

Activity Antibacterial Extract Ethanol Duku (*Lansium domesticum* Corr) to Bacteria *Salmonella typhi*

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ABSTRACT

Indonesia is currently among the countries with the highest incidence of typhoid fever, and research suggests that langsung fruit extract may inhibit the spread of *Salmonella Typhi*. Typhoid fever is a systemic infection caused by the bacterium *Salmonella enterica* subspecies *enterica* serovar *Typhi* (*Salmonella Typhi*) and is an important cause of illness and death worldwide, with an estimated 10.9 million new infections and 116,800 deaths. Objective: This study aims to determine the antibacterial activity of the ethanol extract of langsung fruit peel against *Salmonella typhi* by reviewing related articles. Method: This literature review uses a descriptive approach, examining several studies published in journals and scientific articles on the antibacterial activity of langsung ethanol against *Salmonella Typhi*. The databases used are Google Scholar and Scopus, with a time span of the last 10 years. Results: In this study, antibacterial activity against *Salmonella Typhi* was observed at concentrations of 25%, 50%, and 75%. The average diameters of the inhibition zones are 10.22mm, 11.94mm, and 13.63 mm. The concentration with a strong inhibition zone is 75%, which has greater antibacterial activity compared to concentrations of 50% and 25%. This is due to the presence of secondary metabolite compounds, including alkaloids, flavonoids, saponins, tannins, and triterpenoids. Conclusion: Experimental research shows that langsung fruit peel extract has potential as a natural solution for inhibiting *Salmonella Typhi*.

Keywords: Typhus, *Salmonella typhi*, duku, antibacterial, Ethanol

INTRODUCTION

The WHO (World Health Organization) notes that Indonesia is one of the countries that most often transmit typhoid fever. Estimates suggest that typhoid fever occurs worldwide in 11-20 million cases. The disease is most commonly spread among poor communities or in unhygienic environments that lack access to clean water and adequate sanitation. (Jahan et al., 2022). Typhoid fever is an acute illness characterized by high fever, lethargy, and abdominal discomfort that originates from invasion of extra-intestinal compartments even without the development of inflammation or diarrhea (Dougan & Baker, 2014, as cited in Jahan et al., 2022). Typhoid fever is a systemic infection caused by the bacterium *Salmonella enterica* subspecies *enterica* serovar *Typhi* (*Salmonella Typhi*) and is an important cause of illness and death worldwide, with an estimated 10.9 million new infections and 116,800 deaths associated with typhoid fever (Christian et al., 2020).

The spread of typhoid fever requires further

action to be minimized. *Salmonella Typhi* is a major human health risk. In the developing hemisphere, especially in developing countries where open defecation is common, fecal collection and disposal are inefficient or involve reuse in agriculture, and there is a lack of access to clean water (Mogasale et al., 2014, as cited in Matrajt et al., 2020). An assessment of the spread of typhoid caused by *Salmonella Typhi* bacteria needs to be carried out so that immediate preventive measures can be identified. Once the cause and pattern of spread are known, prevention and treatment can be carried out using existing natural plants in Indonesia, given that Indonesia is one of the countries with a high rate of distribution. Plants whose content can be utilized are Duku fruit.

According to several studies, langsung fruit can be used to produce ethanol extracts that can serve as antibacterials against *Salmonella Typhi*. The use of natural ingredients is carried out because of the occurrence of bacterial resistance to antibiotics; therefore, the search for compounds that have antibacterial activity sourced from

natural ingredients that can be used to treat infectious diseases caused by bacteria that originate from plants (Sari, 2021). Other studies state that langsung fruit skin extract contains flavonoids, saponins and triterpenoids which have antibacterial potential. This study was conducted to determine the antibacterial activity of ethanol extract of langsung fruit skin against *Salmonella* bacteria by reviewing several previous studies, as well as by collecting data on the spread of diseases caused by these bacteria.

Indonesia is famous for its various herbal medicines taken from natural plants. This wealth should be used optimally to prevent and cure various diseases. This article will discuss various studies on the use of natural ingredients, namely Duku Fruit, to prevent the spread of *Salmonella* Typhi bacteria. Various studies are expected to continue to be conducted so that the medical field can continue to develop and utilize Indonesian herbal plants as effectively as possible. This article is also intended to raise public awareness of the dangers posed by diseases caused by unhygienic practices and an unclean environment.

This study aims to determine the antibacterial activity of an ethanol extract of langsung fruit skin against *Salmonella* Typhi by reviewing several related articles. In this article, we will discuss the use of langsung fruit skin (*Lansium Domesticum* Corr) as an ethanol extract, which is believed to have an antibacterial effect on *Salmonella* Typhi. The method used is a descriptive approach, collecting literature that supports this research. It is hoped that this article can provide further understanding of the use of natural materials found in Indonesia, thereby improving the development of medicines.

METHODOLOGY

This research was conducted by analyzing articles obtained from Google Scholar and Scopus. The search for related articles was conducted based on the topic to be discussed and correlated with the topic raised. The selected articles must also meet the criteria, namely containing relevant and necessary information, specifically information regarding the antibacterial activity of the ethanol extract of langsung fruit skin (*domestic lansium corr*) against the bacterium *Salmonella typhi*. For this reason, researchers conducted a review of 21 articles after selecting the information.

DISCUSSION

In the research by Christian et al. (2020), there is an explanation of resistance to

antimicrobials, including, more recently, azithromycin 37,54,55, and XDR *Salmonella* Typhi outbreaks. 12–14 Studies they covers One study in Pakistan and one study in Indonesia reported meropenem resistance in *Salmonella* Typhi. According to them, this is the first report of carbapenem resistance in *Salmonella* Typhi and is of great concern.

Drug Herbs Keep going developed in Indonesia because of the prevalence of disease. One of the diseases that is widely spread in Indonesia is typhoid fever. This disease is an infectious disease that is mainly caused by *Salmonella enterica* serotype typhi (*S. typhi*). As previously mentioned, microbial resistance to antibiotics causes many disadvantages, including longer therapy that must be carried out by patients and increasing cases of death due to untreated infections with Good (Geissler et al., 2003, as quoted in Rahayu & Tugon, 2020). Indonesian people have long used herbal plants to address everyday health complaints and treat various diseases, including typhoid fever. Along with ethnopharmacological studies related to typhoid fever, researchers in Indonesia began in the 20th century to intensively test herbal plants suspected of having antimicrobial activity against S (Rahayu & Tugon, 2020). In this article, the authors state that many natural ingredients can be used to treat and prevent typhoid fever. Remember, langsung fruit is also a natural ingredient widely found in Indonesia.

Research on *Salmonella* Typhi was also conducted by Jabin et al., in 2021. The study entitled "Phenotypic Characterization of *Salmonella* Typhi from Clinical Specimens and Determination of Drug Susceptibility Patterns in Isolates " discusses the antibiotic susceptibility patterns of *Salmonella* Typhi across age groups and different genders who have clinical symptoms of typhoid fever. The results of the study showed that in Bangladesh (the study site), antibiotic resistance among patients is increasing due to a lack of microbiological research, changing microbial patterns, and an antibiogram. Proper treatment and preventive measures pose challenges for doctors. The study was conducted to determine the antibiotic resistance patterns of *Salmonella* Typhi after investigating 107 patients clinically suspected of typhoid fever.

Salmonella Typhi not only causes typhoid but also plays a role in the development of gallbladder cancer. This study was conducted by Shukla et al. (2021), which stated that the prevalence of *Salmonella* infection is more often

seen in patients aged ≥ 50 years with GBC and XGC, especially in males, compared to HC. Among the four antibodies (Vi, O, AO and BO) against Salmonella infection, Vi antibodies were more frequent in GBC and XGC compared to HC. In addition, all four antibodies were found to be higher in GBC and XGC patients than HC. Interestingly, the frequency of Salmonella infection more often happen on GBC patients suffering from GS compared to patients without GS. From this study it can be seen that Salmonella

Typhi has a dangerous impact on humans. when No prevented its distribution.

Research by Chandra et al. (2021) reported that langsung fruit has been widely studied for its antibacterial activity against microorganisms. He even presented previous research indicating that the ethanol extract of langsung seeds has antibacterial activity against *Staphylococcus aureus*, *Escherichia coli*, and *Salmonella Typhi* at a concentration of 100%.

Table 1
Results of the Inhibition Zone of Ethanol Extract of Duku Seeds (Chandra et al., 2021)

Sample	Mean of Inhibition Zone (mm)
Ethanolic extract of duku seed 1,56%	3,10
Ethanolic extract of duku seed 3,12%	4,50
Ethanolic extract of duku seed 6,25%	3,25
Ethanolic extract of duku seed 12,50%	2,60
Chlorhexidine gluconate 0,2% (Control +)	9,20
Aquadest (Control -)	0

Chandra said, The results of the study showed that ethanol extract of langsung seeds had antibacterial effects against *S. mutans* at all concentrations. Ethanol extract of langsung seeds with a concentration of 3.12% showed a maximum inhibition zone of 4.50 mm, while chlorhexidine gluconate 0.2% as a positive control had a maximum inhibition zone of 9.20 mm. Aquadest as a negative control did not have an inhibition zone.

The research methods used include: Other Extract Preparation which includes maceration of Duku seed powder and 96% ethanol, Culture Media with the type of bacteria used *Streptococcus mutans* (ATCC 25175), and Determination of inhibition zones using the disc diffusion method. From the experimental research they conducted, it was found that the ethanol extract Duku seeds

have antibacterial effects against *S. mutans*. Ethanol extract of duku seeds show content alkaloids, flavonoids, saponins and tannins which have antibacterial effects.

There is a study that tests the antibacterial activity of ethanol extract of langsung fruit skin against *Salmonella Typhi* bacteria. In her research, Pratiwi (2023), conducted sample collection, identification, preparation of simple drugs, examination of simple drug characteristics, phytochemical screening, preparation of extracts, and preparation of test solutions for ethanol extracts of langsung fruit skin (*Lansium domesticum* Cor) with various concentration And antibacterial activity test of the extract. The table below shows the results of the antibacterial activity experiment of Duku Skin Ethanol Extract.

Table 2
Results Test Activity Antibacterial Bark Extract Duku Fruit (Domestic Lansium Kor)

Konsentrasi rasi Ekstrak Kulit Buah Duku	Diameter Zona Hambat (mm)			Rata-Rata	Ket
	P1	P2	P3		
25%	11,4	10,25	9	10,22	Kuat
50%	14,35	11,46	10	11,94	Kuat
75%	15,35	13,35	12,2	13,63	Kuat
Kontrol Positif (Kloramfenikol)	21,15	21,15	21,15	21,15	Sangat Kuat

Based on the table prepared by Pratiwi, the inhibition zone measurements of langsung fruit skin extract against Salmonella Typhi bacteria show different zone diameters. At a concentration of 25%, the average diameter of the inhibition zone was 10.22 mm, at a concentration of 50%, the average diameter of the inhibition zone was 11.94 mm, and at a concentration of 75%, the average diameter of the inhibition zone was 13.63 mm. The average diameter of the inhibition zone at each concentration experienced an increase. Where at a concentration of 75% it has greater antibacterial activity compared to concentrations of 50% and 25%, this is due to the content of secondary metabolite compounds in the form of alkaloids, flavonoids, saponins, tannins and triterpenoids.

Duku fruit skin (*Lansium domesticum Cor*) ethanol against gram-negative bacteria, namely Salmonella typhi. Antibacterial activity test was carried out using the agar diffusion method using disc paper (Kirby-Bauer Test). The parameters observed were the diameter of the bacterial growth

inhibition area at various concentrations. Based on the researcher's observations, it was found that the higher the extract concentration, the greater the diameter of the bacterial growth inhibition zone. From this study, Pratiwi (2023) concluded that the antibacterial inhibition test showed that duku fruit skin extract (*Lansium domesticum Corr*) had antibacterial activity against the growth of Salmonella typhi bacteria.

Test of Alkaloid, Flavonoid, Saponin, Tannin and Triterpenoid Content of Ethanol Extract of Duku Leaves Has been conducted by Rahmawati et al., (2021). The method used is maceration with dried duku fruit leaves then made into powder and using ethanol, methanol and water solvents. The purpose of this study was to analyze the antioxidant activity of leaf extract Duku type Downstream (*Elderly parasiticum (Osbeck) KC Sahni & Bennet*) by distinguishing polar solvents using the DPPH (2,2 Diphenyl-1- Picrylhydrazyl) method.

Table 3
Results Test Phytochemicals Extract Methanol Duku Leaves (Rahmawati et al., 2021).

Senyawa	Ekstrak		
	Air	Metanol	Etanol
Alkaloid	-	+	+
Flavonoid	+	+	+
Saponin	+	+	+
Tanin	-	+	+
Triterpenoid	-	-	-
Steroid	-	+	+

The table above shows the content of alkaloids, flavonoids, saponins, tannins, triterpenoids and steroids in each extract. The compound content is highest in the ethanol extract. This provides support for other studies that also use ethanol as a solvent in the langsung fruit trial.

Other benefits of Duku fruit are discussed in study Lubis et al., (2023). They used duku leaf extract to determine its anticancer activity and

its ability to inhibit HepG2 cell growth. Such as the research of Rahmawati et al., (2021), Lubis also wants to research the secondary metabolite content of langsung leaves. They believe that the presence of secondary metabolites in the form of alkaloids, flavonoids, tannins, triterpenoids, and saponins is likely to be found in langsung leaves, not only in langsung seeds.

Table 4
Phytochemical screening carried out on extract ethanol, ethyl acetate, And n-hexane of duku leaves. (Lubis et al., 2023)

Extract	% Yield	Alkaloids	Flavonoids	Steroid/Terpenoids	Tannins
Ethanol	42.9	+++	++	+++	+++
Ethyl acetate	23.3	++	++	-	++
n-Hexane	12.4	-	-	+++	-

+++; very abundant ++; moderately abundant +; present -: absent

In the table above, you can see the secondary metabolite content found in the ethanol extract. Then in picture 1 is test cytotoxicity of extracts against HepG2 cells. Each langsung leaf extract has a different effect on the development of

HepG2 cells. Increasing concentrations causes increased cell death. Compared with other extracts, ethanol extract had the highest effect on HepG2 cell death.

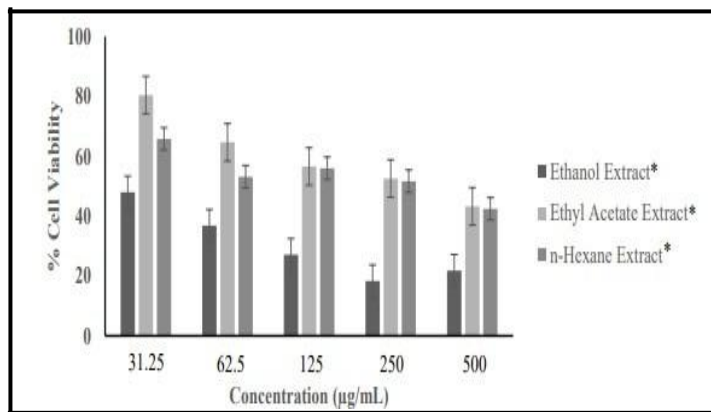


Figure 1. Inhibition of population growth HepG2 cells by Duku leaf extract. (Lubis et al., 2023).

In Wulandari's research (2024), macroscopic examination showed that the skin of fresh langsung fruit was yellow with several brown or black spots on the inside, while the inner surface was white. Microscopic examination was carried out on the properties of the simplicia powder to determine its identity. The results of the microscopic examination showed the characteristics of the simplicia powder in the form of stomatal tissue and vacuoles.

The results of phytochemical screening on langsung fruit skin extract (*Lansium domesticum*) showed several positive reactions for certain groups of compounds, such as alkaloids, flavonoids, saponins, tannins, and triterpenoids, each of which gave typical results according to the tests carried out, such as brown deposits in the Bouchardat test for alkaloids, blackish brown in the FeCl₃ test for flavonoids, and the presence of stable foam for 5 minutes in the saponin test.

In a study related to the antimicrobial activity of langsung fruit peel extract against *Salmonella typhi* bacteria, the results showed that the diameter of the inhibition zone varied according to the concentration of the extract used. At a concentration of 25%, the average diameter of the inhibition zone was 10.22 mm; at a concentration of 50%, the average diameter was 11.94 mm; and at a concentration of 75%, the average diameter was 13.63 mm. These results indicate that higher extract concentrations increase the area that inhibits bacterial growth. The content of secondary metabolites such as alkaloids, flavonoids, saponins, tannins, and triterpenoids in the extract causes stronger antibacterial properties

at higher concentrations. Ethanol extract of langsung fruit peel at a concentration of 25% showed MIC (minimum inhibitory content) with a minimum inhibition zone diameter of 10.22 mm, which is categorized as strong for inhibiting bacterial growth.

Antibacterial activity test of langsung fruit skin extract against *Salmonella typhi* showed that this extract has significant ability to inhibit bacterial growth, with the level of effectiveness increasing along with increasing extract concentration.

At a concentration of 25%, the extract produced an average inhibition zone diameter of 10.22 mm, which was categorized as strong to inhibit bacterial growth. When the extract concentration was increased to 50% and 75%, the inhibition zone diameter increased to 11.94 mm and 13.63 mm, respectively. This increase indicates that langsung fruit peel extract has a positive dose-response relationship, where higher concentrations produce greater inhibitory effects on the growth of *Salmonella typhi*.

The strong antibacterial properties at higher concentrations can be explained by the content of secondary metabolites such as alkaloids, flavonoids, saponins, tannins, and triterpenoids. These compounds work synergistically in inhibiting various metabolic pathways and bacterial cell structures, resulting in inhibition of bacterial cell growth or death.

The results of this test also showed that the ethanol extract of langsung fruit skin at a concentration of 25% was sufficient to achieve the MIC (minimum inhibitory content) with a

minimum inhibition zone diameter of 10.22 mm. This indicates that the extract at low concentrations is effective in inhibiting the growth of *Salmonella typhi*, which provides the potential for use in smaller and more economical doses.

Overall, the results of macroscopic, microscopic, phytochemical screening, and antibacterial activity tests of langsung fruit peel extracts indicate that the fruit peel contains various bioactive compounds with strong antibacterial potential. This study provides a strong scientific basis for the development of herbal products based on langsung fruit peel extracts, both in the form of antibacterial drugs and other health care products. This potential also opens up opportunities for further exploration in identifying and purifying active compounds from langsung fruit peels and testing their mechanisms of action in the treatment of bacterial infections.

In Malik's research (2020), Ethanol extract of *Lansium domesticum* Corr. seeds has the characteristics of a brown color with a distinctive odor and thick consistency. Meanwhile, the n-hexane extract of *Lansium domesticum* Corr. seeds has a green color, a distinctive odor, and also has a thick consistency. Drying shrinkage testing showed that the water content in the 96% ethanol extract of *Lansium domesticum* Corr. seeds was 22.6228%, while in the n-hexane extract of *Lansium domesticum* Corr. seeds the water content was recorded at 18.1324% (Malik, 2020).

Phytochemical Screening:

Phytochemical screening results showed that 96% ethanol extract of *Lansium domesticum seeds Corr.* contains phenols, tannins, saponins, steroids, triterpenoids, flavonoids, and alkaloids. In contrast, n-hexane extract of *Lansium domesticum seeds Corr.* only contains triterpenoids and flavonoids, with negative results in other tests. Table 1 summarizes the results of phytochemical screening, where certain secondary metabolite compounds such as phenols, tannins, and alkaloids were detected in the ethanol extract but not in the n-hexane extract (Malik, 2020).

Bacterial Identification

Gram staining of the test bacteria showed that the bacteria were Gram-positive bacteria that were purple in color and cocci-shaped. Based on the results of biochemical identification using MSA media, *Staphylococcus aureus* bacteria caused a color change to yellow, indicating the presence of the bacteria (Malik, 2020).

Antibacterial Activity Test by Tube Dilution

Method

Minimum Inhibitory Concentration (MIC) is the lowest concentration of an antimicrobial agent capable of inhibiting the growth of organisms in a test tube, which is assessed visually based on the clarity or turbidity that occurs. The MIC test results showed that the extract of 96% ethanol and n-hexane langsung fruit seeds could not show a clear MIC due to turbidity which is suspected to come from contaminants, medium, infusion, or solvents used. This turbidity may be caused by the use of tween 20 as a non-toxic nonionic surfactant, but interferes with the interpretation of the MIC results (Malik, 2020).

Drying Loss

The drying shrinkage test was conducted to determine the water content in the extract obtained. The results showed that the ethanol extract of 96% of *Lansium domesticum seeds Corr.* has a water content of 22.6228%. This fairly high water content can affect the stability and shelf life of the extract because excessive water can be a medium for the growth of microorganisms. Meanwhile, the water content in the n-hexane extract of *Lansium domesticum seeds Corr.* is lower, which is 18.1324%, which indicates that this extract is more stable and durable compared to ethanol extract. This difference may be due to the different solvent properties, where n-hexane tends to produce extracts with lower water content (Malik, 2020).

Comparison of Extract Characteristics

The differences in physical characteristics between ethanol and n-hexane extracts of *Lansium domesticum* Corr. seeds indicate that the type of solvent used in the extraction process greatly affects the composition of the isolated compounds. Ethanol extracts with a brown color tend to contain polyphenol compounds and other polar components, while n-hexane extracts with a green color are likely to contain non-polar compounds such as chlorophyll. This shows that the choice of solvent is very important in determining the type of compound to be extracted and the quality of the resulting extract (Malik, 2020).

Phytochemical Screening Results

Phytochemical screening conducted showed that 96% ethanol extract of *Lansium domesticum seeds Corr.* positive contains various secondary metabolite compounds, including phenols, tannins, saponins, steroids, triterpenoids, flavonoids, and alkaloids. In contrast, the n-hexane extract only showed the presence of triterpenoids and flavonoids. This indicates that the ethanol

extract is richer in bioactive compounds compared to the n-hexane extract. The presence of these secondary metabolites is important because these compounds often have biological activities that have the potential to be used in medicine (Malik, 2020).

Implications of Phytochemical Screening

The differences in phytochemical screening results between ethanol and n-hexane extracts emphasize that different solvents can extract different compounds from the same material. Ethanol extracts tend to be superior in extracting polar compounds, while n-hexane is more effective in extracting non-polar compounds. This means that in order to obtain a broader spectrum of bioactive compounds, a combination of solvents or the use of selective solvents may be necessary. This knowledge is very important in the development of herbal medicines or other natural products that target specific compounds (Malik, 2020).

Bacterial Identification:

Gram staining and biochemical testing were performed to identify the type of bacteria used in the antibacterial activity test. The Gram staining results showed that the bacteria were Gram-positive, which was characterized by a purple color and coccus shape. Testing using MSA media further identified the bacteria as *Staphylococcus aureus*, which is known as a pathogenic bacteria that can cause various infections in humans. The presence of *Staphylococcus aureus* is also indicated by a color change to yellow, which is a specific characteristic of this bacteria (Malik, 2020).

Antibacterial Activity Test

Antibacterial activity test using the tube dilution method aims to determine the Minimum Inhibitory Concentration (MIC) of langsung fruit seed extract. MIC is the lowest concentration of an antimicrobial agent that can still inhibit the growth of microorganisms. The test results showed that neither 96% ethanol extract nor n-hexane extract could show clear MIC due to turbidity at all concentrations tested. This turbidity is most likely caused by contaminants or the effects of the tween 20 solvent used in the testing process (Malik, 2020).

The turbidity that appears in the antibacterial activity test is thought to originate from several factors, including the presence of contaminating organisms, the medium used, the infusion, or the tween 20 solvent. Tween 20 is a nonionic surfactant used to dissolve extracts

containing many essential oils. Although tween 20 is non-toxic and useful in the dissolution process, its presence in high concentrations can interfere with the interpretation of test results, especially in antibacterial activity tests that require visual clarity to determine MIC (Malik, 2020).

Evaluation of Tween 20 Usage

The use of tween 20 in the antibacterial activity test is actually intended to increase the solubility of 96% ethanol extract and n-hexane containing non-polar compounds such as essential oils. However, the presence of tween 20 also poses its own challenges, especially in the visual assessment of turbidity used to determine the Minimum Inhibitory Concentration (MIC). This unwanted turbidity makes it difficult to distinguish between bacterial growth and the effects of the solvent, thus obscuring the test results. Therefore, in similar experiments in the future, it is necessary to consider the use of alternative methods or solvents that do not cause side effects like this (Malik, 2020).

Alternative Testing Methods

To overcome the problems caused by tween 20, one alternative approach that can be considered is the use of other methods such as the agar diffusion method. This method does not rely so much on visual clarity and relies more on measuring the inhibition zone around the disc or well filled with the extract. In addition, alternative solvents that do not cause turbidity, such as dimethyl sulfoxide (DMSO), can also be used to ensure more accurate test results. In this way, the possibility of false positive results due to turbidity can be minimized, thus providing a clearer picture of the antibacterial potential of the extract being tested (Malik, 2020).

Potential for Antibacterial Product Development

Although the results of the antibacterial activity test on 96% ethanol and n-hexane extracts of *Lansium domesticum seeds Corr* . has not provided clear results, the potential for developing antibacterial products from this extract remains significant. The presence of bioactive compounds detected through phytochemical screening indicates that *Lansium domesticum seeds Corr* . has components that have the potential to be antibacterial agents. The next step is to optimize the extraction method and testing to maximize the antibacterial potential of this extract. If successful, *Lansium domesticum seed extract Corr* . Can be further developed into health products or herbal

medicines that have antibacterial properties (Malik, 2020).

Further Research Directions

Further research can be focused on deeper exploration of the antibacterial activity spectrum of *Lansium domesticum seed extract*. *Corr* . against various types of bacteria, including different pathogenic bacteria. In addition, isolation and identification of the active compounds responsible for the antibacterial activity of this extract are also needed to determine the underlying mechanism of action. This study will not only enrich the scientific understanding of the therapeutic potential of *Lansium domesticum seeds Corr* , but also opens up opportunities for the development of new antibacterial agents that can be used in the treatment of bacterial infections, especially those resistant to conventional antibiotics (Malik, 2020).

CONCLUSION

Salmonella Typhi causes typhoid fever. Typhoid fever is widespread in poor communities and in environments without access to clean water. The emergence of resistance to antibacterials is also a concern. To overcome this problem, a solution was found in the use of duku fruit. Not only can the seeds of the langsat fruit be used, but the skin can also be used as an antibacterial.

In one study using the maceration extraction method, the antibacterial inhibition test showed that the langsat fruit (*Lansium domesticum Corr*.) extract has antibacterial activity against *Salmonella Typhi*. Research using the experimental method has been conducted by several researchers, showing that langsat fruit contains alkaloids, flavonoids, saponins, and tannins, which exhibit antibacterial activity. Indonesia It is necessary to develop the benefits of langsat fruit as an antibacterial, considering that langsat has compounds that are capable.

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