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ANTIBACTERIAL ACTIVITY OF THE TARO ETHANOL EXTRACT AGAINST PATHOGENIC BACTERIA

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INTRODUCTION

The Indonesian people have long used the plant as an alternative medicine. The great potential of the plant as a natural alternative medicine continues to be explored by researchers. The study showed data on the potential of the plant as one of the alternative medicine. In Indonesia, it is known that more than 20,000 species of medicinal plants, but ± 1,000 plant species are recorded, and used only ± 300 as traditional medicine. One potential known from the use of plants as an alternative medicine is the ability to inhibit the growth of pathogenic bacteria (Nguta, J. M. et al 2016).

Pathogenic bacteria are groups of bacteria that have the ability to infect or cause diseases. In humans the common pathogenic bacteria are *Escherichia coli,* which can cause diarrhea, *Staphylococcus aureus,* which can cause skin disease, *Bacillus cereus* can cause food poisoning, and other bacteria that have a similar ability.

These pathogenic bacteria are able to infect humans. The ability to infect the resulting disease in humans needs countermeasures to prevent or treat the infection caused by pathogenic bacteria.

Infections are the most common problem in life. Cases of infection caused by pathogenic bacteria can pass through the body tissues, and multiply inside the tissues. Bacterial resistance to antibiotics cause increasing death rates. (Fischbach, M. A. et al 2009). In the case, infectious diseases caused by antibiotics resistance are the serious problems in the field of medical science today worldwide (Srivastava, J et al 2014).

While the reduction of infection by pathogenic bacteria that can cause death is difficult to achieve, other than that the method of treatment using a combination of various antibiotics can also cause resistance problems (Walsh, T. R. et al 2016).

This encourages the discovery of other sources of antibacterial drugs from natural substances that can act as a safer and relatively cheaper antibacterial. Currently, many antibacterials are found in various natural materials such as in plants, spices or microorganisms, other than antibacterials obtained from synthetic materials (Ahmad, I. et al 2006). One plant that is used as a drug is a taro plant (fruit and leaves).

The content contained in this plant is saponins, tannins, flavonoids, glucosides, formic acid, citric acid, and some minerals (especially calcium and potassium). One function of flavonoids and tannins is the antibacterial one. These substances are active compounds in plants that are efficient as a drug that can cure infectious diseases caused by microbes (Balunas, 2005).

Taro (*Colocasia esculenta* L., taro or Araceae tribe) is an important plant that produces tubers. Originally from southeastern Asia or southern Central Asia, taro is thought to have been cultivated by humans since ancient times, even during the days before the rice was planted. Nowadays the taro has spread to various parts of the world, including India, China, West and North Africa, and West Indies. Taro is a staple food, in addition to breadfruit, in some islands in Oceania. In Indonesia, popular taro is grown in almost all the regions.

The chemical content of the taro plant is very important to be explored and investigated in view of its antibacterial potential. This can only be done by doing *in vitro* research to find out the level of antibacterial properties of the taro plants. The antibacterial ability obtained from taro leaves is expected to be an eco-friendly natural remedy.

MATERIALS AND METHODS

Sampling and Processing

Taro leaves are a collection of private plants. The samples used were all leaves. Taro leaves that have been collected, cleaned and then air-dried, protected from direct sunlight. The dried leaves were subsequently stored in a dry container.

Extraction of plant material

Taro leaf simplicia of 1 kg was soaked with 96% ethanol of 7.5 l in a tightly macerated mastery vessel and allowed to stand for 3 days protected from light. Stirring was done several times a day to reach saturation state that the solvent reaches a certain concentration so it can not extract the active substance in the simplicia. The maceration results are filtered with a Buchner funnel. The dregs are

squashed by soaking with ethanol with the same treatment. The macerate was evaporated with a rotary evaporator and evaporated over the water bath to obtain taro leaves ethanol extract.

Making the extract concentration

Taro leaf ethanol extract weighed as much as 100 mg, 200 mg, 300 mg, 400 mg, and 500 mg was dissolved with DMSO of 1 mL to obtain five series of concentrations ie 10mg / ml, 20mg / ml, 30mg / ml, 40mg / ml and 50mg / ml.

Test Antimicrobial Activity

Antibacterial activity was tested against *Escherichia coli*, *Bacillus subtilis, Staphylococcus aureus,* and *Bacillus cereus* bacteria by agar diffusion method with 3 (three) repetitions of each treatment.

A test solution of 10 µl was dripped on a sterile paperdisk with a diameter of 6 mm, then allowed to dry. The 200 µl bacterial suspension is mixed with 20 ml of nutrient agar medium (homogenized), homogenized and then poured into a petri dish. The media waited for a while to freeze.

The paperdisk (6 mm diameter) containing the test solution is then placed on top of the agar medium, and incubated at 37° C for 18-24 hours. Positive control was observed using antibiotic Chloramphenicol 10 µg / disk and negative controls used paperdisk drip solvent DMSO.

RESULTS AND DISCUSSIONS

The results show that the taro leaf extract has antibacterial properties. Each concentration of taro leaf extract showed good results in inhibiting the growth of pathogenic bacteria (table 1) Antibacterial activity already appears starting concentration 10 mg / ml. In control, there was no antibacterial activity.

Taro leaves ethanol extract is able to inhibit the growth of *E.coli, Bacillus cereus, Bacillus subtilis,* and *Staphylococcus aureus*. The higher the concentration used, the greater the inhibition of bacterial growth (figure 1). The greatest inhibition was found at concentrations of 50 mg / ml for both types of bacteria. In tests using commercial antibiotics chloramphenicol (50mg / ml) and penicillin (50mg / ml) showed that *Bacillus cereus* was sensitive to chloramphenicol antibiotics (inhibition zone 28.97mm) and penicillin (inhibit zone 36.42mm), while *E.coli* was only sensitive by chloramphenicol (17.89mm inhibit zone).

Table 1. Inhibitor zone of Microbial growth (diameter in mm)

Phatogenic Bacteria	Concentration (mg/ml)					
	0	10	20	30	40	50
Eschericia coli	0.00	2.77	3.55	5.02	7.21	8.63
Bacillus cereus	0.00	3.46	5.31	6.78	8.02	10.34
Bacillus subtilis	0.00	3.23	5.21	6.21	8.21	9.52
Staphylococcus aureus	0.00	3.02	5.12	6.26	8.32	9.01

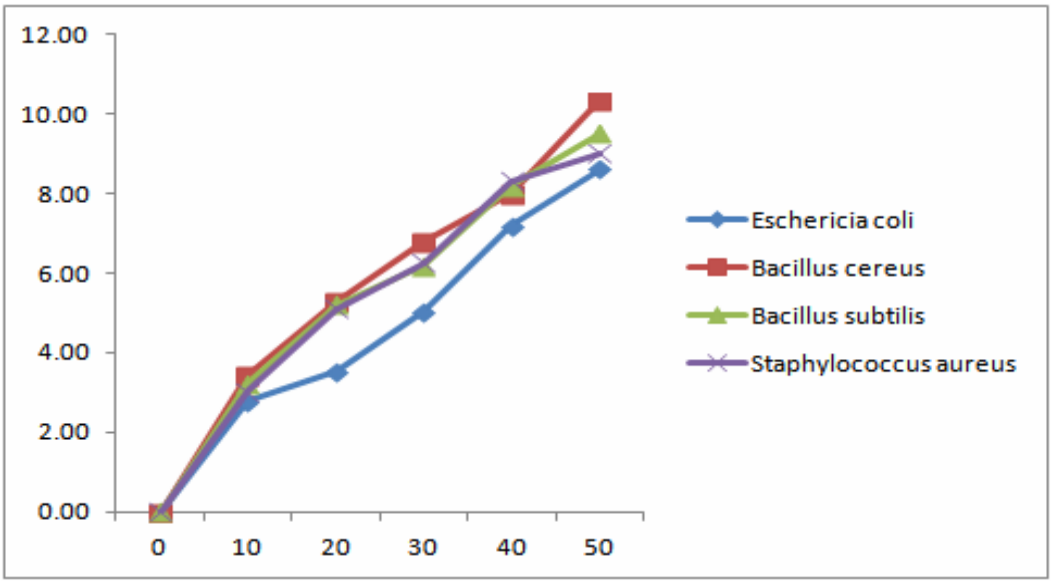

Figure 1. The drag zone graphs were formed for each concentration of taro leaves ethanol extract

Antibacterials produced by taro leaf extract are known to contain secondary metabolite compounds (flavonoids and saponins). Flavonoids are polyphenol compounds that act as antibacterial by forming complex compounds against extracellular proteins that interfere with the integrity of bacterial cell membranes and thus potentially as antibiotics (Savoia, D. 2012). Flavonoids are phenolic compounds capable of being as antimicrobial, anti-inflammatory, antiviral, antitumor (Cazarolli, L. H. et al 2008). Saponin has a high toxicity level as an antimicrobial by disrupting membrane stability (Muniyan, A et al 2017), but it also helps in wound healing. Flavonoids are able to inhibit bacterial growth in the form of quorum sensing or by enzymatic processes (Cushnie, T. T et al 2011) (Kalia, 2013).

The mechanism of inhibition by secondary metabolite compounds produced by bacteria is an opportunity in treatment. Medication using medicinal plants can decrease the side effects caused by commonly consumed chemical drugs. This can be an alternative to the treatment system. In gram-negative and positive bacteria, the mechanism of action of flavonid is by disrupting the function of bacterial cell membrane. Membrane permeability will be disrupted by the presence of antibacterial compounds. Antibacterial efficiency when combined from a variety of leaf extracts may enhance antibacterial ability (Badra et al, 2016).

Secondary metabolite compounds derived from taro leaves are able to inhibit the growth of *Escherichia coli* and *Bacillus cereus* bacteria. The content of flavonoids and saponins is thought to play a role in inhibiting bacterial growth. The best concentration of taro ethanol extract is 50 mg / ml. The greater the concentration of the extract, the greater the inhibition zone is formed.

CONCLUSION

The antibacterial activity of the taro leaf ethanol extract showed the ability to inhibit the growth of pathogenic bacteria. The amount of concentration is directly proportional to the ability of the antibacterial activity of taro leaves to inhibit the growth of pathogenic bacteria. inhibitory mechanism due to the presence of flavonoids or saponins in taro leaves. The best antibacterial activity is to inhibit the growth of *Bacillus cereus.*

ABSTRACT

Taro is a plant with widely consumed tubers by the Indonesian people. In addition to tubers, used as food, taro leaves can be used as an alternative drug for their antibacterial properties. The content of secondary metabolites within the taro leaves is able to inhibit the growth of pathogenic bacteria *Escherichia coli* and *Bacillus cereus*. The method used in this research is by using taro leaf extract which is divided into various concentration variations. Taro leaf extract using ethanol solvent 96%. The results showed that each concentration showed an antibacterial ability in inhibiting the growth of pathogenic bacteria. The best concentration in inhibiting bacterial growth is 50mg / ml. The higher concentration of taro leaf extract is used, the greater the ability to inhibit the growth of bacteria.

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