


The comparison of an effectiveness mangkokan leaf extract (notophanax) and chloramphenicol to salmonella typhi and pseudomonas bacteria

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Article Info	ABSTRACT
Keywords: Mangkokan leaves (Nothopanax scutellarin Chloramphenicol, Salmonella Typhi, Pseudomonas Merr.)	Salmonella Typhi and Pseudomonas bacteria are two pathogenic microorganisms that have the potential to cause serious disease in humans. Salmonella Typhi is the main cause of typhoid fever, while Pseudomonas is a group of bacteria that can cause infections, especially in individuals with weak immune systems. Mangkokan leaves (Nothopanax scutellarin Merr.) and Chloramphenicol are thought to be effective as antibacterials for these two bacteria. This study aimed to compare the effectiveness of Bangkok leaf extract (Nothopanax scutellarin Merr.) and chloramphenicol against Salmonella Typhi and Pseudomonas bacteria. The type of research used was a laboratory experiment at the Microbiology Laboratory, Faculty of Medicine, University of North Sumatra (FK USU) Medan. The test used 250 grams of Bangkok (Nothopanax scutellarin Merr.) leaf extract which was macerated using 70% ethanol to obtain a thick ethanol extract while Chloramphenicol had a concentration of 100 ppm. The test results were compared with the inhibition zone diameter parameters of the Clinical and Laboratory Standards Institute (CLSI, 2013). Based on laboratory test results, show that Bangkok leaf extract (Nothopanax scutellarium Merr.) with a consistency of 70% ethanol is resistant to Salmonella Typhi bacteria ($\bar{x} = 9.17 \pm 0.029$) and Pseudomonas ($\bar{x} = 8.03 \pm 0.058$) while Chloramphenicol is sensitive to Salmonella Typhi (27.0 mm) and Pseudomonas (27.0 mm) bacteria.
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INTRODUCTION

Salmonella Typhi and Pseudomonas bacteria are two pathogenic microorganisms that have the potential to cause serious disease in humans. Salmonella Typhi is the main cause of typhoid fever, a bacterial infection that is transmitted through drinking water or food contamination. Symptoms of typhoid fever include high fever, nausea, vomiting, diarrhea, and other systemic symptoms that can be life threatening if not treated (Tatura, 2022). On the other hand, Pseudomonas is a group of bacteria that can cause infections, especially in individuals with weakened immune systems. They can infect various parts

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of the body, including the lungs, skin, and urinary tract, and often show resistance to antibiotics (Utami, 2022).

Salmonella Typhi and Pseudomonas bacteria have different reproduction methods. Salmonella Typhi, which causes typhoid fever, reproduces asexually through binary fission, in which one bacterial cell divides into two identical cells. This mainly occurs in the human digestive tract after contamination with infected food or water (Darmawati, 2021). Pseudomonas are a group of bacteria that are more versatile in their reproduction methods. They can reproduce asexually through binary fission like Salmonella Typhi, but can also reproduce sexually through the process of conjugation, in which genetic material is exchanged between bacterial cells (Arianda, 2019). One type of infection caused by microorganisms is a skin infection which often produces green-blue pus. Apart from that, this infection can also occur in the eyes, urinary tract, cause diarrhea, and can develop as an infection encountered in the hospital environment. Usually, this kind of infection is caused by the bacteria Pseudomonas aeruginosa (Prescott, 2019). Some Pseudomonas can also form spores or cysts that are resistant to environmental conditions that are not beneficial, allowing them to survive in harsh environments and return to activity when conditions become better (Arianda, 2019).

Typhoid fever is a disease caused by infection with the Salmonella Typhi bacteria which most often occurs in parts of the world. People in low to middle income countries are at high risk of contracting typhus. In South Asia, every year more than 7 million people are infected, with a mortality rate of 10% (Mina et al., 2023). The results of research conducted in five Asian countries, such as China, Vietnam, India, Pakistan and Indonesia, show variations in the costs of treating patients with typhoid fever in hospital. Treatment costs vary from USD 129 in Kolkata, India, to USD 432 in North Jakarta, Indonesia. On the other hand, non-treatment costs ranged from USD 13 in Kolkata, to USD 67 in Hechi, China, with the highest costs recorded in Hechi, followed by North Jakarta, and Karachi, Pakistan (Purba et al., 2016). Based on the performance report of the Ministry of Health of the Republic of Indonesia in 2022, the number of typhoid fever visits was 883,658 visits. The highest rate of visits by typhoid fever patients was recorded in North Maluku Province, with a figure of 0.5 visits per 100,000 National Health Insurance (JKN) participants, which is equivalent to 5 visits per 10,000 JKN participants (Ministry of Health of the Republic of Indonesia, 2022).

The danger of Salmonella Typhi bacteria is that it causes typhoid fever which can cause serious symptoms such as high fever, severe diarrhea, nausea, vomiting, and even life-threatening complications if not treated. Transmission can usually be through food or water that is contaminated by the feces of an infected individual (Boleng, 2018). Pseudomonas is a group of bacteria that has high adaptability and is often an opportunistic pathogen in individuals with a weak immune system. These two bacteria can cause infections, such as urinary tract infections, lung infections, skin and surgical wounds. Some Pseudomonas strains also have resistance to antibiotics, which can hinder treatment efforts (Pelczar & Chan, 2019).

The use of plants as traditional medicine in Indonesia has been a practice passed down from generation to generation in an effort to treat various diseases. However, scientific research needs to be carried out to identify in detail the active compound content in these medicinal plants (Wasito, 2019). One example of a herbal plant often used by the community is mangkokan leaves (*Nothopanax scutellarium* Merr.). The fresh leaves of the mangkokan plant have a variety of benefits, including anti-inflammatory properties, ability as a diuretic, effectiveness in preventing hair loss, and the ability to overcome body odor problems (Hariana, 2020). The mangkokan plant contains various chemicals, such as alkaloids, flavonoids, saponins, fats, polyphenols, as well as various important nutrients such as phosphorus, iron, calcium and vitamins (A, B and C) (Sangadji et al., 2022).

Mangkokan leaves (*Nothopanax scutellarium* Merr.) have the ability to be processed into extracts. Mangkokan leaf extract has been proven to contain active ingredients that have the potential to treat *Salmonella Typhi* and *Pseudomonas* bacteria (Permana, 2022). Scientific studies have shown that mangkokan leaf extract contains active compounds, namely flavonoids, alkaloids, saponins and polyphenols which have antimicrobial properties (Hariana, 2020). These compounds have the ability to inhibit the growth and development of these two bacteria, so they can be used as an alternative in preventing or treating infections caused by *Salmonella Typhi* and *Pseudomonas* (Pelczar & Chan, 2019). Further research is needed to understand in more depth the mechanism of action and effectiveness of mangkokan leaf extract in dealing with these two types of bacteria and to develop optimal methods of use (Wasito, 2019).

Test results conducted by Jahari (2018) showed that ethanol extract from mangkokan leaves had antibacterial capabilities against test bacteria, such as *Pseudomonas aeruginosa* and *Staphylococcus epidermidis*, which could be identified through the formation of an inhibition zone. Based on further statistical analysis, it was found that the optimal concentration of ethanol extract of mangkokan leaves was around 16%, which showed very effective antibacterial capabilities. Furthermore, research by Wijaya et al. (2018) that mangkokan (*Nothopanax scutellarium* Merr.) leaf extract was obtained through a maceration process and then tested for its antibacterial effect using the disk diffusion method. The test results indicated that mangkokan leaf extract showed antibacterial activity with a level of effectiveness that could be categorized as moderate against the growth of *Staphylococcus aureus*.

Apart from mangkokan leaf extract (*Nothopanax scutellarium* Merr.), Chloramphenicol is an antibiotic that has been proven to be active against *Salmonella Typhi* and *Pseudomonas* bacteria. Chloramphenicol is a broad spectrum antibiotic which has the ability to inhibit protein synthesis at the bacterial ribosome level. This makes it effective in treating various bacterial infections, including those caused by *Salmonella Typhi* and *Pseudomonas* (Setiabudy, 2018). However, Chloramphenicol must be used carefully and according to the doctor's instructions, because this antibiotic has serious side effects and can cause bacterial resistance if used incorrectly (Katzung, 2018).

Antibiotics are an efficient alternative therapy in treating typhoid fever, however unwise use can cause resistance and accelerate the development of germs that cause infection (Setiabudy, 2018). According to Rampengan's research in Sarmadi et al (2021), chloramphenicol is still considered the first choice in the treatment of typhoid fever because it remains effective, is widely available, and has a more affordable price. Chloramphenicol works by inhibiting protein synthesis in germs, by binding to the 50S ribosome and stopping the formation of peptide chains. Silfia's research (2020) showed that the greatest inhibitory power was shown in the antibiotic treatment Chloramphenicol 500 mg/mL with an inhibition zone of 38.6 mm followed by the antibiotic Chloramphenicol 250 mg/mL with an inhibition zone of 33.3 mm against *Salmonella* sp.

Literature Review

Mangkokan leaves (*Nothopanax scutellarium* Merr.)

Classification of mangkokan plants (*Nothopanax scutellarium* Merr.) is follows:

Kingdom: Plantae

Division : Spermatophyta

Class : Dicotyledonae

Order : Apiales

Family : Araliaceae

Genus : *Nothopanax*

Species : *Nothopanax scutellarium* Merr.



Figure 1. Mangkokan Plant (*Nothopanax scutellarium* Merr.)

The mangkokan plant, scientifically known as *Nothopanax scutellarium* Merr., has popularity as a decorative plant. The origins of the mangkokan plant can be traced to the Western Pacific Islands region Power. In the process of its spread, this plant was initially found in Southeast Asia, then spread to Indonesia, New Guinea, and finally reached the West Pacific Islands (Santoso, 2020). This plant is often planted as a border around the house or in the garden area, and has a unique shape resembling a bowl. Therefore, it is not surprising that this plant is known as "mangkokan." In the past, the leaves of this

plant were even used as a substitute for plates or bowls in emergency situations (Ramayulis, 2020)

Morphology of Mangkokan (*Nothopanax scutellarium* Merr.) Leaves

The mangkokan plant (*Nothopanax scutellarium* Merr.) is a shrub that lives for one year (annual shrub). The woody stem is branched and round, up to 3 meters long, and has a brown color. The leaves of the mangkokan plant are round like a bowl, dark green in color, have lines on the veins that stick out. The edges of the leaves are serrated, the base of the leaves is heart-shaped, with a leaf diameter ranging from 6 to 12 cm, and has pinnate spines. The flowers on the mangkokan plant are relatively small and yellow. This plant has dark brown to black roots, with taper type roots (Santoso, 2020). Flowers rarely appear on Mangkokan plants, and when they flower, the flowers have a compound shape that resembles an umbrella and is green. The fruit is a type of buni fruit which is flat and green in color. The seeds from Mangkokan are small, hard, and brown (Dalimartha, 2019).

The stems of the Mangkokan plant are included in the woody or lignous stem category. The shape is in the form of a round or cylindrical stem which tends to have straight and long monopodial branch growth, with the growth direction being straight upwards. The surface of this stem has traces of leaves, which are purple when young and turn whitish brown when old. The bark is also relatively thin and has a soft texture (Dalimartha, 2019). The roots of the Mangkokan plant are a type of root The stem is equipped with many small root hairs and is white-brown in color (Dzaroini, 2019).

Content of Mangkokan Leaves (*Nothopanax scutellarium* Merr.)

Mangkokan leaves (*Nothopanax scutellarium* Merr.) contain active compounds, such as alkaloids, flavonoids, tannins, saponins and polyphenols (Nur, 2020):

1. Flavonoids

Flavonoids are the most abundant class of natural phenolic compounds in plants. The basic structure of flavonoids consists of 15 carbon atoms and forms a C₆-C₃-C₆ configuration, which means it consists of two aromatic rings connected by three carbon atoms which may or may not form a third ring.

In the plant world, flavonoids have very diverse roles. First of all, they act as regulators in the process of photosynthesis and plant growth. Apart from that, flavonoids also have antimicrobial, antiviral and antiinsecticide properties, which help plants protect themselves from attacks by pathogenic organisms and pests.

Apart from benefits for plants, flavonoids also have a positive impact on human health. They can function as a preventer of excess cholesterol growth, help protect the body from the development of cancer cells, increase the absorption of vitamin C, and strengthen the immune system. Thus, flavonoids are not only important for plant growth and development, but also have great potential in supporting human health.

2. Saponins

Saponin is a type of steroid glycoside compound that has properties similar to soap. This means that when saponin is shaken in water, it can produce foam, and saponin has a generally bitter taste. However, saponins don't just have interesting physical properties. They also have significant health benefits. One of them is the ability of saponins to inhibit the growth of cancer cells, which has been the subject of research

active research in the development of alternative cancer therapies. Apart from that, saponins can also help reduce cholesterol levels in the body, which is an important factor in maintaining a healthy heart and blood vessels. Thus, saponins are not only chemically interesting compounds, but also have the potential to have a positive impact on human health.

3. Tannin

Tannin is a polyphenolic compound which is included in the flavonoid group. Typically, tannins can be found in significant quantities in products such as tea and often impart a bitter taste to these products. However, the role of tannins in the world of health is very important.

Tannins have powerful antioxidant properties, which means they are able to fight the negative effects of free radicals in the body which can cause cell damage and various health problems. Additionally, tannins also have anti-inflammatory properties, meaning they can help reduce inflammation in the body which is often the root of various diseases. In medical research, tannins have also shown potential as anticancer compounds, meaning they may help inhibit the growth and development of cancer cells. Therefore, tannins not only provide a bitter taste to drinks such as tea, but also have significant health benefits and have become the focus of research in the development of therapies for certain diseases.

4. Alkaloids

Alkaloids are a type of organic compound that is generally found in nature, with most of them coming from plants. One of the distinctive characteristics of alkaloids is the presence of nitrogen (N) atoms in their structure, which makes them have basic properties. This means that all alkaloids contain at least one nitrogen atom which is basic.

Because of their unique properties, alkaloids have great potential as a source of medicine. Many alkaloids have been used in various forms in traditional and modern medicine. They have a variety of activities pharmacological and can be used to treat various health conditions, such as pain relief, anti-inflammatory, antispasmodic, and more. Therefore, research continues to explore the potential and further applications of alkaloids in the development of new medicines for human health.

5. Polyphenols

Polyphenols are an important sub-group of phytonutrient compounds that can be found in plants. In this polyphenol group, there are several types of compounds, including phenolic acids, flavonoids and tannins. The main characteristic of polyphenols is the presence of phenol groups in their molecular structure. Apart from that, polyphenols also act as substances that influence color changes in autumn, which are often seen in changes in leaf color.

These polyphenols are included in the group of antioxidants which are very good for health and can be found in various vegetables and fruits. They have a variety of benefits, including anti-inflammatory properties that help reduce inflammation in the body, antimicrobial properties that fight the growth of pathogenic microorganisms, as well as antioxidant properties that protect cells from damage caused by free radicals.

Apart from that, polyphenols can also improve the immune system, help fight infections, and have the ability to neutralize free radicals that can damage body cells. Therefore, consumption of foods rich in polyphenols can support overall health and contribute to the body's protection against various diseases and conditions.

Some of the flavonoids and phenolic acids contained in mangkokan leaves can be identified in the following table:

Table 1. Mangkokan Non-Nutritional Substance Content Per 100 grams

No	Component	Content
1.	Total phenol	40.39 mg
2.	Quercetin	3.69 mg
3.	Kaempferol	1.74 mg
4.	Anthocyanin	1.42 mg
5.	Chlorogenic acid	0.86 mg
6.	Caffeic acid	1.15 mg
7.	Ferulic acid	0.24 mg

Phytochemical test screening carried out by Ramadan et al. (2020) that Phytochemical testing has been carried out with the aim of identifying the types of types of compounds contained in ethanol extract from mangkokan leaves. Results The test indicated that the ethanol extract from Mangkokan leaves contains flavonoid compounds, tannins and saponins with positive results. However, In this test, alkaloid compounds were not detected or shown negative result. The following are the complete results of the phytochemical tests that have been carried out held

Table 2. Phytochemical Test Results of Ethanol Extract of Mangkokan Leaves

Type	Identification	Reactor	Parameter	Results	Extract
Material	compound			Analysis	Liquid
Bowl	Flavonoids	+FeCl, 1%	Green black	Green black	+
		+Magnesium	Precipitate yellow orange	Chocolate	+
		Saponins	Foam	Foam	+
	Tannin	+FeCl, 1%	Green stable black	Stable chocolate	+
		+Gelatin	Precipitate white	White	+
		Bouchar dat L.P	Precipitate chocolate	White	
	Alkaloids	Mayer LP	Precipitate white yellowish	White	-

Benefits of Mangkokan Plants

The mangkokan plant has a number of benefits that can be used man. Both the roots and the leaves have potential as herbal ingredients or medicinal plants. Some of the benefits that can be obtained from Mangkokan plant involves the treatment of breast inflammation, increasing digestive function, prevents hair loss, speeds up the process wound healing, as well as offering antibacterial and anti-inflammatory propertiesbeneficial. Apart from that, this plant is also known to be able to prevent symptoms of anemia and acts as an antioxidant that supports the body's health whole(Santoso, 2020).

Mangkokan plants contain various types of nutrients such as iron, phosphorus, calcium, peroxidase, protein, fat, vitamins A, B1, and C (Hariana, 2020).The most significant nutritional content in Mangkokan is as follows: carbohydrates as much as 11.8 grams, phosphorus around 49 milligrams, calcium up to 474 milligrams, iron around 4 milligrams, and vitamin A as much as 5450 IU(Ramayulis, 2020).Apart from that, it is also found in Mangkokan plants

various chemical compounds, such as saponins, alkaloids, polyphenols, triterpenoids, tannins, and flavonoids. Various types of flavonoids contained in Mangkokan include myricetin, quercetin, kaempferol, as well as flavones such as apigenin and luteolin(Santoso, 2020).In general, flavonoids have an important role as Antioxidant compounds that help fight the negative effects of free radicals in the body. They work by neutralizing free radicals and helping maintain the health of body cells. On the other hand, saponins have the ability to act as antimicrobial compounds which are

effective in inhibiting the growth and development of pathogenic microorganisms. This makes saponins a useful compound in protecting the body from infections and diseases caused by dangerous microorganisms. Thus, both flavonoids and saponins have important health roles with different but complementary functions(Dzaroini, 2019).

METHOD

The research design used in this research is a type of experimental research in a laboratory (laboratory experiment). In this type of research, researchers conduct experiments in a laboratory environment with the aim of testing hypotheses and studying cause-and-effect relationships between the variables under study. This research involves controlling variables that might influence the results of the experiment, thereby allowing researchers to draw stronger conclusions about the relationships between these variables.

This research was carried out at the Microbiology Laboratory, Faculty of Medicine, University of North Sumatra (FK USU) Medan. The mangkokan (*Nothopanax scutellarium* Merr.) leaf samples used were taken in the city of Medan. The collection process is carried out in the morning to ensure the freshness of the leaves taken. The leaves chosen are fresh, young leaves, with the aim of obtaining optimal quality. In addition, it is important to ensure that the leaves taken do not contain mold that could affect the quality of the sample. Thus, sampling was carried out with high precision and attention to ensure accurate and representative results from mangkokan leaves in the city of Medan.

The samples of mangkokan leaves (*Nothopanax scutellarium* Merr.) that were obtained were sorted wet, washed, then dried by air-drying until dry. Next, the mangkokan leaves (*Nothopanax scutellarium* Merr.) are cut into pieces then powdered and ready to be extracted.

Some of the equipment used includes an autoclave (model YX-28 B from SMIC), a rotary evaporator (Double Cold Trap R1020), a petri dish (Iwaki Pyrex®), an Erlenmeyer (Pyrex®), a beaker with a capacity of 250 ml (Pyrex®), a glass measuring capacity 100 ml (Pyrex®), incubator (Mettler®), sterile cloth, spirit lamp, refrigerator, round tube, straight tube, oven (Mettler®), tweezers, sterile gloves (Maxter), 1 ml syringe (One med®), 10 ml syringe (One med®), test tube (Pyrex®), analytical balance (AND), ruler, and pen.

The materials used in this research were samples of mangkokan leaves (*Nothopanax scutellarium* Merr.), agar, distilled water, 70% ethanol, pure cultures of *Salmonella Typhi* and *Pseudomonas* bacteria, chloramphenicol, paper disks (blank disks), Glucose Nutrient Agar (GNA) medium.), NaCl 0.9%.

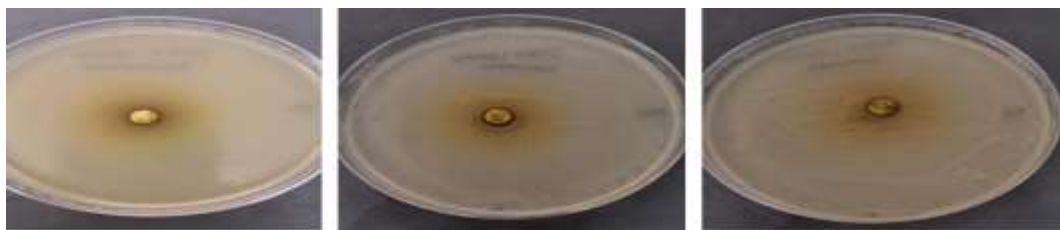
Mangkokan leaf *simplicia* (*Nothopanax Scutellarium* Merr.) was extracted using the maceration method. The dried *simplicia* was then crushed and weighed around 500 grams. Then, the *simplicia* is put into a vessel and macerated using 1 liter of 70% ethanol. After that, the maceration container is tightly closed and left for 3x24 hours,

stirring occasionally. After the maceration process is complete, the mixture is filtered using filter paper to separate the filtrate from the residue. The filtrate resulting from maceration is combined and the solvent is evaporated using a hair dryer, to obtain a thick extract.

RESULTS AND DISCUSSION

Result Effectiveness of Mangkokan Leaf Extract (*Nothopanax scutellarium*Merr.) and Chloramphenicol Against Salmonella Typhi Bacteria

Based on the results of research through laboratory tests at the Microbiology Laboratory, Faculty of Medicine, University of North Sumatra (FK USU) Medan, the effect of 250 grams of mangkokan (*Nothopanax scutellarium* Merr.) leaf extract macerated using 70% ethanol on Salmonella Typhi bacteria can be seen in the following image.



a. Concentration 70%(1) b. Concentration 70%(2) c. Concentration 70%(3)

Figure 2. Concentration of Mangkokan Leaf Extract (*Nothopanax scutellarium*Merr.) 70% Against Salmonella Typhi Bacteria

The test used 250 grams of mangkokan (*Nothopanax scutellarium* Merr.) leaf extract which was macerated using 70% ethanol to obtain a thick ethanol extract of 27.19 grams with 9.06% immersion. Furthermore, laboratory tests on the effect of Chloramphenicol on Salmonella Typhi bacteria can be seen in the following picture.

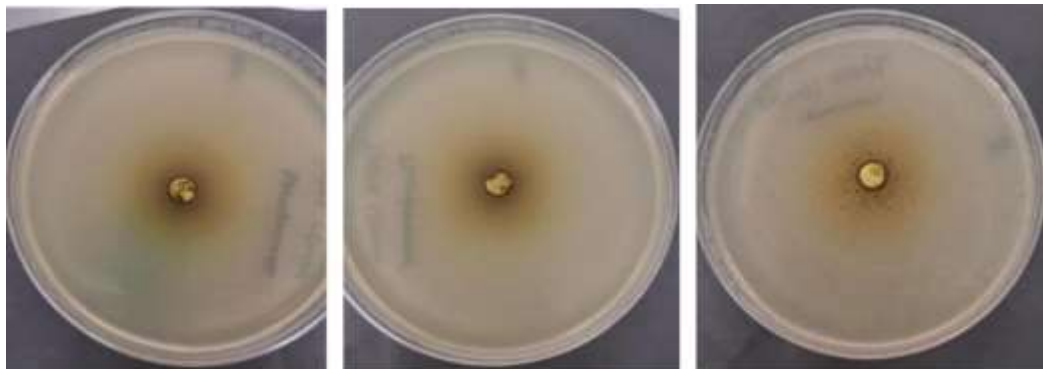


Figure 3. Chloramphenicol Test Against Salmonella Typhi Bacteria

Based on the results of the Chloramphenicol laboratory test on Salmonella Typhi bacteria, the values C- = 0 and C+ = 27 mm were obtained.

Effectiveness of Mangkokan Leaf Extract(*Nothopanax scutellarium* Merr.) and Chloramphenicol Against Pseudomonas Bacteria

Based on the results of research through laboratory tests at the Microbiology Laboratory, Faculty of Medicine, University of North Sumatra (FK USU) Medan, the effect of 250 grams of mangkokan (*Nothopanax scutellarium* Merr.) leaf extract macerated using 70% ethanol on Pseudomonas bacteria can be seen in the following image.



a. Concentration 70%(1) b. Concentration 70%(2) c. Concentration 70%(3)

Figure 4. Concentration of Mangkokan Leaf Extract (*Nothopanax Scutellarium* Merr.) 70% Against Pseudomonas Bacteria

The test used 250 grams of mangkokan (*Nothopanax scutellarium* Merr.) leaf extract which was macerated using 70% ethanol to obtain a thick ethanol extract of 27.19 grams with 9.06% immersion. Concentration calculation:

- a. 70%(1) = 8.1mm
- b. 70%(2) = 8.0 mm
- c. 70%(3) = 8.0 mm

Furthermore, laboratory tests on the effect of Chloramphenicol on Pseudomonas bacteria can be seen in the following picture.



Figure 5. Chloramphenicol Test Against Pseudomonas Bacteria

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Based on the results of the Chloramphenicol laboratory test on Salmonella Typhi bacteria, the values C- = 0 and C+ = 27 mm were obtained. Testing the antibacterial activity of 250 grams of mangkokan leaf extract (*Nothopanax scutellarium* Merr.) which was macerated using 70% ethanol to obtain a thick ethanol extract of 27.19 grams against Salmonella Typhi and Pseudomonas bacteria can be seen in Table 3.

Table 3. Results of Measurement of the Inhibitory Zone of Mangkokan Leaves (*Nothopanax scutellarium* Merr.) Against Salmonella Typhi and Pseudomonas Bacteria Compared with CLSI

Extract Test	Focus- tration	Test (mm)			Flat- mean ± SD (mm)	Interpretation Power Resistor
		I	II	III		
Mangkokan leaves vs <i>Salmonella Typhi</i>	70%	9.15	9.20	9.15	9.17 ± 0.029	<i>Resistant</i>
Mangkokan leaves vs <i>Pseudomonas</i>	70%	8.1	8.0	8.0	8.03 ± 0.058	<i>Resistant</i>

Source: Primary Data, (2023)

Information :

SD = Standard Deviation

Interpretation of Inhibitory Power (CLSI, 2013).

≤ 14 mm = Resistance

15-18 mm = Intermediate

≥ 19 mm = Susceptible

Based on the research results shown in Table 5.1, the activity test of mangkokan leaf extract (*Nothopanax scutellarium* Merr.) against Salmonella Typhi bacteria with an average inhibition zone and standard deviation was 9.17 ± 0.029 , while the activity test of mangkokan leaf extract (*Nothopanax scutellarium* Merr.) against Pseudomonas bacteria with an average inhibition zone and standard deviation of 8.03 ± 0.058 , which indicates that it is in the resistant category based on the inhibition zone diameter parameter of the Clinical and Laboratory Standards Institute (CLSI, 2013).

Clinical and Laboratory Standards Institute(CLSI, 2013) states that Salmonella Typhi and Pseudomonas species with an inhibitory power of <14 mm are included in the resistant category, an inhibitory power of 15-18 mm is included in the intermediate category, and an inhibitory power of >19 mm is included in the susceptible category.

CONCLUSIONS

Based on the results of research by testing mangkokan leaf extract (*Nothopanax scutellarium* Merr.) and Chloramphenicol against Salmonella Typhi and Pseudomonas bacteria, it was concluded that: mangkokan leaf extract (*Nothopanax scutellarium* Merr.) with an ethanol consistency of 70% was resistant to Salmonella Typhi bacteria (\bar{x}

=9.17±0.029) and *Pseudomonas* (\bar{x} =8.03±0.058) while Chloramphenicol is sensitive to *Salmonella Typhi* (27.0 mm) and *Pseudomonas* (27.0 mm) bacteria.

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