
Antibacterial Test Of Avocado Leaf Ethanol Extract (*Persea americana* Mill) ON Staphylococcus Aureus Bacteria

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Abstract

Avocado leaves are one plant that can be used as an antibacterial. The chemical content of flavonoids, alkaloids, tannins and saponins has the potential to inhibit bacterial growth. This research aims to determine the antibacterial activity of ethanol extract of avocado leaves against *Staphylococcus aureus* bacteria. This research uses laboratory experiments using samples of avocado leaf extract (*Persea viiiegativeviii* Mill). With concentrations of 20%, 40%, 60% and 80% using the diffusion method. The ability of avocado leaf extract to inhibit *Staphylococcus aureus* bacteria can be seen from the size of the inhibition zone, namely positive by looking at the area of the inhibition zone around the disc using a caliper. This research shows that the diameter of the inhibition zone for *Staphylococcus aureus* at a concentration of 20% has an inhibition zone diameter of 8.81 mm, namely the medium category, a concentration of 40% has an inhibition zone diameter of 10.11 mm, namely the strong category, a concentration of 60% has an inhibition zone diameter. of 10.71 mm, namely the strong category, a concentration of 80% has an inhibitory zone diameter of 12.16 mm, namely the strong category. Based on the research results, it can be concluded that the ethanol extract of avocado leaves has activity to inhibit *staphylococcus aureus* bacteria

Keywords: Avocado Leaves, Antibacterial, *Staphylococcus Aureus*

INTRODUCTION

Skin disease is one of the diseases that is often found in tropical countries like Indonesia. Skin that is not kept healthy can cause various diseases. Skin disorders often occur due to causal factors such as climate, environment, place of residence, unhealthy living habits, allergies and so on. Skin disease is a skin disorder caused by fungi, bacteria, parasites, viruses or infections which can attack the whole or certain parts of the body and can worsen the sufferer's health condition if not treated seriously (Putri et al., 2018).

One of the microorganisms that is often found on the skin is *Staphylococcus aureus*. *Staphylococcus aureus* is a gram-positive bacteria which is a human pathogenic bacteria. This type of bacteria is a facultative anaerobic bacteria which is the main cause of infection in humans. Its role can be as a causative agent or as a predisposing factor that can cause infection. Some diseases or infections that can be caused by *Staphylococcus aureus* bacteria are skin infections, bacteremia (Sepsis), osteomyelites (bone infection) (Damayanti et al., 2022)

Bacterial infections are usually treated with antibiotics. Antibiotics are organic materials produced by microorganisms that have the capacity to destroy, suppress multiplication or prevent the activity of microorganisms. Continuous use of antibiotics in society can increase the incidence of bacterial resistance. The increasing number of resistances that lead to failure is a problem that continues to arise in the treatment of bacterial infections. Apart from that, allergies, kidney damage, superinfections, rashes and digestive disorders are side effects of treatment for *Staphylococcus aureus* infections (Rifa'i, 2011).

Traditional medicine is an ingredient or concoction of ingredients derived from plants, animals, minerals, extract preparations (galenic) or mixtures of these ingredients which have been used for generations for treatment based on experience. The use and use of traditional medicine is to maintain health as well as prevent and treat disease. Thus, the position of traditional medicine is very important in improving public health (Depkes RI, 2014).

Many plants contain chemical compounds such as flavonoids that exhibit antimicrobial properties. Several classes of chemical compounds such as flavonoids, tannins and other phenolic

compounds also function as defense tools for plants to fight pathogenic microorganisms (Yuniharni et al., 2021).

One herbal ingredient that contains flavonoids is avocado leaves (*Persea americana* Mill). The active substances contained in avocado leaves (*Persea americana* Mill) are flavonoids and quercetin. Avocado leaves (*Persea americana* Mill) taste bitter and are effective as a diuretic and inhibit the growth of several bacteria. Apart from that, it is efficacious for curing urinary stones, high blood pressure and headaches. Tea leaves can cure nerve pain, stomach pain, swollen respiratory tract and irregular menstruation (Anggorowati et al., 2016). Avocado (*Persea americana* Mill) is a plant that contains antibacterial substances, especially the leaves. Avocado leaf extract is known to contain active compounds such as alkaloids, saponins and flavonoids which can inhibit the growth of several bacteria (Wijaya, 2020).

Based on the description above, the author is interested in conducting research with the title "Testing the Antibacterial Activity of Ethanol Extract of Avocado Leaves (*Persea americana* Mill) Against the Growth of *Staphylococcus aureus* Bacteria".

RESEARCH METHODS

The type of research carried out is laboratory experimental. This research was carried out in the Microbiology laboratory of the Arjuna Laguboti College of Health Sciences. This research was conducted for 1 month. The sample used in this research was 3 kg of avocado leaves obtained from Matio village, Balige subdistrict, Toba Regency. The sampling method used is the Purposive Sampling method, which is a research sampling technique based on the characteristics desired by the researcher. The characteristics of avocado leaves are that the leaves are still fresh, have green skin and a hard texture (Fathnur Sani K, 2018).

RESULTS AND DISCUSSION

This research was conducted at the Microbiology Laboratory of the Arjuna Pintubosi-Laguboti College of Health Sciences. Avocado leaves obtained from Matio District. Toba Balige is first selected and cleaned with running water then drained and chopped, then dried for 10 days. After drying, the avocado leaves are weighed and then powdered, then the resulting powder is then weighed. Then identify the simplicia content of avocado leaves using avocado leaf simplicia powder and appropriate reagents.

Avocado leaves contain alkaloid compounds, as evidenced by the yellow color, white precipitate and brown precipitate when the powder is dissolved in methanol + Dragendroff's Reagent, methanol + Mayer's Reagent, methanol + Bouchardat's Reagent. Avocado leaves contain flavonoid compounds as evidenced by the color changing to orange and a slight yellow precipitate when the avocado leaf powder is dissolved in methanol + 2 ml of concentrated HCl + 0.1 gram of Mg metal powder. Avocado leaves contain saponin compounds, as evidenced by the formation of foam when the powder is dissolved in distilled water and shaken for 15-20 seconds. Avocado leaves contain tannin compounds, as evidenced by the color changing to dark blue when avocado leaf powder is dissolved in methanol + 3 drops of 1% FeCl₃.

Table 1 Results of Identification of Simplicia Compounds in Avocado Leaves

No.	Chemical Compounds	Results
1.	Alkaloids	+
2.	Flavonoids	+
3.	Saponin	+
4.	Tannin	+

Based on research, it was found that avocado leaves contain chemical compounds, namely, alkaline, flavonoids, saponins and tannins. The identification of the chemical content of avocado leaves is in accordance with research which states that avocado leaves contain alkaloids, flavonoids, saponins and tannins. Alkaloids function to protect plants from disease, pest attacks, as development regulators, and as mineral bases to regulate ion balance in plant parts. Flavonoids in plants play a role in providing color, flavor to seeds, flowers and fruit as well as protecting plants from environmental influences, as antimicrobials and protection from exposure to UV rays. Saponins in plants have an antimicrobial effect, inhibit fungi and protect plants from insects. Tannin functions as a protector in plants when certain parts grow, as an anti-pest so as to prevent fungal attacks.

In the inhibitory power test carried out with concentrations of 20%, 40%, 60%, 80%, positive control (40% amoxicillin), negative control distilled water and 96% ethanol solvent control using the disc diffusion method, 3 repetitions each to determine the inhibitory power Each concentration of avocado leaf extract on the growth of *Staphylococcus aureus* bacteria shows that each concentration is able to inhibit the growth of *Staphylococcus aureus* bacteria.

Observations of antibacterial activity at various concentrations of avocado leaves were carried out after 1×24 hours of bacterial incubation in an incubator at 37 °C. The results of the inhibition test observations after an incubation period of 1×24 hours can be seen in Figure 1.



Figure 1. Test results of the inhibitory power of avocado leaf extract on the growth of *Staphylococcus aureus* bacteria

After testing the inhibitory power of avocado leaf extract with 4 different concentrations, positive control (amoxicillin), negative control, distilled water and 96% ethanol solvent control. The following are the results of the inhibitory test of avocado leaf ethanol extract on the growth of *Staphylococcus aureus* bacteria:

Table 2. Results of the inhibitory power test of avocado leaf extract on the growth of Staphylococcus aureus

Avocado Leaf Extract Concentration (%)	Resistance (mm)				Category
	Test 1	Test 2	Test 3	Average	
80%	12,75	12,2	11,55	12,16	Strong
60%	10,9	11	10,25	10,71	Strong
40%	10,45	10,35	9,55	10,11	Strong
20%	8,7	9	8,75	8,81	Currently
Positive control	10,2	10,2	10,2	10,2	Strong
Negative control	-	-	-	-	Weak
Solvent control	-	-	-	-	Weak

Table 4.2 shows that a clear zone was formed after an incubation period of 1×24 hours at a temperature of 37 °C with concentrations of 20%, 40%, 60%, 80%, positive control (amoxicilin 40%), negative control (distilled water) and control solvent (ethanol 96%). The measurement results show that a 20% concentration of avocado leaf extract has a clear zone diameter of 8.81 mm, that is, it has the ability to inhibit the growth of Staphylococcus aureus in the medium category, a 40% concentration of avocado leaf extract has a clear zone diameter of 10.11 mm, that is, it has the ability to Inhibitory power against the growth of Staphylococcus aureus is in the strong category, 60% concentration of avocado leaf extract has a clear zone diameter of 10.71 mm, that is, it has the ability to inhibit the growth of Staphylococcus aureus in the strong category, 80% concentration of avocado leaf extract has a clear zone diameter of 12 .16 mm, which has the ability to inhibit the growth of Staphylococcus aureus in the strong category and the positive control (amoxicillin 40%) has a clear zone diameter of 10.2 mm, which has the ability to inhibit the growth of Staphylococcus aureus in the strong category. The higher the concentration of avocado leaf extract, the wider the diameter of the clear zone produced, so that the greater the concentration of avocado leaf extract, the greater its ability to inhibit the growth of Staphylococcus aureus bacteria.

Research conducted by Ismiyati in 2014, suggested that avocado leaf extract with a concentration of 35% could inhibit the growth of Staphylococcus aureus which produced an inhibition zone of 9 mm (Ismiyati et al., 2014). In other research, avocado leaves were able to inhibit the growth of Escherichia coli at concentrations of 25%, 50%, 75% with growth inhibition zones of 2.5 mm, 3.5 mm, 6 mm. The higher the concentration of active substances contained in avocado leaf extract, the greater the inhibition zone formed. The greatest concentration that produces an effective inhibition zone is 75% (Rikomah et al., 2019).

Research conducted by Ramadhan (2013), regarding the resistance test of several hand sanitizers, stated that the largest diameter, namely 12 mm, was found in hand sanitizers containing alcohol with triclosan, but hand sanitizers containing alcohol alone did not form an inhibition zone (0 mm). This is because the alcohol content alone is not effective in killing bacteria and is only short acting.

Avocado leaves can be used as a complementary therapy natural product because avocado leaves contain various ingredients including vitamin E, Vitamin B, iron, potassium, flavonoids, quercetin, saponins and tannins which are good for health. The benefits of the ingredients contained in avocado leaves can reduce blood pressure, uric acid levels, act as an antioxidant, inhibit bacteria, and make a cream for acne. The way to process avocado leaves is by boiling them in hot or warm water to get avocado leaf extract for consumption (Meisya & Yamin, 2022).

The active compounds contained in avocado leaves have the ability to inhibit bacterial growth, namely flavonoids, tannins, alkaloids, saponins. The presence of these compounds is an important factor in their mechanism against bacteria. Flavonoids can denature bacterial cell proteins in the cell wall and damage the cell membrane irreparably. Thus, the cell wall breaks because it is unable to withstand cytoplasmic pressure (Sulaiha et al., 2022). Meanwhile, (Christanto, 2014) stated

that flavonoids can denature proteins in bacterial cell membranes, then protein coagulation occurs, which results in loss of function of the bacterial cell membrane, resulting in bacterial lysis.

Tannins have antibacterial activity which is related to their ability to inactivate microbial cell adhesion as well as inactivating enzymes and disrupting protein transport in the inner layers of cells. Tannins also target polypeptides and cell walls so that cell wall formation is less than perfect. This causes bacterial cells to lyse due to osmotic and physical pressure so that bacterial cells will die (Hidayah, 2016). Saponins provide anti-microbial effects by forming polysaccharide complexes in cell walls. The interaction of saponin with the cell wall will cause damage to the cell wall and membrane and ultimately bacteriolysis. The mechanism of saponin's action as an antibacterial is that it can cause leakage of proteins and enzymes from inside cells. Alkaloids have the ability to act as antibacterials and their inhibitory mechanism is by interfering with the peptidoglycan components in bacterial cells so that the cell wall layer does not form completely and causes bacterial cell death (Madduluri et al., 2013).

CONCLUSION

Based on the research that has been carried out, it can be concluded that the ethanol extract of avocado leaves (*Persea Americana Mill*) has antibacterial activity against *Staphylococcus aureus*. The concentration of ethanol extract of avocado leaves (*Persea americana Mill*) which can inhibit the growth of *Staphylococcus aureus* bacteria is a concentration of 20% in the medium category, namely 8.81 mm, 40% in the strong category, namely 10.11 mm, 60% in the strong category, namely 10.71 mm, 80 The % strong category is 12.16 mm and in the positive control (amoxicillin concentration 40%) the strong category is 10.2 mm.

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