

## Antibacterial Activity Testing of Red Dragon Fruit Peel On Pseudomonas Sp.

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### ABSTRACT

Diabetic foot is a major consequence of neuropathy and peripheral vascular disease. Foot ulcers in diabetics increase the risk of amputation or even death. This study aims to determine the antibacterial activity of red dragon fruit peel against *Pseudomonas Sp.* bacteria that cause diabetic ulcers. This research was conducted using a completely randomized design (CRD) one factor, namely red dragon fruit peel with concentrations of 15%, 25%, 50%, 75%, and 95%, respectively. The positive control is amoxicillin and the negative control is sterile aquadest. The study began on August 12, 2019, until November 14, 2019, at the Laboratory of the TLM *Health Polytechnic of Ministry of Health East Kalimantan*. The data obtained were analyzed descriptively. The results showed the inhibitory concentration of *Staphylococcus Aureus* bacteria with the highest inhibition zone diameter was on the decoction of red dragon fruit peel with a concentration of 95%, which is 16 mm (moderate inhibitory power). While the minimum inhibitory concentration is produced by a decoction of red dragon fruit peel with a concentration of 25% with a diameter of 9 mm. The decoction of red dragon fruit peel with a concentration of 95% has the highest inhibitory zone on the growth of *Pseudomonas Sp.* bacteria that cause diabetic ulcers compared to the dragon fruit peel with other concentrations.

**Keywords:** Antibacterial, *Hylocereus Polyrhizus*, *Pseudomonas Sp.*, Diabetic Ulcer

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## INTRODUCTION

Diabetic foot is a major consequence of neuropathy and peripheral vascular disease, including infection of the lower limb, ulcer formation, and destruction of deep tissue. The incidence and prevalence of diabetic foot are 1.0-4.0% and 5.3-10.5%, respectively. About 20-30% of diabetic foot ulcers are located on the toes. Foot ulcers in diabetics are easy but difficult to cure due to several factors, such as thin subcutaneous fat and skin, slow blood flow, the resistance of large blood vessels, and hidden leg sutures. Foot ulcers also involve leg bones and thus increase the risk of amputation or even death (Ji, Bai, Sun, & Wang, 2016).

Research in India, on 100 people with chronic diabetic ulcers, produced 82 positive cultures. *Staphylococcus Aureus* is a dominant organism, followed by *Pseudomonas Aeruginosa* (Banu, Noorul Hassan, Rajkumar, & Srinivasa, 2015).

At Zainal Abidin Hospital showed that the most common type of bacteria found in consecutive diabetic pus ulcers was *Staphylococcus Sp.* (92.9%), *Klebsiella Sp.* (75.4%), *Proteus Sp.* (73.7%), *Shigella Sp.* (68.4%), *Escherichia Coli Sp.* (42.1%), and *Pseudomonas Sp.* (10.5%) (Nur, A dan Marissa, 2016).

One of the plants that are thought to have an antibacterial effect and are being consumed by many Indonesians is the red dragon fruit. Red dragon fruit is a fruit of the Cactaceae tribe, which is widely consumed in Indonesia. Red dragon fruit can periodically prevent and treat osteoporosis, hypertension, diabetes, and lower cholesterol (Warisno, 2010).

The purpose of this study was to determine the antibacterial activity of red dragon fruit peel against *Pseudomonas Sp.* causes of diabetic ulcers.

## METHODS

### Research Design

This research was conducted using a completely randomized design (CRD) one factor, namely red dragon fruit peel with concentrations of 15%, 25%, 50%, 75%, and 95%, respectively. The positive control is amoxicillin and the negative control is sterile aquadest.

### Population and Sample

The population in this study were all red dragon fruit sold in the Samarinda Kedondong Market area.

The sampling technique was made by the consideration of researchers, by selecting old, ripe, and fresh fruit so that a sample of 1 red dragon was obtained.

### Procedure and Data Collection

Red dragon fruit ingredients are collected and then cleaned. Before boiling, the pulp is separated from the peel and ground using a blender. Then filtering is done to get the red dragon fruit peel extract, after that it is done boiling over low heat for + 5 minutes and made with a concentration of 15%, 25%, 50%, 75%, and 95%.

The test method used is disc diffusion (Kirby-Bauer). First, dip the sterile cotton swab into the 0.5 Mc Farland standard bacterial suspension. Furthermore, the swab was evenly smeared on the MHA and left for 15 minutes so that the suspension of *Pseudomonas Sp.* seep into the MHA.

Then the MHA media was inserted paper disc with different concentrations, positive and negative controls were given a distance of 15 mm each, and incubated at 37°C for 24 hours. Inhibition zone diameter measurements were carried out using a dark-colored base on MHA media and measured using a ruler/calipers. The diameter of the resistance zone measured is the clear zone around the paper disc, measured from one end to the other.

**Data Analysis**

The results of the antibacterial activity test in the form of inhibited zone diameters that have been measured are further presented in the table.

**RESULTS**

Table 1. Inhibition Zone Test Results for Pseudomonas Sp.

		<b>Inhibitory Zone Diameter (mm)</b>	<b>Description</b>
<b>Red Dragon Fruit Peel</b>	15%	10	Medium inhibitory power
	25%	9	Medium inhibitory power
	50%	13	High inhibitory power
	75%	13	High inhibitory power
	95%	16	High inhibitory power
<b>Control</b>	(+)	9	Medium inhibitory power
	(-)	0	Low inhibitory power

Picture 1. Inhibition Zone Test Results for Pseudomonas Sp.

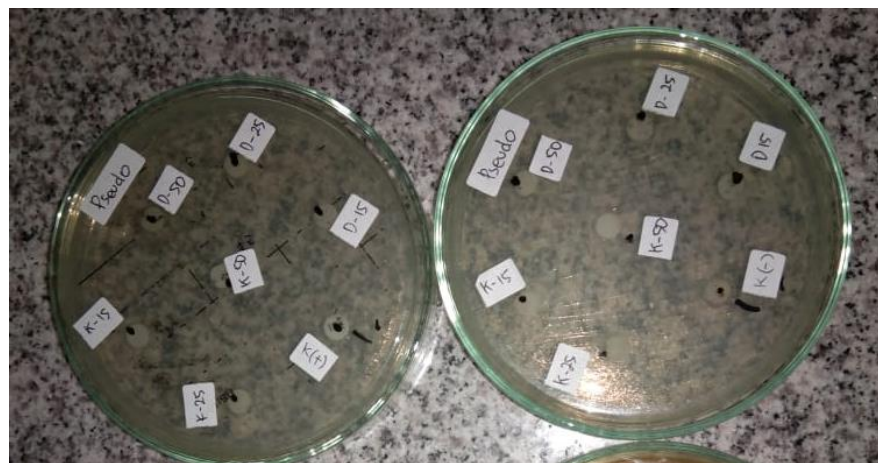


Table 1 shows the inhibitory concentrations of Pseudomonas Sp. with the highest inhibition zone diameter is the decoction of red dragon fruit peel with a concentration of 95%, which is

16 mm (moderate inhibition). While the minimum inhibitory concentration is produced by a decoction of red dragon fruit peel with a concentration of 25% with a diameter of 9 mm.

## DISCUSSION

The results showed that the inhibited zone formed had a diameter variation in each extract concentration and the decoction of red dragon fruit peel with a concentration of 95% had the highest inhibition zone against the growth of *Pseudomonas Sp.* compared to dragon fruit peel decoction with other concentrations.

Aurora (2011) research on the potential of red dragon fruit peel extract (*Hylocereus Polyrhizus*) as an antimicrobial compound shows that 10% of red dragon fruit peel extract can inhibit the growth of bacteria *Pseudomonas Sp.*, *Escherichia Coli*, *Staphylococcus Aureus*, *Bacillus Cereus* (6.83-8.33 mm), but cannot inhibit the bacterium *Penicillum Sp.* and *Mucor Sp.* (Aurora, 2011). Research of Arum Anugrahati, Parhusip, Hardoko, & Boing Sitanggang (2011) also showed antimicrobial activity with 10% extract of red dragon fruit peel (*Hylocereus Polyrhizus*) extracted using ethanol ethylacetate 80:20 at 26°C) can inhibit the growth of gram bacteria positive (*Staphylococcus Aureus* and *Bacillus Cereus*) and gram-negative bacteria (*Escherichia Coli* and *Pseudomonas Sp.*) through inhibitory activity through damage to microbial cell walls indicated by intracellular concentrations of Ca<sup>2+</sup> and K<sup>+</sup>, each found as much as 13.09-15.16 mg/L and 567.96-797.52 mg/L (Arum Anugrahati et al., 2011).

This is in line with Shinta & Hartono's research on the Antimicrobial Activity Test of Dragon Fruit Peel Extract against *Escherichia Coli*, *Staphylococcus Aureus* and *Candida Albicans*. That the results of the study indicate that the higher the concentration given, the greater the inhibitory zone formed. The highest inhibitory power of dragon fruit peel extract against *Escherichia Coli* at the highest dose of 2 grams was 10.33 mm. The highest inhibitory power of dragon fruit peel extract against *Staphylococcus Aureus* at the highest dose was 2 grams, a mean of 8.66 mm. The highest inhibitory power of dragon fruit peel extract against *Candida Albicans* at the highest dose of 2 grams averaged 7.66 mm (Shinta & Hartono, 2018).

Other research results on the Antibacterial Activity of Red Dragon Fruit Ethanol Peel Extract (*Hylocereus Polyrhizus*) against *Streptococcus Pyogenes* bacteria by Suhartati & Roziqin (2017) which shows the red dragon fruit peel can inhibit the growth of *Streptococcus Pyogenes* bacteria. Inhibition zone at a concentration of 10% is 6 mm, the concentration of 20% 6.5 mm, the concentration of 40% 8 mm, the concentration of 60% 9 mm, and the largest zone is produced at concentrations of 80% and 100% that is equal to 12 mm. Positive control of penicillin produces zones of 22 mm while negative controls do not produce inhibitory zones. The results of the Minimum Kill Concentration (KBM) test found at a concentration of 100% can kill the growth of *Streptococcus Pyogenes* bacteria (Suhartati & Roziqin, 2017).

Researchers assume that the content of flavonoids and alkaloids is what makes a major contribution in inhibiting the growth and development of *Pseudomonas Sp.* bacteria.

Red dragon fruit peel contains several active compounds, namely alkaloids, terpenoids, flavonoids, thiamine, niacin, pyridoxine, cobalamin, phenolic, carotene, and phytoalbumin (Jaafar, Abdul Rahman, Mahmud, & Vasudevan, 2009). Red dragon fruit peel extract contains

antioxidants in the form of vitamin C, flavonoids, tannins, alkaloids, steroids, and saponins based on the results of photochemical and FTIR tests (Noor, Yufita, & Zulfalina, 2016).

Research by Sartika, Sutikno, Yuliana, & M (2019) shows that the red dragon fruit peel is dominated by ascorbic acid 2,6-dihexadecanoic (26.56%), oleic acid (24.08%), estradiol (10.13%), trien-17 beta-ol (9.63%), 9,12-okta acid dienoik (Z, Z) (8.27%), and organic acids, phenols, flavonoids, esters (31.46%) which potential as a natural anti-microbial (Sartika et al., 2019).

Flavonoid compounds as anti-microbial have 3 mechanisms of action namely inhibiting nucleic acid synthesis, inhibiting cell membrane function, and inhibiting energy metabolism (Hendra, Ahmad, Sukari, Shukor, & Oskoueian, 2011). The antibacterial mechanism of flavonoids in inhibiting the synthesis of nucleic acids is the rings A and B which play an important role in the process of interconnection or hydrogen bonding by accumulating nucleic acid bases that inhibit the formation of DNA and RNA. The location of hydroxyl groups in positions 2', 4' or 2'', 6'' is hydroxylated in ring B and 5,7 hydroxylated in ring A plays an important role in the antibacterial activity of flavonoids. Flavonoids cause damage to the permeability of bacterial cell walls, microsomes, and lysosomes as a result of interactions between flavonoids and bacterial DNA (Cushnie & Lamb, 2005).

The mechanism of action of flavonoids inhibits the function of cell membranes by forming complex compounds with extracellular and dissolved proteins that can damage bacterial cell membranes and is followed by the release of intracellular compounds. Other studies suggest that the mechanism of flavonoids inhibits the function of cell membranes by interfering with the permeability of cell membranes and inhibiting the binding of enzymes such as ATPase and (Li, Wang, & Liu, 2003). Furthermore, flavonoids can inhibit energy metabolism by inhibiting the use of oxygen by bacteria. Flavonoids inhibit cytochrome C reductase so that metabolic formation is inhibited. Energy is needed by bacteria for macromolecular biosynthesis (Cushnie & Lamb, 2005).

In addition to flavonoids, alkaloids have pharmacological effects on humans and animals as antibacterial substances. This is because alkaloids can inhibit the work of enzymes to synthesize bacterial proteins. Inhibition of the work of this enzyme can result in impaired bacterial metabolism (Ogbuagu, 2008).

## CONCLUSION

Based on the results of this study concluded that the decoction of red dragon fruit peel with a concentration of 95% has the highest inhibitory zone on the growth of the bacterium *Pseudomonas Sp.* causes of diabetic ulcers compared to the decoction of dragon fruit peels with other concentrations.

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