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Research Article

Diuretic activity of *Barleria prionitis Linn* Flower extract

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Abstract

The present study was carried out to evaluate the diuretic effect of *Barleria prionitis* Linn. flower extract in rats. Diuretic and Natriuretic activities were carried out by administration of normal saline along with the treatment modules. The volume of urine (in ml) and the Na^+ and K^+ content in the urine were measured. The extract at 100 and 200 mg / kg, produced significant diuresis and increased sodium elimination but not potassium. Thus the study elucidates that aqueous extract of Barleria prionitis posess significant diuretic and Natriuretic effect but not a potassium sparing effect.

Keywords: *Barleria prionitis*, Diuresis, Natriuretic, Sodium, Potassium.

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]. The study of plant species with diuretic effects is still a fruitful research in search of new diuretics. Diuretics are the drugs that increase the rate of urine flow; clinically useful diuretics also increase the rate of excretion of Na^+ (natriuresis) and an accompanying anion, usually Cl^- Most clinical applications of diuretics aim to reduce extracellular fluid volume (edema) by decreasing total body Nacl content. Although continued administration of diuretic causes a sustained net deficit in total Na^+, the time course of natriuresis is finite because renal compensatory mechanisms brings Na^+ excretion in line with the Na^+ intake, a phenomenon known as diuretic braking. Diuretics alter the excretion of other cations (e.g. K^+, H^+, Ca^{2+}, Mg^{2+}), anions (e.g. Cl^-, HCo_3^- and H_2Po_4) and uric acid. In addition diuretics may alter renal hemodynamics indirectly mediated by local prostaglandins synthesis[2].

Barleria prionitis L. (Family Acanthaceae; commonly known as Vajradanti), is an annual shrub, 1–3 feet high, found throughout tropical Asia and in South Africa. In indigenous system of medicine in India, the aerial parts (stem, leave & flower) are used in fever, toothache, inflammation, as diuretic & gastrointestinal disorders; bark in whooping cough as an expectorant; the whole plant and especially the roots are used as tonic[3-7]. Leaves, stem and root of *B. prionitis* possess antibacterial and anti-inflammatory activities[8-9]. Iridoid enriched fraction of aerial parts (leaves and stems) was reported for hepatoprotective activity in various acute and chronic animal models[10].The aqueous bioactive fractions are reported to possess hepatoprotective, antistress, and immunorestorative properties[11]. An aerial part was reported for barlerinoside, shanzhiside methyl ester, 6-*O*-*trans*-*p*-coumaroyl-8-*O*-acetylshanzhiside methyl ester, barlerin, acetylbarlerin, 7-methoxydiderroside and lupulinoside[12].

Despite the popular use of this species as a medicinal plant, there are no data about the pharmacological effect of flower of *B. prionitis* on diuretic activity. The aim of the present study was to evaluate the potential diuretic and natriuretic activities *Barleria prionitis* flower extract on different experimental animal.

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Material and Methods

Plant material

The *Barleria prionitis* flowers were procured from local area of Dhule (Maharashtra). The plant and plant material were identified and authenticated in Department of Botany, S.S.V.P.S. society's Dr. P. R. Ghogrey Science College, Dhule and Voucher herbarium specimens was deposited in the Departmentof Pharmacognosy of our College. The plant material was dried in sunlight, pulverized, passed through sieve no. 40 and stored in air tight container and used for further extraction.

Preparation of extract

The freshly collected *Barleria. prionitis* flowers were washed with distilled water and air-dried under the control conditions and powdered. The powder was subjected to Maceration with pure distilled water. The aqueous extract was dried and weighed. (yield 14.10 % w/w)

Experimental animals

Healthy male albino rats weighing 180-200 g were used for the study. The animals were maintained in polypropylene cages of standard dimensions at a temperature of 37 ± 1°C and standard 12h : 12h day/night rhythm. The animals were fed with standard rodent pellet diet (Hindustan Lever Ltd.) and water *ad libitum*. Prior to the experiment, the animals were acclimatized to the laboratory conditions. The experimental protocol was approved by Institutional Animal Ethical Committee (IAEC) constituted under CPCSEA.

Drug Treatment

The BPF extract (suspended in 1% carboxy methyl cellulose) at the dose levels of 100, 200 mg/Kg body wt., p.o. was administered once daily for three consecutive days. Furosemide (20 mg/Kg; p.o.) was used as standard for diuretic activity. Control group of animals (n=6) received suspension of 1% CMC in distilled water(10 ml/Kg)

Experimental design

Thee animals were divided into 4 groups of 6 rats each as follows; Group I: received only 1% g CMC Group II: received Furosemide 20 mg/kg, Group III: received AEBP 100 mg/kg body weight p.o., Group III: received AEBP 200 mg/kg body weight p.o.

Diuretic activity

Rats were fasted overnight and treated with vehicle, Furosemide and AEBP as stated above along with normal saline (50 ml/kg). The rats were placed in metabolic cages and the urine samples were collected for 24h, measured using a standard measuring cylinder. The amount of urine (in ml) collected for 24 h was compared and tabulated[13].

Natriuretic activity

Estimation of Sodium and Potassium content of the urine samples of all groups of animals were done by using a laboratory model flame photometer. The ratio of Na^+/K^+ is calculated for Natriuretic activity. A value greater than 2.0 indicates a favorable Natriuretic effect. Ratio greater than 10.0 indicates a potassium sparing effect[14].

Statistical analysis

The results were expressed as mean ± S.E.M. Statistical comparisons were made by means of Dunnet's '*t*' test and *p* values smaller than 0.05 was considered as significant.

Results and discussion

Table -1 shows the urine volume collected in 24 h for all the groups. It is evident that the extract treated groups excreted more urine than the control groups. The extract at 200 mg/kg exhibited comparable effect with that of the reference drug Furosemide 20 mg / kg and the results were statistically significant. Table -2 shows the sodium and potassium content of the urine for all groups. The amount of Sodium excreted was increased for Furosemide treated group; statistically significant rise in Na^+ excretion was also noticed for AEBP treated groups. The potassium content excreted in the urine was statistically insignificant for all the groups. The Natriuretic effect was calculated by employing the formula Na+ / K+. It was found that the extract treated groups possess favorable Natriuretic effect. The present study showed that the aqueous extract of *B. prionitis* significantly increases the urine output and excretion of urinary sodium and had no effect on the urinary potassium excretion. Diuretics have two separate connotations; increase urinary par se and net loss of solute (i.e. electrolyte) and water (i.e. saluretic). These two processes are involved in the suppression of renal tubular reabsorption of electrolytes, water and low molecular weight organic compounds into the blood stream and a consequence; promote the formation of urine [15]. An attempt to extrapolate the diuretic action of plant extract from rats to man using the activity of Furosemide in the organism as a guideline has been reported. The results clearly shows that the AEBP at doses of 100 and 200 mg / kg produced significant dose dependent increase in urinary excretion and urinary sodium loss but no effect on urinary potassium loss with respect to control and standard drug treated groups. The data demonstrates that the extract has diuretic effect, Natriuretic effect but no potassium sparing effect and is as potent as Furosemide. This indicates the use of AEBP as a diuretic agent based on a sound mechanistic background. Also the excretion of potassium ions was similar to the untreated group, which rule out the possibility of hypokalemia and associated ototoxicity [16].

Conclusion

From the above results, it is concluded that *Barleria prionitis* used by tribals traditionally showed significant diuretic activity.
The experimental evidence obtained in the laboratory model could provide a rationale for the traditional use of this plant as diuretic.

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Table 1: Diuretic activity of *Barleria prionitis* (urine Volume) in 24 h

Group	Treatment	Urine volume
I	1% CMC	7.7±0.59
II	Furosemide (20 mg / kg)	12.58±0.80**
III	AEBP (100 mg / kg)	12.58±0.80**
IV	AEBP (200 mg / kg)	11.61±0.69

Values are Mean ± SEM, n=6, *p<0.05, **p<0.01.

Table 2: Natriuretic activity of *Barleria prionitis*

Treatment	Na+	K+	(Na+/K+)
1% CMC	1.67±0.04	0.64±0.02	3.092
Furosemide (20 mg / kg)	3.16±0.06***	0.78±0.02*	4.051
AEBP (100 mg / kg)	1.93±0.07*	0.69±0.02NS	3.574
AEBP (200 mg / kg)	2.87±0.10**	0.66±0.16NS	5.125

Values are Mean ± SEM, n=6, *p<0.05, **p<0.01, ***p<0.001, NS - not significant