Phytochemical Screening and Antimicrobial Activity of Several Medicinal Plants from North Sumatera

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Keywords: Plant extract, Medicinal plant, Maceration, Phytochemical screening.

Abstract: The aim of this research is to evaluate the potency of ethanol extract of several medicinal plants from North Sumatera as antimicrobial and its secondary metabolite composition was determined using qualitative and quantitative analysis. The antimicrobial was evaluated to *Escherichia coli*, (*E. coli)* ATCC25922 and *Stapylococcus aureus (S. aureus)* ATCC 25923 using ethanol extract of seven kinds of medicinal plant. The antimicrobial activity was determined by measuring the inhibition zone of each extract. The phytochemical screening showed the extract contained some secondary metabolites, such as alkaloid, flavonoid, terpenoid, steroid, tannin and saponin. The medicinal plant extracts has a potency as antimicrobial, especially to *E. coli* ATCC 25922 and *S. aureus* ATCC 25923. Based on the inhibition zone, the extract inhibited *E. coli* ATCC 25922 better than *S. aureus* ATCC 25923.

1 INTRODUCTION

WHO (World Health Organization) described that 75-79% of the population in the developing countries used the traditional medicine to cure the health issues. The utilization of traditional medicine is based on the utilization of plant extract that contained active secondary metabolites (N. Prasannabalaji, 2012).

Plant extract can be functionalized as a component of medicine (antimicrobial, antioxidant, anticancer, antimalaria, immunomodulator and etc.) that caused by the presence of bioactive components in the plants (Itoandon, 2012). Those bioactive components are called as secondary metabolites that can be divided to be alkaloid, steroid, tannin, essential oil, saponin, terpenoid, phenolic and etc (Itoandon, 2012) and (Sunayana Nath, 2014). Those secondary metabolites will give physicological affect to human body (Itoandon, 2012). The active compounds mostly have effect to inhibit the microorganism (Prattipati Subhashini Devi, 2014).

The utilization of plant extracts and derivative compounds as antimicrobial showed an increment, this caused by many factors, such as (i) the utilization of antibiotic caused a resistance effect to the bacteria, (ii) the synthetic medicine has negative effect to human body (iii) the slow degradation process of syntetic medicine. The effectivity of antibiotic commonly has a limit, this issue caused an extremely resistance effect to some strain bacterial. For the example, *S. aureus* can resistance to some antibiotics and it can form a new strain of *S. aureus* that called as MRSA (methicillin resistance *Staphylococcus aureus*) (Itoandon, 2012).

The susceptibility of synthetic antibiotic leads the researchers to discover and develop new kind antibiotic based on natural product. The research in the exploration of medicinal plant as antimicrobial has been conducted by several researchers, such as (i) Antibacterial activities of some Indian traditional plant extracts (N. Prasannabalaji, 2012), Screening of Phytochemicals and in Vitro evaluation of Antibacterial and Antioxidant Activities of Leaves, Pods, and Bark Extracts of *Acacia nilotica* (L.)Del. (Muhammad Bilal Sadiq, 2015), Antibacterial Activities of Medicinal Plants Used for the Treatment of Diarrhoea in Limpopo Province, South Africa (M.C. Mathabe, 2006), Preliminary Phytochemical Screening and in Vitro Antibacterial Activity of *Anamirta cocculus* (Linn.) Seed (Umer Qadir, 2015), Preliminary Phytochemical Screening, Plant Growth Inhibition and Antimicrobial Activity Studies of *Faidherbia albida* legume Extracts (Abeer M. Ismail, 2016), Chemical Composition,

Lubis, R.
Phytochemical Screening and Antimicrobial Activity of Several Medicinal Plants from North Sumatera.
DOI: 10.5220/0009903400002480
In *Proceedings of the International Conference on Natural Resources and Sustainable Development (ICNRSD 2018)*, pages 380-384
ISBN: 978-989-758-543-2

Total Phenolic and Flavonoid Contents, and in Vitro Antimicrobial and Antioxidant Activities of Crude Extracts from Red Chili Seeds (*Capsicum frutescens* L.) (Neelam Gurnani, 2016), Preliminary Phytochemical Analysis sand Antimicrobial Properties of Crude Extract of *Combretodendron macrocarpum* Stem Bark (Itoandon, 2012). Those researches indicated the medicinal plant extract have potency as antimicrobial to several bacterial, such as *S. aureus*, *E. coli*, *P. aeruginosa*, *K. pneumoniae*.

Based on the consideration of the exploration of medicinal plant that potent to be antibacterial, the aim of this research is to evaluate the potency of seven kinds of medicinal plants and it secondary metabolite composition.

2 MATERIALS AND METHODS

2.1 Materials

The chemical reagent that used in this research was pro analytic grade that obtained from Merck.

2.2 Plant Sample

Plant that used in this research was leave of *Pandanus amaryllifolius* Roxb, *Euphatorium adoratum* L and *Graptophyllum pictum L. Griff*, peel of *Citrus aurantifolia*, *Allium cinense*, stem of *Tinospora crispa* L., and the root of *Talinum paniculatum*. Jacq.(Gaertn). The plants were obtained from regency of Langkat, North Sumatera and collected around January-February 2017.

2.3 The Preparation of Sample

The collected plant was washed and air-dried for 5 days at room temperature (no direct contact with the sunlight). The dried sample was grounded until fine powder was obtained (N. Prasannabalaji, 2012).

2.4 The Extraction of Sample

500 g of sample powder was macerated using ethanol 70% at room temperature for 24 h. This step was repeated for three times. The obtained filtrate was concentrated with rotary evaporator (Syamsuddin Abdillah, 2015).

2.5 The Phytochemical Screening

The phytochemical screening was conducted to evaluate the secondary metabolite, such as alkaloid, flavonoid, terpenoid, saponin, steroid, and tannin.

2.5.1 Alkaloid

0,2 gr crude extract was added with 2 ml H_2SO_4.The obtained filtrate was reacted with Dragendorf reagent. The presence of orange-red precipitate indicated the presence of alkaloid (Wisal Muhammad Khan, 2016)

2.5.2 Flavonoid

Some drop of HCl was added to the plant extract. The presence of red colour solution indicated the presence of flavonoif (Abeer M. Ismail, 2016).

2.5.3 Terpenoid

5 ml of plant extracts was added with 2 mL of chloroform and 3 mL of H_2SO_4. The presence of reddish-brown ring showed the presence of terpenoid (Abeer M. Ismail, 2016).

2.5.4 Saponin

0.5 g of plant extract was dissolved in aquadest and shaken. The presence of continues foam indicated the presence of saponin (Abeer M. Ismail, 2016)

2.5.5 Steroid

2 mL of anhydride acetic and 2 mL H_2SO_4 was added into 5 mL plant extract. The presence of violet-blue colour indicated the positive reaction for steroid. (Abeer M. Ismail, 2016)

2.5.6 Tanin

0.2 g of extracts was dissolved in aquadest. This solution was heated up and the filtrate was reacted with $FeCl_3$. The dark green colour indicated the positive reaction for tannin (Wisal Muhammad Khan, 2016).

2.6 Antibacterial ActivityAnalysis

The microorganism that used in this research was *S. aureus* ATCC 25923 and *E. coli* ATCC 25922. The agar well diffused was used to determine the antibacterial activity of each extract (M.C. Mathabe,

2006) and (Noureddine Gherraf, 2017). Chloramphenicol was used as the standard.

3 RESULTS AND DISCUSSIONS

This research was focused on phytochemical screening and antibacterial activity of seven kinds of ethanol extract of medicinal plant from North Sumatera. The plant that used in this research was *Pandanus amaryllifolius* Roxb, *Graptophyllum pictum L. Griff., Citrus aurantifolia, Allium cinense*, *Euphatorium adoratum* L., *Tinospora crispa* L., and *Talinum paniculatum. Jacq.(Gaertn)* (Figure 1).

3.1 The Phytochemical Screening

The phytochemical screening result of seven species medicinal plant from North Sumatera was summarized in Table 3.1

Table 3.1: The phytochemical screening result of seven species medicinal plant from North Sumatera

Extracts	Results					
	A	B	C	D	E	F
Leaves of *Pandanus amaryllifolius* Roxb	+	+	+	+	+	-
Daun Handeuleum (*Graptophyllum pictum* L. Griff.)	+	+	+	-	-	+
Kulit Jeruk Nipis *(Citrus aurantifolia)*	+	+	+	+	+	+
Bawang batak (*Allium cinense*)	-	+	+	+	+	+
Daun Kirinyuh (*Euphatorium adoratum* L)	+	+	+	+	+	+
Batang brotowali (*Tinospora crispa* L.).	+	+	+	+	+	+
Leaves of *Graptophyllum pictum L. Griff.*	+	+	+	+	+	+

(+) :positive ; (-) : negative; A : alkaloid;B: flavonoid; C : steroid; D: terpenoid; E : tanin; dan F : saponin

3.2 Antimicrobial Activity

The antimicrobial activity of the medicinal plant extracts against *E. Coli* ATCC 25922 and *S. aureus* was displayed in Table 3.2.

Table 3.2: The antimicrobial activity of the medicinal plant extracts against *E. Coli* and *S. aureus*

Sample	Concetration of Extract (mg/ mL)	Diameter of inhibition zone (mm)	
		E.coli (ATCC 25922)	*S. aureus* (ATCC 25923)
Leaves of *Pandanus amaryllifolius* Roxb	0	0,0	0,0
	50	7,5	6,7
	100	9,1	8,5
	150	11,6	10,2
	200	14,1	13,1
	250	16,5	15,2
Leaves of *Graptophyllum pictum* L. Griff.	0	0	0
	50	13,6	12,8
	100	16,0	15,6
	150	19,6	16,2
	200	21,2	17,6
	250	22,5	18,7
Citrus aurantifolia	0	0,0	0,0
	50	12,6	10,2
	100	15,4	13,3
	150	16,6	14,8
	200	17,3	15,6
	250	18,4	16,7
Allium cinense	0	0	0
	50	9,0	7,0
	100	11,0	8,0
	150	13,0	10,0
	200	14,0	12,0
	250	14,3	12,0
Euphatorium adoratum L	0	0,0	0,0
	50	8,0	5,0
	100	10,0	9,0
	150	13,0	10,0
	200	14,0	12,0
	250	19,0	12,0
Tinospora crispa L.	0	0,0	0,0
	50	10,3	8,2
	100	13,4	12,4
	150	15,6	14,2
	200	18,2	16,1
	250	20,5	18,6
Talinum	0	0,0	0,0

paniculatum. Jacq.(Gaertn)	50	10	5,0
	100	10,1	9,0
	150	10,0	10,0
	200	10,0	11,0
	250	11,0	12,0
Cloramphenicol		31,0	22,0

3.3 Discussion

The phytochemical screening result or seven medicinal plant extracts indicated the presence of alkaloid, flavonoid, steroid, terpenoid, tannin and saponin, except in the leaves of *Graptophyllum pictum* L. Griff. Terpenoid and tannin was not detected. Also, saponinin the leaves of *Pandanus amaryllifolius* Roxb was not detected.

The antibacterial activity of seven medicinal plant extracts was determined using agar wall diffused against two strain of bacterial, such as *E. coli* ATCC 25922 and *S. aureus* ATCC 25923 (Stephen J. Cavalieri, 2005). The result showed all of those extract can inhibit both bacteria. The antibacterial activity was increased with the increase of the extract concentration. In the high concentration of extract the presence of the active component is higher than in the lower concentration. It has linear correlation to the antimicrobial activity of the extracts. The antimicrobial activity of extract against *E. coli* ATCC 25922 was higher than *S. aureus* ATCC 25923. The inhibition zone in the inhibition of *E. coli* ATCC 25922 was 7.5-22.5 mm and *S. aureus* ATCC 25923 was 5-18.7 mm.

Figure 1: The collected sample from North Sumatera

4 CONCLUSIONS

The evaluated medicinal plant extracts have several secondary metabolites, such as alkaloid, flavonoid, terpenoid, steroid, tannin, and saponin. In general, those ethanol extracts showed a greatest inhibition to *E. coli* ATCC 25922 than *S. aureus* ATCC 25923.

ACKNOWLEDGEMENTS

Authors thanks to Laboratory of Natural Product Chemistry, Universitas Sumatera Utara and Laboratory of Chemistry, Universitas Medan Area for the facility that supported this research.

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