THE POTENTIAL OF RED GINGER EXTRACT (ZINGIBER OFFICINALE VAR RUBRUM) AGAINST STAPHYLOCOCCUS AUREUS AND STAPHYLOCOCCUS EPIDERMIS

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Abstract

Red ginger (Zingiber Officinale Var Rubrum Rhizoma) is a plant that is often found in Indonesia. Local people often use rhizomes to treat various diseases such as antibacterial, antioxidant, anti-inflammatory, analgesic, diuretic, antifungal, anticancer, and antiviral. This study aims to determine the antibacterial activity of red ginger extract against the bacteria Staphylococcus aureus and Staphylococcus epidermis. This research method was carried out through the stages of maceration, extraction, and testing the antibacterial activity of red ginger extract using the disc method using concentrations of 25,000ppm, 50,000ppm, and 100,000ppm. The results of the antibacterial activity test were obtained in testing the bacteria Staphylococcus epidermis, there was an inhibition zone at a concentration of 25,000ppm of 70 mm, 50,000ppm of 75 mm, and 100,000ppm of 95 mm, while in the test for Staphylococcus aureus, there was an inhibition zone at a concentration of 25,000ppm of 60 mm. 80,000ppm by 75 mm, and 100,000ppm by 95 mm. This study concludes that in testing Staphylococcus epidermis, the inhibitory power is very strong at a concentration of 100,000 ppm, as well as in Staphylococcus aureus bacteria.

Keywords: *Red ginger (Zingiber Officinale Var Rubrum), extract, antibacterial, disc method.*

1. INTRODUCTION

Infectious diseases are still a health problem in the world, especially in developing countries, one of which is Indonesia. The main cause of infectious disease is exposure to pathogenic microbes which can cause disease (morbidity) and even death (mortality). The types of microbes that often cause sporadic or endemic infections generally come from the bacterial group, one of which is *Staphylococcus aureus*. This bacteria is one of the causes of skin infections, pneumonia, meningitis, abscesses and sepsis[1].

There are several factors that cause infectious diseases, including reducing awareness of personal hygiene behavior, high virulence bacteria accompanied by inappropriate use of antibiotics, resulting in the risk of resistance which can increase the severity of the infection. Based on this, efforts are needed to reduce the risk of infection as well as efforts to overcome bacterial resistance, namely by using herbal ingredients that have the potential to act as antibacterials, one of which is red ginger (*Zingiber officinale* var. rubrum). Red ginger is a type of rhizome plant that contains secondary metabolite compounds such as shogaol and gingerol, flavonoids, terpenoids, saponins and essential oils. Until now, red ginger is mostly used as

medicine. This is because the gingerol and essential oil content of red ginger is higher than other ginger varieties[2].

Considering the great potential of red ginger as a natural antimicrobial, in this study a phytochemical screening was carried out to determine the presence of secondary metabolite compounds in red ginger and then tested the antibacterial activity of red ginger extract against *Staphylococcus aureus* and *Staphylococcus epidermidis*.

2. METHODOLOGY

2.1 Tools and materials

Glassware, blender, maceration vessel, water bath, analytical balance, petri dish, erlenmeyer, test tube, round tube, straight tube, autoclave (Memmert), oven (Memmert), Incubator (Memmert), Viscometer, Laminar Air Flow (LAF), Spirit lamp, blank disk, iwaki glass, tweezers. Red Ginger Simplisia, 96% ethanol, distilled water, clindamycing, disc paper, Nutrient Agar (NA), *Staphylococcus epidermidis* and *Staphylococcus aureus* bacteria.

2.2 Procedure

2.2.1 Red ginger extract maker

Weighed 200 grams of red ginger simplicia, then macerated with 2 liters of 70% ethanol with 3 macerations carried out for 3 x 24 hours, then filtered, then the dregs were macerated again. The collected filtrate is evaporated using a rotary evaporator, then heated in a water bath at 40^{o}C - 60^{o}C. The extract is heated until the weight remains constant[3].

2.3 Antibacterial Activity Test

2.3.1 Sterilizer

The tools used are washed with soap, the wide mouth container is cleaned by soaking in hot detergent solution for 15-30 minutes followed by distilled water. Tools are dried in a vertical position. The test tube and Erlenmeyer flask were plugged with clean cotton. Tools made of plastic are sterilized using an autoclave set at a temperature of 121^{o}C with a pressure of 15 psi (per square inch) for 15 minutes. Glassware is sterilized in the oven at 170 -180^{o}C for 2 hours. Ose needles are burned with a Bunsen fire until red. Sterile tools are wrapped in aluminum foil[4].

2.3.2 Media creation

- Nutrient Agar (NA)

A total of 23 grams of Nutrient Agar (NA) powder was dissolved in sterile distilled water little by little then the volume was increased to 1 liter with the help of heating until all the ingredients were dissolved then sterilized in an autoclave at 1210C for 15 minutes[4].

- Nutrient Broth (NB)

A total of 8 grams of Nutrient Broth (NB) powder was dissolved in distilled water sterilize little by little then the volume is increased to 1 liter with the help of heating until the material is completely dissolved then sterilized in an autoclave at 1210C for 15 minutes [4].\

2.3.3 Preparation of Bacterial Culture Stock

- Preparation of *Staphylococcus epidermidis* and *Staphylococcus aureus*

Bacterial Culture Stock The pure culture of Staphylococcus epidermidis is taken with a sterile needle and then inoculated on the surface of the nutrient agar slant media, then incubated in an incubator at a temperature of around 37°C for 24 hours[4].

2.3.4 Antibacterial testing

The test bacteria used were *Staphylococcus aureus* and *Staphylococcus epidirmidis*, and the aim of using these bacteria was to find out whether the extract from red ginger had antibacterial activity (Delpris, 2019). Testing the growth of turi leaf ethanol extract was carried out using the diffusion method using paper discs with a medium working procedure. 15 ml of sterile sodium agar (NA) was taken then mixed with 0.2 ml of previously prepared bacterial suspension, then poured aseptically into a sterile petri dish and left to harden. Next, paper discs that had been soaked with extracts of different concentrations were placed on the surface of the medium in an antiseptic manner using tweezers and then incubated at 37°C for 24 hours. After 24 hours, observe the clear area that has formed and measure it with a ruler as an inhibition zone[5].

After incubation for 24 hours at a temperature of 37℃, the inhibition zone was observed and measured on the petri dish and paper disc, namely by calculating the diameter of the inhibition zone (clear zone) around the media against *Staphylococcus aureus* and *Staphylococcus epidermis* bacteria. You can measure the diameter of the inhibition zone using a ruler in millimeters (mm)[5].

3. RESULTS

3.1 Rendemen

Table 1: *Yield Results*

Type Of Solvent	Extract Weight (Grams)	Yield%
Ethanol 70%	61,18	33,98

The results of maceration of red ginger leaf simplicia using 70% ethanol resulted in a thick extract of 61.18 g with a yield of 33.98%. The choice of 70% ethanol was used in the research because 70% ethanol is a universal solvent that can attract several secondary metabolite compounds in other plants. From these results, organoleptic data on Red Ginger leaf extract was obtained, it had a red ginger smell, was thick, and had a blackish-red color.

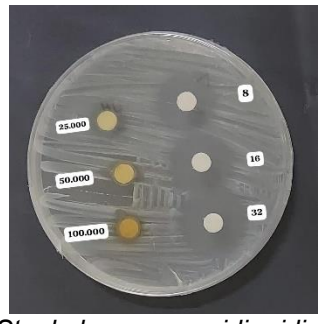
3.2 Antibacterial Activity Test

Table 2: *Results of the inhibition zone of red ginger extract against the bacteria Staphylococcus aureus and staphylococcus epidermis*

No	Test Bacteria	Extract Concentration	Inhibition zone (mm)
1.	*Staphylococcus epidermis*	25.000 ppm	70 mm
		50.000 ppm	75 mm
		100.000 ppm	95 mm
2.	*Staphylococcus aureus*	25.000 ppm	60 mm
		50.000 ppm	80 mm

		100.000 ppm	100 mm
3.	Clindamycin	8 ppm	180 mm
		16 ppm	200 mm
		32 ppm	220 mm

The results of testing the effectiveness of red ginger ethanol extract on the growth of *Staphylococcus epidermis* bacteria using the disc diffusion method at a concentration of 25,000 ppm were said to be very strong with an inhibition zone of 70 mm, a concentration of 50,000 ppm was said to be very strong with an inhibition zone of 75 mm, a concentration of 100,000 ppm was said to be very strong with the inhibition zone is 95 mm, and in testing *Staphylococcus aureus* at a concentration of 25,000 ppm it is said to be very strong with an inhibition zone of 60 mm, a concentration of 50,000 ppm is said to be very strong with an inhibition zone of 80 mm, a concentration of 100,000 ppm is said to be very strong with an inhibition zone of 100 mm using the comparison antibiotic clindamycin as a positive control with an inhibition zone of 180 mm at a concentration of 8 ppm, 200 mm at a concentration of 16 ppm and 220 mm at a concentration of 32 ppm.



a) *Staphylococcuss epidirmidis* with extract concentrations of 25,000ppm; 50,000ppm; 100,000ppm and clindamycin concentration of 8ppm; 16 ppm and 32 ppm.

b) *Staphylococcuss aureus* with extract concentrations of 25,000ppm; 50,000ppm; 100,000ppm and clindamycin concentration of 8ppm; 16 ppm and 32 ppm.

Figure 1: *Disc test results of red ginger extract against Staphylococcus aureus and Staphylococcus epidermis bacteria*

The antibacterial activity test using the disc diffusion method showed that the higher the extract concentration, the higher the resistance caused. Increasing the concentration causes the composition of the active substance to become more concentrated so that the ability to kill or inhibit the growth of bacteria is also stronger. A concentration of 100,000 ppm shows the best activity because it has the greatest inhibitory power with an inhibitory zone diameter of 100 mm. These results are based on Wilda et al., 2017 research, which states that the greater the concentration of an antibacterial substance, the higher the bacterial inhibitory power. This research is also by the statement Wilda *et al*., 2017 that with increasing concentration, the content of antibacterial compounds will be greater so that more antibacterial compounds will diffuse into bacterial cells using their respective mechanisms and the zone of inhibition will be larger[6].

This lack of difference is due to the existence of similarities in the three bacterial tests. All three are Gram+ bacteria which has a relatively thick wall structure simple, compared to bacterial walls Gram – thin but complex. Bacterial cell wall Gram + consists of peptidoglycan components and This lack of difference is due to the existence of similarities in the three bacterial tests. All three are Gram+ bacteria which has a relatively thick wall structure simple, compared to bacterial walls Gram – thin but complex. Bacterial cell wall Gram + consists of peptidoglycan components and teiconic acid is polar so it is easy to be damaged by extracts that are also polar[7].

Apart from the same cell wall arrangement, third This test bacterium has a growth phase hamper the same. According to research by Saraswati (2015), the log phase of *S.aureus* starts from the 3rd hour to 15th jam. Meanwhile, *S. epidermidis* starting from the 4th hour to the 9th hour. Equality of these two bacteria is the log phase less than 24 hours. So when it's done At the 24th hour of treatment, the three bacteria both reached the stationary phase and the decreasing phase until more or less the same inhibition zone is formed[8]. Teiconic acid is polar so it is easy to be damaged by extracts which are also polar[7]. Apart from the same cell wall arrangement, third This test bacterium has a growth phase hamper the same. According to research by Saraswati (2015), the log phase of S.aureus starts from the 3rd hour to 15th. Meanwhile *S. epidermidis* starting from the 4th hour to the 9th hour. Equality of these two bacteria is the log phase less than 24 hours. So when it's done At the 24th hour of treatment, the three bacteria both reached the stationary phase and the decreasing phase until more or less the same inhibition zone is formed.

4. CONCLUSIONS

4.1 In testing antibacterial activity against Staphylococcus epidermis bacteria, there was a very strong inhibitory power at a concentration of 100,000 ppm of 95 mm.

4.2 In testing antibacterial activity against Staphylococcus aureus bacteria, there was a very strong inhibitory power at a concentration of 100,000 ppm of 100 mm.

5. ACKNOWLEDGEMENTS

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