Antibacterial Effectiveness Test Of Kersen Leaf Extract Lotion (*Muntingia Calabura* L.) Against *Staphylococcus Aureus* Using Disc Diffusion Method

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Abstract.

Increasing antibiotic resistance, especially in Staphylococcus aureus, has prompted the search for safer and more effective antibacterial alternatives. Cherry leaves (Muntingia calabura L.) can be used as an antibacterial and contain secondary metabolites flavonoids, alkaloids, and tannins. This study aims to formulate an ethanol extract of cherry leaves in the form of an antibacterial lotion and evaluate its effectiveness against Staphylococcus aureus using the disc diffusion method. This study used a laboratory experimental design with concentrations of ethanol extract of cherry leaves of 5%, 10%, and 15%. The antibacterial effectiveness test was carried out by measuring the growth inhibition zone of Staphylococcus aureus. Evaluation of the physical quality of the lotion included organoleptic tests, homogeneity, pH, spreadability, and viscosity to ensure the stability of the formulation. The irritation test was carried out using the patch test method for 24 hours to assess the safety of using the lotion on the skin. The results of the study on F1 showed an inhibition zone of 10.67 mm, an inhibition zone on F2 of 11 mm, an inhibition zone on F3 of 11.33 mm and in the positive control had an inhibition zone of 12.67 mm. The most optimal concentration in inhibiting the growth of Staphylococcus aureus bacteria was at concentration F3 (15%).

Keywords: *Lotion Preparation; Cherry Leaves; Antibacterial and Staphylococcus aureus.*

I. INTRODUCTION

The cherry tree (Muntingia calabura L.) is a tropical plant commonly found growing wild in the environment. Various parts of this plant have long been used in traditional medicine, particularly the leaves, which have been shown to possess pharmacological activities such as antidiabetic, antioxidant, antibacterial, and anti-inflammatory properties. This therapeutic potential is supported by the content of secondary metabolites such as flavonoids, tannins, saponins, and phenolic compounds.Traditionally, cherry leaves are used as a natural antibiotic, for example by boiling them in water to wash wounds. Recent scientific evidence suggests that cherry leaf extract has antibacterial activity, particularly against Staphylococcus aureus, a Gram-positive bacterium that often causes skin infections. This is relevant given the increasing bacterial resistance to conventional antibiotics, which poses a serious threat to the treatment of global infections.

Developing topical preparations, such as lotions based on cherry leaf extract, is an attractive alternative because it's easy to apply, comfortable to use, and delivers active ingredients directly to the infected area. Lotions also help maintain skin moisture and enhance active ingredient penetration. However, natural formulations still face challenges, such as the stability of active ingredients and the need to optimize penetration effectiveness.This study aimed to formulate an ethanol extract of cherry leaves into a lotion and test its antibacterial activity against Staphylococcus aureus using the disc diffusion method. Three extract concentrations were tested (5%, 10%, and 15%) to determine the most effective formulation. The results are expected to support the development of safe and effective topical antibacterial products based on natural ingredients.

II. METHODS

This research is a type of laboratory experimental research conducted quantitatively. The purpose of this study was to determine the comparative antibacterial effectiveness of cherry leaf extract lotion (Muntingia calabura L.) at each concentration of 5%, 10%, and 15% against Staphylococcus aureus bacteria using the disc diffusion method. The test was carried out by observing the inhibition zone formed. The

inhibition zone is a clear area around the disc indicating no bacterial growth.(Rahmawati et al., 2021). In this study, the population used was 2 kg of fresh cherry leaves, obtained from Brangsong Banjarsari Village, Sayung District, Demak Regency, Central Java. Meanwhile, the sample is part of the population that will be studied further. The sample in this study was 500 grams of dried cherry leaf powder. The data collection technique in this study was carried out through laboratory experiments with observation methods. Observations were carried out directly to observe the effectiveness of antibacterial lotions made from cherry leaf extract (Muntingia calabura L.) at concentrations of 5%, 10%, and 15% against Staphylococcus aureus bacteria.

This study used a cross-sectional approach. The tools needed in this research are analytical scales, blenders, sieves, dark and tightly closed glass containers, maceration equipment, rotary evaporators, water baths, microscopes, test tubes, beakers, hot plates, magnetic stirrers, evaporating dishes, pH meters, object glasses, cover glasses, watch glasses, Brookfield viscometers, autoclaves, loop needles, LAF, petri dishes, incubators, and micropipettes. The materials needed in this study are Cherry Leaves (Muntingia calabura L.), stearic acid, cetyl alcohol, propylene glycol, triatenolamine, propylparaben, methylparaben, 70% ethanol solvent, concentrated HCl, Mg powder, amyl alcohol, Dragendorff reagent, Wagner reagent, Meyer reagent, 10% FeCl3, anhydrous acetic acid, concentrated sulfuric acid, aluminum foil, nutrient agar, 70% alcohol, Staphylococcus aureus bacteria, chloramphenicol disc, distilled water, disc paper, sterile cotton media, and micropipette tips. The data obtained will be analyzed statistically with a normality test using the Shapiro-Wilk Test. From the results of the normality test, the data were not normally distributed. Then the data can be continued with the One Way ANOVA test if normal or the Kruskal-Wallis test and Post Hoc Mann-Whitney if the data is not normal. Data with a p value <0.05 means the data has a significant difference between the two groups and if p>0.05 is obtained, the data does not have a significant difference (Dahlan, 2014).

III. RESULTS AND DISCUSSION

Plant Determination Results

The plants to be used in the research were first identified to ensure their authenticity. The determination process involved matching the morphological characteristics of the plants with the identification key. The results of this study were cherry leaves (Muntingia calabura L.). Proof of the authenticity of the plants to be used was reinforced by the presence of a plant identification letter from the Biology Laboratory of Ahmad Dahlan University, Yogyakarta.

Making Cherry Leaf Powder

This research began with the process of collecting 2 kg of cherry leaves, wet sorting and washing, chopping, drying at room temperature, dry sorting, grinding with a blender, and sieving. After becoming a powder, the water content of the cherry leaf simplicia powder was tested using Moisture Balance. Determination of the water content in the cherry leaf extract aims to ensure that the resulting extract is free of water residues that can accelerate microbial growth and reduce the stability of the extract. The results of the research obtained from the cherry leaf extract (Muntingia calabura L.) contain a water content of 8.21%. This value is still within the safe limit and indicates that the drying process has been carried out optimally, so that the extract is ready to be used in phytochemical tests and further formulations.

Making Cherry Leaf Extract

Extraction was carried out using maceration and remaceration methods using 70% ethanol. This process began by weighing 500 grams of the crude drug and then soaking it in 3,750 ml of ethanol. The maceration was carried out for three days (3x24 hours) with stirring every 12 hours to ensure the solvent was absorbed evenly. Once completed, the solution was filtered and evaporated using a rotary evaporator at 60˚C to remove the solvent. The resulting extract was then reheated using a water bath at 60˚C to ensure no solvent was left behind. The results of the soaking of the cherry leaf extract were then calculated.

Table 1. Results of Cherry Leaf Extract

Wet simplisia	Dry simplicia	Solvent (ethanol)	Thick extract result)	Results of the randem
2 kg	500 g	3,750 ml	151.9 g	30.38%

Table 1 shows the results of cherry leaf extraction using ethanol as a solvent. A total of 2 kg of wet medicinal plants were dried to obtain 500 g of dry medicinal plants. The extraction process was carried out using 3,750 ml of ethanol, resulting in 151.9 g of thick extract. The resulting yield was 30.38%. These results indicate that the extraction process is quite efficient in producing active compounds from cherry leaves.

Phytochemical Screening Results

Table 2. Phytochemical Screening Test Results

Phytochemical Test	Test Method	Observation result		Note
		Before	After	
Flavonoid	1 g extract + HCI, heated for 15 minutes	Chocolate	Red	Positive Flavonoids
Tannin	1 g extract + 10 mL hot water, boiled + FeC13 3-4 drops	Chocolate	Black	Positive Tannin
Alkaloids	2 g of extract 5 ml HCI 2 N was heated, cooled then divided into three and each was given reagent plus Mayer, Wagner, Dragendorf	Mayer: Chocolate Wagner: brown, no sediment Dragendorph: Brown, no sediment	Mayer: yellow Wagner : brown sediment Dragendorph: orange sediment	Positive Alkaloid
Saponin	1 g extract + 10 mL hot water, cooled, shake vigorously for 10 seconds	Brown and no foam	The foam was 8 cm high at the beginning of 5 minutes and after adding 1 drop of 2 N HCI, the foam did not disappear	Positive Saponin

Based on table 2, phytochemical screening was carried out to determine the active groups contained in the cherry leaf extract, which stated that the cherry leaf extract contains flavonoid compounds, which is indicated by the formation of a red color after the addition of HCl and heating. The test for tannin showed positive results, indicated by the formation of a black color after heating FeCl3. The alkaloid test gave positive results marked by a yellow precipitate in the Meyer method, a brown precipitate in the Wagner method, and an orange precipitate in the Dragendorf method. The test for saponins showed positive results, indicated by the formation of foam as high as 8 cm and did not disappear after the addition of 2N HCl.

Ethanol Free Test Results

Table 3. Ethanol Free Test Results

Procedure	Theory	Results
1 gr extract + acetic acid + concentrated sulfuric acid and heated	If there is no distinctive ester odor, then the extract is free from ethanol.	There is no distinctive odor of ethanol.

Based on Table 3, the results of the 70% ethanol-free test were conducted to determine the presence of ethanol in the extract. The results showed no distinctive ethanol odor, thus confirming that the cherry leaf extract was ethanol-free.

Lotion Preparation Characteristics Test

1. Organoleptic

Table 4. Organoleptic Test

Formula	Organoleptic		
	Form	Smell	Color
F0	Semi-solid	Base odor	Milky white
F1 (5%)	Semi-solid	Special extract	Greenish brown
F2 (10%)	Semi-solid	Special extract	Greenish brown
F3 (15%)	Semi-solid	Stronger extract	Dark chocolate

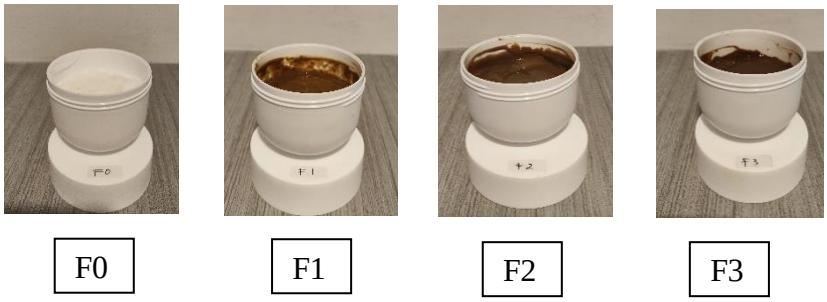

Fig 1. Results of Lotion Formulation

Based on table 4.4, namely the organoleptic test, all formulas are in uniform dosage form, namely semi-solid. The aroma of formula 1, formula 2, and formula 3 has the same, namely the distinctive aroma of cherry leaves, while in formulation 0 it has a distinctive aroma of the base. The color produced by F0 is white because the preparation does not contain a mixture of extracts, in preparations F1 and F2 produce a greenish brown color, while F3 produces a deep green color. The greater the amount of extract added, the color of the preparation will be more intense green. The organoleptic test can be seen in figure 1.

2. pH Test

Table 5. pH Test of Preparations

Formula	Research result			Mean ± SD	Note
	Replication 1	Replication 2	Replication 3		
F0	8.15	8.24	8.26	8.22 ± 0.058	TMS
F1 (5%)	6.89	6.95	6.96	6.84 ± 0.136	MS
F2 (10%)	7.76	7.87	7.89	7.51 ± 0.555	MS
F3 (15%)	6.56	6.67	6.68	6.59 ± 0.075	MS

Description = TMS: Does not meet the requirements

MS : Meet the requirements

Based on table 5, the results of the pH test research showed that the average pH of F0 was 8.22; the average of F1 was 6.84; the average of F2 was 7.5; and the average of F3 was 6.59. The pH test requirements are 4.5 - 8.

3. Homogeneity Test

Table 6. Homogeneity Test

Formula	Research result	Conclusion	Note
F0	There are no coarse grains	Homogeneous	MS
F1 (5%)	There are no coarse grains	Homogeneous	MS
F2 (10%)	There are no coarse grains	Homogeneous	MS
F3 (15%)	There are no coarse grains	Homogeneous	MS

Description = TMS: Does not meet the requirements

MS : Meet the requirements

Based on table 6, the research results show that the four formulas meet the homogeneity requirements, namely that all preparations are homogeneous, which is indicated by the absence of coarse grains in the preparation.

4. Spread Power Test

Table 7. Spread Power Test

Formula	Load (cm)				Mean ± SD	Condition
	50	100	200	500		
F0	5.2	5.4	6.9	8	6.37± 1,322	MS
F1 (5%)	5.5	6.3	7.5	8.5	6.95± 1,320	MS
F2 (10%)	5.8	6.2	7.3	7.5	6.5± 0.888	MS
F3 (15%)	6	6	6.3	7	6.32± 0.471	MS

Description = TMS: Does not meet the requirements

MS : Meet the requirements

Based on table 7, the results of the spreadability test showed that the average spreadability of F0 was 6.37 cm, the average F1 was 6.95 cm, the average F2 was 6.5 cm, and the average F3 was 6.32 cm. The requirement for a good spreadability value is 5 – 7 cm.

5. Adhesion Test

Table 8. Adhesion Test

Formula	Results (seconds)			Mean ± SD	Note
	Replication 1	Replication 2	Replication 3		
F0	1.96	1.53	2.1	1.86± 0.297	MS
F1 (5%)	1.55	1.98	2.33	1.95± 0.390	MS
F2 (10%)	1.98	2.46	3.49	2.64± 0.771	MS
F3 (15%)	2.53	1.26	1.95	1.91± 0.635	MS

Description = TMS: Does not meet the requirements

MS : Meet the requirements

Based on table 4.8, the results of the adhesive power test showed that the average spreadability of F0 was 1.86 seconds, the average F1 was 1.95 seconds, the average F2 was 2.64 seconds, and the average F3 was 1.91 seconds. The requirement for a good spreadability value is no more than 4 seconds.

6. Viscosity Test

Table 9. Viscosity Test

Formula	Results (cp)			Mean ± SD	Note
	Replication 1	Replication 2	Replication 3		
F0	38486	46733	42343	42520.67± 4126.37	MS
F1 (5%)	6968	8094	7733	7598.33± 574.95	MS
F2 (10%)	7733	5231	5912	6292±1293.56	MS
F3 (15%)	5825	5150	5656	5543.67±351.24	MS

Description = TMS: Does not meet the requirements

MS : Meet the requirements

Based on table 9, the results of the pH test research showed that the average viscosity F0 was42,520.67, average F17,598.33 s, average F26.292 s, and the average F3 is5,543,67 The requirements for a good spread value are 2000 – 50,000 cp.

7. Skin irritation test

Table 10. Irritation Test

Formula	Research result	Conclusion
F0	No redness, itching, or swelling occurred after 24 hours of use.	No skin irritation occurs
F1 (5%)	No redness, itching, or swelling occurred after 24 hours of use.	No skin irritation occurs
F2 (10%)	No redness, itching, or swelling occurred after 24 hours of use.	No skin irritation occurs
F3 (15%)	No redness, itching, or swelling occurred after 24 hours of use.	No skin irritation occurs

Based on Table 10, the results of the irritation test on lotion preparations F0-F3 conducted on 15 respondents, none of them experienced skin irritation. Skin irritation is characterized by redness, itching, or swelling after 24 hours of use.(Syarifuddin & Juliana, 2024).

Antibacterial Test

Table 11. Antibacterial Test Results

Sample	Replication (mm)			Mean ± SD	Note:
	1	2	3		
F1(5%)	10	11	12	11 ± 1	Strong
F2(10%)	10	11	11	10.67 ± 0.577	Currently
F3(15%)	11	11	12	11.33 ± 0.577	Strong

Positive Control (clindamycin)	12	13	13	12.67 ± 0.577	Strong
Negative Control	0	0	0	0	There isn't any

Table 11 shows that the lotion containing cherry leaf extract has antibacterial activity, as evidenced by the inhibition zone formed. In F1, the inhibition zone data was 11 mm. In F2, the inhibition zone data was 10.67 mm. In F3, the clear zone data was 11.33 mm. The positive control had an inhibition zone of 12.67 mm. Based on the results, all four formulas were effective in inhibiting Staphylococcus aureus bacteria.

Discussion

Plant Determination

The cherry leaves used were previously identified to ensure the plant's identity and avoid errors in collection. Plant identification was conducted at the Biology Laboratory of Ahmad Dahlan University, Yogyakarta, under the registration number 534/Lab.Bio/B/XII/2024. The results of the identification showed that the plant samples used in the study were indeed cherry leaves (Muntingia calabura L.).

The results obtained in the determination are as follows:

1b – 2b – 3b – 4b – 6b – 7b – 9b -10b – 11b – 12b – 13b – 14a – 15a – 109b - 119b – 120b – 128b – 129b – 135b – 136b – 139b – 140b – 142b – 143b – 146b – 154b – 155b – 156b – 162b – 163b – 167b – 169b – 171b – 177b –

Making Cherry Leaf Powder

The production of cherry leaf powder begins with collecting 2 kg of fresh leaves, followed by wet sorting and washing to remove dirt. The leaves are then cut and dried at room temperature. The dried material is then sorted again, ground using a blender, and sieved to achieve a uniform powder particle size. Factors affecting extraction include plant age, harvest time, growing habitat, and drying conditions such as temperature, humidity, air pressure, and airflow velocity, which play a crucial role in determining the quality of the medicinal plant and its extraction efficiency.(Lady Yunita Handoyo & Pranoto, 2020).

After being powdered, the water content of the cherry leaf powder was tested using a Moisture Balance. Determination of the water content in the cherry leaf extract aims to ensure that the resulting extract is free of water residue that can accelerate microbial growth and reduce the stability of the extract. The results of the study obtained cherry leaf extract (Muntingia calabura L.) contained a water content of 8.21%. The requirement for a water content value of less than 10%. This value is still within the safe limit and indicates that the drying process has been carried out optimally, so that the extract is ready for use in phytochemical tests or further formulations.(Pambudi et al., 2021).

Cherry Leaf Extract

Based on Table 1, the results of the extraction of cherry leaves using ethanol solvent show that from 2 kg of wet simplicia which was dried to 500 g of dry simplicia, then extracted with 3,750 ml of 70% ethanol, 151.9 g of thick extract was obtained with a yield of 30.38%.The extraction method used in this study was maceration, which was chosen because it is simple, easy to perform, and does not require complicated equipment. This opinion is in accordance withFakhruzy et al., (2020).which states that maceration is easy to apply and doesn't require complex equipment. Furthermore, the maceration process is relatively faster than other extraction methods, making it more efficient for laboratory-scale research.The solvent used is 70% ethanol due to its ability to dissolve various active compounds from plant materials. Solvent selection is crucial because it affects the type and quantity of compounds successfully extracted. Ethanol is a polar solvent that effectively extracts phenolic compounds, flavonoids, and other bioactive components, as explained by(Muslihin & Budiyanto, 2023).The maceration extraction process was carried out by soaking 500 g of powdered cherry leaf simplicia in 70% ethanol with a ratio of 1:7.5 for 3 x 24 hours.

This method was chosen based on its ease of implementation without direct heating, so that the active compounds remain stable. During the process, stirring was carried out every 12 hours to accelerate the transfer of the active compounds to the solvent. The resulting dregs were then evaporated using a water bath until they became thick. Evaporation was carried out with a rotary evaporator at a temperature of 60°C to accelerate the process and maintain the stability of the active compounds, followed by a water bath to

remove residual solvent.(Pambudi et al., 2021; Ramadhani et al., 2024),The extract yield is calculated as the percentage of the extract weight to the initial weight of the simplex, as an indicator of extraction efficiency.The yield of 30.38% is different from previous research which used 70% ethanol and produced a yield of only 6.816%.(Utami et al., 2024).These differences can be caused by factors such as sample particle size, storage conditions and time, extraction time, and the sample-to-solvent ratio. A good yield is typically above 10%, so the results of previous studies were considered poor because they were below this threshold.

Phytochemical Screening Test

The results of the phytochemical screening test conducted on cherry leaf extract showed positive flavonoids, tannins, alkaloids, and saponins. The phytochemical screening results can be seen in Table 2. This research is in line with the research conducted on cherry leaf extract.Annisa & Najib, (2022)which proves that the secondary metabolites present in cherry leaves are flavonoids, tannins, alkaloids and saponins.The flavonoid test results showed a change in the color of the solution to red, indicating a positive flavonoid test result.(Jayanti Djrami et al., 2023)This is in line with researchNawir et al., (2021)There was a color change to red in the flavonoid test of cherry leaf extract, which means that the cherry leaf extract contains flavonoids.The tannin test showed a change in the color of the solution to black, which indicates a positive result for the presence of tannin compounds.(Jayanti Djrami et al., 2023)This is in line with researchIslamika et al., (2023)

There was a color change to black in the tannin test of cherry leaf extract, which means that cherry leaf extract contains tannin.In the alkaloid test, Mayer's reagent was added to the first part and produced a white precipitate, while Wagner's reagent was added to the second part, which formed a brown precipitate, and Dragendorff's reagent was added to the third part, which produced an orange precipitate. This is in line withIslamika et al., (2023)In the study, a white precipitate occurred after the addition of the Mayer reaction, a brown precipitate occurred after the addition of the Wagner reagent, and an orange precipitate occurred after the addition of the Dragendraff reagent in the alkaloid test of the cherry leaf extract, which means that the cherry leaf extract contains alkaloids.The saponin test is characterized by the formation of foam up to 8 cm high, which remains stable for 5 minutes and does not disappear. This is in line with research.Nawir et al., (2021)which produces foam in the saponin test of cherry leaf extract, which means that cherry leaf extract contains saponin.

Ethanol Free Test

The ethanol-free test is performed to ensure that the extract to be used as a sample in the antibacterial activity test is free of ethanol. The ethanol content in the test sample can cause false positive results due to the antibacterial properties of ethanol itself, therefore the test sample must be free of ethanol.(Sukadiasa et al., 2023)The results of the ethanol-free test in this study showed that the 70% ethanol extract of cherry leaves. The cherry leaf extract was free of ethanol, as indicated by the absence of the distinctive odor of ethanol. This is in line withVega Gany Febriana, (2020)which states that the ethanol-free test is characterized by the absence of the smell of ethanol in the cherry leaf extract.

Lotion Preparation Characteristics Test

The formulation of the cherry leaf extract lotion begins with preparing all the necessary tools and ingredients, then weighing them according to the specified formulation. In this study, the lotion was made using an oil-in-water formula. The oil-in-water base was chosen because lotion is an emulsion preparation with a high water content, making it easy to apply, non-greasy, and easily washed off with water.(Sawiji et al., 2023). Preparation of cherry leaf extract lotion with each formulation, then tested the physical characteristics, antibacterial test against Staphylococcus aureus bacteria, as well as skin irritation test.(Rusmana, 2019).

Organoleptic

Organoleptic testing is an examination method that uses human senses as the main tool in assessing an object or material.(Rusmana, 2019). The examinations carried out include the color of the preparation, the aroma of the preparation and the form of the preparation. Based on table 4The results of the study showed that the four formulas of cherry leaf extract lotion preparations had different colors, aromas, and shapes, this was due to differences in the concentration of cherry leaf extract. The results of the study on formula F0

were semi-solid, unscented, and milky white. Formulas F1 and F2 had a semi-solid texture with a distinctive aroma of cherry leaf extract and a greenish brown color. Meanwhile, formula F4 had a semi-solid texture with a stronger aroma of cherry leaf extract and a dark brown color. The differences in color, aroma, and shape in the four formulas were caused by variations in the concentration of cherry leaf extract. This is in line with researchUtami et al., (2024)which states that the higher the concentration of extract used, the more concentrated the preparation will be.

pH test

A pH test is performed to determine the acidity or alkalinity of a substance, solution, or material. The pH scale indicates the acidity or alkalinity of a solution. A neutral pH is 7. A pH greater than 7 indicates a base, while a pH less than 7 indicates an acid.(Rusmana, 2019).Based on table 5, the research results show that formula F0 (without extract) has an average pH of 8.22; formula F1 (5%) of 6.84; formula F2 (10%) of 7.51; and formula F3 (15%) of 6.59. Based on SNI 16-3499-1996 , the safe pH range for skin is between 4.5 and 8. Thus, formulas F1, F2, and F3 are still within the safe limits for use on the skin, while formula F0 exceeds the recommended pH limit, so it is considered unsafe because it is too alkaline.(Hidayati et al., 2021)This is in line with previous research.Utami et al.s (2024)The results of the study were a pH test between 6.5-6.7 which identified the preparation as still being within a safe pH range.

Homogeneity Test

A homogeneity test is performed to ensure that all ingredients in a preparation are thoroughly mixed. A preparation is considered homogeneous if it has a uniform composition throughout. A preparation is considered non-homogeneous if particles or lumps are found, indicating that the ingredients have not been thoroughly mixed.(Hidayati et al., 2021)Based on Table 6, the research results show that the four formulas have a uniform composition. All components in the formulation were mixed evenly without any differences in consistency. No coarse particles or lumps were found, thus the formulation was declared homogeneous. This is in line with previous research.Utami et al., (2024)The research results showed no coarse particles or lumps so the preparation was stated to be evenly distributed (homogeneous).

Spreadability Test

A spreadability test is performed to determine the extent of lotion distribution. The lower the concentration, the greater the spreadability. The spreadability test requires a spreadability of 5-7 cm for topical preparations.(Hidayati et al., 2021).Based on table 7, the research results show that formula F0 (without extract) has an average spreadability of (6.37); formula F1 (5%) is (6.95); formula F2 (10%) is (6.5); and formula F3 (15%) is (6.32). Based on previous research, the requirements for the spreadability test for lotion preparations have a requirement of 5-7 cm. Thus, formulas F1, F2, F3 and F4 are still within the specified requirements.(Hidayati et al., 2021)This is in line with previous research.Utami et al., (2024)The results of the study were that the average spreadability test ranged between 5.15 - 5.25, which identified that the preparation was still within the safe spreadability test range.

Adhesion Test

The adhesion test aims to determine the cream's ability to adhere to the skin. The longer the cream remains on the skin, the better the adhesion. A good adhesion time for topical preparations is no less than 4 seconds.(Anindhita & Arsanto, 2020).Based on table 8, the research results show that formula F0 (without extract) has an average adhesive power of (1.86); formula F1 (5%) of (1.95); formula F2 (10%) of (2.64); and formula F3 (15%) of (1.91). Based on previous research, the requirement for lotion adhesion testing is no more than 4 seconds. Therefore, formulas F1, F2, F3, and F4 still meet the established requirements.(Anindhita & Arsanto, 2020)This is in line with previous research.Aditya Nugraha, (2022)The results of the study were that the adhesive strength test had a good initial response of less than 4 seconds, which identified the preparation as still being within the range of the good adhesive strength test.

Viscosity Test

Viscosity testing aims to determine the consistency of the preparation, which affects its application on the skin. The viscosity requirements for lotion preparations, according to SNI 16 4399-1996 , are in the range of 2000-50000 cP.(Utami et al., 2024). Based on table 9The results of the study showed that formula F0 (without extract) had an average viscosity of 42520.67; formula F1 (5%) was 7598.33; formula F2 (10%)

was 6292; and formula F3 (15%) was 5543.67. Based on previous research, the viscosity test requirements for lotion preparations are 2000-50000 cP. Thus, formulas F1, F2, F3 and F4 are still within the specified requirements.(Utami et al., 2024)This is in line with previous research.Utami et al., (2024)The results of the study were that the viscosity test of the preparation was still within the good viscosity test range.

Skin Irritation Test

An irritation test was conducted to evaluate whether the lotion could cause skin irritation. The test results showed that the lotion did not cause any adverse skin effects. Parameters assessed included redness, itching, and swelling in the tested skin area. The skin irritation test on respondents was conducted using an open patch method, which involved applying the lotion to the underarm and monitoring skin changes over 24 hours.(Syarifuddin & Juliana, 2024).Based on table 10The results of an irritation test on lotion preparations F0-F3 conducted on 5 respondents for each formula showed no skin irritation. Skin irritation is characterized by redness, itching, or swelling after 24 hours of use.(Syarifuddin & Juliana, 2024)This is in line with previous research.Sapra et al., (2019)The results of the study were that in the irritation test, the preparation did not cause skin irritation.

Antibacterial Test

Based on Table 11showed that lotion with cherry leaf extract has antibacterial activity against Staphylococcus aureus, indicated by the formation of an inhibition zone. The formula without extract (F0) did not produce an inhibition zone. F1 showed a diameter of 10.67 mm in the moderate category, F2 showed an inhibition zone of 11 mm in the strong category, F3 showed an inhibition zone of 11.33 mm in the strong category and the negative control showed no activity. Thus, it can be concluded that cherry leaf extract shows antibacterial activity and has the potential to be used as an active ingredient in lotion formulations. All four formulas were proven to be able to inhibit the growth of Staphylococcus aureus, with formula F3 providing the most optimal effect. The inhibition zone is directly proportional to the concentration of the extract, the higher the concentration, the larger the inhibition zone formed.(Sukadiasa et al., 2023). Variations in the size of the inhibition zone are influenced by various factors, including the sensitivity of the microorganism, pH, type of bacteria, type of antimicrobial compound, incubation conditions, and the speed of diffusion in the agar medium.(Dzulasfi et al., 2023).

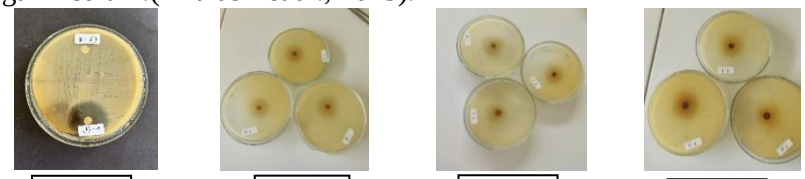

Fig 2. Antibacterial Test Image

IV. CONCLUSION

1. Lotion based on cherry leaf extract showed clear antibacterial activity against Staphylococcus aureus, as evidenced by the formation of a clear zone indicating bacterial inhibition ability.
2. The lotion preparation of ethanol extract of cherry leaves (Muntingia calabura L.) has been proven to contain flavonoids, tannins, saponins, and alkaloids.
3. This lotion meets physical quality standards, including organoleptic, pH, homogeneity, spreadability, adhesion, viscosity, and does not cause irritation.
4. Lotion with concentrations of 5%, 10%, and 15% effectively inhibits Staphylococcus aureus bacteria. The results of the study showed that the inhibition zone in F1 was 10.67 mm with a moderate category, the inhibition zone in F2 was 11 mm with a strong category, the inhibition zone in F3 was 11.33 mm with a strong category and the positive control had an inhibition zone of 12.67 mm with a strong category. The higher the concentration, the larger the inhibition zone.
5. The most optimal concentration in inhibiting the growth of Staphylococcus aureus bacteria is at concentration F3 (15%).

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