EVALUATION OF DIURETIC ACTIVITY OF *Achyranthes aspera* (Chirchita) IN GOATS

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ABSTRACT

The investigations were carried out to evaluate the diuretic activity by oral administration of aqueous extract of *Achyranthes aspera* (Chirchita) at dose level of 3.00 g/kg b.wt. in goats. Furosemide at dose level of 5.0 mg/kg b.wt. was used as standard diuretic drug. The effects of *Achyranthes aspera* on diuresis, pH, creatinine, urea and electrolytes (Na^+, K^+, Cl^-, HCO_3) in blood and urine samples were studied. The plant extract treated goats showed high diuretic effect as compared to control but this effect was less than furosemide. Significant increase in renal clearance of sodium, potassium, chloride and bicarbonate was observed in plant extract treated and furosemide treated goats.

Key words: Diuretic activity, *Achyranthes aspera*, goats

INTRODUCTION

Diuretics alter renal function in a clinically useful manner by promoting the formation of urine and thereby aid in elimination of excess liquid and toxic products from the tissues and circulation. Synthetic diuretics are very useful in the treatment of various ailments related to renal system. However, serious side effects like Hypeuricemia, acidosis, gastric irritation and high level of blood sugar (Deniels and Jorgesen, 1977) associated with them have revived the interest in natural diuretics of plant origin.

Medicinal value of plants is due to the presence of chemical substances like alkaloids, glycosides and saponins that produce a definite physiological action on living system. Our folkloric literature is full of plants with reported diuretic activities (Said, 1970) but no authentic scientific data is available about their reported claim. Therefore, it has been planned to compare the diuretic activity of aqueous extract of *Achyranthes aspera* with that of synthetic diuretic furosemide.

MATERIALS AND METHODS

Authentic samples of seeds of *Achyranthes aspera* (Chirchita) were purchased from a herbal store. A known amount (300g) of ground seeds was boiled with distilled water for half an hour, cooled and volume of filtrate was made to 100ml. This extract represented 3g of seeds/ml of the aqueous extract. Experiment was conducted on 15 female healthy goats of almost same weight and age kept under similar conditions of grazing and management. The body weight of goats ranged between 27 and 33 kg.

The experimental goats were divided into three groups, with five animals in each group. Animals of group I (standard group) were given Furosemide while animals of group. II served as control. Goats of group III (treatment group) were given aquous extract of *Achyranthes aspera*, as detailed below:

Experimental Procedure

After restraining the animals properly, a balloon catheter was introduced in to the urinary bladder of each animal for collections of urine samples. A cannula was introduced in to the jugular vein for the collection of blood samples. Blood samples were taken in mid of two consecutive urine samples. The pH of blood and urine samples was noted immediately after collection. Blood samples was centrifuged for separation of plasma. Plasma and urine samples were preserved in a freezer at –20°C for further analysis. Before administration of drug or plant extract blood samples (5 mL) were collected from each goat of all groups, after fiteen minutes of which urine sample was collected. Thereafter the treatments were given and blood and urine samples were collected at 30 minutes interval upto 360 minutes.

Drug administration

Furosemide (5.00 mg/kg b.wt.), dissolved in distilled water, was orally administrated to each of five goats of standard group. Blood and urine sample were collected as given above.

Plant extract administration

The extract of plant was given to each of five goats of treatment group at the rate of 3.0g/kg b.wt. Blood and urine samples were collected as described above.

Analytical procedure

The concentrations of potassium and sodium in blood and urine samples were determined by flame photometer (Welcher, 1960). The concentrations of chloride and bicarbonate in blood and urine samples were estimated by titration method of Wagner (1956) and Herbert (1980), respectively. Creatinine concentrations in blood and urine samples were determined by using spectronic-21 according to the method of Bonsnes and Toussky (1945) by Jaffe reaction. Urea concentration in plasma and urine was estimated by manual method using spectronic-20 (Marsh *et al.*, 1965). The data were analysed by the analysis of variance using completely randomized design (Steel and Torrie, 1984).

RESULTS AND DISCUSSION

Achyranthes aspera extract was used as diuretic medicine and its effects on various blood and urine parameters were compared with standard furosemide. The diuresis values are given in Table 1 while the mean values of pH, Na^+, K^+, Cl^-, HCO_3^-, creatinine, urea and their renal clearance are given in Table 2.

It is clear from Table 1 that taking diuresis caused by furosemide as 100, orally administered plant extract resulted 52.7% increase in diuresis as compared to control. Moreover, maximum diuresis (0.156 ml min^{-1} kg^{-1} b.wt.) was caused by furosemide after 90 minutes of medication. These results are in accordance with the findings of Romanova and Rudzit (1989), who reported quick diuretic action of furosemide. In plants extract treated goats maximum diuresis (0.063 mL min^{-1} kg^{-1} b.wt.) was seen after 210 minutes of medication. These results justify the use of this plant in diuretic preparations by Hakeems.

It is evident from the Table 2 that the blood pH of furosemide treated goats increased towards alkaline side, although the change was non-significant statistically. A change towards alkaline side in blood pH of furosemide treated goats has previously been reported by Harkins *et al.* (1993). Similarly, a change towards higher pH value in blood of plant extract treated goats was observed which was also statistically non-significant. As for blood, statistically non-significant increase in urine pH of furosemide and plant treated goats than control was observed.

These results are justified by renal clearance of bicarbonate for which values were higher in furosemide and plant extract treated goats as compared to control. Blood sodium decreased significantly ($P<0.05$) in furosemide treated goats as compared to control but sodium contents of plants extract treated goats did not differ significantly from the control however, it was significantly ($P<0.05$) higher than that of furosemide treated goats. Regarding urine sodium contents, significant ($P<0.05$) increase in plant extract treated goats, as well as furosemide treated goats as compared to control was observed. These results suggest natriuretic nature of both furosemide and aqueous extract of *Achyranthes aspera* (Free-Stone *et al.*, 1988). It is evident from these results that blood potassium decreased significantly ($P<0.05$) in plant extract treated goats as compare to control and furosemide treated goats. For potassium in urine there was a significant ($P<0.05$) increase in plant treated goats than control and furosemide treated groups.

It is clear from the values (Table 2) that blood and urine chloride increase significantly ($P<0.05$) in furosemide and plant treated goats than control. However, the increase in furosemide treated goats was less than plant treated goats. The renal clearance of chloride was higher in furosemide treated goats than plant treated and control goats. These results are related to previous results by Knauf and Mustaschler (1995) and Hiari *et al.* (1992). The bicarbonates in blood and urine were present in higher concentrations in plant extract treated goats than furosemide treated goats and control. There was a significant ($P<0.05$) increase in renal clearance of bicarbonate in both plant and furosemide treated goats.

It is clear from Table 2 that the creatinine in blood and urine decreased significantly ($P<0.05$) in furosemide and plant treated goats as compared to control but the creatinine in blood and urine of furosemide treated goats was higher than plant treated goats. Thus, the renal clearance of creatinine is higher in furosemide treated goats as compared to plant treated goats and control.

Urea level in blood and urine samples was significantly higher ($P<0.05$) in furosemide and plant treated goats than control. This shows that renal clearance of urea is significantly higher in plant treated goats than control and furosemide treated goats.

Based on the results of the present study, it can be concluded that the aqueous extract of *Achyranthes aspera* (Chirchita) can be used as diuretic in goats. However, the evaluation of the alcoholic extract needs to be investigated.

Table 1: Effect of oral administration of furosemide and aqueous extract of *Achyranthes aspera* on diuresis in goats

Time (min)	Average ± SEM diuresis (ml.min-1 kg-1 b.wt.)			Percentage change than furosemide		
	Furosemide	Control	Plant extract	Furosemide	Control	Plant extract
0	0.000 ± 0.000	0.000 ± 0.000	0.000 ± 0.000	100	0.00	0.00
30	0.092 ± 0.012	0.021 ± 0.003	0.038 ± 0.005	100	28.40	41.2
60	0.145 ± 0.018	0.023 ± 0.001	0.058 ± 0.004	100	15.80	40.13
90	0.156 ± 0.028	0.019 ± 0.002	0.050 ± 0.007	100	12.17	32.05
120	0.111 ± 0.012	0.026 ± 0.002	0.060 ± 0.003	100	19.81	54.05
150	0.105 ± 0.018	0.015 ± 0.002	0.044 ± 0.008	100	14.28	41.07
180	0.171 ± 0.015	0.017 ± 0.002	0.059 ± 0.009	100	23.90	79.7
210	0.103 ± 0.044	0.022 ± 0.003	0.063 ± 0.007	100	21.00	61.16
240	0.076 ± 0.003	0.019 ± 0.004	0.054 ± 0.008	100	25.00	65.07
270	0.087 ± 0.009	0.025 ± 0.001	0.050 ± 0.009	100	31.03	57.47
300	0.068 ± 0.017	0.026 ± 0.004	0.060 ± 0.007	100	38.2	94.11
330	0.061 ± 0.018	0.022 ± 0.003	0.057 ± 0.008	100	36.06	93.44
360	0.019 ± 0.124	0.024 ± 0.004	0.061 ± 0.008	100	12.00	32.61
Average	0.097 ± 0.113	0.020 ± 0.001*	0.051 ± 0.004	100	20.60	52.5

* Significant ($P<0.05$) N.S. Non-significant

Table 2: Mean values of pH, Na^+, K^+, Cl^-, HCO_3^- creatinine and urea in blood and urine samples of control, furosemide and plant treated goats

	Control			Furosemide treated			Plant treated		
	Blood	Urine	Clearance $ml.min^{-1}\ kg^{-1}$	Blood	Urine	Clearance $ml.min^{-1}\ kg^{-1}$	Blood	Urine	Clearance $ml.min^{-1}\ kg^{-1}$
pH	7.677	8.521	---	7.709	8.868	---	7.680	8.540	---
Na^+ meq/L	40.632	26.966	0.013	37.058	36.139	0.088	40.502	38.490	0.048
K^+ meq/L	1.957	30.514	0.377	1.918	33.741	1.467	1.408	38.250	0.936
Cl^- meq/L	140.614	150.225	0.022	144.980	154.694	0.076	153.226	177.140	0.067
HCO_3^- meq/L	108.65	96.477	0.020	114.146	138.55	0.071	121.65	159.603	0.062
Creatinine µg/mL	80.141	1113.5	0.299	72.346	503.403	0.595	76.122	607.40	0.435
Urea µg/mL	1455.33	4889.00	0.005	1971.931	7569.65	0.026	2003.902	6465.19	0.057

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