JURNAL ILMU KESEHATAN VOL 7 NO. 2 DECEMBER 2019
E-ISSN : 2614-6703

Received : 2019-07-08 Revised : 2019-12-06 Accepted : 2019-12-12 Published : 2019-12-31

EFFECTIVENESS OF RED DRAGON FRUIT MEAT AND SKIN *(HYLOCEREUS POLYRHIZUS)* AGAINST BACTERIAL GROWTH *STAPHYLOCOCCUS AUREUS* (DIABETIC ULCER) IN VITRO

Rivan Firdaus[1]

[1]Department of Nursing, Poltekkes Kemenkes Kaltim, Samarinda

*E-mail : poltekkeskaltim.rivan@gmail.com

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. One plant that is thought to have an antibacterial effect and is starting to be consumed by many Indonesians is dragon fruit. This study aims to determine the effect of red dragon fruit on the bacteria that cause diabetic ulcers. The hypothesis in this study is that there are differences in the inhibition of bacterial growth *Staphylococcus aureus* after administration of red dragon fruit with a concentration of 25%, 50%, 75% and 95%. This research was conducted using a one-factor Completely Randomized Design (CRD), namely red dragon fruit flesh and red dragon fruit skin with concentrations of 15%, 25%, 50%, 75% and 95% respectively. The positive control is amoxicillin, and the negative control is sterile aquadest. The research began on August 12 2019 to November 14 2019 at the Health Analyst Laboratory of the East Kalimantan Ministry of Health Polytechnic. The results of research on the concentration of inhibition on bacteria *Staphylococcus aureus* the highest inhibition zone was in red dragon fruit skin decoction with a concentration of 95%, namely 7 mm (medium inhibition). Decoction of red dragon fruit skin with a concentration of 95% has the highest inhibition zone against bacterial growth*Staphylococcus aureus* compared to boiled dragon fruit flesh.

Keywords: red dragon fruit flesh and skin,*Staphylococcus aureus*

1. Introduction

The diabetic foot is a major consequence of neuropathy and peripheral vascular disease, including lower extremity infection, ulcer formation and deep tissue destruction. The incidence and prevalence of diabetic foot are 1.0%-4.0% and and 5.3%-10.5%, respectively. About 20%-30% of diabetic foot ulcers are located on the toes. Diabetic foot ulcers are easy to develop but difficult to heal due to several factors, such as thin subcutaneous fat and skin, slow blood flow, large vessel resistance and hidden foot sutures. Foot ulcers also involve the bones of the foot 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, resulted in 82 positive culture people.*Staphylococcus aureus* is the dominant organism, followed by*Pseudomonas aeruginosa*. biofilm formation was seen in 38 (46.34 percent) of the organisms. The biofilm formed is dominated by Staphylococcus aureus (20 percent) (Banu, Mohammad, Hassan, Rajkumar, & Srinivasa, 2015)

At Zainal Abidin Hospital that The most common types of bacteria found in diabetic ulcer pus are *Staphylococci*sp. (92,9%),*Klebsiella* sp. (75,4%), *Proteus*sp. (73,7%), *Shigella*sp. (68,4%),*E.coli*sp. (42.1%), And *Pseudomonas*sp. (10.5%) (Nur, A and Marissa, 2016).

Research at RSUP Dr. M. Djamil Padang with a total sample of 148 diabetic ulcer cases. The three most aerobic bacteria in diabetic ulcers are Klebsiella (34%), followed by Staphylococcus aureus (30%), and Proteus mirabilis (12%) (Gaol, et al, 2017).

One plant that is thought to have an antibacterial effect and is starting to be consumed by many Indonesians is dragon fruit. Dragon fruit plant is one of the most widely cultivated plants on the island of Java, especially in the provinces East Kalimantan. Amalia's research results,*et al* (2014) that the n-hexane fraction of red dragon fruit peel has antibacterial activity on*Staphylococcus aureus* ATCC 25923 (Amalia et al., 2014).

The n-hexane fraction of red dragon fruit peel contains alkaloids, steroids, triterpenoids and flavonoids. The n-hexane fraction of red dragon fruit peel has antibacterial activity against Staphylococcus aureus bacteria. The minimum inhibitory concentration (MIC) of the n-hexane fraction of red dragon fruit peel against Staphylococcus aureus was 625 ppm with an inhibition zone of 17 mm (Amalia, et al, 2014). Hartomo's research, et al (2018),that dragon fruit extract super red can be used as an antibacterial agent in periodontal therapy (inhibition of growth *Streptococcus mutans).*

Based on the above background, the authors are interested in conducting further research on the effectiveness of red dragon fruit flesh and skin *(Hylocereus polyrhizus)* against bacterial growth *Staphylococcus aureus* (diabetic ulcer) in vitro.

2. Materials and Methods

Materials and methods should describe complete material applied in the study. Method should contain all steps and rule that used, include the procedure clearly. New method, new procedure or new treatment could be cited from previous researcher that available on the field. Study about animal or human need requirement to provide ethical approval. The type of research used in this study was an experimental study using an in vitro test with disc diffusion technique (Kirby Bauer test) to see the antibacterial activity of red dragon fruit flesh and red dragon fruit skin with respective concentrations of 15%, 25%, 50 %, 75% and 95% against bacteria *Staphylococcus aureus*, with the research design is Completely Randomized Design (RAL).

This research began on 12 August 2019 to 14 November 2019 at the Health Analyst Laboratory of the East Kalimantan Ministry of Health Polytechnic, The tools used in this study were a blender, thermoshaker, ose, test tube, Erlenmayer flask, beaker glass, measuring cup, petri dish, busen burner, autoclave, stove, panic, oven, incubator, scales, spatula, rotator evaporator, knife., pipe, aluminum foil, caliper, sieve, stationery, gauze, dry paper and syringe. The ingredients used are red dragon fruit flesh, red dragon fruit skin, and bacterial atcc *Staphylococcus aureus.* Red dragon fruit flesh and red dragon fruit skin were boiled and prepared with concentrations of 15%, 25%, 50%, 75% and 95% respectively. And for the negative control of distilled water and amoxicillin as a positive control. Treatment in the bacterial activity test with 2 repetitions

3. Results and Discussion

Research results found that the inhibitory concentration against bacteria *Staphylococcus aureus* the highest inhibition zone was in red dragon fruit skin decoction with a concentration of 95%, namely 7 mm (medium inhibition).

Table 4.1. Inhibition Zone Concentration Test Results for Bacteria *Staphylococcus aureus*

		Inhibition Zone Diameter (mm)	Information
red dragon fruit flesh	15%	0	Weak Resisting Force
	25%	0	Weak Resisting Force
	50%	0	Weak Resisting Force
	75%	0	Weak Resisting Force
	95%	0	Weak Resisting Force
red dragon fruit skin	15%	0	Weak Resisting Force
	25%	0	Weak Resisting Force
	50%	0	Weak Resisting Force
	75%	0	Weak Resisting Force
	95%	7	Medium resistance
control	(+)	19	Strong resistance
	(-)	0	Weak Resisting Force

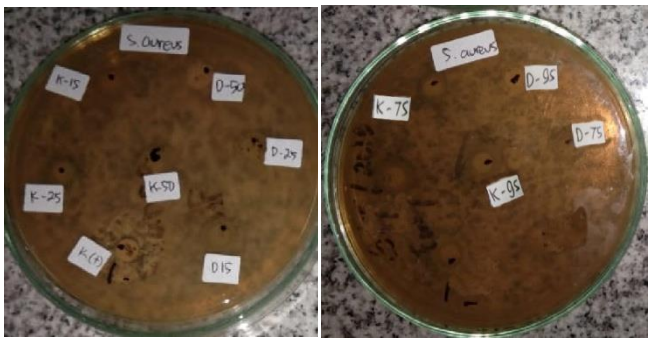

Figure 4.1 Results of Bacterial Inhibitory Test

The results showed that red dragon fruit peel decoction with a concentration of 95% had the highest inhibition zone against bacterial growth *Staphylococcus aureus* compared to boiled dragon fruit flesh.

The results of this study are in line with Shinta's research (2017), regarding the Antimicrobial Activity Test of Dragon Fruit Peel Extract Against E.Coli, Staphylococcus Aureus and Candida Albicans. That the results of the study showed that the higher the concentration given, the greater the inhibition zone formed. The results of the highest inhibition of dragon fruit peel extract against E. coli at the highest dose of 2 grams averaged 10.33 mm. The results of the highest inhibition of dragon fruit peel extract against *Staphylococus aureus*

at the highest dose of 2 g the average is 8.66 mm. The results of the highest inhibition of dragon fruit peel extract against Candida albicans at the highest dose of 2 grams the average is 7.66 mm (Shinta & Hartono, 2017).

Other research that supports this is the Antibacterial Activity of the Ethanol Extract of Red Dragon Fruit Peels *(Hylocereus polyrhizus)* against Streptococcus pyogenes bacteria by Suhartati (2017). That the results of the study showed that red dragon fruit skin could inhibit the growth of Streptococcus pyogenes bacteria. The inhibition zone at 10% concentration was 6 mm, 20% concentration was 6.5 mm, 40% concentration was 8 mm, 60% concentration was 9 mm, and the largest zone was produced at 80% and 100% concentration, which was 12 mm. The positive control penicillin produced a zone of 22 mm while the negative control did not produce an inhibition zone. The results of the Minimum Kill Concentration (KBM) test found that at a concentration of 100% it could kill the growth of the Streptococcus pyogenes bacteria (Suhartati & Roziqin, 2017).

Red dragon fruit skin contains several active compounds, namely alkaloids, terpenoids, flavonoids, thiamine, niacin, pyridoxine, cobalamin, phenolic, carotene and phytoalbumin (Jaafar, Ridhwan, Abdul, Naning, & Gajah, 2009). Other research on 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 testing (Noor, 2016).

Flavonoids are a group of phenolic compounds that are most abundant in nature. The working principle of flavonoids is the same as that of alkaloids, namely by damaging the cell wall, it's just that the method is different, flavonoid compounds damage bacterial cells by exploiting the difference in polarity between the lipids that make up bacterial cells and the alcohol groups in flavonoid compounds. Alkaloid compounds take advantage of the reactive nature of basic groups to react with amino acid groups in bacterial cells. The use of alkaloids for plants is as a protector from pest attacks, plant boosters and hormone regulators (Cowan, 1999).

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

Researchers assume that the content of flavonoids and alkaloids makes a major contribution in inhibiting the growth and development of bacteria*Staphylococcus aureus*.

4. Conclusion

Rebusan kulit buah naga merah dengan konsentrasi 95% memiliki zona hambat yang paling tinggi terhadap pertumbuhan bakteri *Staphylococcus aureus* dibandingkan dengan rebusan daging buah naga

References

Amalia, S., Wahdaningsih, S., & Untari, E. K. (2014). Antibacterial Activity Testing Of N-Hexane Fraction Of Red Dragon (Hylocereus polyrhizus Britton & Rose) Fruit Peel On Staphylococcus aureus ATCC 25923, *19*(May), 89–94.

Banu, A., Mohammad, M., Hassan, N., Rajkumar, J., & Srinivasa, S. (2015). Spectrum of bacteria associated with diabetic foot ulcer and biofilm formation : A prospective study What this study adds :, *8*(9), 280–285.

Cowan, M. M. (1999). Plant Products as Antimicrobial Agents, *12*(4), 564–582.

Jaafar, R. A., Ridhwan, A., Abdul, B., Naning, T., & Gajah, A. (2009). Proximate Analysis of Dragon Fruit (Hylecereus polyhizus) Nor Zaini Che Mahmod and 2 R . Vasudevan Department of Bioengineering , Section of Biosystem and Bioprocess Engineering Technology , University Kuala Lumpur-Malaysian , Institute of Chemical and , *6*(7), 1341–1346.

Jawetz, Melnick, & Adelberg's. (2013). Medical Microbiology (26Th ed., p. 199). New York: McGraw Hill Medical. Retrieved from https://www.google.com/url?q=http://microbiology.sbmu.ac.ir/uploads/jawetz_2013__medical_miceobiology.pdf&sa=U&ved=0ahUKEwiF3re49PbRAhWHPY8KHWUtAuUQFggEMAA&client=internal-uds-cse&usg=AFQjCNHo9vtz4b-TTvmy7JBPSz07PBdQ4w

Ji, L., Bai, J., Sun, J., & Wang, Z. (2016). Nursing care for diabetic toe ulcers: A case series report and literature review. *International Journal of Nursing Sciences*, *3*, 1–5. https://doi.org/10.1016/j.ijnss.2016.04.007

Kahuripan, A., Andrajati, R., & Syafridani, T. (2009). Analisis Pemberian Antibiotik Berdasarkan Hasil Uji Sensitivitas Terhadap Pencapaian Clinical Outcome Pasien Infeksi Ulkus Diabetik Di RSUD DR. H. Abdul Moeloek Lampung, *VI*(2), 75–87.

Kristanto, D. (2008). *Buah Naga : Pembudidayaan Di Pot dan Di Kebun*. Bogor: Penebar Swadaya.

Noor, M. I. ; E. Y. dan Z. ; (2016). Identifikasi Kandungan Ekstrak Kulit Buah Naga Merah Menggunakan Fourier Transform Infrared (FTIR) dan Fitokimia Identification Content of the Red Dragon Fruit Extract Skin Using Fourier Transform Infrared (FTIR) and Phytochemistry. *Journal of Aceh Physics Society (JAcPS)*, *5*(1), 14–16.

Nur, A dan Marissa, N. (2016). Gambaran Bakteri Ulkus Diabetikum di Rumah Sakit Zainal Abidin dan Meuraxa Tahun 2015. *Buletin Penelitian Kesehatan*, *44*(3), 187–196.

Ogbuagu, M. N. (2008). The Nutritive and Anti-Nutritive Compositions of Calabash (Crescentia cujete) Fruit Pulp. *Journal of Animal and Veterinary Advances*, *7*(9), 1069–1072.

Shinta, D. Y., & Hartono, A. (2017). Uji Aktivitas Antimikroba Ekstrak Kulit Buah Naga (Hylocareus costarisensis) Terhadap E.coli, Staphylococcus aureus, dan Candida albicans. *Jurnal Sains Dan Teknologi*, *9*(1), 26–39.

Suhartati, R., & Roziqin, D. A. (2017). Aktivitas Antibakteri Ekstrak Etanol Kulit Buah Naga Merah (Hylocereus polyrhizus) Terhadap Bakteri Streptococcus pyogenes. *Jurnal Kesehatan Bakti Tunas Husada*, *17*(2), 513–518.