Vol 11 No 1, 2026

BULETIN FARMATERA

E-ISSN: 2528-410X

RESEARCH ARTICLE

# Inhibition Test of Aloe Vera Extract (*Aloe vera l.)* Against the growth of *Staphylococcus aureus*

**Muhammad Rizqi Amin Lubis[1], Cut Mourisa,[2]**

[1]Faculty of Medicine, Universitas Muhammadiyah Sumatera Utara, Jalan Gedung Arca No 53 Medan, 20217, Sumatera Utara

[2]Department of Pharmacology and Therapy, Faculty of Medicine, Universitas Muhammadiyah Sumatera Utara, Jalan Gedung Arca No 53 Medan, 20217, Sumatera Utara

**Corresponding Author:** cutmourisa@umsu.ac.id

**Abstract:** The use of antibacterial is a solution to treat various infectious diseases. However, the mismatch of the dose given can lead to bacterial resistance to these antibacterial substances. So, it is necessary to renew or develop natural medicines to kill bacteria and prevent resistance. One type of plant that can be used as a natural antibacterial is aloe vera (Aloe vera L.) because it contains several active substances including saponins, flavonoids, tannins and polyphenols which are thought to have antibacterial activity. This study used an experimental method with a laboratory observation approach. The technique used to measure the extra inhibition of aloe vera (Aloe vera L.) is the well diffusion method. The results showed that aloe vera extract (Aloe vera L.) in all concentration groups (20%, 40%, 60%, 80%, and 100%) had a significant difference. with a probability value (p) <0.05, which means that aloe vera extract is effective in inhibiting the growth of Staphylococcus aureus bacteria. Aloe vera extract ( Aloe Vera L) is effective in inhibiting the growth of Staphylococcus aureus.

**Keywords:** Aloe vera, Staphylococcus aureus, Antibacterial, Effectiveness

## INTRODUCTION

The skin is the outermost layer of the body that has a protective function against all forms of trauma. The skin layer consists of the epidermis, dermis, and subcutaneous, and has a size of about 15% of the weight of the human body. The epidermis lacks blood vessels, nerves, and glands, all of which have the potential to contract disease.[1]

Infectious diseases due to damage to epidermal tissue are one of the most common diseases found in tropical countries, including Indonesia. Data from Indonesia's health profile in 2016 shows that skin and subcutaneous tissue diseases are ranked third out of the top 10 diseases of outpatients in hospitals throughout Indonesia based on the number of visits,

E-ISSN: 2528-410X

which is as many as 192,414 visits, 122,076 new case visits, and 70,338 old cases.[2]

The use of antibacterial is a solution to treat various infectious diseases. However, the mismatch of the dosage given can result in bacterial resistance to the antibacterial substance. The emergence of this resistance problem seems to add to the list of unsolved problems, so it is necessary to update or develop natural medicines to kill bacteria and prevent the occurrence of resistance.[3]

According to the *World Health Organization* (WHO), 80% of the world's population still uses medicinal plants for health maintenance.[4] Medicinal plants will be the best source for various types of diseases. Plant extracts play an important role in inhibiting the growth of pathogenic germs because they are antimicrobial.[5]

One type of plant that can be used as a natural antibacterial is aloe vera (*Aloe vera L.*). Aloe vera contains several active substances including saponins, flavonoids, tannins and polyphenols. The saponins contained in aloe vera can damage the acids (DNA and RNA) in bacteria. Tannin compounds in aloe vera plants pharmacologically function as a prevention of wound infections because they contain antibacterial power and burn medicine. The polyphenols and flavonoids in aloe vera have activities that can result in lysis and inhibit the process of cell wall formation.[6]

Research conducted in India on the effectiveness of aloe vera as an antibacterial showed that aloe vera extract is able to inhibit the growth of gram-positive (*Staphylococcus aureus* and *Enterococcus bovis*) and gram-negative bacteria (*Proteus vulgaris, Proteus mirabilis, Pseudomonas aeruginosa* and *Klebsiella pneumonia*). The effectiveness of aloe vera against gram-positive bacteria has a greater inhibition zone than gram-negative bacteria.[7]

Research conducted by Alim showed that aloe vera leaf extract at different concentrations (25%, 30% and 35%) was able to inhibit the growth of *Staphylococcus aureus bacteria* with different inhibitory properties.[8] Another study on the inhibition of *Aloe vera L extract.* against the growth of *Staphylococcus aureus* (in vitro study) the results were obtained that *Aloe vera L.* can inhibit the growth of *Staphylococcus aureus* bacteria, and minimal inhibition levels of *Aloe vera L extract.* is at a concentration of 25%.[9]

Based on the description above, the researcher wants to conduct research using aloe vera meat (gel) (*Aloe vera L.*) and with aloe concentrations that vary from the lowest concentration below the concentration in the previous study to the concentration that reaches 100%, so it will be seen whether any increase in the concentration of aloe vera extract (*Aloe vera L.*) can have a different effect in inhibiting the growth of *Staphylococcus aureus bacteria*.

## METHOD

The type of research used was experimental in which the researcher gave treatment to *Staphylococcus aureus* bacteria given aloe vera extract (*Aloe vera L.*) in

BULETIN FARMATERA
E-ISSN: 2528-410X

various concentrations. The bacterial species used in this study were obtained from the Microbiology laboratory, Faculty of Medicine, University of North Sumatra. The research material is in the form of aloe vera extract (*Aloe vera L.*). The antibacterial test was carried out by diffusion method and used aquabides as negative control. Dilution test materials from 100%, 80%, 60%, 40%, and 20% concentrations. Aloe vera extract test (*Aloe vera L.*) in inhibiting the growth of *Staphylococcus aureus* bacteria is carried out using *Muller Hinton Agar media*. Then a sterile cotton skewer that has been dipped in bacterial suspense and applied to the surface of the media. After drying, holes are made to assess the resistance that occurs using a cork borer (test method of the borer). Then using a dropper pipette, aloe vera extract is taken and dripped into the media until it is parallel to the agar. then the agar plates are incubated at 37oC for 24 hours. After 24 hours, calculate the obstruction area using the caliper. This study was carried out 2 times. Statistical analysis with *the One Way Anova test* with a significant level of 5%.

## RESULT

### Research Results Data

This study was conducted with the aim of determining the inhibition test of aloe vera extract *(Aloe vera* L) against the growth of *Staphylococcus aureus* by the sub diffusion method. From this study, it can be determined by conducting qualitative observations by measuring the diameter of the inhibition zone at each extract concentration, namely 20%, 40%, 60%, 80%, and 100%, then compare it with negative controls. The ingredients used are aloe vera *leaf extract (Aloe vera* L) with negative control , 20%, 40%, 60%, 80%, and 100% tested against *Staphylococcus bacteria aureus.* The results of the study are presented in the form of a table as follows:

**Table 1 Results Data Effect of concentration on clear zones of *Staphylococcus aureus bacterial growth***

| | **Staphylococcus aureus *Bacterial Inhibition Zone Diameter* (mm)** | | | | | |
|---|---|---|---|---|---|---|
| | **Concentration (%)** | | | | | **Negative Control** |
| | 20 | 40 | 60 | 80 | 100 | |
| Repetition 1 | 1,7 | 2,0 | 2,3 | 2,7 | 2,8 | 0 |
| Repetition 2 | 1,6 | 2,1 | 2,2 | 2,6 | 3,3 | 0 |
| Average | 1,65 | 2,05 | 2.25 | 2,65 | 3.05 | 0 |

In table 1, the results obtained from this study were obtained with an average diameter of the inhibition zone in aloe vera *extract (Aloe vera* L.) with concentrations of 20%, 40%, 60%, 80%, and 100%, respectively 1.65 mm, 2.05 mm, 2.25 mm, 2.65 mm, and 3.05 mm

BULETIN FARMATERA
E-ISSN: 2528-410X

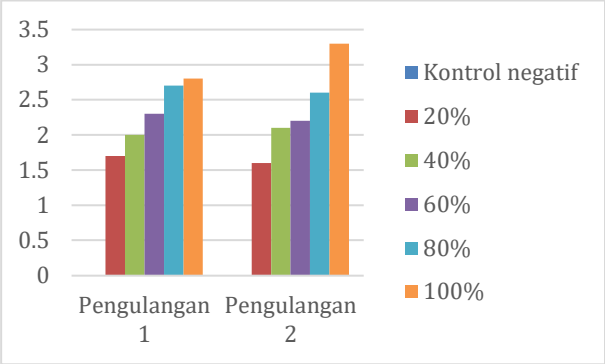


**Figure 1. Inhibition Test Graph of Aloe Vera Extract (Aloe vera L.)**

In this study, based on the results of the normality test, the data from this study has a value of Sig. >0.05, thus it can be concluded that the data for the treatment group is normally distributed, then the One Way ANOVA *test* can be continued.

**Table 2. Results of the One-Way ANOVA Test**

| Group | N | Mean ± SD | p-value |
|---|---|---|---|
| Concentration 0% | 2 | 0,00 ± 0,00 | |
| Concentration 20% | 2 | 1,650 ± 0,707 | |
| Concentration 40% | 2 | 2,050 ± 0,707 | 0,000 |
| Concentration 60% | 2 | 2,250 ± 0,707 | |
| Concentration 80% | 2 | 2,650 ± 0,707 | |
| Concentration 100% | 2 | 3,050 ± 3,536 | |

The results of the analysis were obtained that the average value in the 100% concentration group was 3.05 while the standard deviation was obtained 3.536. The results of *the One Way* ANOVA test were obtained with a result of p<0.05, which means that there is an effect of giving aloe vera extract (*Aloe Vera L.*) against the growth of *Staphylococcus aureus bacteria.*

From the results of the homogeneity test, it was found that the variants of the group were the same, so the follow-up test (*Post Hoc Test*) used was *the Turkish* test. From the results of this study, it can be seen in Table 3 The follow-up test (*Post Hoc Test*) showed a significant difference. The p<0.05 value is said to be significant, this explains that there is a significant difference (p<0.05) in the average difference in bacterial growth in each treatment group with the other treatment group.

**Table 3. Turkey Test Results on Aloe Vera Extract (Aloe vera L.) Test Results at a concentration of 100% with 80%**

| | n | P | Information |
|---|---|---|---|
| 100% Aloe Vera Extract | 2 | 0,236 | Insignificant |
| Aloe Vera Extract 80% | 2 | | |

Table 4 shows that aloe vera extract (*Aloe vera L.*) in the comparison of 100% concentration with 80% obtained a value of p=0.236 (p<0.05) which means that there is no difference in inhibition of aloe vera extract (*Aloe vera L.*) at a concentration of 100% by 80%.

**Table 4. Turkey Test Results on Aloe Vera Extract Test Results (Aloe vera L.) at a concentration of 100% with 60%**

| | n | P | Information |
|---|---|---|---|
| 100% Aloe Vera Extract | 2 | 0,016 | Significant |
| Aloe Vera Extract 60% | 2 | | |

BULETIN FARMATERA
E-ISSN: 2528-410X

Table 4 shows that aloe vera extract (*Aloe vera L.*) in the comparison of 100% concentration with 60% obtained a value of p=0.016 (p<0.05) which means that there is a difference in the inhibition of aloe vera extract (*Aloe vera L.*) at a concentration of 100% with 60%.

**Table 5. Turkey Test Results on Aloe Vera Extract (Aloe vera L.) Test Results at 100% with 40% concentration**

| | n | P | Keterangan |
|---|---|---|---|
| 100% Aloe Vera Extract | 2 | 0,005 | Signifikan |
| Aloe Vera Extract 40% | 2 | | |

Table 6 shows that aloe vera extract (*Aloe vera L.*) in the comparison of 100% concentration with 40% obtained a value of p=0.005 (p<0.05) which means that there is a difference in the inhibition of aloe vera extract (*Aloe vera L.*) at a concentration of 100% by 40%.

**Table 6. Turkey Test Results on Aloe Vera Extract Test Results (Aloe vera L.) at a concentration of 100% with 20%**

| | n | P | Information |
|---|---|---|---|
| 100% Aloe Vera Extract | 2 | 0,001 | Significant |
| Aloe Vera Extract 20% | 2 | | |

Table 7 shows that aloe vera extract (*Aloe vera L.*) in the comparison of 100% concentration with 20% obtained a value of p=0.001 (p<0.05) which means that there is a difference in the inhibition of aloe vera extract (*Aloe vera L.*) at a concentration of 100% with 20%.

## DISCUSSION

Based on the data from the study results, it can be seen that the administration of aloe vera extract can reduce the growth of *Staphy-lococcus aureus*. This can be seen from the average diameter of the bacterial growth inhibition zone in each treatment group.

Judging from table 4.1, it can be seen that there is an effect of the concentration of aloe vera leaf extract on the growth inhibition zone of Staphylococcus aureus bacteria because the average diameter of the inhibition zone from the largest concentration of 100% is 3.05 mm. The data obtained from the results of the study show that aloe vera leaf extract has antibacterial capabilities.It can be seen that different concentrations of aloe vera leaf extract show different antibacterial powers.

The maceration method used in this study uses 96% ethanol as a solvent both polar and non-polar to obtain the content of active substances anthraquinone, tannins, and saponins. So that the chemical components in aloe vera leaves are expected to be extracted perfectly. The higher the concentration, the more inhibited the growth of bacteria.This is due to the content of chemical substances found in aloe vera leaves.

This is in line with research conducted by Sulystiani et al. which states that aloe vera leaf infusion can be used as an antibacterial agent for pathogenic bacteria *Pseudomonas aeroginosa, Salmonella typhi,* and *Staphylococcus aureus*. [10]

BULETIN FARMATERA
E-ISSN: 2528-410X

Another study stated that the content of *aloe vera extract (Aloe* vera L) which contains saponins, tannins and anthraquinone is able to inhibit the growth of bacteria. Tannins have antibacterial powers, namely through a reaction with the cell membrane, where tannins attack cell wall polypeptides so that the formation of cell walls is less complete and causes bacterial cells to lysis due to osmotic pressure so that the cell will die.[11]

Anthraquinone is an antibacterial agent. The working principle of anthraquinone is the interaction of phenol compounds with bacterial cells . These compounds are related to proteins in bacteria through non-specific bonds forming protein-phenol compounds. At low concentrations, protein-phenol complexes are formed with weak bonds and immediately undergo decomposition, which damages the cytoplasmic membrane and causes leakage of cell contents, so that bacterial growth is disrupted. inhibited. Meanwhile, at high concentrations, the substance coagulates with cellular proteins and the cytoplasmic membrane undergoes lysis. Phenol compounds enter the bacterial cell through the bacterial cell wall and cytoplasmic membrane, inside the phenol bacterial cell causing the clumping (denaturation) of protoplasmic proteins so that in such a state metabolism becomes inactive and bacterial growth becomes inhibited.[12]

However, in the research conducted by Rahardjo, it was stated that the antibacterial activity of *Aloe vera* gel ethanol extract against Staphylococcus aureus could not be determined by diffusion method and dilution method. This can occur due to the low level of active compounds used in *Aloe vera gel samples* due to the influence of environmental factors, differences in plant age, degradation processes and enzyme-tics reactions, differences in extraction methods, and oxidation processes when exposed to air.[13]

The research conducted by Widyastuti also showed that the antibacterial test of aloe vera leaf infusion (*Aloe vera L.*) at 100% concentration with the diffusion method did not show the presence of an inhibition zone around the culture of *Staphylococcus aureus* and *Escherichia coli bacteria*.[14]

From the results of this study, it can be concluded that in the table, aloe vera leaf extract is known to have a probability value of (p)<0.05. After continuing, the comparative test starting from the concentration of 20% aloe vera leaf extract can inhibit the growth of Staphylococcus *aureus bacteria.* Thus, aloe vera leaf extract has a good chance of being developed again with different methods as an antibacterial drug preparation, including skin infections, luka and other nosocomial infections.

## CONCLUSION

1. *Aloe vera* extract (Aloe vera L) has significant *antibacterial* effectiveness against Staphylococcus aureus bacteria as the higher the concentration *of aloe vera extract (*Aloe vera L), thenthe greater the diameter of the inhibition zone of Staphylococcus aureus *bacteria.*
2. The lowest concentration of aloe *vera extract (Aloe* vera L) can inhibit the

E-ISSN: 2528-410X

growth of Staphylococcus aureus bacteria at a concentration of 20%, while the highest concentration of aloe vera *extract (Aloe vera* L) is the most can effectively inhibit the growth of Staphylococcus aureus *bacteria* at a concentration of 80 %

## SUGGESTION

It is hoped that research can be carried out to find out the active compounds that play the most antibacterial role in aloe vera *extract (Aloe vera* L).

## REFERENCES


1. Mescher AL. Histologi Dasar Junqueira Teks dan Atlas. Jakarta: EGC; 2012;59-76
2. Kemenkes RI. Profil Kesehatan Indonesia 2016.
3. Puteri T, Tiana M. Uji Daya Hambat Ekstrak Daun Lidah Buaya (*Aloe vera L.*) Terhadap Bakteri *Escherichia coli* dan *Staphylococcus aureus*. Bandung. Skripsi: Universitas Padjajaran: Fakultas Farmasi; 2016;09-14
4. Sheikh M, Abdullah RM, Meghavanshi MK and Irshad M. Studies on Some Plant Extract for Their Antimicrobial Potential Against Certain Pathogenic Microorganisms. *American Journal of Plant Sciences*. 2012. 3. 209-213.
5. Arifin J. Intensif Budidaya Lidah Buaya. Yogyakarta: Pustaka Baru Press; 2015;1-25
6. Johnson M, Renishyeya JJM, Beaulah N, Laju RS, Anupriya G, Ethal RJJ. Antibacterial and antifungal activity of *Aloe vera* gel extract. International Journal of Biomedical and Advance Research. 2012; 03:03
7. Pandey R, Avinash M. Antibacterial Activities of Crude Extract of *Aloe Barbadensis* to Clinically Isolated Bacterial Pathogens. Application Biochemistry Biotechnology. 2010;160;1356-61.
8. Alim, N. Pengaruh Ekstrak Daun Lidah Buaya sebagai Penghambat Pertumbuhan Bakteri *Staphylococcus aureus*. Ambon: FMIPA Universitas Pattimura; 2013.72-77
9. Rieuwpassa I, Rahmat, Karlina. Daya Hambat Ekstrak *Aloe vera* Terhadap Pertumbuhan *Staphylococcus aureus* (Studi in Vitro). Dentofasial. 2011 Juni;10(2):65-70
10. Sulistyani N, Kurniati E, Yakup, Cempaka RA. Aktvitas Antibakteri Infusa Daun Lidah Buaya (Aloe barbadensis Miller). Jurnal Penelitian Saintek. 2016: Vol. 21 (2).
11. Rahmawati. lnteraksi Ekstrak Daun Lidah Buaya (Aloe vera L) dan Daun Sirih (piper betle L) Terhadap Daya Hambat *Staphylococcus aureus*

E-ISSN: 2528-410X

Secara lnvitro. Journal Of Nutrition College. 2014. vol. 2, No. 1. Hh 121-186.

12. Gede AKDIB, Ketut SS. Daya Hambat Ekstrak Kulit Daun Lidah Buaya (Aloe barbedensis Miller) Terhadap Pertumbuhan Bakteri *Staphylococcus aureus A TCC 25923 dan Eschericchia coli ATCC 25922.* Journal Of Nutrition College, 2012. vol. XVI, No.1. Hh 1-4
13. Rahardjo M, Koendhori EB, Setiawati Y. Uji Aktivitas Antibakteri Ekstrak Etanol Lidah Buaya (*Aloe vera*) Terhadap Bakteri *Staphylococcus aureus*. Jurnal Kedokteran Syiah Kuala. 2017; 17(2): 65-70.
14. Widyastuti Y, Yuliani N, Manik IGA. Aktivitas Antibakteri Infusa Daun Lidah Buaya (*Aloe vera L*) Terhadap Pertumbuhan *Staphylococcus aureus* dan *Escherichia coli*. Jurnal Sains Natural Universitas Nusa Bangsa. 2016; 6 (1): 33 – 43.