

Antibacterial Potential of Ethanol Extract of Coriander Seeds (*Coriander sativum*) Against *Staphylococcus aureus*

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Abstract

Background: Coriander seeds are one of the spice plants which have antibacterial benefits because they contain the compounds linalool, sabinene, a-terpinene, myrcene, ocimene, decanal, trantridecen, geraniol, desilaldehyde, octadaseinic acid, scopoletin, petroselinic acid, d-mannite, felandren, camphora, and p-simena. Food poisoning is one of the disasters that often occurs in Indonesia with an incidence rate of 39.8%. *Staphylococcus aureus* bacteria are the bacteria that cause the largest food poisoning, namely 30% of food poisoning cases are caused by *Staphylococcus aureus* bacteria, followed by *Bacillus cereus* bacteria (26.67%), *Bacillus cereus* (26.67%); *Salmonella* spp. (16.67%) *Escherichia coli* (16.67%); and *Clostridium* spp. (6.67%).

Aims: The aim of this study was to test the antibacterial activity of 96% ethanol extract of coriander seeds against *Staphylococcus aureus*.

Methods: The extraction method used was maceration then tested for antibacterial activity using the disc diffusion method.

Results: The results of the antibacterial activity test showed that the average diameter of the inhibition zone of 96% ethanol extract of coriander seeds, 10% concentration, was 9.3 mm, 25% concentration was 10.7 mm, and 50% concentration was 11.7 mm.

Conclusion: The conclusion of this study is that 96% ethanol extract of coriander seeds has antibacterial activity against *Staphylococcus aureus*.

Keywords: antibacterial, coriander seeds, maceration, *staphylococcus aureus*

INTRODUCTION

Indonesia is a country rich in spice plants. Spices are not only useful as complementary ingredients in cooking but can also be used as traditional medicine. One of the spices that can be used as traditional medicine is coriander (Yulianty & Nugroho, 2015).

Coriander is a plant that contains the compounds linalool, sabinene, a-terpinene, myrcene, ocimene, decanal, trantridecen, geraniol, decilaldehyde, octadaseinic acid, scopoletin, petroselinic acid, d-mannite, felandrene, camphora, and p-cimene which have benefits as antibacterial, antifungal, antidiabetic, and so on (Purwanti et al., 2018). The coriander plant consists of leaves, seeds, stems and fruit. This research will examine the antibacterial activity of coriander seeds.

Food poisoning is one of the disasters that often occurs in Indonesia with an incidence rate of 39.8%. In 2020, there were 45 reported cases of extraordinary incidents due to food poisoning. Food poisoning can result in death with a mortality rate of 0.18% (Apriliansyah et al., 2022).

One of the bacteria that can cause food poisoning is *Staphylococcus aureus*. *Staphylococcus aureus* bacteria is the cause of food poisoning which has the largest presentation, namely 30%, followed by *Bacillus cereus* bacteria (26.67%), *Bacillus cereus* (26.67%); *Salmonella* spp. (16.67%) *Escherichia coli* (16.67%); and *Clostridium* spp. (6.67%) (Apriliansyah et al., 2022).

Based on this background, the author wanted to know the antibacterial activity of 96% ethanol extract of coriander seeds against *Staphylococcus aureus*.

METHOD

The materials used in this research were coriander seeds, filter paper, 96% ethanol, Nutrient Agar, *Staphylococcus aureus* bacteria, Nutrient Broth, BaCl₂, H₂SO₄, distilled water, 10% DMSO, and chloramphenicol.

The tools used are oven, blender, rotary evaporator, Biological Safety Cabinet (BSC), incubator, autoclave, glassware, paper discs, and calipers.

Sample Preparation

The sample used in this research was coriander seeds obtained from Tanjung Market, Jember City. The coriander seeds that have been obtained are then cleaned of dirt and then ground using a blender and sieved with mesh sieve no. 16 (Alfiyaturrohman et al., 2014).

Extraction Process

The extraction method used in this research is maceration. A total of 350 grams of coriander seed powder was macerated with 1500 mL of 96% ethanol solvent. Maceration was carried out for 3 days at room temperature with occasional stirring. After 3 days, filter the extraction results using filter paper and a glass funnel. The extracted filtrate is evaporated using a rotary evaporator until a thick extract is obtained. The percentage yield of the thick extract obtained was calculated (Pelealu et al., 2021).

Process for Making Nutrient Agar Media

Nutrient Agar media is used as a medium for bacterial rejuvenation and antibacterial testing. A total of 28 grams of media was dissolved in 1000 mL of distilled water and heated on a hot plate until the media dissolved. Media for bacterial rejuvenation is poured into a test tube $\pm$ 7 mL then cover the test tube with gauze and aluminum foil

while the medium for the antibacterial activity test is poured into a petri dish $\pm$ 30 mL then covered using brown paper. Sterilize the media using an autoclave at a temperature of 121°C for 15 minutes. After sterilization, let the media solidify and the bacterial rejuvenation media tilt the test tube and wait until it solidifies (Hainil et al., 2022).

Rejuvenation of Staphylococcus aureus Bacterias

Bacterial rejuvenation is carried out by streaking the *Staphylococcus aureus* bacterial culture on slanted agar media using the zig-zag method under aseptic conditions and then incubating at room temperature 35°C for 24 hours (Noviyanti & Sumiati, 2016).

Nutrient Broth Media Making Process

Nutrient broth media is used as bacterial inoculum media. NB media is made by mixing 1.3 grams of media was then dissolved in 100 mL of distilled water and then heated using a hotplate until the media was dissolved. then sterilize the media using an autoclave at a temperature of 121°C for 15 minutes (Isnaeni et al., 2021).

Process for Making 0.5 McFarland Standard Solution

0.5 McFarland standard solution is prepared with Mix 0.5 mL of 1% BaCl₂ solution with 99.5 mL of 1% H₂SO₄ solution then vortex until a cloudy solution is formed (Hainil et al., 2022).

Preparation of Bacterial Suspension Solution

Staphylococcus aureus bacteria were taken 1 dose then suspended in the media *nutrient broth* 10 mL and incubated in a shaker incubator at room temperature for 24 hours. Next, the bacterial suspensions

were compared turbidity with standard McFarland solution using a turbidimeter.(Noviyanti & Sumiati, 2016).

Making Negative Control, Positive Control and Varying Concentration of Coriander Seed Extract

The negative control used in this study was 10% DMSO and the positive control used was chloramphenicol. The chloramphenicol solution was made by mixing 0.003 µg of chloramphenicol with 1 mL of 10% DMSO. Variations in the concentration of coriander seed extract to be tested were made with three concentrations, namely 10%, 25% and 50% (Ayen et al., 2017).

Antibacterial Activity Test

The antibacterial activity test method in this study was the disc diffusion method. The paper discs used with a diameter of 6 mm were soaked in the test solution for $\pm$ 1 minute then drained and placed on the surface of the NA media in a petri dish that had been inoculated with bacterial culture and then incubated anaerobically at 35°C for 24 hours. Measurement of the diameter of the inhibition zone was carried out using a caliper (Noviyanti & Sumiati, 2016).

Data analysis

The inhibition zone data obtained was analyzed using the SPSS statistical test, namely the One Way ANOVA test on normally distributed and homogeneous data. If data is obtained that is not normal and homogeneous, the non-parametric Friedman Test is carried out (Fauziah et al., 2022).

RESULTS

Table 1.
Extract Yield Results

Extraction Method	Sample Mass (grams)	Yield (grams)	Yield (%)
Maceration	350	11.61	3,317

Table 2.
Antibacterial Activity Test Results

Extraction Method	Concentration	Test group	Obstacles zone
Maceration	10%	1	10mm
		2	9mm
		3	9mm
		K+	10mm
		K-	0mm
	25%	1	10mm
		2	11mm
		3	11mm
		K+	14mm
		K-	0mm
	50%	1	12mm
		2	11mm
		3	12mm
		K+	14mm
		K-	0mm

DISCUSSION

This research was conducted to determine the antibacterial activity of 96% ethanol extract of coriander seeds against *Staphylococcus aureus*. The extraction method used is maceration. The maceration method was chosen because the equipment used is simple, does not require expertise to do it, is cheap, can be used to extract thermolabile compounds because this method is done without heating (Puspitasari & Prayogo, 2017).

The percent yield obtained from the extraction process in this study was 3.317%. This yield measurement was carried out by dividing the mass of the thick extract by the initial mass of the simplicia powder and then multiplying by 100%. The yield calculation is carried out to determine the percentage of the amount of material produced after the extraction process and to determine the effectiveness of the extraction process carried out (Senduk et al., 2020).

After the extraction process was carried out, the antibacterial activity of 96% ethanol extract of coriander seeds was tested against *Staphylococcus aureus*. Previously, Nutrient Agar media was made for bacterial rejuvenation media and antibacterial activity test media. NA media is used because it contains meat extract, peptone and agar. Meat extract and peptone are sources of protein, nitrogen, vitamins and carbohydrates which can support the growth and development of *Staphylococcus aureus* bacteria (Fatmariza et al., 2017). Bacterial rejuvenation is carried out so that the parent bacteria which are still in a dormant state become new cultures so that the bacteria to be tested are new bacteria (Manalu, 2017).

Nutrient Broth media is used as a bacterial inoculum medium. A total of 1 cycle of rejuvenated bacteria was mixed in 10 mL of NB media then incubated in a shaker incubator at room temperature for 24 hours (Hudaya et al., 2014). Next, compare the turbidity with the McFarland standard using a turbidimeter until the turbidity value is close to the McFarland standard solution. McFarland's solution is a standard solution used to determine the number of bacterial colonies in a bacterial suspension solution. McFarland's standard solution has an estimated colony count of 1.5×10^8 CFU/mL and has an absorbance value of 0.08 – 0.13 at wavelength ($\lambda = 625$ nm) (Dalynn, 2014).

Antibacterial testing in this study used the disc diffusion method. The disc diffusion method is used because it is easy, the testing process is fast, and does not require expertise to do it (Intan et al., 2021). The results of the antibacterial activity test showed that the diameter of the inhibition zone was then measured using a caliper and the resulting average diameter of the inhibition zone in the 96% ethanol extract of coriander seeds, 10% concentration, was 9.3 mm, 25% concentration was 10.7 mm, and 50% concentration. % is 11.7 so it can be said that 96% ethanol extract of coriander seeds with a concentration of 10% has moderate antibacterial activity, 96% ethanol extract of coriander seeds with concentrations of 25% and 75% has strong antibacterial activity (Datta et al., 2019).

The results of data analysis were carried out using the non-parametric Friedman Test. The results of the Friedman Test obtained a sig value. $0.041 < 0.05$ so it can be said that there is a significant difference between the average diameter of the inhibition zone in all test groups. Next, further testing was carried out Post Hoc Test. Post Hoc Test results showed that there was a significant difference in the 10% DMSO negative control test group against all test groups, there was a significant difference in the 10% concentration of coriander seed ethanol extract against the negative control and positive control, there was a significant difference in the 25% concentration of coriander seed ethanol extract. % and 50% to the negative control, there was a significant difference in the positive control of chloramphenicol to the negative control and coriander seed ethanol extract at a concentration of 10%.

CONCLUSION

The conclusion of this research is that 96% ethanol extract of coriander seeds has

antibacterial activity against
Staphylococcus aureus.

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