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The Aqueous Extract of Purple Potato (*Ipomea batatas* L.) Effect Against Bacteris Causing Acne (*Propionibacterium acne*)

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Abstract: The purple potato is widely spread in the world, including Indonesia. Not only for food, but also has medical function. It has been remedies for microbial infections.This study aims to know the effect of aqueous extract of purple potato against bacteria that cause acne, *Propionibacterium acne*.The inhibitory diameter of each concentration, 1%, 3%, 5%, 7%, and 9% is 7; 12,67; 13,67; 17,67; and 19,67 mm, respectively. The potency relative of extract is 1 : 309; 1: 248; 1: 312; 1: 373; and 1: 362 respectively. And the MIC and MKC is 50.000 µg/ml and 100.000 µg/ml, respectively.
Keyword : purple potato, acne, *Propionibacterium acne.*

Introduction

Acne is the one of skin problem that caused of bacteria, one of them is *Propionibacterium acne*[(1)]. Antibacteria agent has been used to treat acne, namely clindamycin, tetracyclin, erythromycin, etc. Due to the resistant of those antibiotics, the chemical compound from plant can be used as alternative antibacterial agent, for instance anthocyanin. Anthocyanins (pigments) are members of the flavonoid group of phytochemicals, a group predominant in teas, honey, wines, fruits, vegetables, nuts, olive oil, cocoa, and cereals. The colorful anthocyanins are the most recognized, visible members of the bioflavonoid phytochemicals. The roles of anthocyanin pigments as medicinal agents have been well-accepted dogma in folk medicine throughout the world, and, in fact these pigments are linked to an amazingly broad-based range of health benefits[(2)]. Historically, for example anthocyanins from *Hibiscus sp* has been used in remedies for liver disfunction and hypertension. In addition, bilberry (*Vaccinium*) anthocyanins have an anecdotal history of use for vision disorders, microbial infections, diarrhea, and diverse other health disorders[(3)]. Further investigation demonstrated that anthocyanin (in particular, cyanidin-3-sambubioside-5-glucoside and cyaniding-3,5-diglucoside) were highly bioavailable in endothelial cells, which was linked to their roles in prevention of atherosclerosis and neurodegenerative disorders([4)]. Anthocyanin can be found in fruits, like purple potato (*Ipomea batatas* L.). According to Jawi [(5)], it contains rich anthocyanin (110-210 mg/gram).

Materials And Methods

Materials

The following materials were used : the tuber of purple potato (*Ipomea batatas* L.), NaCl, medium BHI (Brain Heart Infusion), *Propionibacterium acnes* API 20.A V4 (FK UI), aquadestillata(Brataco®), sterile aquabidestillata (Ikapharmindo®), Beef extract, Peptone, Agar.

Method

Extraction

The tuber of purple potato (*Ipomea batatas* L.) were collected from Barru, South Sulawesi and identified by Laboratory of Moslem University of Indonesia. 700 gram of the tuber of purple potato (*Ipomea batatas* L.) were added 1500 ml aquadest and were extracted by infused method. It was then poured into infused pan once 15 minutes after the temperature at 90^0C[6]. Subsequently, it was filtered and dried by using freezedrying. After that, the dried extract was made for various concentration, 1; 3; 5; 7; and 9%.

Preparation of media

- **Medium of Nutrient Agar**

3 gram beef extract, 5 gram peptone, and 15 gram agar were weighed. Each of them was dissolved with 100 ml sterile distilled water. Particular treatment for Agar is dissolved with hot sterile distilled water and stir constantly. Soluble beef extract, and peptone were poured into Agar soluble and added with sterile distilled water until the volume reached 1000 ml while it stirred to homogenized.Then the pH was measured by indicator pH paper until it showed neutral range, pH 7. After that, the medium was sterilized with autoclave.

- **Medium of Brain Heart Infusion(BHI)**

37 gram BHI was weighed then dissolved with 1 L sterile distilled water and cooked until it well dissolved. After that, it sterilized with autoclave. Composition of BHI (g/L): Nutrient substrate (extract of brain and heart and peptones) 27,5; D-glucose 2; Sodium Chloride 5; and Disodium hydrogen phosphate 2,5.

Preparation of bacterial stock

The bacteria was inoculated on medium of Nutrient Agar by put the small amount of bacteria. Then incubated at temperature 37^oC for 48 hours in anaerob condition.

Preparation of bacterial suspension

The bacteria that has incubated for 48 hours was suspended in NaCl 0,9%. The turbidity was measured by using nephelometer (BD Phoenix) with 0,5 Mc Farland standard (assumed $1,5 \times 10^8$ cell bacteria/ml).

The antibacterial activity test

The antibacterial activity test of aqueous extract of purple potato tuber (*Ipomea batatas* L.) against *Propionibacterium acne* was determined by using diffusion method. The liquid medium of Nutrient Agar was poured into sterile petri for 20 ml and waited until become solid. Once the Agar become solid, 100 µl bacterial suspension was spread on the Agar.

The solute test in each 10 µl was dropped into the sterile disk and then, it put on the Agar. Subsequently, the sterile petri cup was incubated in the reverse position at 37^oC for 48 hours in anaerob condition. The antibacterial activity was observed by the inhibitory area measured in diameter (mm). It was repeated in three times.

The determination of potency relative

Potency relative was determined by using clindamycin HCl as comparison. It has the same procedure with the antibacterial activity test in extract. However, the concentration for clindamycin that were used are 250 µg/ml, 200 µg/ml, 150 µg/ml, 100 µg/ml, 50 µg/ml. It was repeated for three times.

The determination of potency relative was measured by plotted the inhibitory area of extract in the regression linear between the concentration of clindamycin and the inhibitory area. The potency relative then determined the comparison between the inhibitory area of the extract and clindamycin HCl.

b. Determination of Minimum Inhibitory Concentration (MIC) and Minimum Killing Concentration (MKC)

The determination of MIC and MKC was conducted by using broth dilution test. The solute test of extract was made for some concentration in liquid medium with total volume 1 ml (BHI), 10; 5; 2,5; 1,25; 0,625 and 0,3125 % then added with 10 µl bacterial suspension. After that, it was incubated in shaker incubator (200 rpm) at temperature 37°C for 48 jours in anaerob condition. As comparison, we use 5 kind of control:

i. control of bacteria= 1 ml medium + 10 µl bacterial suspension
ii. negative control = 0,5 ml medium + 0,5 ml solvent (sterile distilled water)
iii. medium control = 1 ml medium
iv. extract control = 0,5 ml media + 0,5 ml extract

The value of MIC and MKC was determinated after the solute test was incubated in Agar medium (*Nutrient Agar*) at temperature 37°C for 48 hours in anaerob condition. It was repeated for three times.

Result and Discussion

a. Result

- **Result of extract**

Tabel 1.Result of extract

Berat sampel segar (g)	Vol. pelarut (ml)	Vol. ekstrak cair (ml)	Berat ekstrak (g)	Rendamen ekstrak (%)
700	1.500	1.090	248,87	35,55 %

The antibacterial tested

1. The antibacterial activity test

Tabel 2.The antibacterial activity test of extract

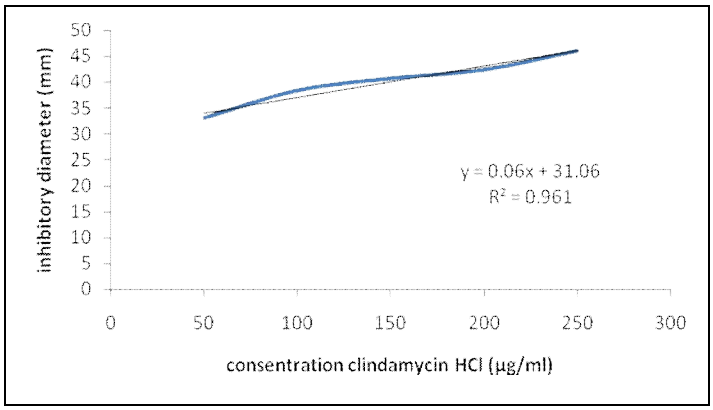
Konsentrasi ekstrak (%)	Diameter hambat (mm)	Rata-rata diameter hambat (mm)
1	7	7
	7	
	7	
3	12	12,67
	14	
	12	
5	14	13,67
	13	
	14	
7	18	17,67
	17	
	18	
9	20	19,67
	20	
	19	

1. The potency relative test

Tabel 3.Result of antibacterial activity of clindamycin HCl

concentration (µg/ml)	Inhibitory diameter (mm)	Average of inhibitory diameter(mm)
50	32	33
	32	
	35	
100	37	38,33
	38	
	40	
150	40	40,67
	42	
	40	
200	40	42,33
	42	
	45	
250	45	46
	46	
	47	

Gambar 2.The curve of consentration of clindamycin HCl and inhibitory diameter against *Propionibacterium acne*



Tabel 4.Result of equality of extract and clindamycin HCl

Concentration (µg/ml)	Inhibitory diameter (mm)	Equal with consentrationof clindamycin HCl (µg/ml)	Potency relative
10.000	33	32,33	1 : 309
30.000	38,33	121,07	1 : 248
50.000	40,67	160,07	1 : 312
70.000	42,33	187,73	1 : 373
90.000	46	248,9	1 : 362

2. The determination of Minimum Inhibitory Concentration (MIC) and Minimum Killing Concentration (MKC)

Tabel 5.The result of determination of MIC and MKC

Consentration (%)	Bacterial growth information
0,3125	-
0,625	-
1,25	-
2,5	-
5	+*
10	+**

explanation : (+) bacterial growth
(-) none of bacterial growth
(*)MIC (**) MKC

b. Discussion

The purple potatoes were extracted by using infundation method with distilled water as a solvent. According to Kevin (2008), anthocyanin dissolves in water. 700 gram purple potato was weighed and added with distilled water. The liquid extract was obtained is 1.090 ml, after that it was dried by using freezedryer immediately. The dried extract was found is 248,87 gram.

Subsequently, the microbiological test was conducted by using *Propionibacterium acne* as a bacterial test, including antibacterial activity test, comparison of potency relative with clindamycin HCl, and determination of Minimum Inhibitory Concentration (MIC) and Minimum Killing Concentration (MKC).*P. acne* was obtained from Laboratorium of Microbiology of Medical Faculty of University of Indonesia.

The antibacterial activity of extract is presented in table 2. It can be seen that the aqueous extract of purple potato has the effect to inhibit the bacterial growth whereas *P. acne* may cause acne (Loden, 2011). The extract with concentration 1%, can be categorized as intermediate (Inhibitory diameter 6-8 mm), while the others concentration has stronger inhibitory effect (inhibitory diameter > 8 mm)

In another word, the more concentration of extract the more inhibitory effect against the bacteria. It can be assumed that the more concentration of extract the more chemical compounds are included. Therefore, the inhibitory effect also increase. The chemical compounds that can have an inhibitory effect (antibacterial activity) is anthocyanin included in flavonoid group that is believed to have antibacterial activity (Anonim, 2010).

The result of concentration (x) and inhibitory diameter of clindamycin HCl (y) were plotted and presented in curve. The curve of inhibitory activity of clindamycin is shown in picture 2. Generally, it can be concluded that there is an increasing of inhibitory activity was followed by an increasing of concentration.The determination of potency relative was obtained from comparison between antibacterial activity of clindamycin HCl and extract. It presented in table 4. The best potency relative value is 1 : 248 (extract 3%)which means that the potency of clindamycin HCl to inhibit the bacteria equal with 248 times of the inhibitory activity of extract.

The Minimum Inhibitory Concentration (MIC) and Mimimum Killing Concentration (MKC) is shown in table5. It clearly seen that the MIC and MKC is 50.000 µg/ml and 100.000 µg/ml,respectively.

Conclusion

The aqueous extract of purple potato has an antibacterial activity. The best potency relative of extract is concentration 3% with potency relative value is 1 : 248. And the MIC and MKC is 50.000 µg/ml and 100.000 µg/ml, respectively.

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