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The Antibacterial Activity Test using Ethyl Acetate Fraction from Kersen Leaves (*Muntingia calabura* L.) against the *Staphylococcus aureus*

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ABSTRACT

Background: *Staphylococcus aureus* is a common cause of skin and soft tissue infections (pyoderma) and has developed resistance to multiple antibiotics. Kersen (*Muntingia calabura L.*) leaves contain bioactive compounds such as flavonoids, triterpenoids, steroids, tannins, and saponins, which have been reported to possess antibacterial properties.

Aim: This study aimed to evaluate the in vitro antibacterial activity of the ethyl acetate fraction of M. calabura leaves against S. aureus.

Methods: An experimental study with a post-test-only control group design was conducted. Phytochemical screening was performed to identify the secondary metabolites present in the fraction. Antibacterial testing was done using the well diffusion method on Mueller-Hinton Agar (MHA). Five treatment groups (ethyl acetate fractions at concentrations of 100%, 60%, 20%, 10%, and 1%) were compared to a negative control (10% DMSO) and a positive control (doxycycline). Inhibition zones were measured manually in millimeters and analyzed using one-way ANOVA ($p < 0.05$).

Results: The ethyl acetate fraction demonstrated a concentration-dependent antibacterial effect. Mean ± SD inhibition zones were 17.20 ± 1.92 mm (100%), 12.94 ± 1.13 mm (60%), 7.99 ± 0.70 mm (20%), 7.34 ± 0.35 mm (10%), and 6.71 ± 0.85 mm (1%). The positive control showed a significantly higher inhibition zone (33.82 ± 1.62 mm), while the negative control showed no inhibition. Phytochemical screening of the kersen leaf ethyl acetate fraction includes tannins, saponins, steroids, triterpenoids, and phenolics.

Conclusion: The ethyl acetate fraction of M. calabura leaves exhibited antibacterial activity against S. aureus. These findings support its potential development as a plant-based antibacterial agent, although further in vivo studies are needed.

Keywords: *Ethyl acetate fraction*; *Muntingia calabura* L; *Staphylococcus aureus.*

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1. Introduction

Bacteria are a primary contributor to infectious diseases globally. The World Health Organization (WHO) states that infectious diseases remain among the ten leading causes of mortality globally (Carita Pia, 2023). *Staphylococcus aureus* is frequently linked to pyoderma, a disorder impacting the skin and soft tissues (Bagus Oka Suyasa & Mastra, 2020; Insyra et al., 2022). Epidemiological data from the United States and Europe indicate that *Staphylococcus aureus* accounts for 18-30% of infections, with a similarly high prevalence observed in Asia (Cheong et al., 2022; Insyra et al., 2022). Antibiotics remain the most efficacious treatment for bacterial infections; nonetheless, the rise of antibiotic-resistant strains due to overuse and misuse constitutes a significant public health issue. Researchers investigated medicinal herbs for novel antibacterial agents. The kersen plant, scientifically known as *Muntingia calabura* L., is prevalent in tropical and subtropical areas. It was once used in traditional medicine to treat wounds, prevent infection spread, and reduce fever and inflammation. The efficacy of the plant as an analgesic, antipyretic, anti-inflammatory, and antibacterial agent has been supported by scientific research, which has validated traditional practices (Irmansyah Nawir et al. 2021; Carita Pia 2023).

The antibacterial activity of kersen leaves is due to their numerous bioactive compounds. The phytochemical analysis revealed the presence of flavonoids, triterpenoids, steroids, tannins, phenolics, and saponins (Carita Pia, 2023). These bioactive substances work by causing structural disruptions in bacteria, preventing the creation of proteins, or interfering with a crucial enzymatic activity in microorganisms (Carita Pia, 2023).

Ethyl acetate liquid-liquid extraction is an excellent method for separating semi-polar bioactive chemicals such as flavonoids and phenolics. Generally, these extraction fractions exhibit greater potency and concentration than the raw or aqueous extraction methods. The specific antibacterial activity of these fractions indicates a potential approach in overcoming drug-resistant diseases. As a result, it demonstrates considerable potential as a means to address this escalating challenge (Carita Pia, 2023).

Kersen leaf extracts are well-known for its inhibitory properties against Staphylococcus aureus; however, most research has concentrated on unrefined crude extracts. Fitri Puspitasari's 2023 study demonstrated that the incorporation of ethanol from fresh kersen leaf extracts at concentrations of 15%, 30%, 45%, 60%, and 70% resulted in inhibitory zones measuring 7.1 mm, 7.9 mm, 10.7 mm, 13.2 mm, and 13.7 mm, respectively. As a result, while the crude extract has been the primary focus, the ethyl acetate fraction has received less attention. This is a significant gap that must be addressed.

Staphylococcus aureus is increasingly developing medication resistance, necessitating the discovery of novel natural antibacterial agents. *Staphylococcus aureus* was chosen as the subject of the study because of its frequent correlation with pyoderma and the rise of many strains that demonstrate resistance to several antibiotics in clinical environments.

As a step toward the development of plant-based antibacterial therapies, this study aims to evaluate the antibacterial efficacy of the ethyl acetate fraction of Muntingia calabura L. leaves against Staphylococcus a reus and identify the concentration with the most potent inhibitory effect.

2. Methods

Study design / research procedures

An experimental investigation using a post-test-only control group design was performed between April and July 2024 in the Microbiology Laboratory at the Faculty of Medicine, Swadaya Gunung Jati University. We used *Staphylococcus aureus* ATCC 25923 for the assay, a strain obtained from the Health Sciences College of Muhammadiyah Cirebon. This particular strain was selected because of its well-established, stable susceptibility profile, which makes it a standard organism for antimicrobial testing under CLSI (2024) guidelines. Based on Federer's method, we determined that four replicates (n=4) were required for each experimental group to ensure the findings would be statistically valid.

The plant items

The plant items used in this research were kersen leaves (*Muntingia calabura L.)*, from the Kalijaga region in Cirebon, West Java. The plant items chosen were completely free of any signs of illness, pest damage, or physical defects. Then, these items dried in May 2024. The preparation process began with washing the leaves thoroughly with running water. They were then drained and spread out in the shade to dry for about a week to ten days at a room temperature between 26°C and 30°C, until they were brittle. The dried material was then ground into a fine powder using a stainless steel grinder to protect against contamination and metabolite degradation. The final step was to store it in containers that protected it from both air and light. Taxonomic identification for this study was conducted by the Herbarium Laboratory at the Department of Biology, Universitas Negeri Semarang, with the reference number 117/UN.37/SHP/Herbarium/IV/2024.

Derivation of the extract

Our procedure for the derivation of the extract began by immersing 300 grams of the ground *Muntingia calabura* leaf powder in 96% ethanol. The mixture, prepared at a 1:10 (w/v) ratio, was then left in a securely sealed glass vessel for a total of three days. During this time, it was stirred manually twice daily (every 12 hours) to ensure a thorough extraction. The mixture was filtered through Whatman No. 1 paper once the maceration period concluded. The solvent was then evaporated from the filtrate under vacuum at 40°C using a rotary evaporator (IKA® RV10, Germany) to produce a concentrated crude ethanolic extract. We then fractionated the extract using a liquid-liquid partitioning method. In a separatory funnel, the extract was washed in sequence with n-hexane, ethyl acetate, and finally, distilled water. The ethyl acetate layer was specifically collected because it contained the targeted semi-polar compounds, such as flavonoids and phenolics. After isolation, this fraction was concentrated further on a rotary evaporator and then stored at 4°C until needed for analysis.

Analysis of phytochemical content

To determine the extract's chemical composition, a phytochemical analysis was performed at the Laboratory of the Center for Biopharmaceutical Studies, LPPM-IPB University, with the results officially documented under certificate number 405.043/LPSB IPB/V/2024. The analytical process involved several different qualitative tests. First, to screen for flavonoids, we dissolved 0.5 g of the ethyl acetate fraction in methanol, heated the solution, and then allowed it to cool. A positive test for flavonoids was indicated by the formation of a reddish-orange color upon the addition of concentrated sulfuric acid. The acidified solution was divided into three parts and treated with different reagents. Test for alkaloids, four different reagents were employed. A positive result of alkaloids will form a brick red (Dragendrauf reagent), yellow or white (Mayer reagent), and brown -black (Hager reagent + methanol + Bauchardt reagent). For the tannin test, the presence of these compounds was confirmed when adding 1% $FeCl_3$ to the hot water extract resulted in a dark blue or greenish-black color change. Kersen leaf ethyl acetate fraction, add hot water and the addition of HCl 2 N, homogenize again until the foam stays for 10 minutes for positive saponin. For phenolic compounds, the fraction was reacted with $FeCl_3$, producing a dark blue to black color. Steroids and triterpenoids were screened using the Liebermann–Burchard test: the sample was treated with ethanol, ether, and acetic anhydride, followed by concentrated sulfuric acid; a red color confirmed triterpenoids, whereas green coloration indicated the presence of steroids.

Antibacterial activity assay

Test the antibacterial activity of the ethyl acetate fraction; the well diffusion method was performed using Mueller-Hinton Agar (MHA; Oxoid™, UK). The agar was prepared by dissolving 38 g of its powdered form in 1 L of distilled water, after which the solution was sterilized for 15 minutes at 121°C in a Yamato® (Japan) autoclave. The process began by cultivating *Staphylococcus aureus* ATCC 25923 on a Nutrient Agar plate, which was incubated for 24 hours at 37°C. Once the growth period was complete, the bacteria were suspended and the culture's density was standardized against the 0.5 McFarland standard, yielding a final concentration of roughly 1.5×108 CFU/mL.

The wells were punched into the using a cork borer. The ethyl acetate fraction of kersen leaf, positive control (doxycycline), and negative control (10% DMSO) were inserted into the wells in 35 µL and incubated at 37°C for 24 hours. After incubation, the zones of inhibition were measured with a Mitutoyo® (Japan) digital caliper. The findings were evaluated according to CLSI criteria and classified as sensitive (S), intermediate (I), or resistant (R).

Statistical Techniques

All data were analyzed using IBM SPSS Statistics version 22. Prior to analysis, normality was assessed using the Shapiro–Wilk test due to the relatively small sample size (n<50). Levene's test was used to determine homogeneity of variance. One-way ANOVA was used to find significant differences between groups if the assumptions were satisfied. Since the variances were not homogeneous, post hoc comparisons were made using Tamhane's T2 method. Statistical significance was set at $p < 0.05$.

Ethical Clearance

Despite not using human or animal participants and being carried out in vitro, this research closely followed the guidelines of Good Laboratory Practice (GLP). Ethical approval for this study was granted by the Ethics Committee of the Faculty of Medicine, Swadaya Gunung Jati University's with the reference number 11/EC/FKUGJ/IV/2024.

3. Results

Phytochemical Screening

Qualitative phytochemical screening tests were carried out on Kersen Leaves (*Muntingia calabura* L.) to show the presence of several classes of secondary metabolite compounds as seen in Table1. The qualitative results of the phytochemical screening test are determined by colour changes or the presence of chemicals that precipitate from secondary metabolites. This indicated the presence of tannins, saponins, steroids, triterpenoids, and phenolics.

Table 1. Outcomes of the phytochemical analysis

No	Phytochemical test	Information	Results
1.	Alkaloid		
	a. Boucharde	Brown-black sediment	-
	b. Dragendrauf	White sediment	-
	c. Hager	Yellow sediment	-
	d. Meyer, methanol, and boucharde	Brown-black sediment	-
2.	Tanin	Formed a dark blue or blackish green color	+
3.	Triterpenoid	Formed red or purple color	+
4.	Steroid	Formed green color	+
5.	Saponin	A steady foam is formed for ±10 minutes	+
6.	Phenolic	Formed red color	+
7.	Flavonoid	Formed red color	-

Antibacterial Activity

The antibacterial test showed that the ethyl acetate fraction demonstrated concentration-dependent inhibitory effects against *Staphylococcus aureus*. With a diameter of 17.20 ± 1.97 mm, group P1 (100%) had the largest mean inhibition zone, which the Clinical and Laboratory Standards Institute (CLSI M100, 2023) categorized as intermediate. Smaller inhibition zones were produced by lower doses, which were categorized as resistant. The negative control (10% DMSO) showed no inhibition, but the positive control (doxycycline) had a much wider inhibition zone of 33.82 ± 1.61 mm (sensitive).

Table 2. Outcomes observed following the management of *Staphylococcus aureus* infection

Groups	Inhibition Zone Diameter (mm)				Recurrence Mean (mm)	Category
	I	II	III	IV		
P1	19.22 (p=0.012)	16.45 (p=0.017)	14.90 (p=0.015)	18.25 (p=0.014)	17.20	Intermediate
P2	14.10 (p=0.004)	11.60 (p=0.005)	12.45 (p=0.003)	13.60 (p=0.004)	12.93	Resistance
P3	7.55 (p=0.001)	7.35 (p=0.001)	8.15 (p=0.001)	8.90 (p=0.001)	7.98	Resistance
P4	7.10 (p=0.001)	7.25 (p=0.001)	7.15 (p=0.001)	7.85 (p=0.001)	7.33	Resistance
P5	5.75 (p<0.001)	7.55 (p=0.001)	6.25 (p=0.001)	7.30 (p=0.001)	6.71	Resistance
K (+)	34.27 (ref)	31.45 (ref)	34.45 (ref)	35.12 (ref)	33.82	Sensitive
K (–)	0.00 (p<0.001)	0.00 (p<0.001)	0.00 (p<0.001)	0.00 (p<0.001)	0.00	–

Statistical Analysis

Shapiro–Wilk analysis indicated that all treatments and positive control groups followed a normal distribution ($p > 0.05$), while the negative control group did not ($p < 0.05$). Levene's test based on the mean yielded a p-value of 0.004, indicating that the data variance was not homogeneous. One-way ANOVA showed a significant difference across all groups ($p < 0.001$). From Table 3, it is found that the p-value is .000. given that the p-value < 0005 it can be said that there is a significant difference in all groups.

Table 3. Results of *Shapiro–Wilk Test, Levene's test, One-way ANOVA test for each groups*

Test	Groups	Results			
		N	**Sig.**	**Information**	
Shapiro–Wilk Test	P1	4	0.832	Normal	
	P2	4	0.749	Normal	
	P3	4	0.604	Normal	
	P4	4	0.074	Normal	
	P5	4	0.490	Normal	
	K+	4	0.152	Normal	
	K-	4	0.000	Abnormal	
Levene's test		**Levene Statistic**	**df1**	**df2**	**Sig.**
	Based on Mean	4.698	6	21	.004
	Based on Median	2.579	6	21	.050
	Based on the Median and with adjusted df	2.579	6	6.596	.127
	Based on trimmed mean	4.371	6	21	.005
One-way ANOVA test		**N**	**Mean**	**Sig.**	
	P1	4	17.20	.000	
	P2	4	12.93		
	P3	4	7.98		
	P4	4	7.33		
	P5	4	6.71		

Table 4. Post-hoc test

Groups	Groups	Mean Difference
P1	P2	4.27000
	P3	9.22000*
	P4	9.87000*
	P5	10.49500*
P2	P1	-4.27000
	P3	4.95000*
	P4	5.60000*
	P5	6.22500*
P3	P1	-9.22000*
	P2	-4.95000*
	P4	.65000
	P5	1.27500
P4	P1	-9.87000*
	P2	-5.60000*
	P3	-.65000
	P5	.62500
P5	P1	-10.49500*
	P2	-6.22500*
	P3	-1.27500
	P4	-.62500

Tamhane's post hoc test revealed statistically significant differences between P1 and all lower-concentration groups, as well as between P2 and P4/P5. The post hoc comparisons detailed in Table 4 point to several statistically significant outcomes. The most notable finding is that Group P1's ability to inhibit bacterial growth was significantly higher than that of groups P3, P4, and P5 ($p<0.05$). The mean differences were substantial, with P1 outperforming them by 9.22 mm, 9.87 mm, and 10.50 mm, respectively. Although the comparison between P1 and P2 showed a difference of 4.27 mm, it was not statistically significant ($p > 0.05$). Group P2 also exhibited significantly greater inhibition than P3, P4, and P5, with differences ranging from 4.95 mm to 6.23 mm ($p < 0.05$). However, there were no significant changes ($p > 0.05$) between P3, P4, and P5, suggesting that the antibacterial effects were comparable at these lower doses.

An examination of the table reveals that the mean inhibition zones varied with statistical significance ($p < 0.05$) across the majority of group comparisons. This difference was especially stark when comparing the low and high concentrations of the ethyl acetate fraction, which points to a clear, concentration-driven antibacterial impact on *Staphylococcus aureus*.

Following the complete analysis, a paired comparison was done to see how the two treatments affected the inhibition zones. This test was done to see if the treatments worked more effectively in reducing bacteria than each other. Table 5 shows a summary of the outcomes.

A statistical analysis of the table 5 shows significant differences ($p<0.05$) in the average inhibition zones for the group comparisons. This effect was especially pronounced when contrasting low and high concentrations of the ethyl acetate fraction against *Staphylococcus aureus*, strongly indicating that its antibacterial activity is concentration-dependent. At higher concentrations, however, the effects seemed to level off, since the differences in activity between P3 and P4, and again between P4 and P5, were not statistically significant. The data suggest that the maximum inhibitory effect was achieved at a lower dose.

Table 5. Summary of pairwise comparisons based on the Tamhane post hoc test

Comparison	Mean Difference (mm)	Significance
P1 vs P2	4.27	$p < 0.05$
P1 vs P3	9.22	$p < 0.05$
P1 vs P4	9.87	$p < 0.05$
P1 vs P5	10.50	$p < 0.05$
P2 vs P3	4.95	$p < 0.05$
P2 vs P4	5.60	$p < 0.05$
P2 vs P5	6.23	$p < 0.05$
P3 vs P4	0.65	Not Sig.
P4 vs P5	0.63	Not Sig.

4. Discussion

This research supported the potential of *Muntingia calabura* L. as a source of alternative antibacterial agents by confirming that the ethyl acetate portion of the plant's leaves showed antibacterial activity against *Staphylococcus aureus*. Our findings both reinforce the prior research by Fitri Puspitasari (2023) and demonstrate the enhanced effectiveness of using an ethyl acetate extraction method. Specifically, the 17.20 mm inhibition zone we achieved at 100% concentration is a clear, although modest, increase over the 7.1–13.7 mm range observed in the earlier study, which used crude ethanol extracts (Puspitasari, 2023).

Enchoing these findings, the work of Irmansyah Nawir et al. (2021) also showed that *Muntingia calabura* leaf extracts possess antibacterial activity against both Gram-positive and Gram-negative organisms, although they did not detail specific results for *Staphylococcus aureus*. Nevertheless, the pattern of activity from our investigation is consistent with mounting evidence that highlights the antibacterial properties of *Muntingia calabura*, particularly when using its semi-polar fractions (Bayu Kristianto et al., 2019; Dwi Indah Putri & Zielda Najib, 2022; Purba et al., 2023).

The primary advantage of our study over previous efforts is its focused analysis of a single fraction (ethyl acetate), which provided a clearer understanding of its dose-dependent effects. Even with the improved understanding from this research, the extract's practical application is hindered by a key drawback. Its antibacterial effect is simply not potent enough to be effective for medical purposes when measured against the strength of standard clinical antibiotics (Harum Anggraini et al., 2021).

The fact that the ethyl acetate fraction lacked flavonoids and alkaloids probably explains why its antibacterial effect is classified as intermediate. This limitation was observed despite the presence of other bioactive compounds (tannins, saponins, etc.) the alignment of our findings with existing literature (Carita Pia, 2023) suggests two alternative interpretations. It's possible that a more powerful antibacterial effect is dependent on compounds isolated in the other fractions. Alternatively, the plant may only exhibit its maximum antibacterial strength when its diverse chemical components interact synergistically.

This research's findings must be understood considering several limitations. The study did not extend to measuring the Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC), which are essential for a precise assessment of antibacterial potency. Another significant limitation was the study's exclusive reliance on an *in vitro* model. This precluded any exploration of essential *in vivo* characteristics, including toxicity, bioavailability, and pharmacokinetics. The study is also constrained by its qualitative phytochemical analysis, which makes it impossible to measure the specific contribution of any one compound to the overall bioactivity. Furthermore, since environmental and seasonal factors known to alter a plant's chemical profile were not standardized, the reproducibility of these results by other researchers could be challenging.

The findings of this study indicate that the ethyl acetate extract from *Muntingia calabura* leaves possesses a moderate level of effectiveness in inhibiting *Staphylococcus aureus* in a lab setting.However, despite this potential, the extract's current level of activity is not strong enough for it to be considered for therapeutic applications without substantial improvement. This includes in vivo assessment, MIC testing, and quantitative analysis.

5. Conclusion

The ethyl acetate fraction of kersen leaf (*Muntingia calabura L.*) at 100% concentration exhibits the highest in vitro inhibition against *Staphylococcus aureus*, showing intermediate activity. The fraction shows clear potential as a natural antibacterial agent, particularly for topical herbal applications, an effect which is attributed to its composition of secondary metabolites like phenolics, triterpenoids, tannins, and saponins. However, it must be noted that its overall potency is still lower than that of conventional antibiotics.Further research is necessary, including quantitative phytochemical analysis, antioxidant testing, in vivo validation, and comparative studies with other solvent fractions such as methanol, to confirm its efficacy and support the development of eco-friendly, plant-based antibacterial treatments.

Conflict of Interest

The research declares that there are no competing interests related to the findings.

References

Bagus Oka Suyasa, I., & Mastra, N. (2020). Gambaran Methicillin Resistant Staphylococcus aureus (MRSA) Pada Petugas Kesehatan RSUD Wangaya Kota Denpasar. *Meditory : The Journal of Medical Laboratory*, *8*(1), 2338–1159. https://doi.org/10.33992/m.v8i1.1074

Bayu Kristianto, Y., Sulistyarini, I., & Suharsanti, R. (2019). Uji Aktivitas Antibakteri Ekstrak Etanol, Air Buncis (Phaseolus vulgaris L.) Dan Fraksi-Fraksinya Terhadap Pertumbuhan Bakteri Staphylococcus aureus. *Media Farmasi Indonesia*, *14*(2), 1546–1550. Retrieved from https://mfi.stifar.ac.id/MFI/article/view/135

Carita Pia, F. (2023). Review: Studi Kandungan Fitokimia dan Aktivitas Antibakteri Ekstrak Daun Kersen (Muntingia calabura L.). *Prosiding WORKSHOP DAN SEMINAR NASIONAL FARMASI*, *2*, 150–161. https://doi.org/10.24843/WSNF.2022.v02.p12

Cheong, N. D. H., Amran, M. M., & Yusof, H. (2022). Phytochemical Investigation and Antimicrobial Activity of Muntingia calabura L. Against Selected Pathogens. Malaysian Journal of Medicine and Health Sciences, 18, 301-307. https://doi.org/10.47836/mjmhs18.s15.42

Dwi Indah Putri, C., & Zielda Najib, S. (2022). Uji Aktivitas Antioksidan Dan Toksisitas Pada Ekstrak Etanol Daun Kersen (Muntingia calabura L.) Di Bangkalan. *Indonesian Journal Pharmaceutical and Herbal Medicine (IJPHM)*, *1*(2), 66–71. https://www.neliti.com/publications/410740/uji-aktivitas-antioksidan-dan-toksisitas-pada-ekstrak-etanol-daun-kersen-munting#cite

Harum Anggraini, P., Dwi Septiarini, A., Siska, T. W., Ilmu Kesehatan, F., Duta Bangsa, U., & Penulis, K. (2021). Uji Daya Hambat Ekstrak Dan Fraksi N-Hekasan, Fraksi Etil Asetat, Fraksi Air Daun Kersen (Muntingia calabura L) Terhadap Bakteri Staphylococcus aureus ATCC 25923. *Duta Pharma Journal*, *1*(2), 8–19. DOI: https://doi.org/10.47701/djp.v1i2.1209

Insyra, A. R., Hagni Wardoyo, E., & Dirja, B. T. (2022). Uji Aktivitas Antibakteri Getah Biduri (Calotropis gigantea) Terhadap Pertumbuhan Bakteri Staphylococcus aureus. *Jurnal Kedokteran Unram*, *11*(3), 1067–1072. DOI: https://doi.org/10.29303/jk.v11i3.4737

Irmansyah Nawir, A., Anna Nur Afifah, C., Sulandjari, S., & Handajani, S. (2021). Pemanfaatan Daun Kersen (Muntingia calabura L.) Menjadi Teh Herbal. *Jurnal Tata Boga*, *10*(1), 1–11. https://ejournal.unesa.ac.id/index.php/jurnal-tata-boga/article/view/37799

Purba, A. U. C., Naliani, S., & Sugiaman, V. K. (2023). Efektivitas Antibakteri Fraksi Buah Merah (Pandanus conoideus Lam) sebagai Pembersih Gigi Tiruan Sebagian Lepasan terhadap Staphylococcus aureus. *E-GiGi*, *11*(2), 143–151. https://doi.org/10.35790/eg.v11i2.44464

Puspitasari, Fitri. (2023). Uji Aktivitas Antibakteri Ekstrak Etanol Daun Kersen (Muntingia calabura L.) Terhadap Bakteri *Staphylococcus aureus*. UGJ.

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