowers (Cananga odorata) against Escherichia coli and Staphylococcus aureus bacteria, the ability test of liquid soap with the addition of essential oil of kenanga flowers (Cananga odorata) against Escherichia coli and Staphylococcus aureus bacteria, organoleptic test, pH test, homogeneity test, viscosity test, foam height test. Organoleptic testing aims to determine the possibility of physical instability of the soap preparation during the process, both in terms of stability of shape, color and odor. Based on the results of the tests that have been carried out, it shows that the preparation remains stable with a liquid form, yellow in color and a distinctive odor of ylang-ylang essential oil (Cananga odorata). pH testing is one of the requirements for the quality of liquid soap. Because liquid soap comes into direct contact with the skin and can cause problems if the pH does not match the skin's pH. The results of measuring the pH of liquid soap in each formula do not differ much, starting from pH 8 to 11. In general, liquid soap products have a pH that tends to be alkaline. This is due to the basic ingredients of the liquid soap, namely KOH, which is a strong base.

Homogeneity testing is one of the parameters that can state that the ingredients used in making the preparation can mix with each other and form a stable liquid soap preparation. The results of the tests carried out did not change. This is in accordance with the homogeneity requirements, namely that the liquid soap preparation must show a homogeneous composition and be free from particles that are still clumped together and there are no visible coarse grains.

Viscosity testing aims to determine the consistency of the preparation which will later affect the application of the preparation such as easy to pour and not easy to spill or flow from the hands. The results of the liquid soap viscosity test showed that all liquid soap preparation formulas experienced an increase in viscosity values and were within the required range. After the cycling test was carried out, it was found that the viscosity value of the liquid soap preparation changed, each formula decreased. The decrease in viscosity is thought to be caused by an increase in water or soap because viscosity is influenced by the water content in the soap. The less water content in the soap, the higher the viscosity, and vice versa, the more water content in the soap, the lower the viscosity.

Foam height testing was carried out to determine the ability to produce foam when used which functions to reduce surface tension so that it can clean dirt. The measurements carried out showed that the foam height test had a value that tended to change from the four formulas, the same as the results of the foam height measurement of the liquid soap preparation. However, this measurement is in accordance with the required value which means that the foam remains stable.

The antibacterial activity of ylang-ylang essential oil (Cananga odorata) against Escherichia coli and Staphylococcus aureus bacteria was determined using the disc diffusion method. The advantage of this method is that it is easier to measure the inhibition zone formed because the isolate is active not only on the surface of the agar but also to the bottom. The results of the antibacterial activity test showed that the liquid soap preparation with the addition of ylang-ylang essential oil (Cananga odorata) was able to inhibit the growth of Escherichia coli and Staphylococcus aureus bacteria at a concentration of F3 15%. The essential oil of ylang-ylang flower (Cananga odorata) showed antibacterial properties indicated by the formation of a clear zone. The antibacterial activity of the liquid soap preparation with ylang-ylang essential oil (Cananga odorata) was classified from moderate to strong based on the inhibition zone data obtained in this study. According to Davis and Stout, 1971, the diameter of the inhibition zone was categorized by the level of response based on the classification of weak (<5 mm), moderate (5-10 mm), strong (11-19 mm), and very strong (≥20 mm).

CONCLUSION

Based on the results of the study, it can be concluded that the antibacterial liquid soap formulation containing essential oil of kenanga flower (Cananga odorata) fulfils all the requirements set by SNI standards, including organoleptic test, homogeneity, pH, viscosity, and foam height. This liquid soap showed stable quality and met the expected standards. The antibacterial activity test showed that essential oil concentrations of 5% and 10% gave inhibitory effects on Escherichia coli and Staphylococcus aureus bacteria with moderate categories. However, at 15% concentration, Ylang ylang flower essential oil showed strong antibacterial activity, with the highest inhibition zone diameter of 11.9 mm for Escherichia coli and 12.7 mm for Staphylococcus aureus. These results confirm that the addition of Ylang ylang flower essential oil to liquid soap not only improves product quality and effectiveness, but also provides better protection against pathogenic bacteria.

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