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**Inovasi dalam Penelitian Kimia dan
Pendidikan Kimia
Untuk
Menciptakan Kemandirian Bangsa**

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FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM

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UNTUK MENCIPTAKAN KEMANDIRIAN BANGSA**

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ARTIKEL

KIMIA

PENGARUH EKSTRAK DAUN CIPLUKAN (*Physallis peruviana* L.) TERHADAP KELARUTAN BATU GINJAL *IN VITRO*

EFFECT OF *Physallis peruviana* L. LEAVES EXTRACT ON THE SOLUBILITY OF KIDNEY STONE *IN VITRO*

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Abstrak–Penyakit batu ginjal merupakan suatu gangguan eksresi yang dapat menghambat pengeluaran urin karena tersumbatnya saluran kemih oleh endapan yang mengeras atau membatu di dalam ginjal. Tanaman ciplukan (*Physallis peruviana* L.) diduga dapat meluruhkan batu ginjal. Penelitian berupaya mencari obat herbal alternatif untuk penyakit batu ginjal dengan memanfaatkan tanaman yang berada di lingkungan sekitar, dalam hal ini daun ciplukan. Penelitian bertujuan menentukan aktivitas ekstrak daun ciplukan sebagai peluruhan batu ginjal dengan metode turbidimetri. Berdasarkan percobaan, kadar air dalam daun ciplukan yang digunakan sebesar 84,35%. Rendemen yang diperoleh dari ekstrak daun ciplukan menggunakan pelarut air sebesar 7,10%, etanol 30% sebesar 34,82%, etanol 70% sebesar 62,80%, dan etanol 96% sebesar 39,63%. Ekstrak daun ciplukan menggunakan pelarut etanol 70% memberikan hasil positif pada semua parameter uji fitokimia meliputi flavonoid, fenolik hidrokuinon, alkaloid, tanin, steroid, dan triterpenoid. Hasil uji peluruhan menunjukkan bahwa ekstrak daun ciplukan dengan alkohol 70% menunjukkan peluruhan yang paling besar (53,98%) dan laju peluruhannya semakin besar seiring dengan besarnya konsentrasi ekstrak.

Abstract. Kidney stone disease is a disorder that can inhibit excretion of urinary output due to blockage of the urinary tract by hardened or fossilized deposits in the kidneys. *Physallis peruviana* L. is indicated can break down the kidney stone. This study showed an alternative herbal medicine for kidney stone disease using common plant found around us, in this case are leaves of *P. peruviana*. The study aims to determine the activity from extract of *P. peruviana* leaves as kidney stone decay with turbidimetric method. Based on the experiment, water content in *P. peruviana* leaves was 84.35%. The yield obtained from the leaves extraction using water was 7.10%; ethanol 30% was 34.82%; ethanol 70% was 62.80%; and ethanol 96% was 39.63%, respectively. Ethanolic 70% extract gave positive result in all parameters of phytochemical test include flavonoid, phenolic hydroquinone, alkaloids, tannins, steroids, and triterpenoids. Results showed that extract with ethanol 70% showed the biggest decay activity (53.98%) and the activity would increase linearly with concentration of extract.

Kata kunci: daun ciplukan, batu ginjal, kalsium oksalat, turbidimetri

Keywords: *Physallis peruviana* L, leaves, kidney stone. Calcium oxalate, turbidimetri

INTRODUCTION

Noncommunicable diseases (NCD) are the leading causes of death globally, killing more people than all other causes. Beside cardiovascular disease, cancer, and diabetes, kidney stone is also affect millions of people in the world. Moreover, kidney stone may also initiate other NCD chronic diseases such as diabetes, hyperlipidemia, and hypertension (WHO 2010).

Patients of kidney stone commonly late to know that there is a stone calcification in their kidney, thus it makes them lack of control in the food consumed. Consequently, the stone will grow larger and harder and cause more pain in the kidney (Maryatiet al. 2009).

Kidney stone may be taken from the body through kidney operation or it could be destroyed using electromagnetic shockwave. Nevertheless, those medication cause unpleasant side effects and expensive in cost (Wakidi 2003). Medicines sold in market commonly take action by destroying the kidney stone or inhibiting its formation, such as acetazolamide and thiazide synthetic drugs. Extract of *Ortosiphon stamineus*, *Strobilanthus crispus*, and *Zea mays* L. (Ratri 2008) leaves have the same activities as herbal medicine. This activity is caused by the phenolic, alkaloid, and saponin content of the extract, which dissolve the stone and excrete it by diuretic action.

Physallis peruviana L. or known as ciplukan in Indonesia was hoped to have the similar phytochemical composition and increase solubility of calcium oxalate kidney stone. Finally we hoped that *P. peruviana* would be potential to be used for treatment of

kidney stone as herbal medicine in the future.

METHODS

Tools and Materials

The leaves of *P. peruviana* were collected from Sukamaju Village, Cibungbulang, Bogor. Leaves collected were mature leaves with 2-3.5 cm in length and 1-2.5 cm in width. Calcium oxalate and other chemicals were purchased from Merck with analytical grade. Major tools used were soxlet instrumentation, rotary evaporator, turbidimeter Lamotte type 2020e, and other chemical glasses and flasks.

PROCEDURES

Extraction

Extraction was carried out using soxlet for 8 hours (60°C) with water, and ethanol (30%, 70%, and 96%) as solvents. Extracts were thickened using rotary evaporator and the yield was to be used in the next procedure.

Phytochemical screening

The phytochemical screening of the aqueous and ethanol extracts of *P. peruviana* was carried out using standard phytochemical methods described by Harborne (1998).

Assay for calcium oxalate solubility

Twenty-five ml of 3% extract solution was made and added by calcium oxalate up to 4,000 ppm. Turbidity was measured before the addition of extract, immediately after the addition of the extract (0 hours) and after 6 hours of incubation. Commercial herbal medicine was used as positive control for the experiment.

Calcium oxalate concentration was measured by plotting the turbidity obtained to the standard curve that was made beforehand. Standard curve of calcium oxalate was made using series of calcium oxalate in acetic acid buffer pH 3.5.

Optimum concentration for calcium stone degradation

Extract with the best activity in increasing calcium oxalate solubility will be used for this experiment. Test was carried out using 1%, 2%, 3%, 4%, and 5% concentration, respectively. calcium oxalate up to 4,000 ppm. Turbidity was measured before the addition of extract, immediately after the addition of the

extract (0 hours) and after 6 hours of incubation.

RESULTS AND DISCUSSIONS

Extraction

Highest yield was obtained using 70% ethanol as solvents (Table 1). This was due to ethanol is a good solvent for initial extraction and it may dissolve major phytochemical components in plants, such as alkaloids and flavonoids (Harborne 1986).

Table 1. Yield obtained from extraction

Extract	Yield (%)
Water	7.10
30% ethanol	34.82
70% ethanol	62.30
96% ethanol	39.63

Phytochemical screening

The result of the examination indicated that *P. peruviana* contain major phytochemical compounds (Table 2). This compounds were majorly extracted using 70% ethanol.

Table 2. Phytochemical test of *P. peruviana* extract

Test	Extract			
	Water	30% Ethanol	70% Ethanol	96% Ethanol
Flavonoid	-	-	+	-
Phenolic	-	+	+	+
Alkaloid	-	+	+	-
Tannin	-	-	+	+
Steroid	+	-	+	+
Triterpenoid	+	-	+	+
Saponin	+	+	+	+

Phytochemistry test was an initial test to identify the presence of secondary metabolite in the analyzed sample. The result of phytochemistry test signified that *P. peruviana* 70% ethanolic extract contained flavonoid,

phenolic, alkaloid, tannin, steroid, triterpenoid, and saponin.

Most herbal medicine to take care of kidney stone contains phenolic compounds, such as *Hydrocotyle asiatica* Linn, *S. crispus*, *O. stamineus*,

Phyllanthus niruri Linn, *Sonchus arvensis* Linn, and *Curcuma xanthorrhiza* Linn (Wakidi 2003).

Alkaloid is the largest group from secondary metabolism product compound in plants. The function of alkaloid in plant has been reported as the growth controller and insect repellent. Saponin is a glycoside that consists of terpene and sterol. Saponin acts as anti-microbe and saponification agents. (Sambadan *et al.* 2004). The presence of phenolic, alkaloid, and saponin supported the people's belief that *P. peruviana* could act to increase solubility of kidney stone.

Assay for calcium oxalate solubility

Figure 1 presented the fact that water and ethanolic extract of *P. peruviana* able to decrease calcium oxalate concentration. This fact signifies that *P. peruviana* was potential to be used for kidney stone therapy. Extract that gave the best result was 70% ethanolic extract, which gave 53% decrease in calcium oxalate concentration in 6 hours. Whereas water extracts, 30% ethanolic extract, 96% ethanolic extract, and commercial herbal medicine gave 29% gave 29.72%, 37.69%, 48.98%, and 63.42% calcium oxalate concentration decrease, respectively.

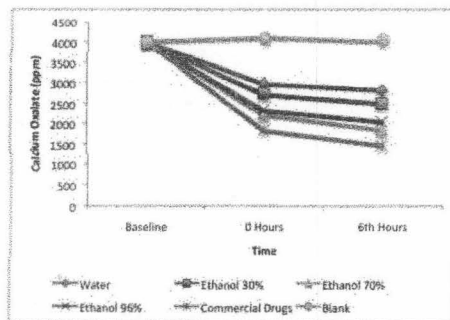


Figure 1. Reduction of calcium oxalate concentration by the addition of water and

ethanolic extract of *Physallis peruviana* L. leaves compared to blank and herbal commercial medicine

Optimum concentration for calcium stone degradation

The results of calcium oxalate concentration as the effect of 70% ethanolic extract in various concentrations was shown in Figure 2. Highest result was obtained by 5% extract that gave 62.17% calcium oxalate concentration decrease in 6 hours. Whereas other 4%, 3%, 2%, and 1% ethanolic 70% extract gave 56.61%, 53.98%, 50.92%, and 48.84% calcium oxalate concentration decrease, respectively. Calcium oxalate concentration decrease while 70% ethanolic extract was raised.

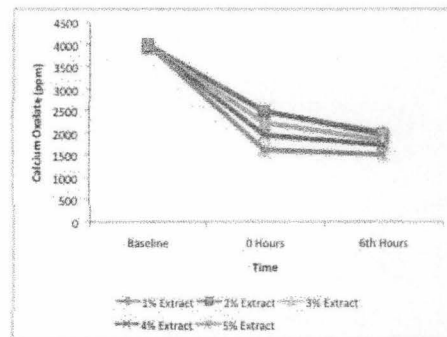


Figure 2. Reduction of calcium oxalate concentration by the addition of 70% ethanolic extract of *Physallis peruviana* L. leaves in 1%, 2%, 3%, 4%, and 5% concentration

CONCLUSIONS

1. Ethanolic 70% was the best solvent to obtain the highest yield, extract phytochemical compounds, and decrease calcium oxalate concentration.
2. Highest decrease in calcium oxalate concentration was obtain

using 5% of ethanolic 70% extract addition.

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