# ANTIBACTERIAL ACTIVITY TEST OF Staphylococcus aureus COFFEE FRUIT PEEL EXTRACT SOLID SOAP

**Mega Karina Putri*, Eni Kartika Sari, Beta Ria Erika Marita Dellima**

*Pharmacy Study Program, STIKes Akbidyo, Yogyakarta, Indonesia*

**Article Info**

***Article history:***
Received July 28th, 2025
Revised September 17th, 2025
Accepted October 11th, 2025

***Corresponding Email:***
megakarinaputri@akbidyo.ac.id

**ABSTRACT**

Bacterial skin infections remain a significant health concern, with Staphylococcus aureus being one of the common pathogens capable of infecting human skin. Preventive measures against such infections include maintaining personal hygiene, particularly through the use of cleansing products such as bath soaps. Fruit peels are known to contain bioactive compounds, namely alkaloids, flavonoids, and phenols, that exhibit antibacterial properties. To enhance their usability, coffee fruit peels can be processed into extracts and formulated into transparent solid soap preparations. This study aimed to formulate solid soap containing coffee fruit peel extract and evaluate its antibacterial activity. The research employed an experimental method comprising several stages: material preparation, extract production, soap formulation, and evaluation of physical properties. These evaluations included organoleptic assessment, pH measurement, foam height and stability, free alkali content, and antibacterial activity testing. The results showed that the transparent solid soap met the criteria for a good-quality solid preparation. Among the tested formulations, Formula 3 demonstrated the highest antibacterial activity.

***Keyword:*** Coffee fruit peel, Staphylococcus aureus, solid soap, physical properties, antibacterial

## Introduction

(Bessada *et al.*, 2018)

The cosmetics industry is intensively looking for new active ingredients, due to consumer demand for natural products that can improve the appearance of healthy skin and eco-friendly products derived from sustainable resources . The addition of herbal ingredients in cosmetic (Jadhav and Kanwar, 2015) formulas is the choice. Herbal cosmetics are natural and free from harmful synthetic chemicals that can have toxic effects on the skin. Synthetic ingredients contained in cosmetic products can cause side effects such as skin irritation, clogging of skin pores, causing dry or oily skin and the appearance of acne. Meanwhile, herbal cosmetics are safer, hypoallergenic, suitable for all skin types (Bessada *et al.*, 2018; Taylor and Unakal, 2025)

The skin is the largest organ in the human body and functions as a body's protector against environmental influences. On normal and healthy skin, bacteria can be found *Staphylococcus aureus* which has the potential to cause infection. However, if allowed to enter internal tissues it can cause a variety of infections, including bacteremia, infective endocarditis, skin and soft tissue infections (e.g. impetigo, folliculitis, furuncle, carbuncle, cellulitis, and *Scalded Skin Syndrome*) (Latifah, 2019) . Prevention efforts to prevent bacteria *Staphylococcus aureus* Do not enter the interal tissue and cause infection, you can use soap with the addition of antibacterial ingredients, one of which is coffee fruit peel.

The general function of soap is as a cleanser that can remove dirt from the skin. Antibacterial ingredients can be added to soap formulations to have more value as antibacterial, so that they can cleanse the skin and kill bacteria that have the potential to cause infections . One of the

herbal ingredients that can be used is coffee fruit peel. Coffee fruit peel contains a wide variety of active compounds that are beneficial to the skin, such as antibacterial. Compounds in coffee fruit peels that have antibacterial activity are proteins, fiber, phenols, flavonoids, saponins, tannins, triterpenoids, and alkaloids (caffeine). Coffee fruit peel is reported to have strong activity against bacteria *Staphylococcus aureus*, *Staphylococcus epidermidis, Escherichia coli*, *Vibrio cholerae,* and *Pseudomonas aureginosa* . In addition, making soap with coffee peel can also take advantage of the abundance of coffee fruit peels. Coffee fruit peels are obtained during the process of separating coffee fruits from coffee peels. Generally, coffee fruit peels are only used as animal feed, cascara tea and compost . This study aims to formulate coffee fruit peel extract into a transparent soap preparation and test antibacterial activity against bacteria *Staphylococcus aureus.*

(Febriani *et al.*, 2023; Serna-Jiménez *et al.*, 2022)

## Methods

(Komaria *et al.*, 2020; Supeno *et al.*, 2018)

### *Simplicia Preparation*

A total of 5 kg of fresh coffee fruit peels are sorted wet, then the selected coffee fruit peels are then washed under running water and aerated for 10 minutes, then dried with a dehydrator (Getra) at 50°C for 21 hours.

### *Identification of Simplification*

Simplicia identification was carried out at the Department of Pharmaceutical Biology, Faculty of Pharmacy, Gadjah Mada University.

### *Extract Preparation*

The peel of the dried coffee fruit is powdered and sifted, then weighed 500 grams and macerated using 96% ethanol in a ratio of 1:7.5. The maceration process is carried out for 5 days with stirring process. First filtrate and residue are separated by filtering. The residue was remacerated using 96% ethanol in a ratio of 1:2.5 for 3 days. Next, a filtering process is carried out, so that second filtrate is obtained. Filtrate I and filtrate II are combined and vaporized until a viscous extract is formed. The condensed extracts obtained are calculated for their yield.

$$\text{Extract yield (\%)} : \text{x100\%}\frac{extract\ weight}{simplicia\ weight} \quad (1)$$

**Table 1** Solid Soap Formula Coffee Fruit Peel Extract

| Components | Formula (grams) | | | | Function |
|---|---|---|---|---|---|
| | **Basics** | **F1** | **F2** | **F3** | |
| Coffee fruit peel extract | - | 1 | 2 | 3 | Active Substances |
| VCO | 30 | 30 | 30 | 30 | Fatty acid bases |
| Stearic acid | 10.5 | 10.5 | 10.5 | 10.5 | Soap hardener |
| NaCl | 0.3 | 0.3 | 0.3 | 0.3 | This former soaps and accelerates the formation of solids |
| NaOH 30% | 30.45 | 30.45 | 30.45 | 30.45 | Alkaline (Base) |
| Ethanol 96% | 22.5 | 22.5 | 22.5 | 22.5 | Solvents and Transparency |
| Sucrose | 22.5 | 22.5 | 22.5 | 22.5 | Transparency |
| Glycerin | 19.5 | 19.5 | 19.5 | 19.5 | Hufixan |
| *Cocomide DEA* | 1.5 | 1.5 | 1.5 | 1.5 | Sufactants in foaming |
| Aquatics | 150 | 150 | 150 | 150 | Solvents |

### *Phytochemical Screening*

Phytochemical screening is carried out on alkaloid compounds, flavonoids and phenols. The testing method refers to research conducted by .

### *Solid Soap Manufacturing*

Ingredients are weighed according to the needs of the formula. Stearic acid is melted on top *Water Bath*, then VCO is added and stirred homogeneously. The process is carried out at a monitored temperature between 70-80$^0$C. Add 30% NaOH to the mixture while stirring. Furthermore, add 96% ethanol, sucrose, glycerin, NaCl, *Cocomide* DEA, and aqueades while maintaining the mixing temperature and stirring continuously until homogeneous. The last stage is to add coffee fruit peel extract with concentration variations of 1%, 2% and 3%. The mixture has been homogenized, poured into the mold and let stand for 24 hours (Hirmawati *et al*., 2018; Stuart *et al*., 2020) .

### *Evaluation of the Physical Properties of Solid Soap*

The evaluation of the preparations carried out consisted of organoleptic, pH, foam height, foam stability and transparency. (Dellima and Sari, 2022)

a. Organoleptis
   The organoleptic test is performed visually by observing the shape, color and smell of the solid soap produced .
b. pH
   The soap is weighed by 1 gram and dissolved into 10 ml of aquaade. pH is measured on each solid soap formula using a pH meter, left for a few seconds until the number listed on the pH meter is stable . (Dellima and Sari, 2022)
c. Alkaline free (Dellima and Sari, 2022)
   Soap weighed 5 g dissolved with neutral alcohol and heated over a water bath, for 30 minutes. If the solution is not alkaline (not red), it is cooled to a temperature of 70 ° C and titrated with a solution of 0.1 N KOH in alcohol, until a red color is formed that lasts up to 15 seconds. If the soap contains many insoluble parts, so as not to interfere, it is filtered first before titration is performed. If the solution turns out to be alkaline (the phenolphthalein indicator is red), then what is checked is not free fatty acids but free alkalis by simmering it with HCl 0.1 N in alcohol until the red color is exactly gone.
d. Foam height
   As much as 1 gram of soap is put into a test tube containing 10 ml of aqua, then shaken by flipping the test tube over for 1 minute. Let stand for 5 minutes and measure the height of the resulting foam . (Dellima and Sari, 2022)
e. Foam stability
   As much as 1 gram of soap is put into a test tube containing 10 ml of aqua, then shaken by flipping the test tube over for 1 minute. Let stand for 5 minutes and measure the height of the resulting foam (Rashati, et al, 2022).

$$\% \text{ Lost Foam} = \text{x } 100\% \frac{(Initial\ foam\ height - final\ foam\ height)}{Initial\ foam\ height} \quad (2)$$

$$\text{Foam stability} = 100\% - \text{percentage of lost foam} \quad (3)$$

(Diyanti *et al*, 2023; Ngajow *et al*, 2013; Pehino *et al*, 2021)

### *Antibacterial Activity Test*

Testing of antibacterial activity in solid soap of coffee fruit peel extract includes sterilization of tools with autoclave, preparation of test samples, media preparation, rejuvenation of bacteria, preparation of base media and seeding media, preparation of Mc. Farmald solution, preparation of test bacterial suspension, preparation of test media, testing of antibacterial activity by suction method, and measurement of inhibition zone diameter .

### *Data Analysis Techniques*

The data obtained from the evaluation of the physical properties of solid soap preparations, such as organoleptis, pH, free alkali, foam height, and foam stability were adjusted to the applicable requirements. The antibacterial activity test in the form of inhibition zone diameter was statistically analyzed with One Way ANOVA.

## Results and Discussion

### *Creation of Simplicia*

Fresh coffee fruit peels are harvested in coffee plantations in Windusabrang, Wonoleleo, Sawangan, Magelang, Central Java. The chosen coffee fruit skin is in the form of red coffee fruit skin. This indicates that the coffee fruit is in a ripe condition. Wet sorting is carried out to separate rotten fruit peels, fruit peels with their stalks, and seeds that are still left in the coffee fruit peel. The skin of the coffee fruit is dried with a dehydrator (Getra) at 50°C for 21 hours.

**Figure 1.** Coffee fruit peel simplicia

### *Identification of Simplification*

Simplicia identification is carried out to guarantee the correctness of the sample used in the study. The results of identification with Certificate No.: 13.5.9/UN1/FFA.2/BF/PT/2023 stated that the sample of coffee fruit peel was *Coffea arabica* L. of the Rubiaceae tribe.

### *Extract Manufacturing*

Sukardi *et al.* (2021)

The yield of the condensed extract obtained was 16.06%. The yield in this study was lower than that of the study . This can happen due to differences in the maceration process carried out. Research Perform repeated remaceration processes until the ethanol solvent becomes clear, so that in the study the yield of the extracts obtained was higher, which was 20.79%.

Arpi *et al.* (2021), Febriani *et al.* (2023), Firdayeni and Sari, (2023), and Serna-Jiménez *et al.* (2022)

### *Phytochemical Screening*

Based on Table 2, it is known that coffee fruit peels contain alkaloids, flavonoids, and phenols. The results are in accordance with

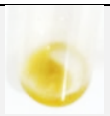
Dellima and Sari, (2022).

which states that Coffee fruit peels contain different types of compounds, such as alkaloids (caffeine), phenols (chlorogenic acid, rutin, tannins, flavonols, flavan-3-ol, anthocyanins, ferrulic acid, catechins, and epicatechins), and flavonoids.

### *Transparent Solid Soap Preparations*

Formulation of transparent solid soap preparations refers to research
The solid soap preparation consists of 4 formulas with different concentrations of coffee fruit peel extracts used. It aims to determine the effect of concentration differences on the evaluation of physical properties such as pH, foam height, foam stability, free alkalis and antibacteria on bacteria *Staphylococcus aureus*.

**Table 2.** Phytochemical screening results

| No. | Active compounds | Reagent | Ethanol Extract |
|---|---|---|---|
| 1. | Alkaloids | Mayer |  (+) White deposits |
| 2. | Alkaloids | Dragendroff |  (+) Orange sediment |
| 3. | Alkaloids | Wagner |  (+) Brown deposits |
| 4. | Flavonoids | HCl + magnesium powder |  (+) Orange color |
| 5. | Phenol | FeCl3 |  (+) blackish-green color |

**A.** **B.** **C.** **D.**

**Figure 2.** Solid soap produced in the study (A. Basis, B. Formula 1, C. Formula 2, D. Formula 3)

### *Preparation Evaluation*

Physical evaluation of solid-based coir preparations, formula 1, formula 2, and formula 3 includes organoleptic test, pH test, foam height test, foam stability test and free alkali. The evaluation of solid soap preparations aims to find out which transparent solid soap preparations are made to meet the requirements of good soap physical properties.

a. Organoleptics

Organoleptic tests on the preparation of transparent solid soap extracts of coffee fruit peel ethanol were carried out by observing the consistency, color and aroma of the preparation. The results of the organoleptic examination can be seen in Table III. Based on Table III, it is known that base, F1, and F2 have a typical aroma of the base, while F3 has a distinctive smell of coffee fruit peel extract. This happens because F3 uses the most concentration of extracts. Color differences are also seen in solid soap samples. The base is colorless/clear/transparent because there is no addition of extract, while in F1, F2, and F3 it is brown because of the addition of extracts and the higher the

concentration of the extract used, the color in solid soap is also more concentrated even though it remains transparent. Coffee fruit peel extract has a brown color, so it will affect the color of the preparation made.

**Table 3.** Organoleptic test results

| Test Sample | Smell | Color | Consistency |
|---|---|---|---|
| **Basics** | Smelly base | Transparent | Solid |
| **F1** | Smelly base | Light Brown | Solid |
| **F2** | Smelly base | Chocolate | Solid |
| **F3** | Smells of base and slight smell of coffee fruit peel extract | Dark Brown | Solid |

b. pH

The pH test on transparent solid soap preparations aims to determine the pH of the preparation that is made to meet the requirements of good soap so that it does not cause irritation to the skin The results of the pH test of the solid soap preparation of ethanol extract of coffee fruit peel can be seen in Figure 2. Based on Figure 2, it is known that the pH of the four formulas has met the requirements applicable to SNI 06.3532.1994 (8-11). The average pH of soap tends to be alkaline. The pH of soap which tends to be alkaline is due to the principle of saponification reaction using NaOH as an alkaline material in the reaction .

(Dellima and Sari, 2022)

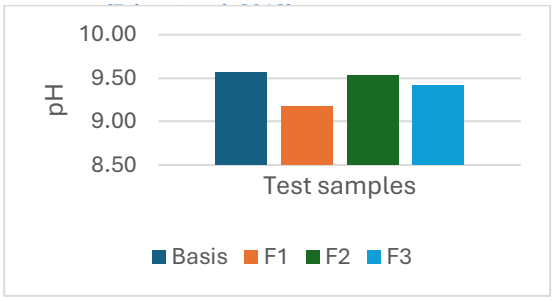



**Figure 3.** pH of soap

c. Foam Height

(Andriani *et al*, 2021)

The foam height test aims to determine the ability of the preparation to produce foam. Foam can be formed due to the dispersion of gases in liquids in the form of air pockets that are encased in a thin layer and can be stabilized through foaming agents or surfactants . In this formula that has the function of a foaming agent or surfactant is *Cocomide* DEA. The results of the high test of the foam preparation of transparent solid soap extract ethanol extract of coffee fruit peel can be seen in Figure 4. The average foam height of the four formulas was declared to have met the requirements of SNI 06.3532.1994 (13 – 220 mm). Use of concentration *Cocomide* The DEA of each formula is the same so the difference in foam height is more due to the concentration of coffee fruit peel extract.

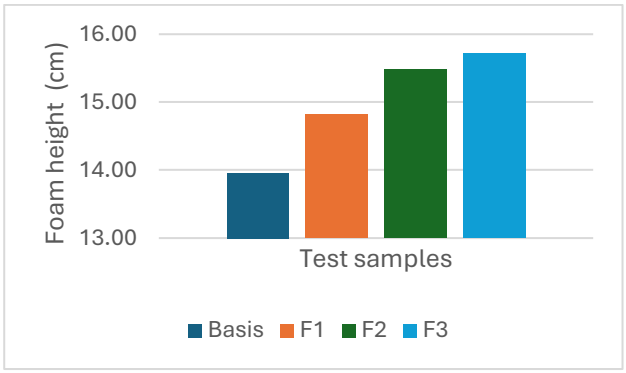



**Figure 4.** High soap foam

The foam stability test is carried out to determine the ability of the preparation to maintain the foaming ability. The results of the high foam test of solid soap preparations ethanol extract of coffee fruit peel are presented in Figure 5. Based on Figure 5, it is known that the solid soap of ethanol extract of coffee fruit peel in the four formulas has an average foam stability percentage that has met the requirements (60-70%) (Dhara et al, 2023).

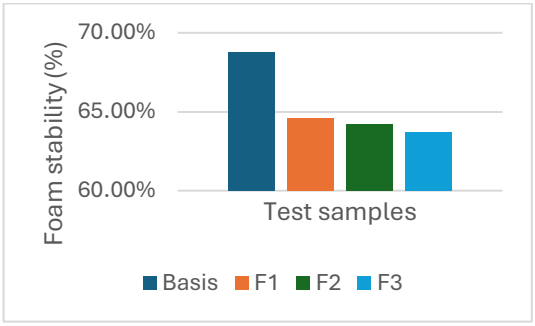



**Figure 5.** Foam stability percentage

d. Free Alkaline Test

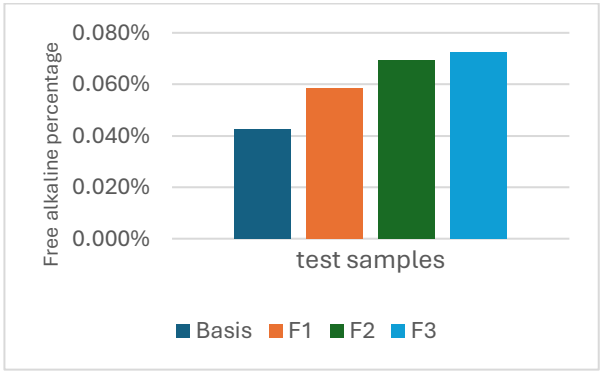



**Figure 6.** Histogram of free alkaline content test

The remaining free alkaline content in soap must meet the requirements set out in SNI-3532:2016, where the standard value must not exceed 0.1%. Excess alkaline levels from the official limit can cause losses for consumers, in the form of skin damage and skin irritation. The determination of the free alkaline content basically uses the acid-base titration method. Based on the results of the free alkaline test presented in Figure 6, it is known that the free alkaline in the four samples has a value of 0.1%, so it can be concluded that the four formulas have met SNI-3532:2016.

### *Antibacterial Test*

This study aims to determine the ability of transparent solid soap preparation of ethanol extract of coffee fruit peel in inhibiting bacteria *Staphylococcus aureus*. The method of testing antibacterial activity in this study uses the suction diffusion method. The well diffusion method was chosen because according to research conducted by , where the research proves that the comparison of the sump method results in a larger diameter of the barrier zone than the disc method.

The results of the antibacterial test can be seen in Table 4. Based on Table 4, the antibacterial activity test of solid soap of coffee fruit peel extract obtained the average diameter of the inhibition zone formed by each formula, which is a base of 17.00 mm (strong), formula 1 of 20.03 mm (very strong), formula 2 by 23.85 mm (very strong), and formula 3 by 26.64 mm (very strong). The difference in the diameter of the barrier zone formed can be influenced by the difference in the concentration of coffee peel ethanol extract in the formula. In addition, it is likely due to other supporting ingredients in the formula that have the potential to inhibit bacterial growth, such as 96% ethanol, the content of lauric acid in VCO, and NaCl .

Nurhayati *et al.*, (2020)

**Table 4.** Measurement of the diameter of inhibition zone

| Test Sample | Inhibition Zone Diameter (mm) | Categories |
|---|---|---|
| Basics | 17.60 | Strong |
| F1 | 20.03 | Very Strong |
| F2 | 23.85 | Very Strong |
| F3 | 26,64 | Very Strong |

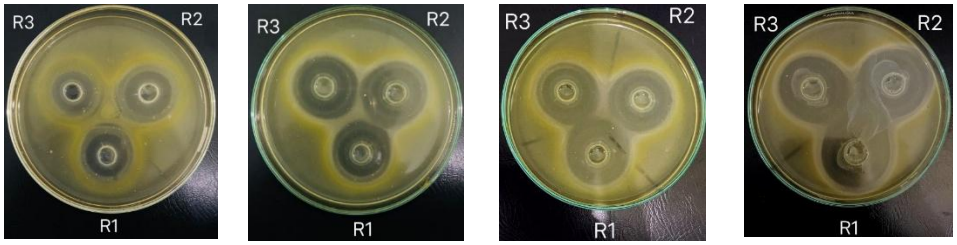
(Idaryani *et al*, 2023; Maromon *et al.*, 2020; Wowor *et al.*, 2022)

Based on the data in Table 4 obtained, it is known that the higher the concentration of coffee fruit peel extract formulated in a transparent solid soap preparation, the greater the diameter of the barrier zone formed. The barrier zone formed is caused by the presence of secondary metabolite compounds in the ethanol extract of coffee fruit peels. In accordance with Table 2 which has activity as an ntibacterial such as flavonoids, alkaloids, and phenols.

Phenols can be bactericidal or bacteriostatic depending on the level. Phenols in low levels will create protein complexes in cell membranes with weak bonds. The bond results in a decrease in permeability and will facilitate the penetration of phenols into bacterial cells and the leakage of cell nutrients. Penetration of phenols leads to precipitation and denaturation of cell proteins. The mechanism of protein denaturation in cells begins with the formation of hydrogen and protein bonds, so that the permeability of the cell wall and cytoplasmic membrane composed of proteins is disturbed, inhibition of bacterial enzyme activity so that cell metabolism is disrupted, and cell lysis occurs . Research mentioned that coffee fruits have phenolic compounds in the form of *flavanols, hydroxycinnamic acid,* and tannins.

(Al-

Yousef and Amina, 2018; Carolia and Noventi, 2016; Purwanto and Irianto, 2022) Al-youssef, (2017); Ariadi, (2018); Ramírez-Coronel *et al.*, (2004)




**A.** **B.** **C.** **D.**

**Figure 7.** Antibacterial test results with the plumbing method (A. Basis, B. Formula 1, C. Formula 2, D. Formula 3)

The antibacterial mechanism of flavonoids is by damaging the cell membrane, inhibiting the formation of cell membranes or walls, preventing nucleic acid synthesis, inhibiting the excretion of

toxins from within the cell, and inhibiting the system *efflux pumps* Bacteria . Alkaloids function as antibacterials in relation to the disruption of the components that make up peptidoglycan of bacterial cells, which will result in the cell wall layer being incomplete and leading to cell death .

Coffee also contains compounds that have antibacterial activity, namely chlorogenic acid, caffeine, and trigonelin . Chlorogenic acid works by increasing the permeability of the plasma membrane thereby reducing the defense function of bacterial cells and leakage of the nucleotide and contents of the cytoplasm. Trigonelin also has more or less the same antibacterial activity as chlorogenic acid, namely by disrupting the stability of the cytoplasmic membrane of bacteria. Membrane instability causes bacterial nutrient exchange to be disrupted, resulting in inhibited bacterial metabolism and growth . Caffeine is an alkaloid *Xanthin* which is crystal in shape has an antibacterial mechanism by inhibiting the synthesis of the cell wall and then causing cell lysis which will subsequently lead to the death of the cell itself .

The inhibition zone data obtained was then statistically analyzed using *the One Way* ANOVA test to see the effect of variations in the concentration of ethanol extract of coffee fruit peel formulated in the form of a transparent solid soap preparation against *Stapyhlococcus aureus bacteria.* The initial stage of *the One Way* ANOVA test is to conduct a normality test and a homogeneity test first. The results of the normality test are known that all formulas have a Sig. > 0.05 and can be declared to be distributed normally so that they meet the requirements. The homogeneity test is known to have a Sig. value of > 0.05 and can be concluded to meet the requirements of the homogeneity test. The *One Way* ANOVA test is a test that is carried out with the aim of determining the effect of treatment from an experiment, so in this study the *One Way* ANOVA test was carried out to determine the significant difference between the treatment group and the antibacterial inhibition zone *of Staphylococcus aureus*. Based on the results of the *One Way* ANOVA test, it is known that the significance value obtained is .000, meaning that there is an effect of variations in the concentration of ethanol extract of coffee fruit peel formulated in the form of a transparent solid soap preparation on the activity *of Staphylococcus aureus* bacteria with a significance value of <0.05.

**Table 5.** Results *post hoc LSD test*

| Formula | Formula | Nilai Sig. | Meaning |
|---|---|---|---|
| Basics | F1 | 0.000 | The diameter of the soap-base inhibition zone is significantly different from the diameter of the F1 soap inhibition zone |
| | F2 | 0.000 | The diameter of the soap base inhibition zone is significantly different from the diameter of the soap inhibition zone F2 |
| | F3 | 0.000 | The diameter of the soap-base inhibition zone is significantly different from the diameter of the F3 soap inhibition zone |
| F1 | F2 | 0.000 | The diameter of the F1 soap inhibition zone is significantly different from the diameter of the F2 soap inhibition zone |
| | F3 | 0.000 | The diameter of the F1 soap inhibition zone is significantly different from the diameter of the F3 soap inhibition zone |
| F2 | F3 | 0.000 | The diameter of the soap barrier zone F2 is significantly different from the diameter of the soap barrier zone F3 |

To find out whether there is a significant difference or not from each formulation of solid soap preparations, ethanol extract, coffee fruit bark against *Staphylococcus aureus bacteria, a* Posc Hoc *LSD* test was carried out. Based on Table 5, a significant value of 0.000 was obtained, where this value shows that the variation in the concentration of ethanol extract of coffee fruit peel provides a significant difference in the inhibition zone produced. The more concentration of the extract used, the greater the

inhibition zone produced. The increase in inhibition is due to the higher concentration of the extract is proportional to the increase in phytochemical compounds which has an effect on increasing antibacterial activity. The concentration of coffee peel ethanol extract of 3% in formula 3 provides a very strong *antibacterial inhibition zone of Staphylococcus aureus* and the resulting soap meets the requirements of physical properties including organoleptic test parameters, pH test, foam height test, foam stability test and alkaline free test.

## Conclusion

The coffee fruit peel extract can successfully be formulated into a transparent solid soap preparation, demonstrating its potential as a functional ingredient in personal care products. Furthermore, variations in the concentration of coffee fruit peel extract were found to influence the antibacterial activity against *Staphylococcus aureus*, suggesting that the extract not only contributes to the physical properties of the soap but also enhances its effectiveness as an antibacterial agent depending on the formulation used.

## Acknowledgement

Thank you to LPPM UIN Sunan Ampel Surabaya and the Ministry of Religion of the Republic of Indonesia and the entire kombucha research team.

## References

Al-youssef, H. M., 2017, Pharmacognostic Studies on Coffee Arabica L. Husks : A Brilliant Source of Antioxidant Agents, *European Journal of Pharmacheutical and Medical Research*, 4(1), 86–92.

Amalia, F. F., 2020, Antibacterial Activity of Robusta Coffee in Accelerating the Incidence of Wound Healing in Diabetic Ulcers, *Healthy Tadulako Journal*, 6(1), 1–6.

Andriani, R., Ambari, Y., and Nurrosyida, I. H., 2021, Formulation of Solid Soap Preparation of Ethanol Extract of Ginger Rhizome (Zingiber officinale Rosc.) With the Combination of Virgin Coconut Oil (VCO) and Palm Oil, *Scientific Periodical of Pharmaceutical Chemistry*, 8(2), 62–68.

Arpi, N., Muzaifa, M., Sulaiman, M. I., Andini, R., and Kesuma, S. I., 2021, Chemical Characteristics of Cascara, Coffee Cherry Tea, Made of Various Coffee Pulp Treatments, *IOP Conference Series: Earth and Environmental Science*, 709(1) https://doi.org/10.1088/1755-1315/709/1/012030

Bessada, S. M. F., Alves, R. C., and Oliveira, M. B. P. P., 2018, Coffee Silverskin: A Review on Potential Cosmetic Applications, *Cosmetics*, 5(1), https://doi.org/10.3390/cosmetics5010005

Carolia, N., & Noventi, W., 2016, Potential of Green Betel Leaf Extract (Piper betle L.) As an Alternative Therapy of Acne vulgaris, *Majority*, 5(1), 140–14.

Dellima, B. R. E. M., and Sari, E. K., 2022, Analysis of Vitamin C of Moringa Leaf Ethanol Extract (Moringa Oleifera Lam.) and Its Formulation in Transparent Bath Soap Preparations, *Journal of Jamu Kusuma*, 2(2), 83–88. https://doi.org/10.37341/jurnaljamukusuma.v2i2.47

Dhara, J. T. N. A., Sinala, S., and Ratnah, S., 2023, Formulation of Transparent Solid Soap with Red Dragon Fruit Pulp Juice (Hylocereus polyrhizus) as an Antioxidant, *Original Article Pharmacy and Pharmacology Magazine*, 27(1), 21–31

Diyanti, M. R. N., Issusilaningtyas, E., and Yulianto, N. A., 2023, Formulation and Evaluation of Solid Soap Preparations of Ethanol Extract of Telang Flower (Clitoria ternatea L) as an Antibacterial Against Staphyloccoccus aureus, *Scientific Journal of Pharmacy*, 5(1), 118–126.

Fahrozi, D., Heru, P. W., and Ismail., 2018, Variations of Cocoa Paste and Essence in the Process of Making Liquid Soap, *Scientific Journal of Agricultural Students Unsyiah*, 3(1), 340–344.

Febriani, A., Koriah, S., & Syafriana, V., 2023, Literature Study on Antibacterial Activity of Arabica Leaf, Fruit Peel, Arabica (Coffea arabica) and Robusta (Coffea canephora) Coffee Beans Against Various Bacteria Literature Review on Antibacterial Activity of Leaf, Fruit Peel, Seed Extracts of Arabica (Coffea arabica), *Sainstech Farma: Journal of Pharmaceutical Sciences*, 16(2), 94–102.

Himawan, H. C., Masaenah, E., and Putri, V. C. E., 2018, Antioxidant Activity and Spf of Ambon Banana Peel Cream Preparation (Musa acuminata colla)*, Journal of Farmamedika*, 3(2), 73–81.

Firdayeni, I. G. A. R. M. and Sari, P. M. N. A., 2023, The Potential of Coffee Skin Waste (Coffea sp.) as a Raw Material in Anti-Aging Cosmetic Products, *Proceedings of the National Workshop and Seminar on Pharmacy*, 1, 590–603. https://doi.org/10.24843/wsnf.2022.v01.i01.p47

Idaryanti., Islawati., and Novriani, A. H., 2023, Effectiveness of NaCl as an Antibacterial against the Growth of Acne-Causing Bacteria (Prionibacterium acnes), *Journal of Global and Multidisciplinary*, 1(5), 569–576.

Joshi, L. S., and Pawar, H. A., 2015, Herbal Cosmetics and Cosmeceuticals: An Overview*, Natural Products Chemistry & Research,* 3(2), 1–8. https://doi.org/10.4172/2329-6836.1000170

Khameneh, B., Iranshahy, M., Soheili, V., and Bazzaz, B. S. F., 2019, Review on Plant Antimicrobials: A Mechanistic Viewpoint. *Antimicrob Resist Infect Control*, 2019(8), 118.

Komaria, N., Suratno, Prihatin, J., and Sudarti, 2020, An Analysis of Innovation on the Utilization of Cascara By Coffee Farmers, *Journal of Physics: Conference Series*, 1563(1). https://doi.org/10.1088/1742-6596/1563/1/012015

Kuncoro, S., Sutiarso, L., Nugroho, J., and Masithoh, R. E., 2018, Kinetics of Caffeine and Chlorogenic Acid Reduction Reaction of Robusta Coffee Beans via Closed System Steaming, *AgriTECH, 38*(1), 105–111.

Latifah, R., 2019, Quality characteristics of coffee soap with variations in mixing time and framming time, *AGRITEPA*, V(2), 111–125.

Maromon, Y., Pakan, P. D., and Maria, A. E. D., 2020, Antibacterial Activity Test of Virgin coconut oil against the Growth of Staphylococcus aureus Bacteria in Vitro, *Cendana Medical Journal, 20(*2), 250–255.

Marsya, N. M., Haribudiman, O., and Yuwono, H., 2021, Antibacterial Activity of Robusta Coffee Water Extract (Coffea Canephora) against Pseudomonas aeruginosa Bacteria. *Journal of Health and Science Integration*, 3(1), 38–40.

Ngajow, M., Abidjulu, J., and Kamu, V. S., 2013, Antibacterial Effect of Matoa Stem Peel Extract (Pometia pinnata) on Staphylococcus aureus Bacteria in vitro*, Journal of Mathematics and Natural Sciences*, 2(2), 128. https://doi.org/10.35799/jm.2.2.2013.3121

Nurhayati, L. S., Yahdiyani, N., and Hidayatulloh, A., 2020, Comparison of Testing of Antibacterial Activity of Yogurt Starter with the Sumpus Diffusion Method and the Disc Diffusion Method, *Journal of Livestock Product Technology*, 1(2), 41–46.

Pananginan, J. A., Hariyadi, Paat, V., and Saroinsong, Y., 2020, Formulation and Test of Antibacterial Activity of Jatropha multifidi Tintir Tintir Leaf Extract Liquid Soap Preparation*, Journal of Tropical Biopharmaceuticals*, 3(1), 148–158.

Pehino, A., Fatimawali, F., and Suoth, E. J., 2021, Antibacterial activity test of Duku Lansium domesticum fruit seed extract against Staphylococus aureus and Escherichia coli bacteria, *Pharmacon*, 10(2), 818. https://doi.org/10.35799/pha.10.2021.34030

Purwanto, and Irianto, I. D. K., 2022, *Natural Compounds as Antibacterial and Its Mechanism of Action,* Gadjah Mada University Press.

Ramirez-Coronel, M. A., Marnet, N., Kolli, V. S. K., and Roussos, S., Guyot, S., Augur, C., 2004, Characterization and Estimation of Proanthocyanidins and Other Phenolics in Coffee Pulp (Coffea arabica) by Thiolysis-HighPerformance Liquid Chromatography, *Journal of Agricultural and Food Chemistry*, 52(5), 1344–1349.

Rashati, D., Nurmalasari, R. D., and Putri, A. V., 2022, Effect of NaOH Concentration Variations on the Physical Properties of Purple Sweet Potato Extract (Ipomoea batatas lam) Solid Soap, *Manutung Scientific Journal*, 2(8), 311–316.

Serna-Jiménez, J. A., Siles, J. A., de los Ángeles Martín, M., & Chica, A. F., 2022, A Review on the Applications of Coffee Waste Derived from Primary Processing: Strategies for Revalorization. *Processes*, 10(11), 1–24. https://doi.org/10.3390/pr10112436

Sukardi, Marcellia, S., and Chusniasih, D., 2021, Formulation of Antioxidant Gel Mask Preparation of Coffee Fruit Peel Extract (Coffea Canephora), *Journal of Pharmacy and Tropical Issues*, 1(4), 108–

119.
Supeno, B., Erwan, and Ernawati, L., 2018, Diversification of Utilization of Coffee Fruit Peel Waste for Products with High Economic Value in North Lombok Regency, *Faculty of Agriculture*, University of Mataram, 1, 23–25.
Taylor, T., and Unakal, C., 2025, *Staphylococcus aureus Infection*, StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK441868/
Wowor, M. G. G., Tampara, J., Saogo, P. S., Suryanto, E., and Momuat, L. I., 2022, Phytochemical Screening and Antibacterial Test of Peel-Off Mask of Ethanol Extract of Bird Kalu Leaf (Barleria prionitis L.), *Scientific Journal of Science*, 22(1), 75–86.