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Research Article

EVALUATION OF DIURETIC ACTIVITY OF PICRIA FEL-TERRAE LOUR LEAVES EXTRACTS

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ABSTRACT

Objective: The aim of this study was to evaluate the diuretic activity of different leaves extract of Picria fel-terrae using n-hexane, ethyl acetate, and ethanol as solvents.

Methods: The diuretic activity of the extracts were evaluated by determining urine volume and electrolyte (Na^+, K^+) concentration in male Wistar rats at a various dose extract of 400 and 800 mg/kg bw. Furosemide (10 mg/kb bw) was used as reference drug and cmc-Na 1% was used as normal control.

Results: Urine volume was in a significant increase by n-hexane extract at dose 800 mg/kg bw in comparison to normal control groups. The excretion of sodium was also increased by the all extracts. The n-hexane extract showed the better diuretic effect in comparison to other extract.

Conclusion: The leaves extracts of Picria fel-terrae have diuretic activity.

Keywords: Picria fel-terrae Lour, Diuresis, Urine electrolyte.

INTRODUCTION

Medicinal plants can be important sources of unknown chemical substances with potential therapeutic effects. Besides, the World Health Organization has estimated that over 75% of the world's population still relies on plant-derived medicines, usually obtained from traditional healers, for basic health-care needs [1]. Diuretic are commonly defined as drugs that increase the amount of urine output by the kidney. These agent increase the renal excretion of sodium and either chloride or bicarbonate primarily, and water excretion secondarily. It is beneficial in many life-threatening disease conditions such as congestive heart failure, nephritic syndrome, cirrhosis, renal failure, hypertension, and pregnancy toxemia. Thiazide and the high ceiling loop diuretics are more commonly used in clinical practice, and are associated with several side effects such as impotence, fatigue, and weakness [2,3]. Hence, there is a need for novel diuretics which is considered to be relatively safe with better or equivalent diuretic activity.

Picria fel-terrae lour., of family *Scropulariaceae*, is an annual herbaceous plant, growing up to 40 cm. This plant is used traditionally as stimulant, diuretic, malaria, hepatoprotective, and anti-inflammation agent. Phytochemical literature reveals the presence of phenylpropanoid glycosides, and might be used beneficially in the treatment of oxidative stress-related human diseases. Previous study showed that it contains β-sitosterol and effective as antidiabetic [4-6]. Despite the traditional use of Picria fel-terrae as a diuretic agent, to date, no study in existing literature has evidenced its diuretic activity. Therefore, the aim of this study was to evaluate the diuretic activity of n-hexane, ethyl acetate, and ethanol extracts of this plant in a rat model. Furthermore, acute toxicity of this plant was assessed in albino mice.

METHODS

Drugs and chemicals

All the solvents and chemicals required for extraction were of analytical grade. Furosemide (Lasix, Aventis Pharma, Indonesia) was used as a reference drug (positive control), cmc-Na 1% was used as a normal control drug.

Plant material

The leaves of Picria fel-terrae were collected from Tiga Lingga Village, Dairi, Sumatera Utara, and it was authenticated in Bogoriense Herbarium, LIPI, Jakarta.

Preparation of extracts

The dried leaves of Picria fel-terrae was grinded to a coarse powdered form, and was extracted by remaceration method using n-hexane, ethyl acetate, and ethanol as solvents. The extracts so obtained were concentrated under vacuum using a rotary evaporator and dried in desiccator until use.

Acute toxicity study

Acute toxicity study was done according to Organization for Economic Co-operation and Development Guideline 420 by fixed dose method, with starting dose of 2000 mg/kg bw and 5000 mg/kg bw were adopted. Starting dose of 2000 mg/kg and 5000 mg/kg bw, orally of n-hexane (EnHPT), ethyl acetate (EEtPT), and ethanol (EEPT) extracts was given to 5 animals (albino mice). Animals were kept for observation of behavioral change and death up to 14 days [7].

Diuretic activity

Healthy adult Wistar male rats of weighing 150-200 g procured from the animal house of Faculty of Pharmacy, University of Sumatera, Utara,

Table 1: Effect of Picria fel-terrae extracts on urine volume of Wistar rats

Groups	Drugs	Dose (mg/kg bw)	Urine volume (mL±SEM)	Diuretic index
I	CMC-Na 1%	-	2.13±0.49	1
II	Furosemide	10	7.28±2.08*	3.42
III	EnHPT	400	2.55±2.14	1.2
IV	EnHPT	800	6.75±4.14*	3.17
V	EEAPT	400	2.55±0.50	1.2
VI	EEAPT	800	1.98±0.43	0.93
VII	EEtPT	400	2.95±2.08	1.38
VIII	EEtPT	800	3.1±2.13	1.46

$p<0.05$ significantly (*) different from the control, SEM: Standard error of the mean

Table 2: Concentration of sodium and potassium in urine of rats treated with Picria fel-terrae extracts

Groups	Drugs	Dose (mg/kg bw)	Na^+ (mEq/L±SEM)	K^+ (mEq/L±SEM)	Na^+/K^+ ratio
I	CMC-Na 1%	-	169.84±30.26	145.09±16.45	1.17
II	Furosemide	10	235.48±15.39*	298.68±45.45*	0.79
III	EnHPT	400	110.18±64.03	70.42±30.76	1.56
IV	EnHPT	800	186.76±50.38	105.19±20.42	1.78
V	EEAPT	400	161.45±31.56	66.76±8.62	2.42
VI	EEAPT	800	109.78±22.68	92.29±21.13	1.19
VII	EEtPT	400	180.34±74.91	119.49±55.87	1.51
VIII	EEtPT	800	156.25±59.91	111.73±47.06	1.39

$p<0.05$ significantly (*) different from the control, SEM: Standard error of the mean

were used for the study. The animals kept in polypropylene cages with environmental condition and fed with standard diet and water ad libitum. The animals were housed for 2 weeks prior to the experiment to acclimatize the laboratory conditions. All animal experiments conducted during the present study got prior permission from Institutional Animal Ethics Committee, Department of Biology, Faculty of Mathematics and Science, University of Sumatera, Utara.

Wistar rats were divided into eight groups and in each group consisting of four rats. The animal of Group I served as normal control, which received cmc-Na 1% orally. The animal of Group II served as positive control, which received furosemide 10 mg/kg bw, orally. Group III-VIII received EnHPT, EetPT, and EEPT, respectively, at a varied dose of 400 and 800 mg/kg bw, orally.

The animal were fasted overnight (18 hrs) prior to the test but with free access to tap water only and then were given an oral loading of normal saline 0.9% of 20 mL/kg bw. Immediately after administration, the rats were placed in metabolism cages. Urine was collected in a graduated vials and its volume was recorded at 1-hr interval for 6 hrs. Electrolyte (Na^+ and K^+) concentrations were estimated from the urine sample of rats at the end of the experimental period (6 hrs) by Atomic Absorption Spectroscopy (Hitachi Zeeman 2000) and the result were reported as mean ± standard error of the mean (SEM).

Statistical analysis

The data were expressed as mean ± SEM. The data of diuretic activity were analyzed by one-way Analysis of Variance followed by "Tukey's test" $p<0.05$ was considered statistically significant.

RESULT

Acute toxicity study

No toxic symptoms or mortality were observed in any animals, which lived up to 14 days after the administration of EnHPT, EetPT, and EEPT at the single dose level of 2000 and 5000 mg/kg bw. No significant changes in body weights of treated mice were observed when compared with control groups. The relative weights of the organs (heart, liver, spleen, kidney, and lungs) were not significantly ($p<0.05$) different from the control.

Diuretic activity

The n-hexane extract of Picria fel-terrae leaves (800 mg/kg) showed marked diuresis (6.75±4.14 ml) during the 6^{th} hr versus control (2.13±0.49 ml) ($p<0.05$), but has the same effect as reference drug (furosemide, 7.28±2.08 ml) ($p>0.05$). Diuretic activity of the n-hexane extract (800 mg/kg) was 3.17 and furosemide 3.42, respectively (Table 1).

The effect of furosemide (10 mg/kg bw) and the all extracts of Picria fel-terrae on electrolyte (Na^+ and K^+) excretion in the 6 hrs urine are presented in Table 2.

DISCUSSION

In the present study, we can show that the n-hexane, ethyl acetate, ethanol extracts of Picria fel-terrae leaves have increased the urinary output along with an increase in concentration of sodium ions in urine. Maximum diuretic effects were observed by n-hexane extract at dose of 800 mg/kg with diuretic index was 3.17. The diuretic activity is considered to be good if the diuretic index values are >1.50, moderate if the values are in between 1.00 and 1.50, mild if the values lie in between 0.72 and 1.00 and there is no diuretic activity if the value is <0.72 [8].

The phytochemical analysis showed the presence of active phytochemical groups such as steroid and terpenoids in n-hexane group; flavonoids, glycoside, tannin, and saponins in ethyl acetate group; saponin and glycoside in ethanol group. Active principles such as steroids, triterpenoid, saponins, flavonoids, tannins, and glycosides are known to be responsible for diuretic activity [9-11]. The effect may be produced by stimulation of regional blood flow or initial vasodilation, or by producing inhibition of tubular reabsorption of water and anions, the result in all cases being diuresis [12]. The increased sodium and water excretion activity also provides strong basis for its proved anti-hypertensive action.

CONCLUSION

It can be concluded that the extracts of Picria fel-terrae have diuretic activity. However, the components responsible for the diuretic activity are currently unclear. Therefore, further investigation is needed to isolate and identify the compounds present in the extract, which are responsible for these activities.

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