Phytochemical Screening And Antibacterial Potential Ethanol Extract Of Kemangi Leaves (*Ocimum Basilicum* L.) Towards *Staphylococcus Aureus.*

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Abstract
An infectious disease is a disease with the highest prevalence in the world, with a great risk of transmission. Staphylococcus aureus is a pathogen that can cause several infectious diseases. The use of kemangi leaves as vegetables can be used as an invention in treating infections caused by bacteria. The purpose of this study was a phytochemical screening test to determine what metabolites are contained and their potential activity against Staphylococcus aureus. The research method is to carry out a qualitative phytochemical screening test using reagents and an antibacterial potential test against Staphylococcus aureus using the Kirby-Bauer method (diffusion agar) with varying concentrations. The results showed that kemangi leaves extract showed positive results on the secondary metabolite compounds, were alkaloids, flavonoids, saponins, tannins, glycosides, and steroids/triterpenoids. The diameter of the inhibition zone at a concentration of 500 mg/mL showed the diameter of the inhibition zone was 11.93 ± 0.25 mm with the strong category group. The conclusion is that the ethanolic extract of kemangi leaves shows the ethanolic extract of kemangi leaves has potential as an antibacterial.

Keywords: *Staphylococcus aureus, antibacterial, kemangi leaves, and Ocimum basilicum L.*

I. INTRODUCTION

Staphylococcus aureus is a member of the *Micrococcaceae* family. On microscopic examination, the organism appears as a group of gram-positive cocci [1]. *Staphylococcus aureus* is a group of bacteria with which the body's resistance to antibiotics is quite similar, with invasive and virulence toxins, which are the main causes of abnormalities in the skin and joints [2]. Infectious disease is one of the diseases with a very large risk of occurrence because infection is a disease that occurs due to bacterial infection. The size of the bacteria that is so small that it is invisible to the eye makes an infectious disease a disease that is difficult to identify if it has not yet given symptoms [3], [4]. Treatment of diseases caused by bacterial infections is to use antibiotics, but this has side effects, namely causing antibiotic resistance coupled with irrational use of antibiotics [3].

So it is necessary to try to find the potential of natural ingredients that are able to provide the effect of overcoming infectious diseases without causing excessive side effects.Indonesia is one of the countries with lots of herbal plants that have the potential as traditional medicine. Kemangi leaves are one of the plants that have the potential to be antibacterial, in addition to treating stomatitis, eliminating halitosis, improving blood flow in the body, helping bone growth, boosting immunity, eliminating nausea and flu, and relieving flatulence [5], [6]. Kemangi leaves contain chemicals such as essential oils, alkaloids, glycosides, saponins, flavonoids, triterpenoids, steroids, and tannins [6].Research on the effectiveness of kemangi leaves as antibacterials has been carried out by many previous researchers, including the effectiveness of kemangi leaves as an inhibitor of the growth of *Escherichia coli* and *Staphyloococcus aureus* bacteria, inhibiting pathogenic bacteria using the TLC method, and inhibiting *Streptococcus mutans* bacteria [5], [7], [8].

II. METHODS

2.1 Apparatus

Glasswere used in this study, such as glass beakers, erlenmeyer, and petri dishes, were sterilized in an oven at 170^{o}C for 1 hour. The materials used for this test, such as Muller Hinton Agar and Muller Hinton Broth, were sterilized in an autoclave at 121^{o}C for 15 minutes [9].

2.2 Meterials

Kemangi leaves, Mueller Hinton Agar (MHA), Mueller Hinton Broth (MHB), dimethylsulfoxide (DMSO), *Staphylococcus aureus*, bacteria collection of the Microbiology Laboratory of Faculty of Pharmacy USU.

2.3 Characterization of Kemangi Leaves Dried Powder

Examination of the features of the dried powder of Kemangi leaves involves determining the water content, the water-soluble extract content, the ethanol-soluble essence content, the total ash content, and the acid-insoluble ash content [10].

2.4 Ethanol Extract Preparation of Kemangi Leaves

Kemangi leves extract was obtained by cold extraction,were maceration using 96% ethanol solvent, where 500 g of dried powder of kemangi leaves was soaked with 75 parts of ethanol for 5 days at least 3 times, stirring, then remaseration with 25 parts of the remaining solvent for 2 days, filtered and then evaporated with a rotary evaporator at 40-60^{o}C [11].

2.5 Phytochemical Sreening

The flavonoid compounds, alkaloids, saponins, tannins, glycosides, and steroids/triterpenoids in kemangi leaves dried powder are tested as part of the phytochemical screening [12].

2.5.1 Alkaloid Examination

Added 1 mL of HCl 2N to 0.5 g of extract, followed by 9 mL of distilled water. two minutes of heating in a water bath Cooled and filtered, the filtrate was then divided among three tubes. To the first tube, two drops of Mayer's reagent are added. To the second tube, two drops of Bouchard's reagent were introduced. In the third tube, two drops of Dragendoff's reagent were added. Two of the three test tubes were positive for alkaloids, indicating a positive outcome [13], [14].

2.5.2 Flavonoid Examination

Weighed 10 grams of extract, added 100 milliliters of distilled water, and then heated for five minutes. Filtered while hot, then Mg powder, 1 mL HCl (p), and 2 mL amyl alcohol were added [15].

2.5.3 Saponin Examination

The tube was filled with as much as 0.5 g of extract and 10 ml of hot distilled water before being violently shaken for 10 minutes. With one drop of HCl 2N, foam production was stimulated [16].

2.5.4 Tannin Examnination

One g of extract was added to 10 mL of distilled water, which was then filtered and diluted until colorless. To 2 ml of diluted filtrate solution, 2 drops of 1% $FeCl_3$ reagent were added [16]

2.5.5 Glikosida Examination

Overall, 7:3 To a combination of 96% ethanol and distilled water, 1 g of extract was added, followed by 10 mL of HCl 2N and 10 minutes of refluxing. Before filtering, 20 mL of the filtrate was combined with 25 mL of distilled water and 25 mL of $Pb(CH_3COO)_2$ 0.4 M, shaken, and left to stand for 5 minutes. Using a mixture of 20 mL chloroform-isopropanol (3:2) and adequate anhydrous sodium, the filtered findings were extracted. filtration and evaporation afterward, dissolve in 2 mL of ethanol. The residue was treated with 2 ml of water and 5 drops of Molisch reagent, followed by the addition of H_2SO_4 (p) [15].

2.5.6 Steroid / Triterpenoid Examination

One gram of extract was weighed in total. Two hours of maceration with 20 mL of n-hexane, followed by filtration. The filter was evaporated, and the remaining substance was dripped with Libermann-Bouchart reagent [17].

2.6 Sterilization of Apparatus and Materials

Glasswere used in this study, such as glass beakers, Erlenmeyer, and petri dishes, were sterilized in an oven at 170^{o}C for 1 hour. The materials used for this test, such as Muller Hinton Agar and Muller Hinton Broth, were sterilized in an autoclave at 121^{o}C for 15 minutes [3], [18].

2.7 Preparation of Various Concentration

The ethanol extract of kemangi leaves was weighed as much as 5 g, then dissolved with dimethyl sulfoside up to 10 mL to obtain an extract concentration of 500 mg/mL. then dilution was carried out for the concentration series to obtain variations in concentrations of 250 mg/mL, 125 mg/mL and 62.5 mg/mL [3].

2.8 Antibacterial Potential Examination

Evaluation of antibacterial activity using the Kirby-Bauer method (diffusion agar) [19]. *Staphylococcus aureus* inoculum of 0.1 ml was pipetted and put into a sterile Petri dish. Then 15 mL of MHA medium was added and the mixture was homogenized. On the surface of the agar medium, paper discs with pre-existing concentration fluctuations are inserted. The sample was then incubated at 37°C for 18 to 24 hours. A digital caliper (in millimeters) was used to measure the inhibitory zone's diameter [4], [20].

III. RESULT AND DISCUSSION

3.1 Result of The Kemangi Leaves Dried Powder Characterization

The results of the examination of the characterization of basil leaves kemangi leaves dried powder powder, which included examination of water soluble extract content, ethanol soluble extract content, total ash content, and acid insoluble ash content, are in accordance with the requirements of Indonesian Medical Materials (MMI). This can be seen in Table 2.

Tabel 2. Characterization of Kemangi Leaves Dried Powder

No	Parameter	Result (%)	Requirements in Indonesian Materia Medika (MMI)
1	Water content	5,11%	<10%
2	Water-solube content	11,71%	<15%
3	Ethanol-solube content	9,13%	<13%
4	Total ash content	7,46%	<7,6%
5	Acid insoluble ash content	0,53%	<1%

The examination of the characterization of the kemangi leaves kemangi leaves dried powder powder aims to determine the quality of the kemangi leaves dried powder that will be used for extraction [21]. This examination also aims to ensure uniformity of kemangi leaves dried powder quality in order to meet the kemangi leaves dried powder quality requirements. Determination of the water content of kemangi leaves dried powder is important because if the amount of water is high in kemangi leaves dried powder, it will trigger microbial growth and can damage the compounds contained in kemangi leaves dried powderl [22]. Based on the results of the kemangi leaves dried powder water content test of 5.11%, this indicates that the water content meets the requirements according to the Materia Medika (MMI), which is less than 10%.

The evaluation of total ash content seeks to identify the estimated amount of internal and exterior mineral content from the initial processing of raw materials into kemangi leaves dried powder [22]. The mineral composition of total ash includes both organic and inorganic components. While the acid insoluble ash content aims to determine the amount of ash obtained, such as sand or silicate soil [23], the acid insoluble ash content aims to determine the amount of ash obtained. Total ash concentration of 7.46% (requirements less than 7.6%) and acid insoluble ash content of 0.53% (requirements less than 1%) conform to Materia Medika Indonesia specifications.Determination or examination of the content of the essence is carried out with the aim of knowing the approximate number of compounds that can be dissolved with water and ethanol solvents from a material or kemangi leaves dried powder [24]. The test results still meet the requirements of Materia Medika Indonesia.

3.2 Result of Phytochemical Screening of Kemangi Leaves Ethanol Extract

The content of secondary metabolites or phytochemicals in the ethanolic extract of kemangi leaves (*Ocimum basilicium* L.) has been carried out qualitatively, indicating the presence of phytochemical compounds including alkaloids, flavonoids, steroids/triterpenoids, saponins, tannins and glycosides. Screening results can be seen in Table 1.

Table 1. Kemangi Leaves Phytochemical Screening Result

Secondary Metabolites	Reagent	Result
Alkaloid	Dragendroff	+
	Bouchardat	+

	Meyer	+
Flavanoid	Mg powder + Amil Alcohol + HCl (p)	+
Steroid / Triterpenoid	Liberman-Bouchart	+
Saponin	Hot water / shaken	+
Tannin	$FeCl_3$	+
Glikosida	Mollish + H_2SO_4	+

The results of phytochemical screening showed all positive tests for secondary metabolites from several groups. Alkaloids are declared positive if at least 2 out of 3 or the overall reaction shows positive results. A Meyer's reagent is said to be positive if it forms a white or yellow precipitate. In Bouchardat reagent it forms a brown precipitate. And the Dragendroff reagent shows a brown or orange color. It is said that flavonoid compounds are positive if there is a red, yellow, or orange color formation on the amyl alcohol layer [25]. On examination of saponins using hot water and the help of shaking when HCl is given, it shows a stable foam. It can be stated that it is positive for the saponin group [26]. For tannin testing, it will show positive results if it forms a blue-black or green-black color at the end of the reaction [27]. While the positive results on testing for the group of glycoside compounds in the presence of a purple ring are formed [28]. And a positive result on the steroid/triterpenoid test shows a blue or green-blue color means positive for steroids; a red, pink, or purple color means positive for triterpenoids [29].

3.3 Antibacterial Potential Result

Positive bactericidal test findings were indicated by the creation of a clear zone surrounding the paper discs [20]. Figure 1 depicts the clean zone surrounding the paper discs in the antibacterial potential test of kemangi leaves extract. At a concentration of 62.5 mg/mL, the inhibition zone measured 9.43 ± 0.32 mm, while at 500 mg/mL, it measured 11.93 ± 0.25 mm. The difference in concentration is illustrated in Figures 1 and 2. The inhibition zone is largest at 500 mg/mL, followed by 250 mg/mL, 125 mg/mL, and finally 62.5 mg/mL, as depicted in Figures 1 and 2. The diameter of the inhibition zone for each concentration is shown in Table 3 for complete data.The results of the antibacterial test revealed that the bacterial inhibition zone at each concentration varied. This was attributable to the concentration differential, which also impacted the number of secondary metabolites present in each concentration [20]. The larger the zone of inhibition, the greater the concentration. According to Davis and Stout (1971), the classification of inhibition zone diameter is divided into four groups: extremely strong group (more than 20 mm), strong group (10-20 mm), medium group (5-10 mm), and unresponsive group (below 5 mm) [30].

Table 3. Diameter of inhibition zone of kemangi leaves ethanol extract towards *staphylococcus aureus*

Concentration (mg/mL)	**Diameter Inhibitory Zones (m))**			
	R1	**R2**	**R3**	**X ± SD**
500	12,2	11,9	11,7	11,93 ± **0.25**
250	11,4	11,6	11,2	11,40 ± **0.20**
125	10,5	10,7	10,2	10,47 ± **0.25**
62,5	9,8	9,3	9,2	9,43 ± **0.32**

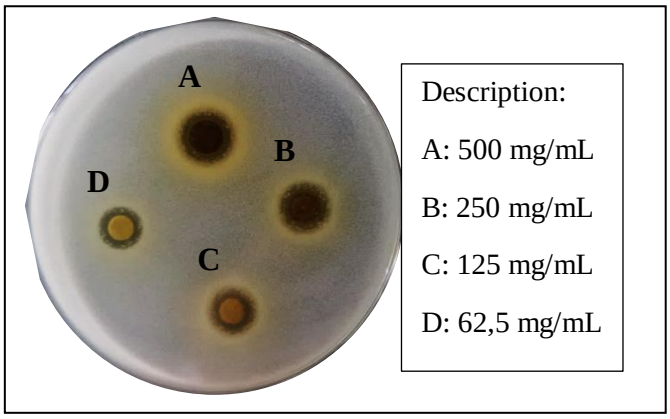

Fig 1. The results of testing the antibacterial potential of the ethanol extract of basil leaves against staphylococcus aureus

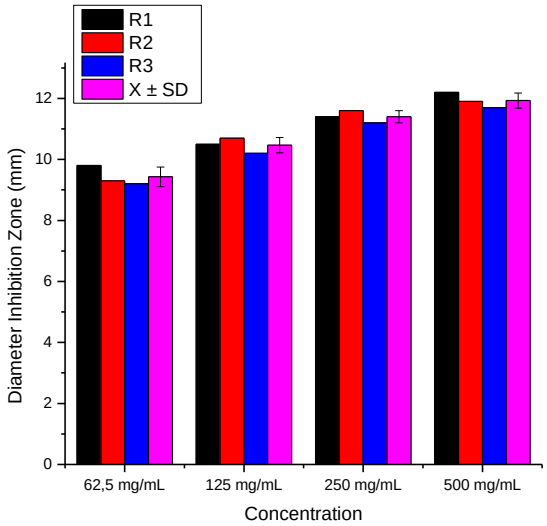

Fig 2. Graph of Diamter inhibition zone of ethanol extract of kemangi leaves towards *Staphylococcus aureus*

The mechanism of action of antibacterial compounds is divided into two, namely bacteriostatic and bactericidal [31]. The ability of secondary metabolites to be antibacterial has its own mechanism in which the mechanism varies. Flavonoid compounds inhibit the growth of bacteria by damaging the cell wall so that it enters the cell and interferes with its metabolic processes in the cell [32]. Another mechanism, such as in saponins, is by lowering the cell surface tension [33]. Alkaloid compounds also have a way of killing bacteria by messing with the peptidoglycan parts of bacterial cells [34].

IV. CONCLUSION

The phytochemical analysis of the ethanolic extract of kemangi leaves revealed the presence of alkaloids, flavonoids, saponins, tannins, glycosides, and steroids/triterpenoids. The antibacterial capability of the ethanolic extract of basil leaves demonstrated the ability to inhibit the development of Staphylococcus aureus bacteria with an inhibition zone of 11.93 ± 0.25 mm and a category of "strong".

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