



Minimum Inhibitory Concentration of Aloe Vera And Citrus Limon (L) Burm Extract. F As Antibacterial In Streptococcus Sp

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ABSTRACT

Aloe Vera and Citrus Limon are herbal plants that have various properties as antibacterial and antimicrobial. The active ingredients in aloe vera are anthraquinones, saponins, tannins, flavonoids, alkaloids and phenolics from phytochemical tests that act as antimicrobials and antibacterials. The substance that has many antibacterial properties in lemons is citric acid which is the main organic acid contained in lemon juice. The bioactive compounds contained in lemon each have antibacterial properties. The presence of limonoids which are thought to be able to fight clinically isolated bacteria. Limonoids exhibit good antibacterial and antifungal activity. Streptococcus sp is a bacterium commonly found after tooth extraction.

This study aims to determine the effectiveness of aloe vera and citrus limon extracts as antibacterials with Minimum Inhibitory Concentration (MIC) against Streptococcus sp. Using Quasy Experiment pretest-posttest with control group design. Sampling was done by identifying tooth extraction tools exposed to Streptococcus sp media Nutrient Agar (NA). Bacterial testing using spectrophotometry is a fast way to count the number of bacteria in a solution using the liquid dilution method. Subjects were the concentration intervention group, namely 50%, 45%, 35%, 20%, 15%, 10%, 5%. This research uses a pharmaceutical chemistry laboratory and a microbiology laboratory. The results showed that the 5% concentration had effective bacterial inhibition against Streptococcus sp as evidenced by a large absorption value. The conclusion shows the combination of Aloe Vera and Citrus Limon extracts had a greater inhibitory power against *Streptococcus sp*.

Keywords: *Aloe vera da citrus Limon*, Minimum Inhibitory Concentration, *Streptococcus sp*

Introduction

Health is a human right as one of the basic necessities of life, including a state of well-being of body, soul, and social life for everyone who lives socially and economically productive. Health is not only physical but includes physical health, mental health, spiritual and social health. Health maintenance to overcome, and prevent health problems that require examination, treatment or care includes efforts to maintain dental and oral health.¹

According to 2018 Basic Health Research data, the national prevalence of dental and oral health problems is 57.6%, while dental and oral diseases that many Indonesians suffer from are generally related to dental and oral hygiene 2.8%. Dental and oral diseases such as dental caries and periodontal disease can be treated by several measures, one of which is tooth extraction.² In 2018 people in Indonesia who received dental extraction services were 79%.³

The Dental and oral therapist is one type of health worker who has the authority to carry out his professional practice in the field of promotive and preventive dental health through the management of changes in patient behavior in order to prevent dental and oral diseases and patient safety as an effort to prevent cross-infection.⁴

Infectious diseases can be transferred through dental health services which are routinely exposed to microorganisms present in the patient's blood and saliva. This is because dental health services are services that are at risk of being exposed to the patient's body fluids.⁵ The prevalence of cross-infection in Indonesia is quite high, namely 6-16% with an average of 9.8%. Cross infection can occur if there is a source of infection, an intermediary, and a mode of transmission.⁶

Post-tooth extraction cannot be separated from the entry of pathogenic microorganisms into the former tooth extraction. *Streptococcus* sp is the most common bacteria found after tooth extraction, which is 66.67%,⁷ *Streptococcus* sp is one of the bacteria that is commonly found after tooth extraction, this bacterium produces various extracellular substances and enzymes.⁸

Aloe vera is a thick-leaved plant that stores water and contains many active chemicals and has various properties, one of which is antibacterial and antimicrobial.⁹ The active ingredients are anthraquinones, saponins, tannins, flavonoids, alkaloids and phenolics from phytochemical tests that act as antimicrobial and antibacterial.¹⁰

Citrus limon, commonly known as lemon, belongs to the family Rutaceae, generally cultivated in South Asian countries. Lemon contains many bioactive compounds such as flavonoids, carotenoids, limonoids, tannins, phenolics, terpenoids. The bioactive compounds contained in lemon each have antibacterial.¹¹ The presence of limonoids which are thought to be able to fight clinically isolated bacteria. Limonoids exhibit good antibacterial and antifungal activity. The substance that has many antibacterial properties in lemons is citric acid which is the main organic acid contained in lemon juice.¹²

Based on this, a study was conducted to determine the effectiveness of the combination of aloe vera and lemon extracts as antibacterial and antimicrobial which has a large effect on the inhibition of *Streptococcus* sp bacteria in tooth extraction tools.

Research Methods

The design of this study was a Quasy Experiment with a Randomized Pretest-Postest design with a control group design. The research was conducted in the microbiology laboratory and the pharmaceutical laboratory. The sample size is calculated based on the Federer formula. The sample group is the concentration intervention group, namely 50%, 45%, 35%, 20%, 15%, 10%, 5%.

The sample in this study was the number of colonies of *Streptococcus* sp bacteria obtained from the identification of tools after tooth extraction. *Streptococcus* Sp colonies growing on Nutrient Agar (NA) were treated and incubated at 37°C for 24 hours.

Using the maceration method because it is suitable for compounds contained in aloe vera and citrus lemon plants, namely flavonoids, saponins and tannins which are not resistant to

heating.¹³ Making extract by cycling test method. Samples were stored at 4°C for 24 hours and then transferred to a hot oven at 40°C for 24 hours (one cycle). The test was carried out for 6 cycles and then the organoleptic and physical stability was observed.

Research Results

A. Organoleptic Test

The results of the observation of the cycling method for the organoleptic test which was carried out visually showed that the texture, color, aroma of the base and the two formulas after the cycling test for 6 cycles did not experience any change or separation.

Table 1 Aloe Vera And Citrus Limon Extract Organoleptic Test By Method Cycling test

Formulation	Before Cycling Test		
	Color	Scent	Texture
Extract Aloe Vera dan Citrus Lemon	Brown	Lemon	liquid
Formulation	After Cycling Test		
	Color	Scent	Texture
Extract Aloe Vera dan Citrus Lemon	Brown	Lemon	liquid

B. Physical Stability Test

The results of changes in temperature after a cycling test for 6 cycles have a significant effect on changes in the pH of the preparation. The pH value of the solution from the base and the two concentrations after the cycling test decreased and met the SNI standard No. 06-2588 pH of the preparation solution, namely in the interval 4.5 – 6.5, pH.

Table 2 Aloe Vera And Citrus Limon Extract pH Test Using Cycling Test Method

Formulation	pH Sediaan		p-value
	Before Cycling Test	After Cycling Test	
	Mean±SD	Mean±SD	
Esktrak Aloe Vera dan Citrus Lemon	6,203±1,0068	4,966±1,0241	0,002

* Paired samples test

C. Minimum Inhibitory Concentration

Conducting turbidimetric observations, followed by measuring the absorbance value or turbidity value using a UV-Vis spectrophotometer. Wavelength before and after incubation.

Table 3 Minimum Inhibitory Concentration to Streptococcus sp

Concentration Extract Aloe Vera dan Citrus Limon	Result		Description
	Pre	Post	
50%	0.0292	0.0162	Down
45%	0.0125	0.0120	Down
35%	0.0082	0.0028	Down
20%	0.0127	0.0118	Down
15%	0.0049	0.0028	Down
5%	0.0051	0.0048	Down

The results of Table 3 show that at concentrations of 50%, 45%, 35%, 20%, 15%, 5% there has been a decrease in the absorbance value which means that bacterial growth is inhibited so that this concentration is set as the minimum inhibitory concentration of aloe vera and citrus lemon extracts on growth. *Streptococcus sp* using UV-Vis Spectrophotometer method.

Discussion

Extraction is a process of separating active compounds it contained in one type of plant. The selection of the extraction method is adjusted to the nature of the material and compounds to be isolated and the appropriate solvent. Extraction or extraction is a process of separating compounds from the matrix or simplicia by using an appropriate solvent.¹⁹

The results of organoleptic observations showed that the extracts of aloe vera and citrus lemon were brown the color with a distinctive aroma of lemon and a liquid texture. After storage at 40°C and 4°C for 6 cycles, the preparation did not change or separate in color, aroma, texture because aloe vera and citrus lemon had good stability in the storage process. One study stated that the organoleptic test was carried out using the five senses or visually

which included the components of color, shape, aroma using the cycling test method.¹⁴

The results of the physical stability test using the cycling test method for 6 cycles by measuring the pH test which aims to determine the acid-base levels and safety of the preparation.¹⁵ The results of temperature changes that occur after the cycling test for 6 cycles have a significant effect on changes in the pH of the preparation. This is evidenced by the results of the paired data test, the p-value ($p < 0.05$), meaning that there are differences in effectiveness at pH before and after the cycling test for 6 cycles.

The presence of limonoids in citrus species, which has great potential against clinically isolated bacteria. Limonoids obtained from lemons showed good antibacterial activity.¹⁶ A study found that the effectiveness of aloe vera against gram-positive bacteria has a greater killing power than gram-negative bacteria, this is in line with research because the treatment carried out on *Streptococcus sp* is a gram-positive bacterium.¹⁷

MIC testing has been carried out in several concentrations from high concentration to low concentration, namely 50%, 45%, 35%, 20%, 15%, 10%, 5% to know the concentration limit of the combination of active compounds from aloe vera and lemon on the power of resistor. The results showed that the 5% concentration had effective bacterial inhibition against *Streptococcus sp* as evidenced by a large absorption value. This was proven by previous researchers that aloe vera extract was able to inhibit the growth of gram-positive (*Staphylococcus aureus* and *Enterococcus bovis*) and gram-negative bacteria (*Proteus vulgaris*, *Proteus mirabilis*, *Pseudomonas aeruginosa*, *Klebsiella pneumonia*).¹⁸

Active compounds such as lignin, saponins, anthraquinones are substances that function as antibacterial. In addition, aloe vera also contains some amino acids arginine, asparagine, aspartic acid, alanine, serine, valine, glutamate, threonine, glycine, lysine, proline, histidine, leucine isoleucine. Aloe vera leaf flesh also has many active compounds such as lignin,

anthraquinone (which is a substance that functions as an antibacterial), saponins.¹⁹

The theory was obtained from a study of terpenoids in the compound content in lemons that can react with porins (transmembrane proteins) on the outer membrane of the bacterial cell wall, forming strong polymer bonds that damage the porin in the bacterial layer, reducing the permeability of the bacterial cell wall so that bacterial cells lack nutrients, growth dead bacteria, 20 and high concentration of aloe vera extract can reduce *Streptococcus mutans* bacteria colonies in the oral cavity which are gram-positive bacteria.²¹

Conclusion

Based on the results of the study, it was concluded that the extracts of aloe vera and citrus lemon have great inhibitory power against *Streptococcus sp* and can be used as a preventive in preventing cross infection which has great benefits as an antibacterial. Extracts of aloe vera and citrus lemon proved effective in inhibiting the growth of *Streptococcus sp* bacteria with the lowest concentration of 5%. evidenced by the results of the microbiology laboratory.

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