DIURETIC ACTIVITY OF FICUS *CARICA* L. EXTRACTS

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Abstract

This paper presents the study of diuretic activity of aqueous and alcoholic extracts of the leaves of *Ficus carica*. Extracts of *Ficus carica* was administred intraperitoneal to experimental rats at the doses of 1,4 mg/kg. Furosemide (30 mg/kg) was used as reference diuretic. The diuretic activity of the extracts was evaluated by measuring the urinary volume, cation and anion excretion and other parameters related to excretion. Extracts studied have significant diuretic effect, like a consecrated diuretic, observing only a slight increase in diuresis and elimination of K^+ in the group treated with ethanolic extract, and in the group treated with the aqueous extract is observed significant uricosuric effect.

Keywords: *Ficus carica* ,leaves, flavonoids, diuretic activity, furosemide

INTRODUCTION

Diuretics are drugs that increase the rate of urine flow, sodium excretion and are used to adjust the volume and composition of body fluids in a variety of clinical situations. Drug-induced diuresis is beneficial in threatening diseases such as congestive heart failure, nephritic syndrome, cirrhosis, renal failure, hypertension, and pregnancy toxaemia [5, 7]. The several plants, *Salvadora Persica L.* [2], *Salvia officinalis* L.[2], *Spilanthes acmella murr*[19], *Rubus idaeus* [20], *Tinospora sinensis* [5], *Hygrophila salicifolia* [10], *Phyla nodiflora* Linn. [16], *Lawsonia inermis* [14], *Lepidium sativum* [12], *Ficus glumosa* (Moraceae) [17] have been investigated for their excellent diuretic activity.

Ficus carica is a small sized tree which is one of the oldest medicinal plants used in Indian medicine. Literature studies indicate that the fig tree is cultivated since antiquity in general for medicinal use and as food for humans and animals.

Traditionally the plant is used for its therapeutic effects, namely: aphrodisiac, purgative, anti-inflammatory, expectorant, diuretic, anti-anxiety and sedative slightly but due to its pharmacological properties [1].

The leaves and the fruits are traditionally used as laxative, stimulant, against throat diseases, antitussive, emmenagogue and resolvent. The fig leaf decoction is used for hemorroids and fresh leaves are dabbed on warts [9].

Literature studies indicated the presence in the leaves of this species of flavonoids, cumarins, sterols, triterpenoids, antocyanins and other compounds that are responsible for the pharmacological effects. Because was been studied only diuretic activity of *Ficus carica* fruit extract, the purpose of this study is to determine the diuretic activity of *Ficus carica* leaf extracts (ethanolic and aqueous extracts).

MATERIAL AND METHODS

Plant material

Leaves of *Ficus carica* were collected from Arad (Romania) and dried at room temperature in the dark place. Before extraction dried leaves of *Ficus carica* was chopped into small pieces.

Chemicals:

All reagents and chemicals used in this work were of analytical grade.

Preparation and characterization of extracts

Flavonoid were extracted from *Ficus carica* by Soxhlet extraction (E1) and marinated extraction (E2). (Table nr. 1)

Extraction method	Soxhlet extraction (E1)	Marinated extraction (E2)
Solvent	Ethanol 70%	Ethanol 70%
Temperature	60°C	25°C
Extraction time	12 h	48 h

Table nr. 1. Specification of extraction methods

Characterization of the extracts was performed by determination of total flavonoids.

The amount of total flavonoids in the extracts was measured spectrofotometrically according to the Romanian Pharmacopeea method [15]. The amount of total flavonoid was expressed as percentage of Rutin in plant extracts. The concentration of flavonoids (rutin) in the sample was calculated from the calibration plot (Y= 0,6262X+0,0240; R^2 = 0,9934) and expressed as mg Rutin equivalent per mL extract.(Table nr. 2)

Table nr. 2. Flavonoid content in extracts of *Ficus carica leaves*

Extracts[a]	Flavonoid (rutin) mg/mL extract	Flavonoids g% (rutin, %)
E1	0.613±0.01	2.452±0.10
E2	0.895±0.03	3.580±0.05

[a]All experiments given bellow were carried out free time. All dates are expressed as means ± standard deviation

Experimental animals

For experiment were used male albino rats Wistar Brastislava. The animals were maintained under standard conditions of temperature, humidity and light- dark cycle (12h-12h). The experimental protocol has been approved by the Institutional Animal Ethics Committee and Directive 2010/63 / EU of the European Parliament and of the Council on the protection of animals used for scientific purposes.

Determination of diuretic activity

The metod described by Mogosan [4, 6, 11, 18] was used. At the start of the experiment all the animals were hydrated in a uniform maner and receiving by gavage 2,5 mL of normal saline (0.9%)/ 100 mg body weight. The animals were divided into four group of eight animals each as follow:

Group 1 – received IP 1 mL deionized water / kg body weight

Group 2 – received IP diuretic reference furosemide 30 mg/kg body weight (1 mL solution/rats)

Group 3–received IP *extract* E1 of *Ficus carica* 1.4 mg/kg body weight (1mL/rats)

Group 4 – received IP *extract E2* of *Ficus carica* 1.4 mg/kg body weight (1mL/rats)

After administration, animals were placed in an metabolic cages. The urine was collected in a graduated cylinder after 24 h of the administration. Volume of urine was calculated in relation to body weight and expressed in mL/24 h/kg.

Electrolite concentration (Na^+ an K^+) were estimated. Na^+ was dosed using reference elector Ag/AgCl and Na^+ selective electrod. The results was expressed as mM/24h/kg body weight(20). Potassium (K^+) was quantified throught potentiometer using referece electrode Ag/AgCl and selective K^+ electrod. The results was expressed as mM/24 kg.

Uric acid was dosed colorimetric at 670 nm wavelength and the results are expressed
in mg/24 h/kg [5] .

Statistical analysis

The results are expressed as mean values ± standard error of mean. Was also calculated diuretic index and saluretic index, between the content

Groups	Drugs	Doze (mg/kg)	Urinary volume ml/24 h/kg	Saluresis Na^+(mM/24h/kg)	Saluresis K^+(mM/24h/kg)	Acid uric mg/24 h/kg
1	Deionized water	-	18.47±2.80	4.98±0.75	1.16±0.17	0.25±0.03

of sodium or potassium ions excreted in the urine.

RESULTS AND DISCUSSION

The results are listen in table nr. 3 and table nr.4.

2	Furosemide	30 mg/kg	46.22±6.26	6.07±0.82	4.26±0.57	1.33±0.18
3	Extract E1	1.4mg/kg	26.46±2.60	4.93±0.48	2.25±0.22	0.49±0.05
4	Extract E2	1.4mg/kg	20.32±4.47	3.55±0.78	1.48±0.32	1.56±0.34

Table nr. 3. Diuresis, saluresis and urinary excretion of uric acid for studied products

Table nr.4. Diuretic index and saluretics index for experimental groups

Group 1, considered control presents a diuresis at 18,47±2,80 ml /24 /kg, and saluresis of 4,98±0,75 mM / 24 / kg Na^+ and 1,16±0,17 mM / 24 / kg K^+, and the elimination of uric acid in the urine at 0,25±0,03 mg / 24 h / kg.

For group treated with diuretic reference -furosemide at 30 mg / kg, the diuretic saluretics, diuresis being 46,22±6,26 ml / 24 hours / kg, saluresis at 6,07±0,82 mM / 24h / kg Na^+ and 4, 26±0,57mM / 24 / kg K^+, and the elimination of uric acid 1,33±0,18 mg /24 h / kg.

Group 3 treated with ethanolic extract of *Ficus carica* 1.4 mg / kg presents a diuresis of 26,46±2,6 ml/24/kg, a saluresis of 4,93±0,48 mM / 24 / kg Na^+ and 2.25±0,22 mM / 24 / kg K^+, and urinary excretion of uric acid is 0,49±0,05 mg / 24 h / kg.

Group 4 treated with *Ficus carica* L. aqueous extract of 1.4 mg / kg presents a diuresis of 20,32±4,47 ml / 24 / kg, a salureză of 3,55±0,78 mM / 24 / mM Na^+ and 1,48±0,32 kg / 24h / kg K^+, and the elimination of uric acid in the urine 1,56±0,34 mg / 24 h / kg.

Diuresis groups treated with dyes studied is significantly increased compared to the control group. There is a slight increase in diuresis for the group treated with ethanolic extract of *Ficus carica* 1.4 mg / kg and a significant increase in diuresis for the group treated with furosemide 30 mg / kg.

Saluresis reported to the sodium ions presents similar values with

Group	Drugs	Dose	Diuretic Index	Saluretic Index Na^+	Saluretic index K^+
1	Deionized water	-	-	-	-
2	Furosemide	30 mg/kg	2.50	1.21	3.67
3	Extract E1	1.4 mg/kg	1.43	0.98	1.93
4	Extract E2	1.4mg/kg	1.10	0.71	1.27

to the group treated with ethanolic extract of *Ficus carica* and also for the group treated with the same dose of aqueous extract of *Ficus carica*. An increased removal of sodium ions is noted in the group treated with furosemide with an index greater than one saluretics.

Saluresis reported to the potassium ions is significantly increased in the group treated with ethanolic extract of *Ficus carica* and the group treated with aqueous extract of *Ficus carica* showing similar values to the control group. Saluresis values obtained in the group treated with ethanolic extract of *Ficus carica* (IS = 1.93) remain below to the group treated with furosemide 30 mg / kg, with an saluretic index for potassium. 3.67 .

The uricosuric effect appreciated by the amount of uric acid excreted in urine is present in the groups treated with furosemide 30 mg / kg and aqueous extract of *Ficus carica* 1.4 mg / kg, values were significantly higher in both cases the diuretic reference .

CONCLUSIONS

It can be concluded that the two extracts studied have significant diuretic effect, like a diuretic consecrated (furosemide), observing only a slight increase in diuresis and elimination of K^+ in the group treated with ethanolic extract of *Ficus carica* 1.4 mg/kg.

It is noted for the group treated with aqueous extract of *Ficus carica* 1.4 mg / kg significantly uricosuric effect, which could be a benefit for patients with high increased uric acid levels.

The aqueous and ethanolic extract showed a dose-dependent increase in urine excretion. The investigation of chemical composition of extracts indicated the presence of flavonoids in ethanolic and aqueous extract. It was suggested that this compound which could be responsable for the diuretic activity. The efect may be produced by inhibition of tubular reabsorbtion of water and anions, and the result being diuresis.

These result was concluded that the extracts of *Ficus carica* L. showed diuretic activity; ethanolic extract showed more activity than aqueous extract..

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