

Evaluation of Diuretic Effect of an Indigenous Herbal Preparation in Goats

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ABSTRACT

Diuretic activity of a herbal mixture containing *Foeniculum vulgare* (saunf) and *Cichorium intybus* (kasni), *Cucumis melo* (Tukhme-khayareen) and *Cucumis sativus* (Tukhm-e-kharbooza) was evaluated by using furosemide as standard diuretic drug. Furosemide (@ 5 mg/kg body weight) and aqueous extract of herbal mixture (@ 0.4 gm/kg body weight) were administered orally to each of eight goats. Blood and urine samples were collected at half an hour interval and analyzed for electrolytes (Na^+ , K^+ , Cl^- and HCO_3^-), creatinine and urea. The herbal mixture was observed to increase diuresis by 29% as compared to furosemide. Significant increase in renal clearance of sodium and chloride with a significant decrease in renal clearance of potassium was observed in the treated goats.

Key Words: Diuretic; Herbal; Goats

INTRODUCTION

Synthetic diuretics, although very useful in the treatment of many diseases, yet serious side effects like hyperuricemia, acidosis, gastric irritation and high levels of blood sugar (Deniels & Jorgesen, 1977) associated with them have revived the interest in natural diuretics of plant origin. Folkloric literature is full of plants with reported diuretic activities and many of these plants form essential and important constituents of patented herbal diuretics (Said, 1970; Nawaz *et al.*, 1991, 1993). This paper describes the diuretic activity of aqueous extract of a herbal mixture containing equal amounts of *Foeniculum vulgare* (saunf), *Cichorium intybus* (Kasni), *Cucumis melo* (Tukhme-khayareen) and *Cucumis sativus* (Tukhm-e-kharbooza).

MATERIALS AND METHODS

Herbal preparation. Herbal mixture was made by taking equal amounts of seeds and roots of *Foeniculum vulgare* and *Cichorium intybus* and only seeds of *Cucumis melo* and *Cucum sativus*. A known amount of this mixture was boiled for half an hour with distilled water and filtered. The filtrate was made to a known volume so as to represent 0.1 g of the herbal mixture per milliliter of the extract.

Animals and dose levels. Experiments were conducted on eight healthy taddy goats with an average weight of 25 kg. The extract and furosemide were administered orally at the dose levels of 0.4 g and 5.0 mg per kg body weight, respectively.

Experimental procedure. A balloon catheter was introduced into the urinary bladder of each animal for the collection of urine, while jugular vein was cannulated for the collection of blood samples. Urine samples were collected at 0, 30, 60, 90, 120 and 150 minutes post-administration of trial drugs. Each blood sample was collected between two consecutive urine sample collections. Samples were analyzed for sodium, potassium by flame photometer, chloride and bicarbonates titrimetrically and creatinine and urea by colorimeter, as described previously (Nawaz *et al.*, 1993). Diuresis was calculated as volume of urine voided/minute/kg body weight and renal clearance by the formula:

$$\text{Renal clearance} = \frac{\text{Urine Concentration} \times \text{Diuresis}}{\text{Plasma Concentration}}$$

The data was analysed by the analysis of variance (Steel & Torrie, 1985).

RESULTS AND DISCUSSION

It is evident from Table I that oral administration of herbal mixture resulted in 29% increase in diuresis as compared with standard furosemide. The mean value of blood pH in furosemide treated goats was 7.78 while an increase ($P < 0.01$) in pH value (8.04) in the herbal mixture treated goats was observed. Similar difference in the urine pH was also recorded among the furosemide and herbal mixture treated goats. Compared with the

Table I. Mean \pm SE (n=8) values of different parameters in the furosemide and herbal mixture treated goats

Parameters	Furosemide	Herbal extract
Diuresis (ml/min. kg)	0.05 \pm 0.01	0.07 \pm 0.01
pH (blood)	7.78 \pm 0.04	8.04 \pm 0.02
pH (urine)	8.38 \pm 0.05	8.62 \pm 0.04
Creatinine (μ g/ml)		
Plasma	9.84 \pm 0.52	9.50 \pm 0.10
Urine	319.16 \pm 7.22	975.79 \pm 119.39
Urea(μ g/ml)		
Plasma	614.27 \pm 27.68	485.15 \pm 34.98
Urine	6376.16 \pm 336.53	12864.70 \pm 1081.40
Sodium (mEq/L)		
Plasma	158.01 \pm 1.74	109.50 \pm 2.95
Urine	179.42 \pm 7.74	345.39 \pm 25.35
Potassium (mEq/L)		
Plasma	6.24 \pm 0.10	5.12 \pm 0.10
Urine	332.91 \pm 33.67	12.23 \pm 0.83
Chloride (mEq/L)		
Plasma	124.10 \pm 0.41	87.69 \pm 0.96
Urine	118.00 \pm 10.70	177.60 \pm 30.18
Bicarbonate (mEq/L)		
Plasma	109.42 \pm 2.90	41.36 \pm 1.20
Urine	179.70 \pm 16.08	99.52 \pm 1.70
Renal Clearance (ml/min./kg)		
Creatinine	1.87 \pm 0.33	3.37 \pm 0.28
Urea	0.45 \pm 0.07	1.68 \pm 0.15
Sodium	0.06 \pm 0.01	0.07 \pm 0.01
Potassium	1.52 \pm 0.14	0.12 \pm 0.01
Chloride	0.04 \pm 0.01	0.06 \pm 0.01
Bicarbonate	0.06 \pm 0.01	0.12 \pm 0.03

furosemide, the plasma concentration of endogenous creatinine showed a decrease ($P<0.05$) while urine concentration increased ($P<0.05$) in the herbal mixture treated goats. The decrease in the plasma urea of the herbal mixture treated goats was significant. The urine concentration of urea increased significantly in the herbal mixture treated goats. The renal clearance of endogenous creatinine in the furosemide treated goats was lower ($P<0.05$) than the herbal mixture treated goats. A similar pattern was also seen in the renal clearance of endogenous urea.

The plasma level of sodium was lower ($P<0.01$ or 0.05) in the herbal mixture than in the furosemide treated group whereas the urine level of sodium was increased significantly. A significant increase in renal clearance of sodium in herbal mixture treated goats was also observed. There was no difference in the plasma levels of potassium in both furosemide and herbal mixture goats but the urine concentration was lower ($P<0.01$) in herbal mixture treated goats. A significant difference was found in the renal clearance of potassium in the experimental and standard groups of goats. The chlorides and the bicarbonates were lower ($P<0.05$) in

the herbal mixture treated plasma than the furosemide treated animals while the chlorides in urine increased and the bicarbonates in urine decreased significantly. The renal clearance of chlorides increased significantly while the renal clearance of bicarbonates increased non-significantly.

The diuresis in furosemide treated goats was 0.05 ± 0.01 ml/min/kg while in herbal mixture treated goats, it was 0.07 ± 0.01 ml/min/kg. It showed a marked diuretic effect at the dose level of 0.4 g/kg body weight as the percentage change in diuresis than the furosemide was 29%. The increase in renal clearance of sodium, chloride and bicarbonate has indicated that oral administration of aqueous extract of the herbal mixture tested has reduced absorption of sodium and chloride and it acted as natriuretic i.e. excretion of sodium and chloride and reabsorption of potassium. Moreover, reduced renal clearance of potassium further confirmed its natriuretic effect. All diuretics which reduce reabsorption of sodium and chloride act as antihypertensive by lowering blood pressure.

CONCLUSIONS

Based on the results, the herbal mixture containing *Foeniculum vulgare* (seeds), *Cichorium intybus* (roots), *Cucumis melo* (seeds) and *Cucumis sativus* (seeds) could be used as diuretic as well as a hypotensive preparation.

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