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**Original Research Article**

# Comparison of the Effectiveness of Red Ginger Extract with Emprit Ginger against the Growth of Staphylococcus Aureus Bacteria

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**Abstract:** Ginger (Zingiber officinale) is one of the spice plants found in Indonesia that is useful as a drug, containing secondary metabolite compounds flavonoids, alkaloids, terpenoids, and essential oils that are antibacterial. The purpose of this study was to find out the comparison of the effectiveness of red ginger extract and ginger emprit against the growth of Staphylococcus aureus bacteria. This study is an Experimental Laboratories study using true experimental design with the design of Post Test Only Control Group Design. Where extracts of red ginger and ginger emprit are obtained by the maceration method which is then varied into several concentration treatments namely 20%, 40%, 60%, 80%, and 100% as well as positive control of ciprofloxacin and dmso negative control, followed by disc diffusion methods to test antibacterial activity, analyzed statistically using the One Way Anova test. The results showed that red ginger extract and ginger emprit were able to inhibit the growth of Staphylococcus aureus bacteria with weak to moderate activity. The final results showed a value of p<001 so that at least there was a meaningful average between the data groups of red ginger extract and ginger emprit. The conclusion of this study was that at a concentration of 100% red ginger extract was more effective in inhibiting the growth of Staphylococcus aureus bacteria with a bland zone of 17.83 mm compared to emprit ginger extract with a bland zone large of 17.16 mm. The advice we give that red ginger more quickly inhibits bacteria so it is very well consumed and becomes an alternative non-pharmacological treatment.

**Keywords:** Red Ginger; Ginger Emprit; Staphylococcus Aureus; Anti-Bacterial.

## INTRODUCTION

Infectious diseases are one of the growing problems in the field of health with a fairly high prevalence rate that occurs around the world. *World Helath Organization* (WHO) data that estimates the incidence of infectious diseases in developing countries is 0.29 parts per child/year and in developed countries 0.05 parts per child/year. The data is reinforced because there are 156 million new parts of the world per year where 151 million cases (96.7%) occur in developing countries [1]. This problem is a global problem and also occurs in Indonesia.

In Indonesia, infectious diseases are listed in the ten most disease-causing diseases in society according to the results [2]. The development of infectious diseases in Indonesia can be seen from several infectious disease data, for example the prevalence of respiratory infections (ARI) is 4.4%, pneumonia is 2.0%, while diarrhea has an incidence and prevalence at all ages in Indonesia is 6.8% and 8.0%. One of the causes of infectious diseases is pathogenic bacteria that are at risk for their host cells, namely *Staphylococcus aureus* [3].

Infections caused by *Staphylococcus aureus* are characterized by tissue damage accompanied by purulent abscesses and are capable of causing various suppurative infections of varying severity. Staphylococcus aureus infection is a serious problem today because bacterial resistance to various types of antibiotics has increased due to improper use.



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Reports of Staphylococcus aureus resistance to various antibiotics continue to appear in various places over time. Because it can cause significant negative effects, ranging from increased therapy costs to the risk of complications that can be life-threatening [4]. Therefore, people began to switch to using alternative therapies by using herbal plants around us which are considered effective and safe to use to minimize the use of antibiotics and avoid the occurrence of resistance [5].

The use of herbal plants in Indonesia for treatment is already widespread. Herbal plants that have the potential to be used by the community to treat infectious diseases are ginger (family; Zingiberaceae) [6]. Ginger (*Zingiber officinale*) is one of the spice plants that are commonly found in Indonesia and is very important in everyday life. There are three types of ginger that are known in terms of the shape, size, and color of their rhizomes, namely small white ginger or emprit ginger (Zingiber officinale *var. officinale). Amarum*), red ginger (Zingiber officinale *var. officinale). Rubrum*) and elephant ginger (Zingiber officinale *var. officinale). Officinale*) [7]. Red ginger (Zingiber officinale *var. officinale).* Rubrum( lat. Rubrum) has a small rhizome structure in layers, the flesh of the rhizome is red, from orange to red, and is smaller in size than that of a small ginger. While emprit ginger is known by the Latin name *Zingiber officinale var. Amarum,* the structure of the rhizome is small and layered. The flesh of the rhizome is yellowish-white [8].

Various studies have been conducted on the benefits of ginger in inhibiting the growth of bacteria. Among them, research [9] states that fresh extract of rhizomes of red ginger (Zingiber officinale *var. officinale). Rubrum*) has a moderate inhibitory region against *S. aureus* and a weak level against *E. coli* using a 96% ethanol solvent [9]. Unlike the case with the research conducted by [9] showed that ethanol extracts and fractions from the rhizomes of three varieties of ginger had great inhibitory power against *S. aureus* using n-hexane fraction solvents [10]. However, some previous studies have not compared which is more effective between red ginger extract and emprit ginger extract against the growth of *Staphylococcus aureus bacteria,* therefore the purpose of this study is to find out the comparison of the antibacterial effectiveness of red ginger extract (*Zingiber officinale var. Rubrum*) and emprit ginger (*Zibgiber officinale var. Amarum*) against the growth of *Staphylococcus aureus* bacteria.

# METHOD

This research is an *experimental research by laboratories* using a *True Expremintal Design* design with *a post only control group design research design*. Ginger extract was obtained based on the extraction results of ginger rhizomes at the Applied Chemistry Laboratory of STIKES Panrita Health Analyst Husada Bulukumba. The method used is the maserai method then continued with the distillation method to obtain pure ginger extract. The research material used was red ginger extract (*Zingiber officinale var. officinale).* Rubrum) and emprit ginger (*Zingiber officinale var. Amarum*), Muller Hinton Agar (MHA) (Oxoid), Nutrient Agar (NA) (Himedia), *Staphylococcus aureus* bacterial isolate, DMSO (One Lab Water One), 96% ethanol, DMSO (Dimethyl Sulfhoxide), 0.9% physiological NaCl, cotton, aluminum foil (Best Fresh), Blank Paper Disk (Oxoid), filter paper, and ciprofloxacin tablets 500 mg.

Data analysis is preceded by normality and homogeneity tests to determine that distributed data are normal and homogeneous as a prerequisite in parametric statistical testing. Test the normality of the data using the *Shapiro-Wilk* test. If the test results show normal and homogeneous data, the *One Way Anova* test is carried out to determine the differences between groups. If there is a discrepancy, then proceed with *the Benferroni Post-Hoc* test.

# RESULT

Table 1 shows that each treatment group of red ginger extract concentrations can form an inhibitory zone, namely a concentration of 20% with an average size of the formed inhibitory zone of 3.66 mm, a 40% concentration of 5.16 mm, a 60% concentration of 7.16 mm, an 80% concentration of 10.5 mm , and a 100% concentration of 17.83 mm. From the five concentration treatment groups, it was seen that the concentration of 100% of the inhibition zone formed was the largest inhibitory zone; this can be seen from the average inhibition zone formed, which is 17.83 mm.

**Table 1: Results of Measuring the Diameter of the Red Ginger Extract Inhibitory Zone against the Growth of *Staphylococcus aureus* Bacteria with 24 Hours Incubation Time**

| Diameter of the Inhibitory Zone (mm) | Control Negative (mm) | Kontrol Positive (mm) | Diameter of the Inhibition Zone of Each Concentration of Red Ginger Extract (mm) | | | | |
|---|---|---|---|---|---|---|---|
| | | | 20% | 40% | 60% | 80% | 100% |
| I | 0 | 24,5 | 3,5 | 5 | 7 | 11,5 | 18 |
| II | 0 | 22 | 4 | 5 | 7,5 | 10,5 | 17,5 |
| III | 0 | 22 | 3,5 | 5,5 | 7 | 9,5 | 18 |
| Average | 0 | 22,83 | 3,66 | 5,16 | 7,16 | 10,5 | 17,83 |

Table 2 shows that each treatment group of emprit ginger extract concentration can form an inhibitory zone, namely a concentration of 20% with an average size of the formed inhibitory zone of 8.66 mm, a 40% concentration of 11.66 mm, a 60% concentration of 13 mm, an 80% concentration of 15 mm, and a 100% concentration of 17.16 mm. From the five concentration treatment groups, it was seen that the concentration of 100% of the inhibition zone formed was the largest inhibitory zone; this can be seen from the average inhibition zone formed, which is 17.16 mm.

**Table 2: Results of Measurement of the Inhibition Zone of Emprit Ginger Extract against the Growth of *Staphylococcus aureus* Bacteria with 24 Hours Incubation Time**

| Inhibitory Zone Diameter (mm) | Control Negative (mm) | Positive Control (mm) | Diameter of the Inhibition Zone of Each Emprit Ginger Extract Concentration (mm) | | | | |
|---|---|---|---|---|---|---|---|
| | | | 20% | 40% | 60% | 80% | 100% |
| I | 0 | 24,5 | 9,5 | 12,5 | 15 | 14,5 | 17 |
| II | 0 | 22 | 9 | 10,5 | 12,5 | 14,5 | 19,5 |
| III | 0 | 22 | 7,5 | 12 | 11,5 | 16 | 15 |
| Average | 0 | 22,83 | 8,66 | 11,66 | 13 | 15 | 17,16 |

Table 3 shows that the results of the *One Way anova* test of the red ginger extract treatment group had a p value = 0.000. Because the value (p<0.05), the mean value between the red ginger extract treatment groups is at least a meaningful average between data groups. The results of the *Post-Hoc Bonferroni* test showed that there was a significant difference between the 100% concentration treatment and the 80%, 60%, 40%, 20% concentration treatment group which showed (p<0.05). Meanwhile, the 100% concentration treatment group did not have a significant difference in the positive control group (*Ciprofloxacin*).

**Table 3: Test Results One Way Anova Post Hoc Analysis Bonferroni pno ginger Red**

| Concentration | n | Mean (SD) mm | P-value |
|---|---|---|---|
| 100% | 3 | 17,83 (0,28) | 0,000* |
| 80% | 3 | 10,5 (0,57) | |
| 60% | 3 | 7,16 (0,28) | |
| 40% | 3 | 5,16 (0,28) | |
| 20% | 3 | 3,66 (0,28) | |
| Control (+) | 3 | 22,83 (1,44) | |

Table 4 shows that the results of the *One Way anova* test against the emprit ginger extract treatment group had a p value = 0.000. Because the value (p<0.05), the mean value between the treatment groups of red ginger extract is significant or significantly different. The results of the *Post- Hoc Bonferroni* test showed that there was a significant difference between the 100% concentration treatment and the 80%, 60%, 40%, 20% concentration treatment group and the positive control (Ciprofloxacin) which showed (p<0.05).

**Table 4: Test Results *One Way Anova* Post *Hoc Bonferroni* Analysis on Emprit ginger**

| Concentration | N | Mean (SD) mm | P-value |
|---|---|---|---|
| 100% | 3 | 17,16 (2,25) | 0,000* |
| 80% | 3 | 15 (0,86) | |
| 60% | 3 | 13 (1,80) | |
| 40% | 3 | 11,66 (1,04) | |
| 20% | 3 | 8,66 (1,04) | |
| Control (+) | 3 | 22,83 (1,44) | |

## DISCUSSION

The results of this study showed that red ginger and emprit extracts have the ability to inhibit the growth of *Staphylococcus aureus* bacteria which is indicated by the presence of clear zones formed around the disc paper. The results of the comparison between the two extracts showed that red ginger extract has a more effective antibacterial activity as evidenced by the average inhibitory zone formed greater than emprit ginger extract. This is due to the greater content of red ginger essential oil, which is 0.887% while emprit ginger is 0.675%. This study is similar to the research conducted by [10] which mentions that ethanol extract and fractions from the rhizomes of three varieties of ginger have an inhibitory power against *Staphylococcus aureus* , namely red ginger 9.90 mm, emprit ginger 9.80 mm and elephant ginger 9.78 mm. Research conducted by [11] reported that fresh extracts of red ginger rhizomes had the highest inhibitory regions against *S. aureus* and *E. coli* and emprit ginger extract had the highest inhibitory regions against *C. albicans* [10].

The clear zone formed in this study has a different diameter for each treatment group. The treatment group with the highest concentration had the highest size of the inhibitory zone. The results of this study show that the higher the concentration used, the greater the diameter of the inhibitory zone formed. This, according to the statement [10], that the higher the concentration used, the greater its ability to inhibit bacterial growth [10].

The ability of ginger extract to inhibit bacterial growth can be caused by compounds found in the ginger plant. According to [12] The mechanism of bacterial inhibition by the ginger plant due to the content of secondary metabolite compounds mainly from the flavonoid group, phenolic, alkaloids, terpenoids, and essential oils. This ginger plant extract is reported to inhibit the growth of pathogenic microorganisms with different mechanisms of action. The mechanism of bacterial inhibition by ginger plants starts with the destruction of bacterial cell integration or can damage bacterial cell membranes by damaging walls so that nucleotides and amino acids come out and prevent the entry of other active ingredients needed into the cells, this can cause bacteria to die by flavonoid compounds [9].

Ginger contains phenol compounds that can damage the bacterial cell wall into lysis by denatured the proteins in bacteria so that bacterial cells will be damaged due to a decrease in the permeability of bacterial cell walls which causes stunted cell growth and bacterial cells will experience death [10]. The mechanism of action of alkaloids in inhibiting bacterial growth is by inhibiting the formation of bacterial cells so that cells are damaged and cause death [10].

Terpenoids can interfere with the formation of bacterial cell walls by disrupting the entry of important ions in bacterial cells and terpenoids are able to bind to fats and carbohydrates which will cause the permeability of the bacterial cell wall to be disturbed. Essential oil in ginger can interfere with the process of forming bacterial cell walls by means of essential oils can cause bacterial cell membranes to be in a hypertonic environment, which can cause inhibition of bacterial cell wall arrangement so that cells are only limited by thin cell membranes [6].

The formed inhibitory zone can be classified as how big the resistance response is by matching in the response classification table the inhibitory zone according to [13]. In this study, the moderate response was found at a concentration of 100% in red ginger and emprit ginger extract in inhibiting the growth of *Staphylococcus aureus* bacteria because it has an average inhibitory zone diameter of 17.83 mm and 17.16 mm [13]. *Ciprofloxacin* used as a comparison has an average inhibitor zone diameter of more than 20 mm so it is classified with a strong response. The selection of ciprofloxacin as a positive control because *ciprofloxacin* is a class of flouroquinoion drugs that have a function to inhibit bacterial DNA synthesis so as to inhibit microbial resistance and is a large-spectrum antimicrobial. Antibiotics of this group enter the cell by passive diffusion through a water-filled protein channel in the outer membrane of the bacteria intracellularly. DMSO is used as a negative control indicating the absence of an inhibitory zone. DMSO solvents are organic solvents and are not bactericidal. This indicates that the solvent used as a diluent does not affect the test results of the antibacterial activity of the extract. In addition, DMSO is also a solvent that can dissolve almost polar and non-polar compounds.

## CONCLUSIONS AND SUGGESTIONS

Based on the results of the study, it can be concluded that red ginger and emprit ginger extracts have antibacterial activity against the growth of *staphylococcus aureus* bacteria. Where at a concentration of 100% red ginger extract is more effective in inhibiting the growth of *Staphylococcus aureus* bacteria with a large inhibitory zone of 17.83 mm compared to emprit ginger extract with a large inhibitory zone of 17.16 mm. The results of this study can hopefully be used as a reference, science, as a reference or guide for students in practicum about antibacterial activity tests in the Health Analyst Laboratory.

## REFERENCES

1. Firnanda, N., & Junaid, J. (2017). Analisis Spasial Kejadian Penyakit Infeksi Saluran Pernapasan Akut (Ispa) Pada Balita Di Kelurahan Puwatu Tahun 2017. *Jimkesmas (Jurnal Ilmiah Mahasiswa Kesehatan Masyarakat*, 2, 1–10.
2. Dasar, R. K. (2018). Riset Kesehatan Dasar. Badan Penelitian dan Pengembangan Kesehatan, Jakarta.
3. Riskesdas. (2018). Hasil Utama Riskesdas 2018.
4. Nuryah, A., Yuniarti, N., & Puspitasari, I. (2019). Prevalensi dan Evaluasi Kesesuaian Penggunaan Antibiotik pada Pasien dengan Infeksi Methicillin Resistant Staphylococcus Aureus di RSUP Dr. Soeradji Tirtonegoro Klaten. *Majalah Farmaseutik*, 15, 123–129.
5. Wikananda, I., Hendrayana, M. A., & Pinatih, K. J. P. (2019). EFEK ANTIBAKTERI EKSTRAK ETHANOL KULIT BATANG TANAMAN CEMPAKA KUNING (M. champaca L.) TERHADAP PERTUMBUHAN Staphylococcus aureus. *Jurnal Medika.*
6. Purbaya, S., Aisyah, L. S., Jasmansyah, J., & Arianti, W. E. (2018). Aktivitas Antibakteri Ekstrak Etil Asetat Jahe Merah (Zingiber officinale Roscoe var. sunti) Terhadap Bakteri Staphylococcus aureus dan Escherichia coli. *Jurnal Kartika Kimia,* 1, 29–34.

7. Ayuratri, M. K., & Kusnadi, J. (2017). Antibacterial Activity Kombucha Jahe (Zingiber officinale) (Study of Ginger Varieties and Concentrations of Honey Addition). *Jurnal Pangan dan Agroindustri*, 5, 95–107.
8. Anwar, F. (2016). Kiat Ampuh Bertanam Jahe Merah, 1st ed. Villam Media, Depok.
9. Handrianto, P. (2016). UJI ANTIBAKTERI EKSTRAK JAHE MERAH Zingiber officinale var. Rubrum TERHADAP Staphylococcus aureus DAN Escherichia coli. *Journal of Research and Technologies*, 2, 1–4.
10. Dianasari, D., Puspitasari, E., Ningsih, I. Y., Triatmoko, B., & Nasititi, F. K. (2020). Potensi Ekstrak Etanol dan Fraksi-Fraksinya Dari Tiga Varietas Jahe Sebagai Agen Antibakteri Terhadap Staphylococcus aureus. Pharmacon: *Jurnal Farmasi Indonesia*, 17, 9–16.
11. Sari, K. I. P., Periadnadi, & Nasir, N. (2013). Uji Antimikroba Ekstrak Segar Jahe-Jahean ( Zingiberaceae ) Terhadap Staphylococcus aureus, Escherichia coli dan Candida albicans Antimicrobial test of ginger fresh extract ( Zingiberaceae ) against Staphylococcus aureus, Escherichia coli and Candida al. *Jurnal Biologi Universitas Andalas*, 2, 20–24.
12. Lely, N., Firdiawan, A., & Martha, S. (2016). Efektivitas Antibakteri Minyak Atsiri Rimpang Jahe Merah (Zingiber officinale var. Rubrum) Terhadap Bakteri Jerawat. Scientia : *Jurnal Farmasi dan Kesehatan*, 6, 44.
13. Hasanuddin. P., & Salnus, S. (2020). Uji Bioaktivitas Minyak Cengkeh (Syzygium aromaticum) Terhadap Pertumbuhan Bakteri Streptococcus mutans Penyebab Karier Gigi. Bioma : *Jurnal Biologi Makassar*, 5, 47–59.