THE POTENTIAL DIURETIC COMPARISON BETWEEN PARTS OF CUCUMBER (*CUCUMIS SATIVUS* L.) IN MALE *MUS MUSCULUS*

Elicia Vincensa[1)], Bambang W Tjipto[2)], Bernadette D Novita[3)]

Introduction : Cardiovascular diseases are one of the most common cause of death in Indonesia. One kind of cardiovascular event is hypertension. Hypertension is a type of Cardiovascular Disease which incidence rate is predicted to increase in the year of 2025. Diuretic is one of the therapies that can be used for this disease. Diuretic works by decreasing blood volume by managing water and sodium balance inside the body. This effect can be obtained from Cucumber (*Cucumis sativus* L.).
Purpose : The aim of this study is to explain the differences in potential diuretic effect among parts of Cucumber (*Cucumis sativus* L.).
Method : This study use post-test only control group design method in animal subject(*in vivo*). Animal subjects in this study were 44 male *Mus musculus.* the animals were divided into 9 treatment groups and 2 control groups. All *Mus musculus* get 1 mL methanol extract of Cucumber (*Cucumis sativus* L.) according to their group. The animals were put in metabolic cage to measure urine volume for 24 hours.
Results : Part of Cucumber (*Cucumis sativus* L.) that has the best potential diuretic were the flesh and rind on 0,5 mg/mL. Part of Cucumber (*Cucumis sativus* L.) that has the highest natriuresis and kaliuresis was whole fruit (flesh, rind, and seed).
Conclusion : Cucumber (*Cucumis sativus* L.) has a similar potential diuretic with Furosemid. Low concentrations lead to better potential diuretic. Natriuresis and Kaliuresis can also be found on Cucumber (*Cucumis sativus* L.).

Keywords : Potential diuretic, Cucumber (*Cucumis sativus* L.), sodium in urine, potassium in urine

[1)] Student of Faculty of Medicine, Widya Mandala Catholic University Surabaya, Jl. Kalisari Selatan No. 1 Surabaya Email: eliciavincensa10@yahoo.com
[2)] Medical Biology Department, Faculty of Medicine, Widya Mandala Catholic University Surabaya, Jl. Kalisari Selatan No. 1 Surabaya
[3)] Clinical Pharmacology Department, Faculty of Medicine, Widya Mandala Catholic University Surabaya, Jl. Kalisari Selatan No. 1 Surabaya

INTRODUCTION

One of the most common causes of death in Indonesia is cardiovascular disorders which is 35%. One types of cardiovascular disorders is hypertension. The death often occurs without any previous clear symptoms. Death due to hypertension is often only discovered after complications arise.[1] The incidence of hypertension is also expected to increase in 2025. [2] Hypertension can arise because of lifestyle and the environment. [3] Two factors that can affect blood pressure is cardiac output and total peripheral resistance. If one factor increases under normal circumstances, then the other factors will make adjustments by decreasing it. The adjustment process in hypertension cannot occur properly. Interventions in both cases become a way to control blood pressure. [4] Drugs that can control blood pressure are sympathoplegics, direct vasodilators, angiotensin drugs, calcium channel blockers, and diuretics. [5]

Diuretic works by controlling the balance of fluid and sodium in the body. This balance setting can reduce blood volume which helps reduce the cardiac output. [5] Diuretic effects can be obtained from drugs, fruits, and vegetables. One fruit that can provide a diuretic effect is Cucumber (*Cucumis sativus* L.). Cucumber (*Cucumis sativus* L.) has mineral and phytochemical contents. Phytochemical is one of the compounds that has an effect on mammals when consumed. One of the effects is diuretic. Phytochemicals can affect urine volume and potassium as well as urine sodium levels. Previous studies have examined that polyphenols are potassium-sparing diuretics thus they are similar to loop diuretics. Unlike polyphenols, triterpenoids have a potassium-saving diuretic effect that is similar to potassium-sparing diuretic drugs. cucumber (*Cucumis sativus* L.) consumption in Indonesia is very diverse, including using the skin, without the skin, using seeds, and without seeds. Hence, this study would compare the effectiveness of diuretics in several groups, namely (1) flesh of fruit without seeds and skin, (2) fruit flesh with skin without seeds, and (3) whole fruit (fruit flesh, seeds, and skin). This study aims to look at the differences in urine volume, urine sodium level, and urine potassium levels after various variations of cucumber (*Cucumis sativus* L.) are given thus, they can give the benefit of the nutritional diet therapeutic knowledge of cucumber (*Cucumis sativus* L.) in controlling blood pressure through the diuretic effect caused.

METHOD

This study was conducted by using a post-test only control group design. This

study was conducted at the Animal Laboratory, Faculty of Pharmacy, Widya Mandala Catholic University in Surabaya on July 24 to August 27, 2019. The study was examined in vivo on experimental animals, namely male *Mus musculus*. Experimental animals that were used were 44 animals. All experimental animals were divided into 11 groups. Two groups were as a control group (positive and negative) and 9 other groups were as a treatment group. The positive control group would get furosemide and the negative control group would get aquadest. Nine groups of treatment were divided into 3 large groups of cucumber (*Cucumis sativus* L.) groups, namely fruit flesh only, fruit flesh and skin, and whole fruit. Each group of cucumber (*Cucumis sativus* L.) consisted of 3 concentrations, such as 0.5 mg / mL, 5 mg / mL, and 50 mg / mL. After the administration of the extract, the urine volume of *Mus musculus* was measured at the 30th, 60th, and 6th minutes, 9th, 12th, and 24thhours. Twenty-four-hour urine would be measured in sodium and potassium levels. Data were processed and analysed by One-way Anova and Kruskal Wallis tests using the SPSS system.

RESULTS

Table 1. Research Data

	Urine Volume	**Urine Sodium**	**Urine Potassium**
Negative Control	1,4	33,3	52,3
Positive Control	1,483	52,67	54
Fruit flesh only			
0,5 mg/mL	1,85	88,5	127,5
5 mg/mL	1,8	42	76,25
50 mg/mL	1,6	64,67	117,67
Fruit flesh and skin			
0,5 mg/mL	2,025	45	96,5
5 mg/mL	1,4	40	46
50 mg/mL	0,775	42,5	94,75
Whole fruit			
0,5 mg/mL	1,575	167,75	178,5
5 mg/mL	1,3	40,25	112,25
50 mg/mL	1,44	37,5	155,5

Based on Table 1, it can be depicted that the biggest urine volume

came from fruit flesh and skin of cucumber (*Cucumis sativus* L.) on the concentration of 0,5 mg/mL. However, the highest urine sodium and potassium came from the whole fruit on the concentration of 0,5 mg/mL.

Table 2. Phytochemical Test Result

	Triterpenoid	**Phenol**
Fruit flesh only	Negative	Positive
Fruit flesh and skin	Negative	Positive
Whole fruit	Negative	Positive

Based on Table 2, it can be depicted that the whole fruit of cucumber (*Cucumis sativus* L.) consisted of phenol and not consisted of Triterpenoid.

Table 3. Normality Test

	Sig.
Inter-Section	
Urine Volume	0,510
Urine Sodium	0,000
Urine Potassium	0,000
Inter-Concentration	
Urine Volume	0,510
Urine Sodium	0,000
Urine Potassium	0,000

Normality test result showed that all data were normally distributed due to p > 0,05

Table 4. Homogeneity Test

	Sig.
Inter-Section	
Urine Volume	0,089
Urine Sodium	0,086
Urine Potassium	0,065
Inter-Concentration	
Urine Volume	0,357
Urine Sodium	0,010
Urine Potassium	0,357

This result showed that all data were homogenic except urine sodium on the Inter-concentration of p < 0,05.

Table 5. Difference Test

	Urine Volume	Urine Sodium	Urine Potassium
Inter-Section	Anova p = 0,843	*Kruskal Wallis* p = 0,577	*Kruskal Wallis* p = 0,137
Inter-Concentration	Anova p = 0,564	*Kruskal Wallis* p = 0,310	*Kruskal Wallis* p = 0,024

This result examined that there was no significant difference (> 0,05) except

Urine Potassium between concentration at the significance of (< 0,05).

Table 6. *Post Hoc test* on the result of Urine Volume

	Fruit flesh	Fruit flesh and skin	Whole fruit	P
0,5 mg/ml				0,903
5 mg/ml				0,878
50 mg/ml				0,231
P	0,920	0,130	0,720	

Table 7. *Post Hoc test* on the Result of Urine Sodium

	Fruit flesh	Fruit flesh and skin	Whole fruit	P
0,5 mg/ml				0,626
5 mg/ml				0,791
50 mg/ml				0,385
P	0,492	0,861	0,442	

Table 8. *Post Hoc Test* on the Result of Urine Potassium

	Fruit flesh	Fruit flesh and skin	Whole fruit	P
0,5 mg/ml				0,694
5 mg/ml				0,491
50 mg/ml				0,300
P	0,417	0,084	0,469	

All the data result of *Post Hoc test* showed that there was no significant result due to p > 0,05.

Table 9. Conversion of Cucumber (*Cucumis sativus* L.) Extract Needs

	Mus musculus (40 gram)	Human (60 kg / 60.000 gram)
Need for Cucumber Methanol Extract (*Cucumis sativus* L.)	0,5 mg	750 mg

The amount of cucumber methanol extract (*Cucumis sativus* L.) that was needed by human was 750 mg.

Table 10. Conversion Number of Cucumbers (*Cucumis sativus* L.)

Fruit flesh and skin of cucumber (*Cucumis sativus* L.)	Simplisia powder	Methanol Extract
1500 gram	70 gram	15,5 gram
72,6 gram	3,4 gram	0,75 gram (human needs)

Table 10 revealed that the number of cucumber (*Cucumis sativus* L.) that was needed by human was 72,6 gram.

DISCUSSION

Characteristics of Cucumbers (*Cucumis sativus* L.)

Cucumber (*Cucumis sativus* L.) that was used was taken from Materia Medica Stone. The processing to become methanol extract was performed in Materia Medica Batu and Phytochemical Laboratory, Faculty of Pharmacy, Widya Mandala Catholic University, Surabaya. Phytochemical test results on the methanol extract used showed that the entire group of cucumber (*Cucumis sativus* L.) sections contained phenol and did not contain triterpenoid. These results showed a different results from the literature. Soil conditions and the planting process would affect the condition of Cucumber (*Cucumis sativus* L.). [6]

Diuretic Characteristics

Phytochemical test results reveal that the action of a diuretic on cucumber (*Cucumis sativus* L.) is in the ascending limb of loop of Henle in the kidney. Phenol is also stated in previous studies that the diuretic effect is similar to Furosemide. [7] The results also show that the potassium produced by cucumber (*Cucumis sativus* L.) is higher than Furosemide. The differences in the results of volume, sodium, and urine potassium between sections are not too far. If it is compared to the positive control group, the result of diuretic effect is even higher than furosemide. The difference in the results of this study is the urine volume obtained in the positive control group that was very large at the beginning and after 6 hours, there was no urine produced. This happens due to the short duration of furosemide action which is 2-4 hours.[5] This also shows that the duration of cucumber (*Cucumis sativus* L.) action is longer than Furosemide. The most effective use is using the fruit flesh and skin with a concentration of 0.5 mg / mL. A higher amount of concentration would reduce the potential for existing diuretics, whereas the largest concentration of sodium and potassium were found in animals treated

with the whole fruit, with a concentration of 0.5 mg / mL. [8]

Statistical results that show significance were only observed in potassium at inter-concentration. Significant differences between groups, including the positive control group shows that cucumber (*Cucumis sativus* L.) is a potassium sparing diuretic.

CONCLUSION

According to the result of the study, it can be concluded that cucumber (*Cucumis sativus* L.) has a diuretic potential similar to Furosemide. The best diuretic potential is produced by the group of fruit flesh and skin. However, the highest urine sodium and potassium levels were obtained from the whole fruit group (fruit flesh, skin, and seeds). Conversion of the amount of cucumber (*Cucumis sativus* L.) which has the best potential in humans is 72.6 grams in a day. For the administration of whole fruit, it is necessary to pay attention to the balance of sodium and potassium in patients that is taking potassium sparing diuretic drugs.

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