

THE EFFECT OF THE CUCUMBER CONSUMPTION TO THE LEVEL OF SODIUM POTASSIUM IN MUS MUSCULLUS'S URINE PRODUCTION

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ABSTRACT

Cucumber (*Cucumis sativus L.*) was known for lowering blood pressure agents. Some researches show that Cucumber had a similar mechanism with a loop diuretic (Furosemide), exceeding sodium and potassium excretion. However, a part of Cucumber that gives a better effect on managing water and sodium balance remains unknown. This study was to explain the differences potential diuretic among parts of Cucumber (*Cucumis sativus L.*). This study was using a post-test only control group designed in animals. There were 44 male *Mus musculus* tested in this study. All of the animal testings was divided into 9 different treatment groups and 2 control groups. All *Mus musculus* got 1 mL methanol extract of Cucumber (*Cucumis sativus L.*) according to their group. The animal testing was put on metabolic cage to measure urine volume for 24 hours. The flesh and rind part of Cucumber (*Cucumis sativus L.*) showed a similar result with furosemide as diuretics agents. However, whole part of the fruit of Cucumber (*Cucumis sativus L.*) (flesh, rind, and seed) showed as natriuretic and kaliuretic, Cucumber (*Cucumis sativus L.*) has a similar potential diuretic with Furosemide. Even in low concentrations of Cucumber extract, it led to having a potential diuretic, with natriuretic and kaliuretic effects in the whole part of the fruit. This could be suggested to people with chronic kidney diseases to prevent hyperkalemia.

Keywords: Cucumber (*Cucumis sativus L.*); natrium in urine; potassium in urine; human & health

ABSTRAK

Mentimun (*Cucumis sativus L.*) Mentimun (*Cucumis sativus L.*) dikenal memberikan efek menurunkan tekanan darah. Beberapa penelitian menunjukkan bahwa Mentimun memiliki mekanisme yang mirip dengan loop diuretik (Furosemide), dengan meningkatkan ekskresi natrium dan kalium. Bagian buah mentimun yang memberikan efek lebih baik pada keseimbangan air dan garam natrium masih belum diketahui. Untuk mengetahui bagian buah mentimun (*Cucumis sativus L.*) yang memiliki potensi sebagai diuretic dan natriuresis serta kaliuresis yang lebih baik. Penelitian eksperimental menggunakan metode post-test only control group design dilakukan pada hewan coba (*in vivo*). Hewan percobaan yang digunakan adalah *Mus musculus* jantan sebanyak 44 ekor. Hewan coba dibagi menjadi 9 kelompok perlakuan dan 2 kelompok kontrol. Setiap hewan coba pada kelompok perlakuan mendapatkan ekstrak metanol Mentimun (*Cucumis sativus L.*) sebanyak 1 mL sesuai dengan bagian dan konsentrasi kelompok perlakuan. *Mus musculus* dimasukkan ke kandang metabolik untuk mengukur volume urine selama 24 jam. Hasil urine 24 jam diserahkan Laboratorium untuk analisis kadar Natrium dan Kalium urine. Bagian mentimun (*Cucumis sativus L.*) yang memiliki profil natrium dan kalium urine paling tinggi adalah buah keseluruhan (daging buah, kulit, dan biji) pada konsentrasi 0,5 mg/mL. Mentimun (*Cucumis sativus L.*) memberikan efek natriuresis dan kaliuresis pada konsentrasi kecil sehingga dapat disarankan pada pasien gagal ginjal kronis untuk mencegah hiperkalemia.

Kata kunci: Mentimun (*Cucumis sativus L.*); sodium; potassium pada urine; human & health

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INTRODUCTION

Fruits and vegetables have been considered as functional foods due to their health benefits besides nutritional contents such as macronutrients and micronutrients. Polyphenols in fruits and vegetables have most popular antioxidants (Yunusa et al 2018). Cucumber (*Cucumis sativus* L.) is one of vegetables that has got health benefit and known as lowering blood pressure agents. Some researches show that Cucumber had similar mechanism with loop diuretic, Furosemide (Uzuazokaro et al 2018). It has phytochemical and mineral compounds, such as Potassium, Magnesium, and Phosphorus (Sari et al 2021). The phytochemical compounds in Cucumbers (*Cucumis sativus* L.), were including triterpenoids, alkaloids, glycosides, saponins, steroids, polyphenols, tannins, flavonoids, and resins (Tiwari et al 2012, Mahmood et al 2018, Uzuazokaro et al 2018, Yunusa et al 2018).

Phytochemicals are secondary metabolites of plants products (Kumari et al 2017). These products are biologically active, naturally occurring chemicals in various parts of a plant that providing health benefits and giving plants colour, flavour, and smell and are part of plants' natural defence system, protecting plants' cells from environmental hazards such as pollution, stress, drought, UV exposure and pathogenic attacks (Uzuazokaro et al 2018). Meanwhile in Cucumber (*Cucumis sativus* L.), phytochemical compounds, especially polyphenol and triterpenoids contributed in diuretic effect (Gill et al 2009, Dhiman et al 2012, Uzuazokaro et al 2018, Yunusa et al 2018).

Polyphenols has similar on site of action to loop diuretics, that also show a high potassium release effect (Jadhav et al 2010, Agarwal et al 2012, Tiwari et al 2012, Badal et al 2016, Bartnik & Facey 2016, Katzung et al 2018, Uzuazokaro et al 2018). Triterpenoids works differ from polyphenols, Triterpenoids provides potassium-sparing diuretic effect (Jadhav et al 2010, Agarwal et al 2012, Tiwari et al 2012). Since this fruit consumes in variety of ways, this study aimed to provide comparison data between each part of Cucumber (*Cucumis sativus* L.) (flesh, rind, and seed) that has potency as diuretic, especially with natriuretic and kaliuretic effects as a nutritional food. This study was expected to find out the effect of the cucumber (*Cucumis sativus* L.) on mus musculus's urine production.

MATERIALS AND METHODS

This study was a post-test only control group designed in animal. Ethics was approved by the Ethical

Committee of Research of the Faculty of Medicine, Universitas Katolik Widya Mandala, Surabaya with a decree No.0134/KEPK/T/2019. Methanol extract of Cucumber (*Cucumis sativus* L.) were provided by Laboratory of Botany, Faculty of Medicine, Universitas Katolik Widya Mandala, Surabaya. 44 male mice *Mus musculus* were used in this study, and divided into 11 different groups. Two control groups divided into negative control group was given aquadest as placebo and positive control group that was given 0,5 mg/mL furosemide as diuretic standard therapy. There were also nine experimental groups divided into three different parts of cucumber with three different concentration of cucumber (0,5 mg/mL, 5 mg/mL, and 50 mg/mL) for each parts. Cucumber extract used in this study was alcohol based.

To reset the *Mus musculus* condition, all mice were rehydrated with 1 mL aquadest an hour before treatment. After administration of the extract, the urine volume of *Mus musculus* was measured several times from 30 to 24 hours. The urine sodium and potassium levels were measured from 24-hour urine.

RESULTS

After 24 hours of observation and measurement, all results were seen in Table 1.

Table 1. Results of 24 hours observation and measurement

Urine	Volume	Natrium	Kalium
Negative Control (Aquadest)	1,4	33,3	52,3
Positive Control (Furosemide)	1,483	52,67	54
Flesh part			
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
Flesh and Rind			
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			
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

As seen in Table 1, the largest urine volume was obtained from the fruit flesh and rind of Cucumber (*Cucumis sativus* L.) at a concentration of 0.5 mg/mL, higher than Furosemide within 24 hours, even in the first 60-minute furosemide produced higher urine volume. Meanwhile, the highest sodium and potassium urine were from the whole fruit at a concentration of 0.5 mg/mL. This optimal concentration was conversed and

calculated into human needs, and 0,5mg/mL was equals to 72,6-gram Cucumber (*Cucumis sativus L.*) daily.

The phytochemical test was also obtained for each part of Cucumber (*Cucumis sativus L.*), and all of part contained mostly phenol. This result was similar with previous researches in Cucumber (Sahu & Sahu 2015, Uzuazokaro et al 2018, Yunusa et al 2018).

DISCUSSION

Furosemide as loop diuretic inhibits NaCl reabsorption in the TAL loop of Henle (Brunton et al 2011, Katzung et al 2018). Since, furosemide was rapidly absorbed, it showed faster diuretic effect, and it was similar result in this study. Duration of action in Furosemide was relatively short by around 2-4 hours (Brunton et al 2011, Katzung et al 2018). Cucumber (*Cucumis sativus L.*) at a concentration of 0.5 mg/mL produced urine volume higher than furosemide within 24 hours due to its effects in similar with furosemide site of action with relatively longer in duration of action more than 6 hours (Katzung et al 2018).

The existing research data also showed that the sodium and potassium urine produced by the treatment group was higher than the sodium and potassium urine produced from *Mus musculus* that received furosemide. The research data also showed that the highest sodium and potassium profiles were obtained from the whole fruit group (fruit flesh, skin, and seeds) at a concentration of 0.5 mg/mL. Smaller concentrations showed higher results than larger concentrations.

CONCLUSION

This study showed that the urine sodium and potassium profile increased after treated by Cucumber (*Cucumis sativus L.*). This was equivalent to the exceeding profile of sodium and potassium after given Furosemide. The highest urine sodium and potassium levels were obtained from the whole fruit group (fruit flesh, skin, and seeds) at a concentration of 0.5 mg/mL. Conversion of the amount of Cucumber (*Cucumis sativus L.*) which had the potential to increase the profile of sodium and potassium in humans was 72.6 grams daily. Therefore, Cucumber (*Cucumis sativus L.*) whole part could be consumed by chronic kidney diseases patients to prevent hyperkalaemia, at least one fruit daily. This was significant in early prevention of a disease, such hyperkalaemia.

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