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Effectiveness Test Of The Inhibition Power Of Ethanol Extract Of Salak Pondoh Fruit Skin (*Salacca Zalacca (Gaertn.) Voss*) Against *Eschericia Coli* Bacteria And *Salmonella Typhi* Bacteria

Manahan Situmorang[1], Widya Fitri[2], Julia Susanti[3], Enjelina Br Sembiring Kembaren[4]
[1,2,3,4]Universitas Sari Mutiara Indonesia
Corresponding Author: mnhansitumorang@gmail.com

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Abstract

Diarrhea is the occurrence of defecation with a more liquid consistency than usual and may be accompanied by liquid mucus or blood with a frequency of three times or more within 24 hours. Salak pondoh contains chemical compounds consisting of flavonoids, saponins, phenols, tannins, alkaloids, chlorogenic acid, ferulic acid, and protocatechuic acid. The bacteria Escherichia coli and Salmonella typhi cause diarrhea and fever due to tissue damage. Based on the above description, this study will test the effectiveness of the inhibitory power of the ethanol extract of salak pondoh fruit skin (Salacca zalacca (Gaertn.) Voss) against Escherichia coli and Salmonella typhi bacteria. This research method uses an experimental agar diffusion method to test the antibacterial activity of salak pondoh fruit skin with concentrations of 20%, 40%, 60%, and 80%. The results of this study show that the concentrations of 20%, 40%, 60%, and 80%, and the positive control (chloramphenicol) of salak pondoh fruit skin have antibacterial inhibitory power against the growth of Escherichia coli bacteria, as indicated by inhibition diameters of 4.81 ± 22.74 mm, 7.81 ± 22.74 mm, 10.15 ± 06.65 mm, 15.07 ± 19.00 mm, and 27.56 ± 48.58 mm, respectively. For Salmonella typhi, the antibacterial inhibitory power was 2.22 ± 18.19 mm, 3.48 ± 23.30 mm, 7.32 ± 67.41 mm, 11.68 ± 112.07 mm, and 24.14 ± 77.77 mm, respectively. The conclusion from the results of this study is that the effectiveness test of the ethanol extract of salak pondoh fruit skin (Salacca zalacca (Gaertn.) Voss) can inhibit the growth of Escherichia coli and Salmonella typhi bacteria, and the concentration that can significantly affect bacterial growth inhibition is 80%.

Keywords: Antibacterial effectiveness, (Salacca zalacca (Gaertn.) Voss), Escherichia coli and Salmonella typhi

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INTRODUCTION

Escherichia coli is one of the coliform bacteria included in the Enterobacteriaceae family. Enterobacteriaceae are enteric bacteria or bacteria that can live and survive in the digestive tract. Escherichia coli is a rod-shaped bacteria that is gram-negative, facultative anaerobic, does not form spores, and is a natural flora in the intestines of mammals. Some strains of this bacteria provide benefits to humans, for example preventing the colonization of pathogenic bacteria in the human digestive tract, several other groups that can cause disease in humans, known as pathogenic E. coli. Pathogenic Escherichia coli was first identified in 1935 as a cause of diarrhea (Rahayu et al., 2018).

Typhoid fever is transmitted through contamination of Salmonella typhi bacteria in food, drinks and feces of typhoid fever carriers carried by water flow. Food or drinks that have been contaminated with Salmonella typhi bacteria also enter the small intestine and multiply in the epithelial cells of the small intestine. Salmonella typhi bacteria will

produce toxins that cause inflammatory reactions and fluid accumulation in the intestines, bacteria in the epithelial cells will produce thermolabile enterotoxins and will later affect the secretion of water and electrolytes, causing diarrhea. Some Salmonella typhi in intestinal epithelial cells will enter the lymphatic tract and then join the bloodstream (Ulya et al., 2020).

Salak is one of the many fruits originating from Indonesia. Salak fruit can be eaten fresh directly and can also be made into preserved fruit, for example in cans. One type of salak fruit is salak pondoh which tastes sweet, not astringent, not bitter, the flesh is thick, smells fragrant, the fruit is large. Salak pondoh can grow large from lowlands to highlands and in areas exposed to direct sunlight. Chemical compounds contained in the skin of the snake fruit consist of flavonoids, saponins, phenols, tannins, alkaloids, chlorogenic acid, ferulic acid and protocatechuic acid (Rochani, 2007). From the research by Rahmah, 2016 previously studied the skin of the snake fruit, namely the antimicrobial test of the skin extract of the snake fruit against Eschericia coli which stated that the skin of the snake fruit was able to inhibit Eschericia coli. Where the results obtained were with the concentration of the skin extract of 20%, 50%, 750%, and 100% respectively which were obtained with a diameter of 6.8 mm, 7.8 mm, 9.4 mm and 18.6 mm, then the inhibition zone formed by 10% chloramphenicol as a positive control with an average diameter of 25 mm, the greater the concentration of the snake fruit extract, the greater the inhibition power produced.

In testing the antibacterial activity profile of snake fruit peel extract on the growth of Salmonella typhi bacteria studied by Setiyabudi et al., 2021, the overall concentration range of snake fruit peel extract was 1%, 3%, 10%, 20%, 40% and 80%, amoxicillin 25 µg as a positive control, and 70% methanol as a negative control. In this concentration range, there is a clear zone with a different diameter, namely 0 mm for the negative control and an extract concentration of 1%. This indicates that there is no inhibition of the growth of Salmonella typhi. However, at concentrations of 3, 5, 10, 20, 40, and 80% there is a clear zone with a diameter of 0.53 mm, 2.11 mm, 5.37 mm, 6.42 mm, 6.77 mm and 7.04 mm respectively. For positive control, a clear zone with a diameter of 18.6 mm was produced. Based on the background, this study will conduct a "Test of the Effectiveness of Inhibitory Power of Ethanol Extract of Pondoh Snake Fruit Peel (Salacca zalacca (Gaertn.) Voss) Against Eschericia coli and Salmonella Typhi Bacteria".

MATERIALS AND METHODS

Population and Sample

The population in this study were all Escherichia coli and Salmonella typhi bacteria and all salak pondoh fruit skin taken from Kutabuluh, Karo Regency, North Sumatra. The

sample used was salak pondoh fruit skin extract (Salacca zalacca (Gaertn.) Voss) taken from Kutabuluh, Karo Regency, North Sumatra.

Statistical analysis

Data from the research on ethanol extract of salak pondoh fruit skin against Escherichia coli and Salmonella typhi bacteria were measured by inhibition zones using a caliper. Then the data was analyzed using SPSS to see the difference in effectiveness of each test disc containing negative controls, several concentrations of salak fruit skin extract and positive controls to inhibit the growth of Escherichia coli and Salmonella typhi. The research data used the One Way Anova test.

RESULTS

The results of the antibacterial activity test of ethanol extract of salak pondoh skin against Escherichia coli bacteria using concentrations of 20%, 40%, 60% and 80% with positive control of chloramphenicol. Then incubated for 18-24 hours at a temperature of 37ºC with the presence or absence of an inhibition zone around the disc paper which can be seen in the table 1

Table 1. Measurement Results of the Inhibition Zone of Ethanol Extract of Salak Pondoh Skin Against the Growth of Escherichia coli Bacteria

No	Kelompok	Zona Hambat Pertumbuhan Bakteri Std.Dev	Respon Hambatan
1.	20%	4,81 ± 22,74	Lemah
2.	40%	7,81 ± 22,74	Sedang
3.	60%	10,15 ± 06,65	Kuat
4.	80%	15,07 ± 19,00	Kuat
5.	Kontrol (+)	27,56 ± 48,58	Sangat kuat
6.	Kontrol (-)	-	Tidak ada

In table 4.4, it is known that the administration of concentrations of 20%, 40%, 60% and 80% can increase the diameter of the clear zone and the largest increase in the diameter of the clear zone is at a concentration of 80% with an average value of the clear zone diameter of 15.07 ± 19.00. The average value of the clear zone diameter of 80% and the control (+) 27.56 ± 48.58 is different compared to the control (-) 0 ± 0. This shows that the effectiveness of ethanol from the skin of salak pondoh fruit at a concentration of 80% is comparable to the control (+) of the Chloramphenicol disk in inhibiting the growth of Escherichia coli bacteria. Based on the criteria, it can be seen that the antibacterial effect of salak pondoh fruit skin at a concentration of 20% (4.81 ± 22.74) is

weak, 40% (7.81 ± 22.74) is moderate, 60% (10.15 ± 06.65) is strong and 80% (15.07 ± 19.00) is strong, Chloramphenicol (27.56 ± 48.58) is very strong, where the inhibition of the growth of Escherichia coli bacteria by chloramphenicol is caused by the mechanism of action of inhibiting bacterial protein synthesis by binding reversibly to the ribosome subunit so as to inhibit the formation of peptide bonds. Based on the results obtained, the inhibition zone of Escherichia coli bacteria on the skin of snake fruit is in accordance with or not in comparison with the research guidelines of Rahmah 2016, namely a concentration of 25% 6.8 mm, 50% 7.8 mm, 75% 9.4 mm, 100% 18.6 mm and a positive control of chloramphenicol 25 mm.

Table 2. Measurement Results of Inhibition Zone of Ethanol Extract of Salak Pondoh Fruit Peel Against the Growth of Salmonella typhi Bacteria

No	Kelompok	Zona Hambat Pertumbuhan Bakteri Std.Dev (mm)	Respon Hambatan
1.	20%	2,22 ± 18,19	Lemah
2.	40%	3,48 ± 23,30	Lemah
3.	60%	7,32 ± 67,41	Sedang
4.	80%	11,68 ± 112,07	Kuat
5.	Kontrol (+)	24,14 ± 77,77	Sangat kuat
6.	Kontrol (-)	-	Tidak ada

Based on the table, it can be seen that the antibacterial effect of the skin of salak pondoh fruit at a concentration of 20% (2.22 ± 18.19) and 40% (3.48 ± 23.30) is weak, at a concentration of 60% (7.32 ± 67.41) it is moderate at 80% (11.68 ± 112.07) it is strong, Chloramphenicol (24.14 ± 77.77) is very strong, where the inhibition of the growth of Salmonella typhi bacteria by chloramphenicol is caused by the working mechanism of inhibiting bacterial protein synthesis by binding inversely to the ribosome subunit, thereby inhibiting the formation of peptide bonds. Based on the results obtained, the inhibition zone of Salmonella typhi bacteria on the skin of snake fruit is in accordance or not in comparison with the research guidelines of Setiyabudi et al., 2021, namely a concentration of 3% 0.53 mm, 5% 2.11 mm, 10% 5.37 mm, 20% 6.42 mm, 40% 6.77 mm, 80% 7.04 mm and positive control amoxicillin 18.6 mm.

In this study, using a sample of n1 = 20%, n2 = 40%, n3 = 60%, n4 = 80%, n5 = control (-) and n6 = control (+), with an average value of x1 = 4.8133, x2 = 7.8133, x3 = 10.1533, x4 = 15.0733, x5 = 0.0000 and x6 = 27.5667 and standard deviation S1 = 22.74, S2 = 22.74, S3 = 06.65, S4 = 19.00, S5 = 0.000 and S6 = 48.58 the results obtained were taken from descriptives. Next, a test of homogeneity is carried out to determine whether the samples used have the same variance, from the table of est of homogeneity the sig value is 0.48 from the results of the comparison with sig = 0.48> α = 0.05 so that the

decision H0 is accepted, that is, there is no difference in the variance value of the sample so that a one-way anova test can be carried out. The purpose of one-way anova is to determine whether there is a difference in the average of the sample obtained sig 0.01 thus H0 is rejected, Where sig 0.01 <0.05 so that there is a difference in concentrations of 20%, 40%, 60%, 80%, control (-) and control (+).

In this study, a sample size of n1 = 20%, n2 = 40%, n3 = 60%, n4 = 80%, n5 = control (-) and n6 = control (+) was used, with an average value of x1 = 2.2200, x2 = 3.4800, x3 = 7.3267, x4 = 11.6867, x5 = 0.0000 and x6 = 24.1467 and standard deviation S1 = 18.19, S2 = 23.30, S3 = 67.41, S4 = 112.07 S5 = 0.000 and S6 = 77.77 the results obtained were taken from descriptives. Next, a test of homogeneity is carried out to determine whether the samples used have the same variance, from the table of est of homogeneity the sig value is 0.08 from the results of the comparison with sig = 0.08> α = 0.05 so that the decision H0 is accepted, that is, there is no difference in the variance value of the sample so that a one-way anova test can be carried out. The purpose of one-way anova is to determine whether there is a difference in the average of the sample obtained sig 0.001 thus rejecting H0, Where sig 0.001 <0.05 so that there is a difference in concentrations of 20%, 40%, 60%, 80%, control (-) and control (+).

CONCLUSIONS

Based on the results of the research that has been conducted, it can be concluded as follows:

1. The skin of the pondoh snake fruit (Salacca zalacca (Gaertn.) Voss) has an antibacterial effect on Escherichia coli bacteria where the skin of the snake fruit contains Alkaloids that work as antibacterials by disrupting the components of peptidoglycan, Flavonoid compounds have antibacterial activity by denaturing bacterial cell proteins and damaging microbial cell membranes beyond repair, tannins have antibacterial activity by inactivating microbial cell adhesions, also inactivating enzymes, and disrupting protein transport in the inner layer of cells, Saponins have antimicrobial and antifungal activity, the best concentration that can provide an effect on inhibiting the growth of Escherichia coli bacteria is 80%.
2. The skin of the pondoh snake fruit (Salacca zalacca (Gaertn.) Voss) has an antibacterial effect on Salmonella typhi bacteria where the skin of the snake fruit contains Alkaloids that work as antibacterials by disrupting the components of peptidoglycan, Flavonoid compounds have antibacterial activity by denaturing bacterial cell proteins and damaging microbial cell membranes beyond repair, tannins have antibacterial activity by inactivating microbial cell adhesions, also inactivating enzymes, and disrupting protein transport in the inner layer of cells, Saponins have

antimicrobial and antifungal activity, the best concentration that can provide an effect on inhibiting the growth of Salmonella typhi bacteria is 80%.

SUGGESTIONS

Further research is recommended to conduct antibacterial effectiveness tests using red snake fruit skin (Salacca affinis) and using extractions such as percolation and using other bacteria and other concentrations.

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