THE EFFECT OF CHILDREN (Ocimum sanctum) LEAF EXTRACT ON BACTERIA GROWTH *Staphylococcus aureus*

Moh. Andi Laboddu[1)], **Kostiawan Sukamto**[2)], **Syam S. Kumaji**[3)]
[1)]Bina Mandiri University Gorontalo
[2)]Gorontalo State University
[3)]Gorontalo State University
E-mail: moh.andylaboddu@gmail.com

ABSTRACT

This research aims todetermine the effect of basil leaf extract (Ocinum sanctum) on the growth of Staphylococcus aureus and the optimal concentration of basil leaf extract (Ocinum sanctum) in inhibiting the growth of Staphylococcus aureus.

This research method used a completely randomized design (CRD) with 5 treatments with 4 replications consisting of negative control (aquades), positive control (Amoxicillin), extract 20%, 40% and 60%.

Research results obtained that basil leaf extract (Ocinum sanctum) has an effect on the growth of Staphylococcus aureus bacteria. The optimal concentration of basil leaf extract (Ocinum sanctum) in inhibiting the growth of Staphylococcus aureus bacteria is at a concentration of 40% with the category of "strong" bacterial inhibition.

Keywords: Basil (Ocinum sanctum), Staphylococcus aureus,Extract, Bacteria

INTRODUCTION

Infectious diseases are the most common type of disease suffered by the population in developing countries, including Indonesia. One of the causes of infectious diseases is bacteria. Bacterial infections are obtained from the community or nosocomial. The most common infections are those caused by Staphylococcus aureus.[1]

Staphylococcus aureus are cocci-shaped bacteria and are gram-positive, widely distributed in nature and some live as normal flora in humans found in the axilla, inguinal and perineal areas, and anterior nostrils. Approximately 25-30% of humans carry Staphylococcus aureus in the nasal cavity and skin.[1]

*Staphylococcus aureus*can cause disease in humans or are pathogenic. Body tissues can be infected and cause disease with characteristic signs, namely inflammation, necrosis, and abscess formation. Infections caused by Staphylococcus aureus bacteria can include throat infections, pneumonia, meningitis, food poisoning, various skin infections, and impetigo. The spread of this disease is quite high in endemic areas.[2]

Microorganisms can become insensitive called antibacterial resistance, where antibacterial resistance is caused by several factors, such as the intensity of exposure in an area and the uncontrolled use of antibacterials in the presence of antibacterial resistance, the need to look for other antibacterial alternatives is increasing including basil, antibacterial derived from plants.[2]

Basil (Ocimum sanctum) is a medicinal plant that has many benefits, one of which is antibacterial. Some of the active compounds that act as antibacterials are alkaloids, flavonoids, tannins, saponins, and eugenol. Overall, the basil plant contains essential oils that have a lot of antibacterial activity. Besides, it also contains flavones apigenin, luteolin, flavone O-glucoticide apigenin 7-O glucuronide, luteolin 7-O glucuronide, flavone C-glucoside orientin, molludistin and ursolic acid. While on the basil leaf itself, phytochemical studies have proven the presence of flavonoids, glycosides, gallic acid and asternya, caffeic acid, and essential oils containing eugenol as the main component. The essential oil in basil leaves (Ocinum sanctum) contains aldehydes, alkaloids, ascorbic acid, beta carotene, carvacrol, cineole, eugenol, eugenol-methyl-ether, glycosides, linalol, methyl chavicol, limatrol, caryophyllin, ursolic acid, n-triacontanol and phenol. The content in purple basil seeds include beta-sitosterol, fat, linoleic acid, oleic acid, palmitic acid, pentose 11 and protein. The chemical content of basil leaves which are larvicidal are eugenol and methyl chavicol.[3]

Basil leaf extract can inhibit gram-positive and gram-negative bacteria. The results showed that the minimum inhibitory concentration of basil leaf extract was 10% with an average diameter of 10.3 mm. the effect of the use of basil leaf extract (Ocimum sanctum L) on the decrease in the number of Staphylococcus aureus in the oral cavity.

The concentration of 50% is the minimum killing rate (MBC) for pure strains of Staphylococcus aureus bacteria, and the minimum inhibition level (MIC) for clinical isolates of Staphylococcus aureus.

Concentration of 25% only found the minimum inhibitory level (MIC) for pure strains of Staphylococcus aureus Basil essential oil (Ocimum sanctum L.) is able to inhibit the growth and kill several pathogenic bacteria including Staphylococcus aureus and Escherichia coli.[4]

The basil plant (Ocimum sanctum) has a rounded crown morphology, erect herb or shrub, very fragrant, many branches, with a height of 0.3-1.5 cm, the main stem is not clear, the leaves are purplish green, and hairy or not, the leaves are single opposite., arranged from bottom to top. It has a petiole length of 0.25-3 cm and each leaf blade is elliptical to oval, elongated, blunt ends or tapered. The base of the peg leaves is rounded, both surfaces are smooth hairy, wavy, the edges are weak or flat, green or purple, and contribute to the composition of the fruit, the flower crown is white with stamens inserted at the base of the crown, the pistil is branched but not the same. Has a fruit with a dark brown box shape, erect, and depressed, the end is a circular hook.[4]

The fruit petals are 6-9 mm long. Small seeds dark brown, hard type, and when taken immediately swelled, each fruit consists of four seeds. Taproot and white. The leaves are oval, elongated, oval elongated, pointed tip, pointed leaf base blunt to rounded, pinnate leaf bones, serrated edges shallow or flat, and wavy, flesh thin leaves, smooth hairy surface, leaf length 2.5 cm to 7.5 cm, 1cm to 2.5 cm wide, petiole round in cross section, 1 cm to 2 cm long, smooth hair.[4]

From the biological activity that has been studied, basil is antipyretic (reduces

fever), carminative (laxative fart gas), emenagogue (laxative menstruation) and stimulates the mammary glands. The aroma of forest basil oil is very useful for treating sunburned skin, headaches, influenza, inflammation of the throat, ears and eyes and stomach aches. According to the records of the Ministry of Health of the Republic of Indonesia, basil contains nutrients that are beneficial for the health of the body.[5]

The chemical content of basil is essential oil, phytosterols, alkaloids, phenolic compounds, tannins, lignins, saponins, flavonoids, terpenoids and anthraquinones. The chemical content of basil includes 1,8 cineol, anetol, apigenin, arginine, aspartic acid, and boron. Basil leaves also contain flavonoids which are antibacterial. Flavonoids can inhibit nucleic acid synthesis, inhibit cytoplasmic membrane function, and inhibit cell energy metabolism. In several studies it was stated that the antibacterial material of basil leaves was more effective against Gram positive bacteria than Gram negative bacteria. Flavonoids are compounds that are widely found in green plants which are the largest natural polyphenolic compounds, especially in the form of glycosides both as C- and O-glycosides, Polyphenols are compounds with more than one benzene nucleus and are polar. And flavonoid compounds are generally antioxidants, antioxidants are the ability of substances that are easily oxidized, so that oxygen will oxidize antioxidant compounds before oxidizing other compounds, flavonoids are called antioxidants because they can capture free radicals by liberating hydrogen atoms from their hydroxyl groups. Flavonoid compounds are phenolic compounds that can affect juvenile hormone titers in the body of Aedes aegypti and will affect the development of insects from eggs to larvae. The process of inhibiting the hatchability of Aedes aegypti eggs is thought to occur due to the entry of flavonoid active substances into the eggs through a diffusion process on the surface of the shell through polygonal points found on the entire surface of the egg. The entry of insecticidal active substances is caused by the potential for insecticides in the water outside the egg to be higher (hypertonic) than the water potential inside the egg (hypotonic). The entry of insecticidal active substances into the eggs will disrupt the metabolic process and cause various effects on the eggs.[5]

Saponins are glycosides, namely secondary metabolites that are widely found in nature, consisting of sugar groups bound to aglycones or sapongenins. Saponins are also entomotoxicity, this mechanism of action occurs when flavonoids have damaged the egg shell so that later the active compounds of saponins will enter the egg which can inhibit the development of eggs into larvae by damaging the egg membrane and causing developmental disorders in Aedes aegypti eggs which leads to the failure of eggs to hatch into larvae. larvae.[6]

Alcolloids are a group of secondary compounds found in higher plants that have a basic structural arrangement in the form of a nitrogenous base, namely one or two nitrogen atoms, usually in combination, as part of a cyclic system. Alcolloids are usually colorless, mostly crystalline but only a few are liquids at room temperature. Alkaloids in insects act as stomach poisons and can work as inhibitors of the acetylcholinesterase enzyme so that it interferes with the central nervous system, and can degrade the egg cell membrane to enter the cell and damage the egg cell. The process of inhibiting the hatchability of Aedes aegypti eggs occurs because the incoming alkaloid causes the metabolic process of the eggs to be disrupted.

Terpenoids are one of a group of secondary metabolites that are widely contained in plants, besides that terpenoids are organic chemical compounds of natural ingredients whose carbon skeleton is composed of two or more isoperna units, most terpenoids are found freely in plant tissues, but many of them are found in plant tissues. as glycosides, esters of organic acids and in some cases bound to proteins. Terpenoid compounds Compounds as juvenile hormones that can inhibit the development of eggs into larvae.[6]

The essential oil in basil leaves has the ability to inhibit the growth of bacteria and fungi.

*Staphylococcus aureus*is a gram-positive bacterium that is spherical in shape, clustered like a grape-like arrangement of gray to dark yellow colonies, coagulase positive, 0.8-1.2 m in diameter, easy to grow on growth media under aerobic conditions, does not have spores, and does not move. These bacteria grow at an optimum temperature of 37oC, but form pigments best at room temperature (20-250C).[7]

*Staphylococcus aureus*is a bacterium that can produce toxins, gram positive, and includes aerobic bacteria. This bacterium can contaminate food and poison food, S. aureus is a bacterium that generally grows on the mucous layer of the skin and mucous membranes in humans. S. aureus is usually harmless but occasionally causes infection and severe illness.[8]

The antigenic structures produced by S. aureus include teichoic acid which is a polymer of glycerol or ribitol phosphate, binds to peptidoglycan and is antigenic. Antitheicoate antibodies, which can be detected by gel diffusion, can be found in patients with active endocrisis caused by S. aureus. Another antigenic structure is protein A which is bound to the FC portion of the IgG molecule, except for IgG3. The Fab portion of IgG bound to protein A is free to bind to the specific antigen. Protein A is an important reagent in immunology and laboratory diagnostic technology.[9]

*Staphylococcus aureus*is a normal flora on the skin, respiratory tract, and digestive tract of humans. The pathogenic ability of S. aureus is a combination of the effects of extracellular factors and toxins and the invasiveness of the strain. S. aureus can also cause disease through its ability to multiply and spread widely in tissues.

Infections caused by S. aureus are mediated by virulence factors and host cell immune responses. In general, bacteria attach to host cell tissues and then colonize and infect. The bacteria then survive, grow and develop the infection based on the bacteria's ability to resist the growth of host cells. The host cell response is mediated by leukocytes derived from the expression of adhesion molecules on endothelial cells. The ability of S. aureus cell walls, namely peptidoglycan and terichoic acid, stimulates the release of cytokines. Leukocytes and other host cell factors can be damaged locally by toxins produced by these bacteria. In addition, the presence of extracellular adherent proteins results in an anti-inflammatory response. This protein also inhibits host cell leukocyte secretion by interacting directly with host cell adhesive proteins and fibrinogen.

S. aureus bacteria can cause infection in damaged skin or wounds in body organs because the bacteria will defeat the body's defense mechanism. When bacteria enter the bloodstream, bacteria can spread to other organs and cause infections, such as pharyngitis, tonsillitis, acute otitis media, pneumonia, infections of the heart valves that lead to heart failure, bone inflammation, and can even cause shock that can cause death. a substance or compound that can suppress or kill the growth or reproduction of bacteria. Compounds or substances used to

eradicate bacteria that cause infection in humans must have the highest possible selective toxicity, meaning that these compounds must be highly toxic to bacteria but relatively non-toxic to the host. Based on the nature of selective toxicity, there are antibacterials that inhibit the growth of bacteria known as bacteriostatic substances and there are those that kill bacteria known as bactericidal substances. The minimum levels required to inhibit microbial growth or kill them are known as Minimum Inhibitory Levels (MIC) and Minimum Killing Levels (MBC) respectively[11]

Antibacterial substances are substances that are used to kill or inhibit the growth of bacteria. The mechanism of inhibition of bacterial growth is [12]

a) Damage to the cell wall The structure of the cell wall can be damaged by inhibiting the formation or changing after it is formed. Example: penicillin and cephalosporin antibiotics.
b) Changes in cell permeability, the cytoplasmic membrane maintains certain materials in the cell and regulates the entry and exit of other materials and maintains the whole cell. Changes in the cytoplasmic membrane can result in inhibition of cell growth, causing cell death. Example: polymyxin B antibiotics and amphotericin.
c) Changes in molecules and nucleic acids, Cell life depends on the maintenance of protein and nucleic acid molecules. Antimicrobials can cause protein coagulation or denaturation of important cell materials. Example: tetracycline and streptomycin type antibiotics.
d) Enzyme inhibition Each enzyme of the hundreds of different enzymes present in the cell is a potential target for the action of an inhibitor. This inhibition can result in disruption of metabolism or cell death. Example: chloramphenicol and metaphene antibiotics.
e) Inhibition of nucleic acid synthesis of proteins, proteins, DNA and RNA plays an important role in the normal life processes of cells. This means that any interference with these substances can result in cell damage. Example: Norphosacin and sulfanilamide antibiotics.

Antibiotics are substances produced by a microbe, especially a fungus that can inhibit other types of microbes. Antibiotics are a class of compounds that have the effect of killing microorganisms in the body, for example when a bacterial infection occurs. The word antibiotic is given to metabolic products produced by a particular organism which in very small amounts are destructive or inhibit other microorganisms. In other words, antibiotics are chemical substances produced by a microorganism that inhibit microorganisms.[13]

Disinfectants are chemicals used to prevent infection or contamination of micro-organisms such as bacteria and viruses, as well as to kill or reduce the number of microorganisms or other germs. Disinfectants are used to kill microorganisms on inanimate objects.[14]

Antiseptics are substances that can inhibit or destroy microorganisms on living tissue, while disinfection is used on inanimate objects. Antiseptics are antimicrobial substances that are applied to living tissue or skin to reduce the chances of infection, sepsis (potentially fatal whole-body inflammation) caused by severe infection, and putrefaction.[15]

Resistance test is a test carried out to determine the sensitivity of bacteria to an antibiotic. Excessive or uncontrolled use of antibiotics causes harmful side effects that cause certain bacteria to be resistant (resistant) to antibiotics. Resistance

problems occur when bacteria change bacteria change which causes a decrease or loss of effectiveness of drugs, chemical compounds or other chemicals used to prevent or treat infections. The main cause of antibiotic resistance is its widespread and irrational use.[15]

Bacterial resistance can be intrinsic or acquired. Intrinsic resistance occurs chromosomally and takes place through cell multiplication which will be passed on to the next generation. Acquired resistance can occur as a result of chromosomal mutations or as a result of DNA transfer. The nature of resistance to antibiotics involves genetic changes that are stable and passed down from one generation to another, and any process that results in the genetic composition of bacteria such as mutation, transduction (transfer of DNA through bacteriophages), transformation (DNA comes from the environment) and conjugation (DNA comes from the environment). from direct contact of one bacterium to another through pili) can cause the emergence of these resistant properties. mutation process,

Extraction is the process of separating a substance or several from a solid or liquid with the help of a solvent. The extracted simplicia contains soluble active compounds and insoluble compounds such as fiber, carbohydrates, protein and others. The active compounds contained in various simplicia can be classified into essential oils, alkaloids, flavonoids and others. Knowing the active compounds contained in simplicia will facilitate the selection of solvents and the right extraction method.[16]

Several types of solvents commonly used in the extraction process include petroleum ether, benzene and alcohol. The solvent used in the extraction process is ethanol. Ethanol, also known as ethyl alcohol, is known in the market as alcohol, which is an organic compound with the chemical formula C2H5OH. Under ambient conditions, ethanol is a flammable and volatile liquid.[17]

The maceration method is a simple extraction method that is carried out by immersing the simplicia powder in a liquid for several days at room temperature and protected from light. This method is used to search for simplicia containing chemical components that are easily soluble in the liquid solvent, and do not contain volatile substances such as benzoin, stirax and wax. The use of this method is for example in samples in the form of leaves, for example in the use of ether or acetone solvents to dissolve fats/lipids.[16]

Percolation is a way of filtration by flowing the filter through the simplicia powder that has been moistened. The principle of extraction by percolation is that the simplicia powder is placed in a cylindrical vessel, the bottom of which is given a porous bulkhead, the filter liquid is flowed from top to bottom through the powder, the liquid filter will dissolve the active substance in the simplicia cells through which the sample is saturated. The downward movement is due to the force of its own gravity and the filtering pressure of the fluid above it, minus the capillary forces which tend to resist the downward movement.[16]

The water vapor distillation method is intended for extracting simplicia containing volatile oil or containing chemical components that have a high boiling point at normal air pressure, for example in the extraction of essential oils contained in the Lemongrass (Cymbopogon nardus) plant. In this method, water vapor is used to extract simplicia with a small heating, the water vapor evaporates again with the evaporated oil and is condensed by the condenser so that water molecules are formed which drip into the separatory

funnel which has been filled with water. Distillation is carried out to perfection.[18]

RESEARCH METHODS

The approach used in this research is a quantitative approach. Quantitative research method is a method used to answer research problems related to data in the form of numbers and statistical programs.[19]

The type of research used is experimental research to determine the effect of basil leaf extract (Ocimum sanctum) on the growth of Staphylococcus aureus bacteria.[19]

The data source is the result of experimental research conducted directly in the microbiology laboratory of Bina Mandiri University, Gorontalo to determine the effect of basil leaf extract (Ocimum samctum) on the growth of Staphylococcus aureus bacteria. [19]

The tools used in this study include a digital balance, rotary evaporator, blender (kirin), 250 mL flat bottom flask (duran), hot plate and magnetic stirrer, a set of glassware (pyrex), ose needles, tweezers, incubator, agar punch (cork borrer), ruler or compass

The materials used in this study included basil leaves at a distance of 20 cm from the plant shoots, 70% ethanol, aluminum foil, filter paper, aquades, agar media (NA), Methanol, and the test bacteria used by Staphylococus aureus.

The sample used was basil (Ocinum sanctum L.). The part taken was fresh leaves, sampling was carried out in the morning by picking manually, basil leaves were obtained in the district of Boalemo.

This research begins with the extraction of basil leaves using the maceration extraction method10 kg of basil leaves were taken, washed thoroughly and air-dried. After drying, the basil leaves were blended until smooth, so that they became powder and then macerated using 70% ethanol solvent for 3 x 24 hours at room temperature. Every 1 x 24 hours simplicia that has been macerated with ethanol solution is filtered to obtain an extract,extraction process and extract purification process with *rotary evaporator* at 45oC. The evaporation results were then analyzed including yield and phytochemical screening.

Before sterilizing the tools used, wash them thoroughly and then dry them. The beakers, test tubes, measuring cups, petri dishes, Erlenmeyer, and stirring rods were wrapped in paper and then sterilized in an oven at 160oC for ± 2 hours. Meanwhile, other tools made of metal, such as ose, are sterilized in any incandescence for up to ± 1 minute.

15 ml of agar medium was poured into each sterile petri dish and allowed to stand until the media became solid for 15 minutes. Staphylococcus aureus bacteria. which had previously been suspended as much as 1-2 oses of pure bacterial culture according to the Mc.Farland standard (1 x 108 CFU/ml) was spread on agar medium using a sterile cotton swab and then rubbed or scratched tightly over the entire surface of the petri dish.

Then the soaked disc paper is then placed in each petri dish. The media was incubated at 37oC for 24 hours. After that, the diameter of the inhibition zone was measured using a caliper with an accuracy of 0.01 mm and the zone of inhibition was measured according to the measurement method.

The data analysis technique used in this research is quantitative descriptive analysis. The data that has been obtained from the research results will then be statistically analyzed using SPSS version 16. The analysis was carried out using the Parametric Test with the Anova method and continued with Duncan's test to see significant differences between each test group. Parametric test can be done if the data meets the requirements of normally distributed data and distributed data. If the data does not meet the requirements for

normality and homogeneity, it will be continued with the Kruskal Wallis test
Statistical hypothesis was determined if the significance value 0.05 then Ha was accepted or there was an effect of administration of basil leaf extract (Ocinum sanctum) on Staphylococcus aureus bacteria. If the significance value is 0.05, then Ha is rejected and H0 is accepted. There is no effect of administration of basil leaf extract (Ocinum sanctum) on Staphylococcus aureus bacteria.

RESEARCH RESULT

This research was conducted at the Pharmaceutical Microbiology Laboratory at the University of Bina Mandiri Gorontalo, during the research period of approximately 2 months, The sampling of basil leaves (Ocimum sanctum) used in this study was obtained from Huwongo Village, Kec. Community, Kab. Boalemo. Sampling was carried out in the village because the sample grew in the lowlands with an altitude of about 1,400 meters above sea level, geographically the Regency of Kab. Boalmeo is located at an altitude of 0-1,500 meters above sea level. This is in accordance with where the basil plant grows. Sampling was carried out at 07.00-09.00 am.
The results of the inhibition test of Basil leaf extract (Ocimum sanctum) on bacterial growth showed that there was a difference in the diameter of the inhibition zone for Staphylococcus aureus bacteria, which can be seen in table 1.

Table 1. Average Inhibitory Zone Diameter

No	Treatment	Average Inhibition Zone (mm)	Category
1	Negative control	0	-
2	Extract 20%	7	Currently
3	Extract 40%	10	Currently
4	Extract 60%	11	Strong
5	positive control	12	Strong

Source of personal data, 2021.

Based on Table 1, it can be seen that the average diameter of the inhibition zone for the positive control, 60% extract was in the 11-12 mm range including the strong category, while the negative control, 40% extract and 20% extract were in the 6-10 mm range including the medium category.
The results of the normality test showed that the significance value of the basil leaf extract was one of the test groups which had a significance value of <0.05 so it could be concluded that the data were not normally distributed. then in the test that was carried out on the homogeneity test there was a significance value of $p < 0.05$ ($0.034 < 0.05$) so it could be concluded that the data was not homogeneous. Based on this, the statistical test used was the Kruskal Wallis test with a 5% confidence level indicating that the significance value $P = 0.000$ which means $P < 0.05$ ($0.000 < 0.05$) or basil leaf extract (Ocimum sanctum) has an effect on the growth of Staphylococcus aureus bacteria, which can be seen in table 2.

Table 2. Effect of basil leaf extract

No	Treatment	Average (mm)	Sig (p)	Note: (α = 0.05)
1	Negative control	0		
2	Extract 20%	7	0.000	Have Influence
3	Extract 40%	10		
4	Extract 60%	11		
5	positive control	12		

Source of Personal Data 2021

After the Kruskal Wallis test was carried out, further tests were carried out using Duncan's Post Hoc test to see the effective concentration of Basil Leaf extract (Ocimum sanctum) in inhibiting the growth of Staphylococcus aureus bacteria, the results are shown in Table 3.

Table 3. Duncan's Post Hoc Test

No	Treatment	Average (mm)	Symbol
1	Negative control	0	A
2	Extract 20%	7	B
3	Extract 40%	10	C

4	Extract 60%	11	C
5	positive control	12	D

Source of Personal Data 2021

Based on Table 4.3, it can be seen that from the results of Duncan's Post Hoc test there were significant differences between the negative control group, positive control, 20%, 40% and 60% extract. However, there was no significant difference between the 40% and 60% extract groups.

DISCUSSION

*Staphylococcus aureus*are cocci-shaped bacteria and are gram-positive, widely distributed in nature and some live as normal flora in humans found in the axilla, inguinal and perineal areas, and anterior nostrils. Staphylococcus aureus can cause disease in humans or be pathogenic.

Antibacterial is a substance that can inhibit the growth of a microorganism. Anti-bacterial is the best choice for tackling an infection. Many chemicals can be used as anti-bacterial either in the form of synthetic or chemical compounds derived from nature obtained from animals or plants. Generally, the use of chemical compounds derived from nature as an alternative way of utilizing natural materials as the forerunner of new drugs that have properties in accordance with the content contained in the animal or plant. One of the plants that are often used as medicine is the basil plant. Basil (Ocimum sanctum) is one of the medicinal plants that has many benefits and it is suspected that basil leaves have antibacterial benefits due to the presence of flavonoids as the main antibacterial component. [20]

In this study, basil leaves were extracted using ethanol as a solvent to extract flavonoid compounds which are thought to be anti-bacterial.

The factor of the use of solvents can also affect the yield of secondary metabolites obtained. Flavonoid compounds and tannins can be dissolved in polar solvents such as methanol, ethanol, ethylacetate or other polar solvents.

The antibacterial activity of basil (Ocimum sanctum) was tested using Staphylococcus aureus bacteria. The selection of this test bacteria because of its pathogenic nature. Staphylococcus aureus is a cocci, Gram positive bacteria that are pathogenic causing skin infections and ulcers. Antibacterial tests were carried out by grouping the samples into 5 treatments with 5 replications, namely negative control (without basil leaf extract), 20% concentration of basil leaf extract, 40% concentration of basil leaf extract, 60% basil leaf extract and positive control with amoxicillin antibiotics. 20% concentration.[20]

The results showed that basil extract (Ocimum sanctum) was able to inhibit several pathogenic bacteria, especially skin bacteria (Stapylacoccus aureus) which was characterized by the presence of a clear zone outside the piper disk which meant that it was not overgrown with bacteria. Antibacterial testing using basil leaf extract given to Staphylococcus aureus bacteria showed that 20% extract had an average inhibition value of 7 mm and 40% had an average inhibition value of 10 mm in the medium category, while the 60% extract had 11 mm in the strong category. . This is in accordance with the statement that if the inhibition zone formed in the agar diffusion test is less than 5 mm in size, then the inhibitory activity is categorized as weak. If the inhibition zone measuring 5-10 mm is categorized as medium,

From the statistical analysis conducted using the non-parametric Kruskal Wallis test, it was found that the basil leaf extract (Ocimum sanctum) affected the growth of Staphylococus aureus bacteria with a significance value of $P < 0.05$ ($0.000 < 0.05$). The non-parametric Kruskal Wallis

test was carried out as an alternative to the ANOVA test because after being analyzed the data did not meet the normal and homogeneous requirements. After that the analysis was continued with Duncan's post hoc follow-up test to see the differences in each group and the results showed that there were significant differences between the negative control group, positive control, 20%, 40% and 60% extract, but there was no significant difference between the extract groups. 40% and 60%. The inhibition of the growth activity of Staphylococcus aureus bacteria is thought to be caused by the content of secondary metabolites in the basil leaf extract, namely flavonoids in the phytochemical test of the Ocimum sanctum extract. This compound acts as an antibacterial. The content of phenolic compounds in the form of flavonoids can denature protein bonds on the microbial cell membrane so that the cell membrane becomes lysed, this will make it easier for compounds to enter the cell nucleus. In addition, alkaloids and tannins cause disruption of the peptidoglycan constituent components in bacterial cells, so that the cell wall layer is not fully formed and causes cell death and shrinks the cell membrane so that it interferes with cell membrane permeability. As a result, cells cannot carry out living activities so that their growth is inhibited or even dies[20]

CONCLUSION

The conclusions in this study are:

1. There is an effect of basil leaf extract on the growth of Staphylococcus aureus bacteria
2. There were significant differences between the negative control group, positive control, 20%, 40% and 60% extract, but there was no significant difference between the 40% and 60% extract groups.

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