

CHEMICAL COMPOUNDS CONTAINED *Saurauia vulcani* (Korth.) AND ITS ANTIBACTERIAL ACTIVITY AGAINST *Staphylococcus aureus* AND *Escherichia coli*

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ABSTRACT

Herbal plants such as *Saurauia vulcani* (Korth.) have a great potential to be developed as raw materials for natural medicines. This plant has numerous secondary metabolite compounds like terpenoid, flavonoid, saponin, and tannin. The results of the study reported that the chloroform extract of this plant has antibacterial activities against *E. coli* and *S. aureus* bacteria. The variation of chloroform extract is 100, 250, 500, and 1000 (ppm). Positive control was used as an Amoxicillin antibiotic. From the results of the antibacterial test, the chloroform extract showed better activity against bacteria *S. aureus* at the inhibition zone with a maximum concentration of 1000 ppm.

Keywords: Phytochemicals Screening, Antibacterial Activity, *Saurauia vulcani* (Korth.)

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INTRODUCTION

One of the wild plants in tropical forests that is used as herbal medicine is *Saurauia vulcani*, Korth. The famous part of this plant is the leaves. *Saurauia vulcani* Korth. The plant, which is located in the tropical forest of the Aek Nauli area, Sumalungun Regency, North Sumatra Province, has very good properties for health. People often make it as an alternative treatment when someone is sick with diabetes, cancer, rheumatism, and others by boiling the dried leaves.¹⁻³

Using natural ingredients as natural medicines to treat diseases is much safer than chemical drugs because the side effects of using natural ingredients as herbal medicines are smaller. Recently, many studies have investigated the benefits of natural ingredients in treating various types of diseases, because herbal plants contain active compounds and their extracts have been known to provide many abilities to be used for several natural medicinal purposes. These bioactive compounds are known as phytochemicals which have the property of providing a unique physiological effect on certain organisms.⁴ Previous studies reported that *Saurauia vulcani* Korth. The leaves contain secondary metabolites of alkaloids, flavonoids, steroids, and terpenoids which are scattered throughout plant tissues⁵⁻⁶.

The ethanol extract can accelerate wound healing and is antidiarrheal.⁷⁻⁸ The methanol extract contains alkaloids, flavonoids, saponins, steroids, polyphenols, saponins, and tannins.⁹ The secondary metabolites of the terpenoid group are known to have various activities including antibacterial, antitumor, anti-inflammatory, and antidiabetic.¹⁰⁻¹² Qualitative analysis of terpenoids from medicinal plants is rarely explored even though the terpenoid content in natural compounds is very large, so it is widely used in traditional medicine.¹³

Flavonoid compounds may result in impaired permeability of the bacterial cell walls and their constituent components. Saponins are active substances that have the function to increase the permeability of the membrane resulting in cell hemolysis. If these saponins make interaction with bacterial cells, they will rupture or lysis so that the bacteria will die. Protein is one of the substances that make up cell membranes, saponins will cause denaturation of proteins on the bacterial cell membrane so that the cell membrane will be damaged.¹⁴

This research aims to identify the antibacterial activity of the chloroform extract of *S. vulcani* Korth. Leaves inhibit the bacteria the growth and identify the most effective content for inhibiting the growth of *S. aureus* and *E. coli* bacteria.

EXPERIMENTAL

The whole leaves of *Saurauia vulcani* (Korth.) were taken from the Aek Nauli rural area, North Sumatra Province. The samples were cleaned, dried in an open room protected from sunlight, then crushed and stored in a sample storage bottle.

Preparation and Extraction Process

Dried leaves were used at 500 grams. The sample was macerated using 5 L of 96% ethanol. Sample maceration was carried out for 3x24 hours with two repetitions. After that, filtering was carried out to obtain the ethanol extract. The liquid extract was then evaporated using a water bath for 36 hours to obtain 350 g of dry extract. The dry ethanol extract was then reconstituted with 400 ml of chloroform solution, stirred, and allowed to stand until a greenish precipitate was formed. Furthermore, filtering was carried out to separate non-polar solvents and 120 g of thick chloroform extract was produced. The extract was reheated and 5.31 g of dry chloroform extract was obtained and then stored in a sample storage bottle.

Phytochemical Analysis

Methods¹⁵⁻¹⁶ were used for the qualitative phytochemical analysis of *Saurauia vulcani* (Korth.) leaves extract.

Antibacterial Test

The antibacterial test was done by the agar diffusion method. *Staphylococcus aureus* and *Escherichia coli* bacteria were used as the negative control, while positive control used Amoxycillin. The dried chloroform extract was dissolved in 10 mL DMSO with 4 concentrations, namely 100, 250, 500, and 1000 (ppm). Bacterial cultures to be tested were planted on Mueller Hinton Agar (MHA), then incubated in an incubator at 37°C for 24 hours. Paper discs with a diameter of 0.55 cm were dipped in *Saurauia vulcani* (Korth.) leaves extract. Then put into a petri dish that already contains the media and culture, then incubated at 37°C for 24 hours. The bright zone formed around the paper disc was calculated using a caliper.¹⁵

RESULTS AND DISCUSSION

Phytochemical Analysis

Based on the results of phytochemical analysis, the chloroform extract of *Saurauia vulcani*, (Korth.) leaf contains components of secondary metabolites which are presented in Table-1. The groups of compounds present in the chloroform extract of *Saurauia vulcani*, (Korth.) leaves contain terpene, tannin, alkaloids, saponins, and flavonoids.

Table-1: Phytochemical Analysis of Chloroform Extract of *S. vulcani*, (Korth.) Leaves

Secondary Metabolite	Reagent Test	Description
Alkaloid	Mayer	++
	Dragendroff	++
	Wagner	++
Flavonoid	Shinoda	+
Saponin	Foaming	++
Tannin	FeCl ₃	++
Terpenoid	Liebermann Bouchard	++

Antibacterial Activity

The antibacterial test chloroform extract of *S. vulcani*, (Korth.) leaves was carried out using the agar diffusion method by different bacteria, namely the bacterium *Staphylococcus aureus* and *Escherichia coli*. The antibacterial activity from the extract of *S. vulcani*, (Korth.) leaves is presented in Table-2. Based on Table-2, the antibacterial test of chloroform extract of *S. vulcani*, (Korth.) leaves against *S. aureus* and *E. coli* bacteria showed good antibacterial activity. From these results, the diameter of the inhibition zone of chloroform extract against *S. aureus* is greater than that of *E. coli*.

Figure-1 shows the bacterial inhibition zone from chloroform extract of *S. vulcani*, (Korth.) leaves against *S. aureus* and *E. coli* bacteria. Antimicrobial activity can be seen from the resulting clear zone. Figure-

1(a), (b), (c), and (d) show that there is a clear zone at each concentration. Therefore, the chloroform extract of pirdot leaves had significant activity on *S. aureus* and *E. coli* bacteria. At a concentration of 100 ppm chloroform extract of *S. vulcani*, (Korth.) leaves showed no antibacterial activity against *E. coli* bacteria, as seen from the diameter of the clear zone produced, while *S. aureus* bacteria had a wider clear zone diameter (Table-1).

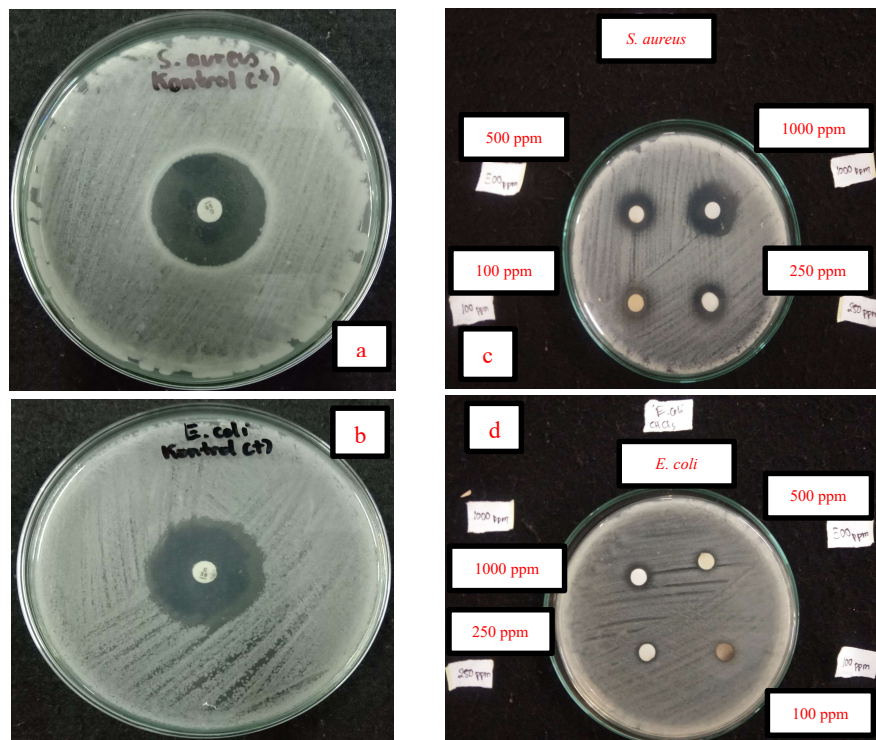


Fig.-1: Antibacterial test of (a) Amoxicillin against *S. aureus* ; (b) Amoxicillin against *E. coli* ; (c) Chloroform Extracts against *S. aureus* ; and (d) Chloroform Extracts against *E. coli*

Table-2: Inhibition Zone of Chloroform Extracts of *S. vulcani*, Korth Leaves

Bacteria	Concentration	Zone of inhibition (mm)	Index Antimicrobial
<i>E. coli</i>	Amoxycillin	30.8	4.13
	100 ppm	0.0	0.00
	250 ppm	8.7	0.45
	500 ppm	9.1	0.52
	1000 ppm	10.6	0.77
<i>S. aureus</i>	Amoxycillin	29.5	3.93
	100 ppm	9.7	0.62
	250 ppm	12.7	1.12
	500 ppm	14.7	1.45
	1000 ppm	19.9	2.32

This difference occurs because each chemical content in plants has a different activity against various microorganisms.¹⁷⁻¹⁸ The chloroform extract showed better antibacterial growth activity than the previously studied *S. vulcani*, (Korth.) leaves simplicia.¹⁹ Terpenoids detected in chloroform extract showed good antibacterial activity^{17,20-23} although the effect was smaller than the antibacterial test of amoxicillin. This is because the presence of terpenoids can react to proteins transmembrane on the outer wall of the bacterial cell, establish strong polymer bonds, and corrupt the protein's transmembrane so that the bacterial cell lacks nutrients and eventually become damaged or die.^{4,24}

CONCLUSION

The chloroform extract of *S. vulcani*, (Korth.) leaves showed good antibacterial activity. Antibacterial activity of *S. vulcani*, (Korth.) leaves showed a better inhibition zone against *S. aureus* at 1000 ppm.

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