



## Test The Antibacterial Effectiveness of Ginger Juice (*Zingiber officinale* Rosc. Var Rubrum) Against Food Pathogen Bacteria

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### ABSTRACT

The use of very dangerous chemicals for food reservations is still happening in Indonesia. To overcome this problem, it is necessary to have public awareness of the importance of food safety and health, causing the use of synthetic preservatives to be avoided and switching to natural preservatives, one of which is ginger (*Zingiber officinale* Rosc. Var Rubrum). Ginger contains gingerols which have activities such as antioxidant, antibacterial, anti-inflammatory, anticarcinogenic, antimutagenic, and antitumor. The content of secondary metabolites contained in ginger rhizome plants is an antimicrobial group of phenols, flavonoids, terpenoids, and essential oils contained in the ginger extract and is a group of bioactive compounds that can inhibit microbial growth. The purpose of the study was to determine the antibacterial effectiveness of ginger juice (*Zingiber officinale* Rosc. Var Rubrum) against food pathogenic bacteria. The results obtained were that at a concentration of 25% it could not inhibit *Salmonella Typhimurium* and *Staphylococcus aureus* bacteria, while at concentrations of 50%, 75%, and 100% it could inhibit *Salmonella Typhimurium* and *Staphylococcus aureus* bacteria with inhibition zone criteria from moderate to very strong. The greater the concentration of ginger juice given, the greater the inhibition zone obtained.

### Introduction

The use of very dangerous chemicals for food preservation is still happening in Indonesia. According to (BPOM, 2018) annual report, as much as 24.75% of the food circulating in the community does not meet the safety and quality requirements because some of them contain

formalin and borax; synthetic preservatives whose use exceeds the permitted limits; and microbial contamination exceeds the limit, causing food poisoning and diseases such as cancer, kidney, and others if consumed continuously.

To overcome this problem, it is necessary to have public awareness of the importance of food safety and health, causing the use of synthetic preservatives to be avoided and switching to natural preservatives (Pangan, 2014). This condition provides an opportunity for the use of medicinal plants (herbs) as natural food preservatives in inhibiting the growth of food pathogenic bacteria such as *Salmonella typhimurium* and *Staphylococcus aureus* such as ginger (*Zingiber officinale* Rosc. Var *Rubrum*).

Ginger is a type of spice from the Zingiberaceae family that lives indigenously in mainland Southeast Asia, which has a tropical climate. Ginger rhizome produces a quite pungent aroma, so it is widely used as a flavoring agent in food, as a spice, processed fresh, as well as herbal ingredients (herbs) and medicines. Based on statistical data, ginger production in Indonesia in 2020 reached 147,627.65 tons per year (Sugiarti *et al.*, 2021). With its high availability in Indonesia, ginger can be turned into a potential source as an antibacterial agent for food preservation.

According to Purbaya *et al.* (2018), ginger rhizome contains gingerol which has activities such as antioxidant, antibacterial, anti-inflammatory, anticarcinogenic, antimutagenic, and antitumor. The content of secondary metabolites contained in ginger rhizome plants is an antimicrobial group of phenols, flavonoids, terpenoids, and essential oils contained in the ginger extract and is a group of bioactive compounds that can inhibit microbial growth. Flavonoids are one of the largest natural phenol group compounds that have various pharmacological activities, one of which is as an antibacterial (Arifin *et al.*, 2018).

## **Materials and Methods**

This research was carried out for 4 weeks at the Microbiology Laboratory, Faculty of Agriculture, Hasanuddin University, Makassar. The tools used in this study were petri dishes, test tubes, glass beakers, Erlenmeyer, Bunsen, tip, propipet, autoclave and incubator, paper discs. The material used is also the test bacteria used are *Salmonella Typhimurium* and *Staphylococcus aureus*. Samples: ginger juice with a concentration of 100%, 75%, 50%, and 25% each as much as 10 ml, Media NA.

## Research Methods

### Antibacterial Effectiveness Test with Disc Method

Paper On paper discs, a paper disc is used which serves as a place to accommodate antimicrobial substances. The filter paper containing the antimicrobial substance was placed on an agar plate that had been inoculated with the test microbe and then incubated at a certain time and temperature, according to the optimum conditions of the test microbe at 37°C for 18-24 hours. There are 2 kinds of inhibition zones formed by the Kirby Bauer method. The radical zone is an area around the disc where there is absolutely no bacterial growth found. The antibacterial potential was measured by measuring the diameter of the radical zone. Irradical zone is an area around the disc where bacterial growth is inhibited by antibacterial, but not killed.

### Results and Discussion

In this study, ginger juice was tested against the bacteria *Salmonella typhimurium* and *Staphylococcus aureus*. Ginger contains essential oils and oleoresin (Arifin *et al.*, 2018) and has bioactive components including (6)-gingerol, (6)-shogaol, diarylheptanoid, and curcumin which have antioxidant activity that exceeds tocopherol and antibacterial (Perrmatasari, 2010).

The effectiveness of ginger juice as an antibacterial can be seen by testing the inhibitory power using the agar diffusion method by looking at the clear zone formed around the paper disc that has been dripped with ginger juice at several concentrations (100%, 75%, 50%, 25%) and control + and control -. The paper disc that had been dripped with ginger juice was placed on the surface of the NA media which was homogenized with the solidified suspension of *S. aureus* and *E. coli* bacteria. According to (Zaini & Kunci, 2017) the clear zone around the paper disc indicates the presence of antibacterial activity.

The results of the effectiveness test of ginger juice show that the higher the concentration is given, the greater the power of the active substance that works so that it can inhibit the growth of *Salmonella typhimurium* and *Staphylococcus aureus* bacteria. Peoloengan *et al.* (2006) that the greater the concentration, the greater the active substance contained in it, thus causing the inhibition of bacterial growth to also be greater. According to (Ekananda *et al.*, 2015), what causes inhibition is due to the presence of compounds that disrupt the integrity of cell membranes, inhibit enzyme work, interfere with protein, and nucleic acid synthesis, and inhibit cell wall synthesis.

**Table 1.** Test Results of Antibacterial Effectiveness of Ginger Juice on *Salmonella Typhimurium* Bacteria

CONCENTRATION	DIAMETER			Average	CATEGORI
	J1 (mm)	J2 (mm)	J3 (mm)		
Control + (Amoxicillin)	42	42	42	42	Very strong
Concentration 100%	15	15	13	14.33	Strong
Concentration 75%	11	11	10	10.67	Strong
Concentration 50%	8	8	8	8	Currently
Concentration 25%	0	0	0	0	No Obstacle
Control - (Aquades)	0	0	0	0	No Obstacle

## Description

Positive control : Amoxicilin

Negative Control : Aquades

Ginger Juice : 25%, 50%, 75%, 100%

Inhibition Zone Criteria :

- No Barries : 0mm
- Weak Inhibition Zone : <5mm
- Moderate Inhibition Zone : 5 – 10mm
- Strong Inhibition Zone : 10 – 20mm
- Very Strong Inhibition Zone : >20mm

**Table 2.** Test Results of Antibacterial Effectiveness of Ginger Juice on *Staphylococcus aureus* Bacteria

NO	CONCENTRATION	DIAMETER			Average	CATEGORY
		J1 (mm)	J2 (mm)	J3 (mm)		
1	Control + (Amoxicillin)	36	32	34	34	Very strong
2	Concentration 100%	21	17	15	17.67	Strong
3	Concentration 75%	15	12	12	10.67	Strong
4	Concentration 50%	11	10	10	13	Currently
5	Concentration 25%	0	0	0	0	No Obstacle
6	Control - (Aquades)	0	0	0	0	No Obstacle

## Description;

Positive control : Amoxicilin

Negative Control : Aquades

Inger Juice : 25%, 50%, 75%, 100%

Inhibition Zone Criteria:

- No Barries : 0mm
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The mechanism of antibacterial inhibition of bacterial growth can be in the form of cell wall damage resulting in lysis or inhibition of cell wall synthesis, changing the permeability of the cytoplasmic membrane, causing the release of food materials through the cell wall, denaturation of cell proteins and destruction of the metabolic system in the cell by inhibiting the work of intracellular enzymes (Utomo *et al.*, 2018). According to Davis & Stout (1971) the criteria for

antibacterial power are as follows: an inhibition zone diameter of 5 mm or less is categorized as weak, an inhibition zone of 5-10 mm is categorized as moderate, an inhibition zone of 10-20 mm is categorized as strong and an inhibition zone of 20 mm or more is said to be very strong. Based on these categories, the inhibitory power produced by guava leaf extract in the hand sanitizer gel preparation is categorized as strong because it produces an inhibition zone above 10 mm. The results of testing the antibacterial effectiveness of ginger juice on *Salmonella typhimurium* and *Staphylococcus aureus* bacteria with the diameter of the inhibition zone around the paper disc can be seen in the table below.

## Conclusion

Based on the results of the study above, it can be concluded that a concentration of 25% could not inhibit *Salmonella typhimurium* and *Staphylococcus aureus* bacteria but with concentrations of 50%, 75%, and 100% could inhibit *Salmonella typhimurium* and *Staphylococcus aureus* bacteria with the criteria of moderate to very strong inhibition zones. The greater the concentration of ginger juice given, the greater the inhibition zone obtained. Thus ginger juice is very effective as an antibacterial in inhibiting the growth of food pathogenic bacteria as well as a natural preservative.

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