



Antibacterial Activity of Red Dragon Fruit Leaves Extract and White Dragon Fruit Leaves Extract Against Meningitis Bacterial

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ABSTRACT

Dragon fruit leaves extract contains various phytochemicals, namely: alkaloids, flavonoids, tannins, saponins, glycosides, steroids, and terpenoids. Diverse phytochemical content allows the dragon fruit leaves extract to have antibacterial activity. The objectives of this research were to test antibacterial activity of dragon fruit leaves extract against meningitis bacterial (*Neisseria meningitidis*, *Streptococcus pneumoniae*, and *Listeria monocytogenes*). Dragon fruit leaves extract was obtained by maceration. Antibacterial activity test was done by the paper disc diffusion method with ceftriaxone as the positive control and dimethylsulfoxide as the negative control. Antibacterial activity of red dragon leaves extract with concentration 600 µg/mL and white dragon fruit leaves extract with concentration 800 µg/mL were not show significantly different antibacterial activity from ceftriaxone with concentration 10 µg/mL against meningitis bacterial (*Neisseria meningitidis*, *Streptococcus pneumoniae*, and *Listeria monocytogenes*). The results prove that the red dragon fruit leaves extract was more potential antibacterial activity than white dragon fruit leaves extracted against meningitis bacterial (*Neisseria meningitidis*, *Streptococcus pneumoniae*, and *Listeria monocytogenes*).

Keywords: Antibacterial Activity, Dragon Fruit, *Neisseria meningitidis*, *Streptococcus pneumoniae*, *Listeria monocytogenes*

INTRODUCTION

Meningitis is inflamed in the meninges which function as a protector of the brain and spinal cord. Meningitis is caused by five main factors, namely bacterial, viruses, fungi, amoeba and several diseases. The main cause of meningitis is

caused by bacteria. The bacteria that cause bacterial meningitis are *Neisseria meningitidis*, *Streptococcus pneumoniae*, *Listeria monocytogenes*, *Haemophilus influenzae*, and *Escherichia coli*. The most common cause of bacterial meningitis is *Neisseria meningitidis*. These bacteria can live in the nose and throat without causing infection. But, there is a time when these



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bacteria can fight and defeat the human immune system resulting in meningitis. In general, adults have immunity to *Neisseria meningitidis*. These bacteria cannot live long outside the human body. These bacteria are usually spread through direct contact or at close range, for example through coughing, sneezing, or kissing. *Streptococcus pneumoniae* can also live on the nose and throat of humans without causing infection. But when the human immune system goes down, this bacteria can attack and cause meningitis. These bacteria cause meningitis in infants more often, when their immune system is not fully developed¹.

Dragon fruit leaves extract contains various phytochemicals, namely: alkaloids, flavonoids, tannins, saponins, glycosides, steroids, and terpenoids². Several phytochemical has been tested for the antidiabetic³, antimalarial^{4,5}, anticancer^{4,6-7}, anticonvulsant⁸ and antinephrolitiatic⁹ activity. The antioxidant^{10,11}, antidiabetic^{12,13}, antihypercholesterolemic¹⁴, hepatoprotective¹⁵, and anticancer¹⁶, activity has been observed from dragon fruit flesh. The antibacterial^{17,18} and antioxidant¹⁰ activity has been observed from dragon fruit peel. But until now no research observed the antibacterial activity of dragon fruit leaves against meningitis bacterial (*Neisseria meningitidis*, *Streptococcus pneumoniae*, and *Listeria monocytogenes*). In this research the objectives was to observed antibacterial activity test of dragon fruit leaves against meningitis bacterial (*Neisseria meningitidis*, *Streptococcus pneumoniae*, and *Listeria monocytogenes*).

MATERIALS AND METHODS

Tools and Materials

The tools used in this research were micropipette (Eppendorf), autoclave (Fison), oven (Fischer), paper disc (Oxoid), vortex (Health), and other glassware (Iwaki).

The materials used in this research were Mc Farland Standard Suspension (Biosan), Nutrient Broth (Oxoid), Nutrient Agar (Oxoid), *Neisseria meningitidis* (Thermo), *Streptococcus pneumoniae* (Thermo), and *Listeria monocytogenes* (Thermo), and other chemical (E-Merck).

Sample Collection

Sampling is purposively done without comparing with the same sample from other places.

The sample used was white dragon fruit leaves (*Hylocereus polyrhizus*) and red dragon fruit leaves (*Hylocereus undatus*). Which was green colours obtained from the farmers in Gundaling, Sumatera Utara, Indonesia.

Sample Identification

Identification of white dragon fruit (*Hylocereus polyrhizus*) leaves and red dragon fruit (*Hylocereus undatus*) leaves was carried out at Herbarium Medanense, Laboratory of Herbarium, Faculty of Mathematics and Natural Sciences, University of Sumatra Utara, Medan Selayang, Medan Baru, Sumatera Utara, 20155, Indonesia.

Preparation of Extract

The extraction process was based on modification of Nazliniwaty *et al.*, reserach, the part used is white dragon fruit (*Hylocereus polyrhizus*) leaves and red dragon fruit (*Hylocereus undatus*) leaves. The leaves are cleaned, washed with running water, drained, dried in a drying cabinet at a temperature of $\pm 40^{\circ}\text{C}$ to dry, smoothed using a blender, then stored in a tightly closed glass container. 0.5 kg of dragon fruit leaves was soaked for 5 days with 5 L methanol, and filtered the mixture. Extract was evaporated with a rotary evaporator until a viscous extract was obtained^{19,20}.

Antibacterial Activity Test

The antibacterial activity was based on modification of Karsono *et al.*, reserach and Masfria *et al.*, research, tools and materials that will be used in an antibacterial activity test must be free from the presence of microbes so they are sterilized before being used in experiments. The growth media was sterilized in autoclave at 121°C for 15 min. and the glassware used was sterilized in an oven at 170°C for 1 hour. Inoculating loop and lux are sterilized by burning with bunsen flame. 10 g of red dragon fruit leaves extract and white dragon fruit leaves extract was weighed, inserted into a 10.0 mL volumetric flask, added 60.0 mL of dimethylsulfoxide, shaken until dissolved, diluted with dimethylsulfoxide to the marked line, and shaken homogeneously (obtained extract solutions with concentration 1000 mg/mL). Solution was diluted with dimethylsulfoxide to obtain solutions with concentration 1000 $\mu\text{g/mL}$; 800 $\mu\text{g/mL}$; 600 $\mu\text{g/mL}$; 400 $\mu\text{g/mL}$; 200 $\mu\text{g/mL}$; 100 $\mu\text{g/mL}$. The bacterial colony was taken from the culture stock with a sterile inoculating loop, then suspended in a

In the all of test concentration range obtained a smaller diameter of the inhibitory zone against *Neisseria meningitidis* than against *Streptococcus pneumoniae* and against *Listeria monocytogenes*. This difference occurs because the two test bacteria have different cell wall composition and structure resulting in Gram positive bacteria more susceptible to chemical compounds than Gram negative. The cell structure of Gram positive bacteria is simpler, that is single layered with a low lipid content making it easier for bioactive ingredients to enter the cell. Gram negative bacterial cell wall structure is more complex, namely three layers consisting of an outer layer of lipoprotein, a middle layer of lipopolysacrida which acts as a barrier to the entry of antibacterial bioactive material, and an inner layer of peptidoglycan in high lipid content²³. The higher the concentration of red dragon fruit leaves extract and white dragon fruit leaves extract shows the higher the antibacterial activity. This result shows that the red dragon fruit leaves extract and white dragon fruit leaves have a dose dependent antibacterial activity. Flavonoids are known to have antimicrobial activity by forming complexes with bacterial cell walls. Flavonoids work by destroying bacterial cell membranes in the phospholipid portion,

thereby reducing permeability because phenolic compounds result in changes in the composition of the phospholipid membrane so that cells undergo lysis²⁴. The mechanism of the action of saponins as antibacterial is by causing leakage of proteins and enzymes in the cell. Tannins also have a function to denature bacterial cell proteins that inhibit bacterial growth²⁵.

CONCLUSION

Dragon fruit leaves extract has antibacterail activity against meningitis bacterial (*Neisseria meningitidis*, *Streptococcus pneumoniae*, and *Listeria monocytogenes*). Red dragon fruit leaves extract was more potential antibacterial activity than white dragon fruit leaves extracted against meningitis bacterial (*Neisseria meningitidis*, *Streptococcus pneumoniae*, and *Listeria monocytogenes*)

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