Antibacterial Activity of Fresh Palm Fruit (*Veitichia merillii*) Against Propionibacterium acnes Bacteria

Abstract

Antibiotics or antimicrobials are a group of compounds, both natural, semi-synthetic and synthetic, which have the property of killing or inhibiting the growth of bacteria. The infection that will be studied in this study is a skin infection caused by the bacterium Propionibacterium acnes. Several studies have examined the bioactivity potential of palm plant parts such as the toxicity of palm fruit seeds to Artemia salina larvae. but there is no data regarding the antimicrobial potential of the palm fruit itself. The novelty of this study lies in the maturity phase of the simplicia or fruit used, namely ripe, unripe and unripe palm fruit and the type of pathogenic bacteria that was inhibited, namely Propionibacterium acnes which was carried out in vitro. The purpose of this study was to determine whether palm fruit has antimicrobial activity against Propionibacterium acnes and the ripening phase of the fruit has the highest antimicrobial activity. The research method used is laboratory experimental research. Antibacterial activity test of palm fruit against bacteria was carried out in vitro using the disc method with an activity indicator in the form of the diameter of the inhibition zone. Fresh palm fruit (Veitichia merillii) juice has antibacterial activity against the acne-causing bacteria Propionibacterium acnes, but has a different level of inhibition when viewed from the level of maturity. The highest antibacterial activity based on research results was observed at the ripeness level (yellow/orange color) which was indicated by the width of the inhibition zone of 23.9 mm.

Keywords: Acne, Antimicrobial, Palm fruit, Propionibacterium acnes

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INTRODUCTION

Acne or acne vulgaris is a chronic inflammatory disease in the polycebaus that often occurs especially among adolescents and young adults caused by Propionibacterium acnes which is a normal microflora on the skin but under certain conditions can become an opportunistic pathogen causing skin infections such as acne (Milanda et al., 2021). The appearance of acne is characterized by the presence of papules, pustules, nodules, and cysts. In general, acne often occurs in areas such as the face, shoulders, chest, back and upper arms. Acne cases often appear in women, namely aged 14-17 years reaching 83-85% and in men aged 16-19% reaching 95-100%. Until now there has been no complete cure for acne and still rely on the use of antibiotics as a solution (Afriyanti, 2015).

Antibiotics have been used for decades to treat Propionibacterium acnes, but there is concern over the emergence of antibiotic resistance which has become a worldwide problem in recent years. A pattern of resistance to antibiotics has been observed in patients previously treated with antibiotics (Alkhawaja et al., 2020).

Alternatives that are able to overcome the problem of antibiotic resistance to bacteria are plants that have medicinal properties, one of which is the palm plant (*Veitchia merillii*). Palem Putri (*Veitchia merillii*) is a type of tropical ornamental palm that has been widely cultivated and used as a garden decoration plant and as a roadside plant. This plant reaches a height of 20 meters and reproduces with red seeds about 2 cm long (Sumiasri et al., 2010). The results of palm fruit bioactivity tests conducted by Adawiah (Adawiah, 2016) using palm seed ethanol extract showed that palm seeds contain secondary metabolites in the form of alkaloids, terpenoids, flavonoids, phenolic hydroquinones and saponins. In addition, palm seeds have high antioxidant activity and have anti-diabetic activity with an IC50 value of 1.97 ppm, which is higher than quercetin. In addition, this fruit is also known to be toxic to Artemia salina larvae with a fairly high level of toxicity (Adawiah, 2016).

Until recently there is no scientific data related to the potential of the palm fruit itself as an antimicrobial in the treatment of skin infections, especially acne. Seeing the

development of the world of health today which uses a lot of natural ingredients as ingredients that are utilized and developed as natural antimicrobial agents in terms of beauty and skin care, this research topic is very interesting to study.

RESEARCH METHODS

The materials used in this study were palm fruit with 3 different maturity levels (red, yellow and green fruit in color), Aquades, Nutrient Agar Media, 70% Alcohol, Paper Discs, *Propionibacterium Acnes* Bacteria Isolate, Ciprofloxacin. This research is experimental, which mean this research aims to determine a symptom or effect that arises as a result of a certain treatment. The research phase was divided into two stages, namely the antimicrobial activity test stage and the observation and inhibition zone measurement stage.

Antimicrobial Activity Test

The antimicrobial activity test of palm fruit was carried out using the disc diffusion method (Kirby Bauer) using paper discs (Hayati et al., 2020.; Wahdaningsih & Untari, 2021)

a) Prepare a Petri dish containing MHA media that has been inoculated with *Propionibacterium acnes* bacteria.
b) Prepare 6 paper discs in a petri dish to test each palm fruit sample concentration.
c) Paper discs that had been prepared were soaked for ± 10 minutes with concentrations of 20%, 40%, 60%, 80% and 100% as test concentrations, while the positive control used ciproploxacin.
d) The paper disc that has been soaked in the palm fruit test sample is then placed in each petri dish containing the media and Propionibacterium acnes bacteria and then incubated for 1x 24 hours at 37oC.

Observation and measurement of the Zone of Inhibition

Antimicrobial activity can be determined based on the measurement of inhibition (clear zone or clear area without the growth of microorganisms around the paper disc). Measurements were taken with vernier calipers and expressed in millimeters. The diameter of the resistance is obtained by measuring the radius of the inhibition zone by adding up the vertical and horizontal diameters, then dividing by 2 and subtracting the diameter of the paper disc (6mm). The results of the 3 repetitions are then averaged (Hayati et al., n.d YEAR.)

RESULT AND DISCUSSION

Medicinal plants hold a significant role in the health issues in developing countries. Several plants offer as a new source of antibacterial, antifungal, and antiviral with significant activity against infective microorganisms (Paul et al., 2018). Several studies related to the use of plants as antimicrobial agents have been carried out, such as the antibacterial and antifungal activity of the ethanol extract of Acacia auriculiformis leaves (Shobha Rao et al., 2018) and studies conducted using barks of *Casuarina equisetifolia* showed antibacterial activity against *E. coli* with maximum zone of inhibition 23±0.24 mm at a 100µg concentration (K. & Gowrie, 2018).

Based on the results of the antibacterial activity test of fresh palm fruit juice against *Propionibacterium acnes* bacteria using the Kirby Bauer method, it was found that palm fruit has antibacterial ability. The palm fruit used in this study consisted of 3 maturity phases,

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namely ripe (red), Mengkal (yellow/orange) and unripe (green). The size of the inhibition zone formed by each simplicia against Propionibacterium acnes can be seen in table 1 which shows that the highest antibacterial activity was observed in samples of yellow palm fruit with an inhibition zone diameter of 29.3 mm.

Table 1. Antibacterial activity of fresh palm fruit simplicia

Sampel	Zona Hambat (mm)					
	100%	80%	60%	40%	20%	K+
Merah	0	0	0	0	0	34.7
Kuning	29.3	26.7	24	19.7	17.7	36.3
Hijau	13.7	15.3	14.3	11.7	9.7	43.3

Source : personal data

Table 1 shows the inhibition zones formed in the yellow and green samples, while the red or ripe palm fruit samples did not show inhibition zone activity against Propionibacterium acnes. The inhibition zones formed by each sample can be seen in Figure 1. The formation of inhibition zones in the yellow and green palm fruit samples indicated that there were substances or secondary metabolites contained in the palm fruit. Putri palm fruit seeds contain several metabolites that can act as antimicrobial substances. The content of secondary metabolites of the princess palm seeds can be seen in table 2 which shows that the daughter palm seeds contain flavonoids and tannins. Flavonoids are known as natural phenolic compounds which can generally be found in almost all parts of plants. Several studies have shown that flavonoids also have antibacterial activity (Hidayah et al., 2022; Sabir, 2005). Apart from flavonoids, the seeds of the princess palm also contain tannin which is known to have an antibacterial effect because it can cause lysis of the bacterial cell wall and deactivate the enzymes responsible for the process of synthesizing the bacterial cell wall layer (Ngajow et al., 2013).

Table 2. Content of secondary metabolites of methanol extract of palm seed

No	Pengujian	Pereaksi	Hasil	Keterangan
1	Alkaloid	Mayer	Terbentuk endapan jingga	+
		Dragendorf	Tak terbentuk endapan coklat	_
		Wagner	Terbentuk endapan coklat	+
2	Flavonoid	Mg (s) + HCl pekat	Berbusa dan laruta berwarna merah muda	+
3	Terpenoid	Anhidrida asetat + Asam sulfat pekat	Larutan berwarna merah	+
4	Kuinon	NaOH	Larutan berwarna merah kecoklatan	+
5	Saponin	-	Tak menimbulkan busa	_
6	Polifenol/Tanin	FeCl3	Larutan berwarna hijau kehitaman	+

Keterangan :
+ : positif
- : negatif

Source : (Adawiah, 2016)

The results of this study indicate that the high concentration of the sample is consistent with the high antibacterial activity produced. This can be seen in table 1 where the higher the sample concentration, the greater the inhibition zone formed. This indicates that the

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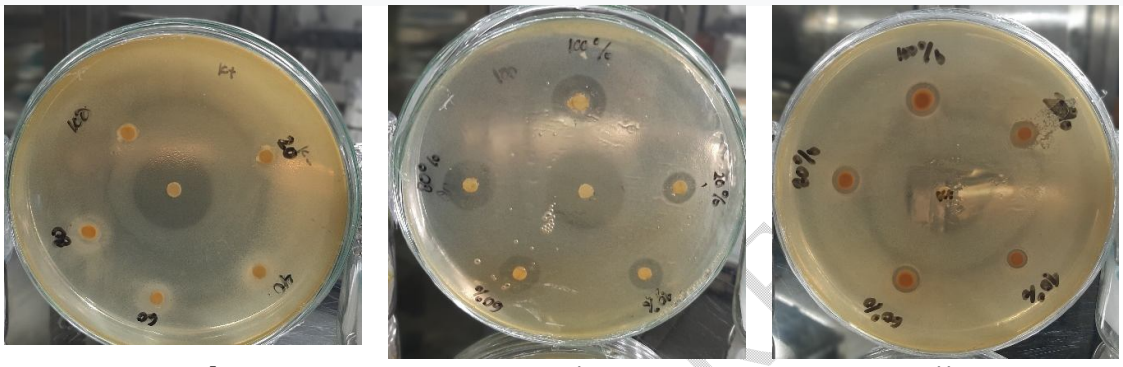
concentration of the extract has an effect on the inhibition ability. This is because the quantity of secondary metabolites present in the test sample also increases or is more in comparison to the samples with lower concentrations. The highest inhibition zones in the yellow and green samples were observed at 100% concentration with the respective diameters of the inhibition zones being 29.3 mm and 13.7 mm. This is similar to the research conducted (Hidayah et al., 2022) who tested the antibacterial activity of acacia leaf extract against *Bacillus* sp and Staphylococcus aureus bacteria showed that along with the high concentration of the test extract, the wider the inhibition zone was formed where the test extract had an optimum concentration of 750 µl/ml which was classified in the strong category.



Merah **Kuning** **Hijau**

Figure 1. Zone of Inhibition of plam fruit juice against *Propionibacterium acnes*
Source : personal data

Based on Figure 1 presented, it shows that no inhibition zone was formed in the sample of ripe female palm fruit (red), while in the yellow and green samples there was an inhibition zone with the highest inhibition zone size in the yellow sample. This indicates that the content of metabolite compounds in palm fruit has a different quantity in each maturity phase, thus affecting the ability of the resulting antibacterial activity. The cause of the inhibition that is formed is due to the entry of the antibacterial compounds contained in the test sample into the bacterial cell which then damages the bacterial intracellular metabolism. The antibacterial activity of plant extracts is often associated with the presence of phenolic compounds in the tested plant parts. One of the phenolic compounds, namely flavonoids which known possess a functional hydroxyl group that mediates the antioxidant effect by scavenging free radical or by chelating the metal ions (Kumar et al., 2013) and is thought to be the compound responsible for inhibiting the growth of bacteria (Soetjipto et al., 2010).

CONCLUSION

Fresh palm fruit (*Veitichia merillii*) juice has antibacterial activity against the acne-causing bacteria Propionibacterium acnes, but has a different level of inhibition when viewed from the level of maturity. The highest antibacterial activity based on research results was observed at the ripeness level (yellow/orange color) which was indicated by the width of the inhibition zone of 23.9 mm.

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