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DIURETIC ACTIVITY OF *COLEUS AROMATICUS* BENTH ON RATS

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ABSTRACT : *Water extract of the leaves of Coleus aromaticus Benth was tested for its diuretic activity in male albino rats. The study was carried out on normal rats using furosemide as a standard reference drug. Rats were treated with furosemide (4 mg/kg. p.o) and Coleus aromaticus (0.5 g/kg and 1.0 g/kg, p/o). Urine was collected and its volume was recorded. Urinary levels of sodium, potassium and chloride were estimated. Treatment with Coleus aromaticus produced diuresis. The urine output and electrolytes concentration was significantly increased. Hence, it is suggested, Coleus aromaticus leaves has diuretic activity on rats.*

INTRODUCTION

Diuretics increase the rate of urine flow and sodium excretion and are used to adjust the volume and composition of body fluids in a variety of clinical situations, including hypertension, heart failure, renal failure, hephrotic syndrome and cirrhosis. As number of diuretics like mannitol, thiazides, furosemide, ethacrinic acid are used in practice. Still there is need for more effective and less toxic diuretic. Many indigenous drugs have been claimed to have diruretic effect in Ayurvedic system of medicine but they were not properly investigated. Among these veral plants, *Boerrhavia diffusa*[1], *Spergularia purpurea*[2], *Urtica dioica*[3], *Strychnos potatorum*[4], *Dolichos biflorus*[5], etc. have shown excellent diuretic activity.

Coleus aromaticus Benth (Family: Labiatas) is a wonder plant and cultivated throughout India. The leaves of *Coleus aromaticus* juice is used in urinary diseases, calculus, dyspepsia, liver disease, chronic cough etc.[6-8]. In our laboratory, it was observed that the leaves of *Coleus aromaticus* has potentiality on urolithiasis[9]. The present study has been planned to evaluate and compare the diuretic activity of *Coleus aromaticus* leaves in albino rats.

MATERIALS AND METHODS

(i) Plant Extract: The plant material was identified by Botanical Survey of India, Howrah. The leaves were washed and shade-dried. The dried leaves made into a fine powder. Freshly prepared aqueous suspension was used diuretic study.

(ii) Animal: Male Wistar rats weighing 150 ± 5 g were used. The animals were grouped in polypropylene cages at an ambient temperature of 22 ± 1^{0}C with 12 h light and dark cycle. The animals were maintained with commercial rats fed and water *ad libitum*.

(iii) Experimental Procedure: Overnight fasted rats were divided into four groups, 6 animals in each, and treated as follows:

Group I : served as control and received distilled water.
Group II : treated with furosemide at the dose of 4 mg/kg, p.o.

Group III: rats received *Coleus aromaticus* at a dose of 0.5 g/kg, p.o.
Group IV: animals received *Coleus aromaticus* at a dose of 1.0 g/kg, p.o.

The rats were hydrated with 5 ml of distilled water / 100g body weight and placed in metabolic cages. Volume of urine collected for 24 hours were recorded, centrifuged and then estimated for sodium and potassium by using digital flame photometer. Chloride was estimated spectrophotometrically by Schales and Schales[10] method.

The urine volume excreted per 100g body weight was calculated for each group. The results of urine volume was expressed as Lipschitz- value [11], i.e., the ratio of T/C, in which T was the response of the test compound, and C, that of control. Indices of 1.0 and more were regarded as positive effect. The saluretic activity [12] ($Na^+ + Cl^-$) and natriuretic (Na^+/K^+)[12] of the test compound was also calculated. The values greater than 2.0 indicate a favorable natriuretic effect.

(iv) Statistical analysis: Unpaired Student's t-test was applied for statistical evaluation of the data. P value less than 0.05 considered as significant.

RESULTS AND DISCUSSION

Diuretics play an important role in situations of fluid overload, like acute and chronic renal failure, hypercalciuria, and cirrhosis of liver and also as an anti-hypertensive agent. NaCl in the body is the major determination of extra cellular fluid volume, and most clinical applications of diuretics are directed toward reducing extracellular fluid volume by decreasing total body NaCl content. A sustained imbalance between dietary Na^+ intake and Na^+ loss is incompatible with life[13]. The present study revealed that *C. aromaticus* leaves showed significant increase in urinary output. In the present study, *C. aromaticus* showed potent diuretic effect dose dependently. Urine volume was enhanced 82.5% when treated with *C.aromaticus* at the dose of 0.5% g/kg and 155.8% when given at 1 g/kg orally, whereas standard drug, furosemide showed 118.8% enhancement. These results were also expressed in Lipschitz value, in which indices more than 1.0 always considered as a positive effect. Here, the Lipschitz values were 1.82 in lower dose and 2.55 in higher dose, whereas, 2.18 were found in furosemide. Similarly, administration of *C.aromaticus* water extract, both higher and lower doses, statically enhanced the excretion of sodium (114.2% and 185.2% respectively) in 24 hours urine in rate. But furosemide showed was 146.6% increment in urinary sodium concentration. Furosemide contains sulfonamide moiety and known as loop diuretics. Because, it acts primarily in the thick ascending limb of the loop of Henle and has additional effects in the proximal tubules, however, the significance of these effects is unclear[14].

Some diuretics not only alter the excretion of Na^+, but also may modify renal handling of other actions like, K^+, H^+, Ca^{2+}, Mg^{2+} and anions like, Cl^-, HCO_3^-, $H_2PO_4^{-3}$. Administration of *C. aromaticus* water extract, both higher and lower doses, statistically enhanced potassium level (61.1% and 137.4% respectively) and also chloride level (55.5% and 92.6% respectively) in urine in normal rats (Table 1). Furosemide showed positive effect in potassium excretion (39.7%) but it did not altered chloride excretion significantly. Inhibitors of Na^+-K^+-$2Cl^-$ symport have in common an ability to block the Na^+-K^+-$2Cl^-$ symporter in the thick ascending limb of the loop of Henle or also in the proximal tubules[14]. Further, saluretic and natriuretic action of *C. aromaticus* leaves were noted by using standard formulas. It

was observed that, *C. aromaticus* leaves has potential saluretic effect 9119.9% and 181.5%, but did not any natriuretic action (Table 1), which are similar to furosemide 9141% saluretic effect.

In earlier studies it has been reported that *C.aromaticus* attenuated the urinary excretion of calcium and oxalate without affecting the phosphate in rats [9]. The modulatory role of *C.aromaticus* on ATP-ases and phosphohydrolases which are responsible in the process of calcification has also been observed[15]. The results obtained in this study indicate that *C. aromaticus* exhibited not only enhanced the urine volume but also helps in urinary electrolyte excretion, namely, sodium, potassium and chloride. Whereas, furosemide showed significant enhancement in volume as also in sodium and potassium excretion, but did not effect in chloride levels. Hence, it is suggested, leaves of *C.aromaticus* may be effective in the therapy of fluid overload in human. Further studies can be done using different models to evaluate the mechanism of action and compare with other known diuretics.

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Table 1 : Effect of *Coleus aromatics* leaves on urinary volume, sodium, potassium and chloride concentration in normal rats.

Group	Treatment	Volume of Urine (ml/24h)	Sodium (mEq/24h)	Potassium (mEq/24h)	Chloride (mEq/24h)
I	Control	4.28 ± 0.20	6.55 ± 0.42	21.65 ± 2.05	0.27 ± 0.03
II	Furosemide (4mg/kg, p.o)	9.35 ± 0.61* (+118.4%)	16.15 ± 0.87* (+146.6%)	30.25 ± 1.62* (+39.7%)	0.34 ± 0.07^{NS} (+ 25.6%)
III	C. aromaticus (0.5 g/kg, p.o)	7.81 ± 0.52* (+82.5%)	14.03 ± 0.52* (+114.2%)	34.88 ± 1.30* (+61.1%)	0.42 ± 0.01* (+55.5%)
IV	C. aromaticus (1.0 g/kg, p.o)	10.95 ± 0.28* (+155.8%)	18.68 ± 1.14* (+185.2%)	51.93 ± 3.30* (+137.4%)	0.52 ± 0.03* (+92.6%)

n = 6 in each group; Values are Mean ± SEM; * indicate P<0.001 when compared with Group I; NS means not signifant; Parenthesis indicate Percent changes when compared with Group I.

Table 2 : *Coleus aromatics* leaves on diuretic, saluretic and potassium sparing activity in rats.

Treatment	Diuretic activity (LIPSCHITZ value)	Saluretic activity ($Na^+ + Cl^-$)	Natriuretic activity (Na^+/K^+)
Control	-	6.82 0.30	
C. aromaticus	1.82 14.45	(+111.9%)	0.40
(0.5 g/kg, p.o) *C. aromaticus*	2.55 19.2	(+181.5%)	0.35
Furosemide (4 mg/kg, p.o)	2.18 16.47	(141.5%)	0.53

LIPSCHITZ values indicated positive results (>1);
Parenthesis indicate Percent Change when compared with Group I;
Natriuretic activity showed negative results (>2)