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DIURETIC ACTIVITY OF ETHANOLIC EXTRACTS OF *FICUS CARICA L.* FRUITS

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ABSTRACT

Ethanol extracts of *Ficus carica L.* fruits were tested for diuretic activity in rats. The parameters studied on individual rat were total urine volume, urine concentration of Na+, K- and Cl-. In the present study ethanol extracts of *Ficus carica, L.* (100 and 200mg/kg of body weight) showed an increase in urine volume, cation and anion excretion. Furosemide was used as the reference diuretic. Based on the above results, we can conclude that *Ficus carica L.* treatment produced a marked diuresis when rats were acutely treated. In our study, no lethality was observed at least for the dose (2000mg/kg body weight), and duration used. The best results of urine output observed with the ethanolic extract of *Ficus carica L.* fruits obtained through this evaluation. These findings support the traditional uses of *Ficus carica L.* as diuretic agents.

Keywords: *Ficus carica L.,* diuretic activity, Lipschitz test.

INTRODUCTION

Diuretics not only alter the excretion of Na^+ but also may modify renal handling of other cations (*e.g.,* K^+, H^+, Ca^{2+}, and Mg^{2+}), anions (*e.g.,*Cl^-, HCO_3^-, and $H_2PO_4^-$), and uric acid. In addition, diuretics may alter renal hemodynamics indirectly. Diuretics remain the cornerstone for the treatment of edema or volume overload, particularly that owing to congestive heart failure, ascites, chronic renal failure, and nephrotic syndrome. Naturally occurring diuretics include caffeine in coffee, tea, and cola, which inhibit Na + reabsorption. Hence search for a new diuretic agent retains therapeutic efficacy and yet devoid of potassium loss is justified [1,2].

Ficus carica L. (family-Moraceae) is a tree of small dimension that produces copious milky latex and fruits, which are actually a synconium, i.e. a fleshy hollow receptacle with a small opening at the apex partly closed by small scales. The latex of the unripe fruit and other parts of the tree cause severe irritation to the skin, if not removed promptly. The latex is widely applied on warts, skin ulcers, soresand abnormal growth. It also lowers the levels of total cholesterol, triglycerides and total cholesterol/HDL cholesterol ratio. In addition, *Ficus carica L.* has been used to treat many other medical conditions such as cough, flu, asthma, cancer, abscesses, constipation, diabetes, gingivitis and used as a diuretic [3]. The aim of this present study was the diuretic activity of ethanolic extracts of *Ficus carica* fruits.

MATERIALS AND METHODS

Plant material

The fruits of *Ficus carica L.* was collected from Tirumala hills, Tirupati, Andhra Pradesh. India. It was identified and authenticated by Prof. *Madhava Chetty, K.*, Taxonomist, S.V. University, Tirupati, Andhra Pradesh, India. A voucher specimen has been kept in our laboratory for future reference.

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Preparation of plant extract

The collected whole plant was dried at room temperature, pulverized by a mechanical grinder, sieved through 40mesh. About 100g of powdered materials were extracted with Ethanol (90%) using soxhlet apparatus. The extraction was carried out until the extractive becomes colourless. The extract is then concentrated and dried under reduced pressure. The solvent free semisolid mass thus obtained is dissolved in tween 80 and used for the experiment. The percentage yield of prepared extracts was around 10.5%w/w.

Animals Used

Albino rats (180–200 g) of either sex were maintained in a 12 h light/dark cycle at a constant temperature 25 ◦C with free access to feed (Sai durga feeds and foods, Bangalore) and water. All animals were fasted prior to all assays and were allocated to different experimental groups each of six rats. Moreover, the animals were kept in specially constructed cages to prevent coprophagia during the experiment. All experiments were carried out according to the guidelines for care and use of experimental animals and approved by Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA). Ethical committee clearance was obtained from IAEC (Institutional Animal Ethics Committee) of CPCSEA.

Acute toxicity study

The acute toxicity of Ethanol extracts of *Ficus carica L.* fruit was determined as per the OECD guideline no. 423 (Acute Toxic Class Method). It was observed that the test extract was not lethal to the rats even at 2000 mg/kg doses. Hence, $1/10^{th}$ (200mg/kg) and $1/5^{th}$ (400mg/kg) of this dose was selected for further study [4].

Diuretic activity

Group I received 2% v/v aqueous tween 80 solutions (5ml/kg, p.o.). Group II received Furosemide (100mg/kg, i.p), Group III and Group IV received 200 and 400mg/kg of EEFC suspended in 2% v/v aqueous tween 80 solutions, p.o. respectively. Four groups of six rats in each and were fasted and deprived of water for eighteen hours prior to the experiment. The first group of animals serving as control, received 2% v/v aqueous tween 80 solutions (5ml/kg, p.o.); the second group received furosemide (100 mg/kg, i.p.) in 2% v/v aqueous tween 80 solutions; the third, fourth groups received the EEFC at the doses of 200 mg/kg and 400 mg/kg respectively, in 2% v/v aqueous tween 80 solutions. The animals were fasted overnight (18 h) prior to the test but with free access to tap water only and then drugs were administered to respective groups. Immediately, after administration, the animals were placed in metabolic cages, specially designed to separate urine and feaces, kept at room temperature of 25± 0.5°C throughout the experiment. The urine was collected in measuring cylinders up to 5 h after dosing. During this period, no food or water was made available to animals. The parameters taken for individual rat were volume of urine output, total concentration of Na^+, K^+, and Cl^- in the urine. Na^+, K^+ concentrations were measured by Flame photometry [5], and Cl^- concentration was estimated by titration [6] with silver nitrate solution (N/50) using three drops of 5% Potassium chromate solution as an indicator. Appearance of brick red precipitate was taken as the end point [7,8].

The volume of the urine excreted in 5 h study by each group was expressed as percent of the liquid administered giving rise to a measure of "Urinary Excretion" (U.E) - Independent of group weight.

$$\textbf{Urinary excretion (U.E)} = \frac{\text{Total urinary output}}{\text{Total liquid Administered}}$$

$$\textbf{Diuretic Index} = \frac{\text{U.E in test group}}{\text{U.E in control group}}$$

$$\textbf{Lipschitz Value} = \frac{\text{Mean urine volume of test}}{\text{Mean urine volume of Standard}}$$

Statistical analysis

The data were expressed as Mean ± S.E.M and statistically analyzed using one-way ANOVA followed by Tukey-Kramer's multiple comparison test, $p<0.05$ was considered as significant.

RESULTS AND DISCUSSION

The diuretic activity of the EEFC was significant when compared to control (Table 1). Furosemide (100mg/kg) treated animals very significantly ($p < 0.01$) increased the urinary output and electrolyte excretion of Na^+, K^+ and Cl^- as compared to control. The graded doses of the EEFC in 2% v/v aqueous tween 80 solutions showed a very significant increase in diuresis, natriuresis, kaliuresis and total chloride excretion, which was comparable to the action of Furosemide. The diuretic index of the two different doses, i.e., 200 mg/kg and 400 mg/kg body weight was found to be 2.0433 and 2.7154

respectively (Table 2) where the diuretic activity of EEFC at a dose of 400 mg/kg body weight was found to be extremely significant ($p < 0.01$).

Based on the above results, we can conclude that *Ficus carica L.* treatment produced a marked diuresis when rats were acutely treated. In our study, no lethality was observed at least for the dose (2000mg/kg body weight), and duration used. The best results of urine output observed with the ethanolic extract obtained through this evaluation. However, advanced toxicological studies remain to be performed in other animals before its recommendation to the clinical studies.

Table 1: Effect of Ethanol extract of *Ficus carica* (L.) on urine volume and electrolyte concentration in Rats.

Groups	Treatment & Dose	Mean urine volume (ml)	Electrolyte excretion			
			Na^+ mMoles/L	K^+ mMoles/L	Na^+/K^+ ratio	Cl^- mMoles/L
I	2% v/v tween 80 solution 5ml/kg, p.o	3.69 ±0.06	72.60±0.26	48.65±0.15	1.4922	103.65±0.16
II	Furosemide 100mg/kg, i.p	11.25±0.05**	120.30 ±0.35**	82.20 ±2.96**	1.4635	138 ±0.31**
III	EEFC 200 mg/kg, p.o	7.54 ±0.04*	102.25 ±0.35*	71.22 ±1.50*	1.4357	105.12 ±0.17*
IV	EEFC 400 mg/kg, p.o	10.02 ±0.05**	114.90 ±0.14**	74.36 ±1.14**	1.5452	128 ±0.22**

Values are expressed as mean ± SEM (n = 6); $*p < 0.05$ and $**p < 0.01$ compared with control (One way ANOVA followed by Tukey-Kramer's multiple comparison test).

Table 2: Diuretic effect of Ethanol extract of *Ficus carica* (L.) in comparison to control & standard.

Groups	Treatment & Dose	Diuretic Index	Lipschitz value
I	2% v/v aqueous tween 80 solution, 5ml/kg, p.o	--	--
II	Furosemide 100mg/kg, i.p	3.0487	--
III	EEFC 200 mg/kg, p.o	2.0433	0.6702
IV	EEFC 400 mg/kg, p.o	2.7154	0.8907

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