

Antibacterial Activity of Fresh Palm Fruit (*Veitchia 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 studied in this research 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, half-ripened 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 (*Veitchia 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*

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 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 (Alkhwaja *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, 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 ciprofloxacin.
- 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 1 x 24 hours at 37°C.

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.*, 2020)

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 inhibition zone 23 ± 0.24 mm at a 100 μ g 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, 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

Sample	Inhibition Zone (mm)					K+
	100%	80%	60%	40%	20%	
red (ripe)	0	0	0	0	0	34.7
yellow (half ripe)	29.3	26.7	24	19.7	17.7	36.3
green (unripe)	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	Test type	reactor	result	information
1	Alkaloid	Mayer	Orange precipitate is formed	+
		Dragendorf	Brown precipitate formed	-
		Wagner	Brown precipitate formed	+
2	Flavonoid	Mg(s) + HCL	Frothy and the solution is pink	+
3	Terpenoid	Anhidrida asetat + concentrated sulfuric acid	Red solution	+
4	Kuinon	NaOH	Brownish red solution	+
5	Saponin	-	No foam	-
6	Polifenol/Tanin	FeCl3	Dark green solution	+

Note :

+ : positive

- : negative

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

Adawiah, A. (2016). Phytochemical Content and Bioactivity of the Methanol Extract of Palembang (Veitchia merillii) Seeds. VALENCE Journal of Chemistry, 2(1), 63–70. <https://doi.org/10.15408/jkv.v2i1.3076>

Afriyanti, R. N. (2015). ACNE VULGARIS IN ADOLESCENTS. 4(6).

Alkhawaja, E., Hammadi, S., Abdelmalek, M., Mahasneh, N., Alkhawaja, B., & Abdelmalek, S. M. (2020). Antibiotic resistant *Cutibacterium acnes* among acne patients in Jordan: A cross sectional study. BMC Dermatology, 20(1), 17. <https://doi.org/10.1186/s12895-020-00108-9>

Hayati, D. D., Isa, M., & Harris, A. (2020). Antibacterial Activity of Ethanol Extract of Siamih Leaf (*Ageratum conyzoides*) on *Staphylococcus aureus* bacteria. Journal of Veterinary Medicine.

Hidayah, N., Nurdin, G. M., & Ameliani, N. A. (2022). Antibacterial activity of Acacia leaf extract (*Acacia auriculiformis*) on the growth of *Bacillus* sp., *Staphylococcus aureus* AND *Escherichia coli* bacteria. bionature, 23(2), 126. <https://doi.org/10.35580/bionature.v23i2.37593>

K., S. V. T., & Gowrie, S. U. (2018). Phytochemical analysis and in vitro studies on antibacterial, antioxidant and anti-inflammatory activities using casuarina equisetifolia bark extracts. International Journal of Pharmacy and Pharmaceutical Sciences, 10(1), 118. <https://doi.org/10.22159/ijpps.2018v10i1.22188>

Kumar, S., Mishra, A., & Pandey, A. K. (2013). Antioxidant mediated protective effect of Parthenium hysterophorus against oxidative damage using in vitro models. BMC Complementary and Alternative Medicine, 13(1), 120. <https://doi.org/10.1186/1472-6882-13-120>

Milanda, T., Zuhrotun, A., Nabila, U., Gathera, V. A., & Kusuma, A. S. W. (2021). Antibacterial Activity of Red yeast rice Extract against *Propionibacterium acnes* ATCC 11827 and Methicilin-Resistant *Staphylococcus aureus* ATCC BAA-1683. Pharmacology and Clinical Pharmacy Research, 6(2), 83. <https://doi.org/10.15416/pcpr.v6i2.35062>

Ngajow, M., Abidjulu, J., & You, V. S. (2013). Antibacterial Effect of Matoa (*Pometia pinnata*) Bark Extract on *Staphylococcus aureus* Bacteria in vitro. MIPA Journal, 2(2), 128. <https://doi.org/10.35799/jm.2.2.2013.3121>

Paul, S., Dash, B., Bora, A. J., & Gupta, B. (2018). Preliminary phytochemical screening and in vitro anti-microbial activity of ethanolic extracts of fruits of *annona reticulata* against standard pathogenic strains. International Journal of Current Pharmaceutical Research, 10(4), 59. <https://doi.org/10.22159/ijcpr.2018v10i4.28466>

Sabir, A. (2005). Antibacterial activity of flavonoids *Trigona* sp propolis against *Streptococcus mutans* (in vitro). Dental Journal (Majalah Dentistry), 38(3), 135. <https://doi.org/10.20473/j.djmk.v38.i3.p135-141>

Shobha Rao, A., KI, S., S Shetty, M., & R Pai K, S. (2018). In vitro antibacterial and antifungal activities of aqueous and ethanolic leaf extracts of *acacia auriculiformis*. Asian

Journal of Pharmaceutical and Clinical Research, 11(12), 480.
<https://doi.org/10.22159/ajpcr.2018.v11i12.28853>

Soetjipto, H., Kristijanto, A. I., & Nugroho, F. E. T. (n.d.). SWCU SCIENCE AND SCIENCE EDUCATION NATIONAL SEMINAR PROCEEDINGS.

Sumiasri, N., Priadi, D., & Kabinawa, I. (2010). Growth of Palm Seeds (*Veitchia merilli* (becc) h.f. Moors) on Various Plant Media. *Agriculture*, 21(1).
<https://doi.org/10.24198/agriculture.v21i1.981>

Wahdaningsih, S., & Untari, E. K. (2021). The Antibacterial Activity of Red Dragon Fruit Peel (*Hylocereus polyrhizus* Britton & Rose) Methanolic Fraction Against *Staphylococcus epidermidis* and *Propionibacterium acnes*. *Journal of Pharmascience*, 8(2), 51.
<https://doi.org/10.20527/jps.v8i2.10378>

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