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### THE EFFECTIVENESS OF STARFRUIT (AVERRHOA BILIMBI L.) EXTRACT IN INHIBITING STAPHYLOCOCCUS AUREUS BACTERIA

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#### ABSTRACT

Background: Strafruit (Averrhoa bilimbi L.) can be used to treat canker sores, stomach pain, mumps, rheumatism, coughs, bleeding gums, toothaches, healthy digestive function, removing stains on fabrics, overcoming fishy odors, being a cosmetic ingredient and improving the shine of goods. - Items made of brass. Belimbing starfruit contains active substances including flavonoids, tannins, and saponins which have antibacterial properties. Staphylococcus aureus is a commensal bacteria that can turn into a pathogen if there is a decrease in the body's immunity which can lead to systemic infection and bacteremia of the oral mucosa. Staphylococcus aureus infection is characterized by necrosis, inflammation and abscesses. **Methods:** In this study, the literature review method is used by collecting and reviewing several journals collection was carried out through several stages, namely, analysing, summarizing, and citing the contents related to the antibacterial test of starfruit (Averrhoa bilimbi L.) against Staphylococcus aureus. Results: Starfruit (Averrhoa bilimbi L.) is one of the many types of plants that are often used as traditional medicine. Staphylococcus aureus are bacteria that initially commensal can turn into pathogens if there is a decrease in body immunity which can lead to systemic infections and bacteremia of the oral mucosa. Staphylococcus aureus infection is characterized by necrosis, inflammation and abscesses. Conclusion: Based on the results of a search of several literatures that have been carried out by the author, it can be concluded that the extract of the starfruit (Averrhoa bilimbi L.) has an inhibitory effect on the bacterium Staphylococcus aureus. In addition, the antibacterial content of starfruit (Averrhoa bilimbi L.) such as flavonoids, tannins, and saponins can inhibit staphylococcus aureus bacteria.

Keyword : Starfruit; staphylococcus aureus

#### Introduction

According to WHO (World Health Organization) traditional medicine or herbal medicine is the use of medicine to reduce and cure someone from disease by using parts of plants, such as seeds, flowers, leaves, fruit, flowers, stems, and roots which are then processed into plants. herbal medicine. WHO provides recommendations for using traditional medicine in maintaining health in the community. This shows that WHO supports the "back to nature" movement, namely increasing selectivity in the use of traditional medicines or herbal medicines (3).

One of the plants that is often used by the community as traditional medicine is the starfruit (Averrhoa bilimbi L.). In Indonesia, belimbing starfruit is better known by the general public by the name starfruit acid. This plant is a tropical plant that is easy to obtain, and is not a seasonal plant (7)

Strafruit (Averrhoa bilimbi L.) is one of the many plants that are often used as traditional medicine. Almost all parts of this plant can be used as traditional medicine, namely stems, leaves, flowers, and fruit. Starfruit starfruit or sour starfruit can also be called a plant with a million benefits. Starfruit (Averrhoa bilimbi L.) is often used to treat canker sores, mumps, coughs, bleeding gums, toothaches, stomachaches, healthy digestive function, and overcoming fishy odors. Starfruit contains active substances including flavonoids, tannins, and saponins that function as antibacterial (7).

Starfruit is a plant that contains flavonoid compounds. The mechanism of action of flavonoids as antibacterial in starfruit is by inhibiting the function of cell membranes so as to form complex compounds that can damage bacterial cell membranes. Flavonoids also inhibit cell membrane function by interfering with cell membrane permeability and inhibiting enzyme binding in bacteria. Flavonoids can inhibit energy metabolism by using oxygen by bacteria (11).

Tannins are chemical substances found in plants, including starfruit (Averrhoa bilimbi L.) which has the ability to inhibit the synthesis of cell walls of gram-positive or negative bacteria. Tannins as antibacterial occur through several mechanisms, namely inhibiting antibacterial enzymes and inhibiting bacterial growth by reacting with cell membranes. Tannins can also inactivate genetic enzymes in bacteria (13)

Saponins work as antibacterial by causing leakage of proteins and enzymes in cells. The mechanism of saponins is by lowering the tension on the surface of the bacterial cell wall. This compound also has anti-inflammatory properties. Saponin compounds are found in several plants, one of which is starfruit. The type of saponins found in starfruit is a type of triterpene, this type of tannin also functions as a cough medicine. The level of saponins in starfruit starfruit is 3.582 mg (12).

Staphylococcus aureus is a spherical bacterium with a diameter of 0.8-1 microns, clusters resembling grapes, but is often found in fours or fours, forming chains (3-4 cells), has Gram positive, nonmotile, no spores, colonies with golden yellow color, some strains are paste-shaped, can survive in media with 15% NaCl concentration, and form cocci. Staphylococcus aureus which is initially commensal can turn into a pathogen if there is a decrease in the body's immunity which can lead to systemic infection and bacteraemia of the oral mucosa. Staphylococcus aureus infection is characterized by necrosis, inflammation and abscesses (8).

## Methods

In this study, the Literature Study method was used. Literature study is a technique of finding relevant references with pre-existing data collection methods for the problems found.

The data sources used in this study are secondary data, namely supporting data or previously existing data sourced from journals, articles, books, and other references. Data collection was carried out through several stages, namely, analysing, summarizing, and citing the contents related to the antibacterial test of starfruit (Averrhoa bilimbi L.) against Staphylococcus aureus bacteria. Literature searches were conducted online through the website, namely Google Scholar using keywords, namely: Averrhoa bilimbi L. of antibacterial then selected using inclusion and exclusion criteria.

## **Literature Review Criteria**

InThe literature criteria used contain: the process of selecting literature taken, where the criteria are based on related journals and can answer questions related to the research objectives. These criteria include inclusion and exclusion criteria. The inclusion criteria in this study are: articles used as references are scientific articles, articles published between 2014-2022, full text articles, research focused on starfruit (Averrhoa bilimbi L.) that can inhibit Staphylococcus aureus bacteria. and references using English and Indonesian. As for the exclusion criteria in this study, namely: articles that use solvents other than ethanol, articles that are not full text, and paid articles.

The source of data used in this study is secondary data, namely supporting data or pre-existing data sourced from journals, articles, books, and other references. This reference is obtained from Google Scholar and is relevant to the issue being studied.

### **Results and Discussion**

Starfruit (Averrhoa bilimbi L.) is one of the many types of plants that are often used as traditional medicine. Almost all parts of this plant can be used as traditional medicine, namely stems, leaves, flowers, and fruit. Starfruit can be used to treat canker sores, stomach pain, mumps, coughs, bleeding gums, toothache, improve digestion, remove stains on cloth, and reduce fishy odors. Starfruit contains active substances including flavonoids, tannins, and saponins that function as antibacterial (7). *Staphylococcus aureus* are bacteria that initially commensal can turn into pathogens if there is a decrease in body immunity which can lead to systemic infections and bacteremia of the oral mucosa. Staphylococcus aureus infection is characterized by necrosis, inflammation and abscesses (8).

According to research conducted by Maryam, St., Juniasti, S., and Kosman, R. In 2015, with the title of testing the antibacterial activity of the ethanol extract of starfruit (averrhoa bilimbi L.) from the city of Watampone. In this study, waste starfruit samples were taken from the city of Watampone and the extract was made by macerating with 96% ethanol until the fruit was completely submerged. The results showed that at a concentration of 0.4% produced an inhibition zone of 7 mm, a concentration of 0.8% produced an inhibition zone of 9 mm, and a concentration of 1.6% produced an inhibition zone of 13 mm against Staphylococcus aureus. The ethanol extract of starfruit (Averrhoa bilimbi L.) at the lowest concentration of 0.4% was able to inhibit Staphylococcus aureus bacteria (5).

According to research conducted by Nakhil, U., Sikumbang, IM, Putri, NH, and Lutfivati, H. In 2019, with the title starfruit extract gel (averrhoa bilimbi L.) for recurrent aphthous stomatitis. This research is an experimental laboratory research conducted by identifying and determining the starfruit starfruit, then extracted using 70% ethanol by maceration and then evaporation over a water bath to obtain a thick extract. The results showed that the average zone of inhibition was, for a concentration of 40% it produced inhibition zone of 1.77 mm. a an concentration of 45% produced an inhibition zone of 1.93 mm, and a concentration of 50% produced an inhibition zone of 2.67 mm (7).

According to research conducted by Mokhtar, S. I, and Aziz, NAA in 2016, with the title antimicrobial properties of averrhoa bilimbi extract at various stages of maturity. In this study, starfruit extract was differentiated based on the level of maturity, namely young, half-ripe, and ripe which was used to see the antibacterial effectiveness using the disc diffusion method. Extraction was done by cutting the fruit into two parts and weighing it and then blending it with 100 ml of water. The results showed, for disc diffusion of staphylococcus aureus bacteria on young fruit, it produced an inhibition zone of 9.3 mm, on half-ripe fruit produces an inhibition zone of 12.3 mm, and on ripe fruit produces an inhibition zone of 10 mm. The conclusion of this study is that starfruit extract (Averrhoa bilimbi L.) has inhibitory against Staphylococcus aureus activity bacteria, this is due to the presence of oxalic acid which is a strong source of antioxidants and antimicrobials (6).

According to research conducted by Sulistyani, WI, Sulwana, M., Dwi F., Rahmawati E., Cahyaningtyas N., and Mahardika CN In 2017, with the title the influence of starfruit juice (averrhoa bilimbi L.) against the inhibition of staphylococcus aureus bacteria. This research was conducted at the Chemistry Laboratory. The results showed that for a concentration of 20% produced an inhibition zone of 9.41 mm, a concentration of 40% produced an inhibition zone of 12.11 mm, a concentration of 60% produced an inhibition zone of 14.30 mm, a concentration of 80% produced an inhibition zone of 14.73 mm, and for a concentration of 100% produces an inhibition zone of 16.45 mm. The conclusion of this study is that there is an effect of starfruit juice (Averrhoa bilimbi L.) in inhibiting the growth of staphylococcus aureus bacteria (14).

According to research conducted by RahmiatiA., Darmawati S., and Mukaromah AH in 2017, with the title of inhibition of ethanol extract of starfruit (Averrhoa bilimbi L.) against the growth of Staphylococcus aureus and Staphylococcus epidermis bacteria in vitro. The results of this study indicate that at a concentration of 10% produces an inhibition zone diameter of 21.6 mm, a concentration of 20% produces an inhibition zone diameter of 27.0 mm, a concentration of 30% produces an inhibition zone diameter of 31.3 mm, and a concentration of 40% produces an inhibition zone diameter of 31.3 mm. the diameter of the inhibition zone was 34.0 mm. The conclusion of this study is that the ethanol extract of starfruit starfruit can inhibit the growth of staphylococcus aureus bacteria (10).

Based on several studies that have been conducted previously by several researchers, it is known that the factor that causes the difference in the inhibition zone formed is the difference in concentration. Where the higher the concentration used, the larger the diameter of the inhibition zone produced. There are several secondary metabolite compounds contained in starfruit (Averrhoa bilimbi L.), namely saponins, tannins, flavonoids which have antibacterial activity against Staphylococcus aureus and Streptococus mutans bacteria.

## Conclusion

Starfruit extract (Averrhoa bilimbi L.) has an inhibitory power against staphylococcus aureus bacteria and the antibacterial content found in starfruit (Averrhoa bilimbi L.) such as flavonoids, tannins, and saponins can inhibit staphylococcus aureus bacteria.

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