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Evaluation of Diuretic Activity of *Samanea saman* (Jacq) Merr bark in Albino Rats

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ABSTRACT

The diuretic potential of methanol extract of the bark of *Samanea saman*(Jacq) Merr was assessed in albino rats using *in-vivo* Lipschitz test model. The volumes of urine, urinary concentration of sodium, potassium and chloride ions were the parameters of the study. Furosemide was used as standard. The results indicate that methanol extract at a concentration of 200 mg/kg and 400 mg/kg body weight shows an increase in the urine volume and electrolyte excretion when compared to control. Thus the methanol extract of the bark of *Samanea saman*(Jacq) Merr showed a significant diuretic activity. From the present study it may be concluded that the phytoconstituents present in methanol extract may be responsible for diuretic activity.

Keywords: Diuretic, Lipschitz test, electrolyte excretion, *Samanea saman*(Jacq) Merr.

INTRODUCTION:

Samanea saman(Jacq) Merr is a large umbraculiform tree growing over 20 meters height with a stout trunk about 1.5

m in diameter and large spreading canopy providing shade. Branches are widespread more or less deciduous. Bark is rough and

furrowed. It is valuable as a shade tree in pastures, stimulating grass growth. The leaves fold together on the approach of rain hence named as RAIN TREE. Saponin-like alkaloid pithecolobin has been isolated from the bark and the seed. Alkaloids are said to be abundant in the bark, stems, leaves, and seeds. Leaves and stems have saponin and tannin; gum is present in the trunk. Additionally steroids, cardiac glycosides, terpenoids are also present in the plant. The plant is used in acute bacillary dysentery, enteritis, diarrhea, colds, sore throat and headache.

OBJECTIVE:

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 many life threatening disease conditions such as congestive heart failure, nephritic syndrome, cirrhosis, renal failure, hypertension, and pregnancy toxemia [1]. Most diuretic drugs have the adverse effect on quality of life including impotence, fatigue, and weakness. Naturally occurring diuretics include caffeine in coffee, tea, and cola, which inhibit Na⁺ reabsorption

MATERIALS AND METHOD:

Collection of plant:

A decoction of the inner bark or fresh cambium and leaves are used to treat anaphylactic dermatitis, eczema, skin pruritus. Latex used as gum arabic for gluing. In Venezuela, rain tree is a traditional remedy for colds, diarrhea, headache, intestinal ailments and stomach ache. Root decoction is used in hot baths for stomach cancer. In the West Indies, the leaf infusion is used as a laxative and seeds are chewed for sore throat. The alcoholic extract of the leaves are used to treat tuberculosis. In Columbia, the fruit decoction is used as a sedative.

and alcohol in beer, wine and mixed drinks, which inhibit secretion of ADH [2, 3]. Diuretics relieve pulmonary congestion and peripheral edema. These agents are useful in reducing the syndrome of volume overload, decreases cardiac workload, oxygen demand and plasma volume, thus decreasing blood pressure [4]. No systematic studies have been reported for diuretic activity of *Samanea saman*(Jacq) Merr bark. Hence an effort has been made to establish the diuretic activity of alcoholic extracts of *Samanea saman*(Jacq) Merr.

The fresh barks of *Samanea saman*(Jacq) Merr were collected in the month of July from Ambattur, Chennai, Tamil Nadu state, India, and authenticated by Prof. P Jayaraman, Ph.D., Plant Anatomy

Research Centre, Chennai, Tamil Nadu.(Reg.No: PARC/2010/567). The voucher specimen was deposited at the department for future reference.

Extraction of plant material

About 400g of air dried powdered bark was taken in 1000ml soxhlet apparatus and extracted with petroleum ether for 2 days. At the end of second day the powder was taken out and it was dried. After drying it was again packed and extracted by using methanol as solvent, till

colour disappeared. The temperature was maintained at 55°C-65°C. After that, the extract was concentrated by distillation and solvent was recovered. The final solution was evaporated to dryness and dry residue was obtained.

Experimental animals:

Male Albino rats, weighing 150-200g were used in the present study. All the rats were kept at room temperature (24°C±2) in the animal house. All the animals were housed and treated as per the internationally accepted ethical guidelines for the care of laboratory animals. Prior to the experiments, rats were fed with standard

food and were acclimatized to laboratory conditions. All the experimental procedures were performed on animals after approval from the institutional ethics committee and in accordance with the recommendations for the proper care and use of laboratory animals.

Preliminary phytochemical analysis:

The preliminary phytochemical analysis [5,6] were carried out to find out the phyto constituents present in the crude extracts.

Diuretic activity:

The method of Lipchitz [7] was employed for the evaluation of diuretic activity. The Male Albino rats 150 -200g were divided into four groups of six rats in

each and were fasted and deprived of food and water for 18hrs prior to the experiment. On the day of experiment, the group I animals serving as control,

received normal saline (25ml/kg,p.o), the group II animals received methanolic extract (200mg/kg,p.o) and group III animals also received methanolic extract (400mg/kg,p.o), the group IV animals received Furosemide (20mg/kg,p.o), respectively, in normal saline. Immediately after the administration the

Estimation of electrolytes in urine:

The concentration of Na⁺ and K⁺ were measured by flame photometry [8] and Cl⁻ concentration was estimated by titration

Statistical analysis:

All the values are expressed as mean ± S.E.M for groups of six animals each. Analyzed by one way ANOVA and compared by using Tukey- Kramer

RESULTS:

The methanolic extract obtained was subjected to various phytochemical tests and the results were given (Table 1). The results of the evaluation of diuretic activity carried out on the methanol extract of *Samanea saman* (Jacq) Merr are listed (Table 2 and 3). Table 2 shows the urinary volume (ml/kg/5h) and Table 3 shows other parameters related to excretion of electrolyte (Na⁺, Cl⁻ and K⁺) content (µmol/kg) of urine of the animals. The reference diuretic (Furosemide), increased urine volume up to 7.95±1.40. For the

animals were kept in metabolic cages (3 per cage) specially designed to separate urine and faecal matter and kept at room temperature of 25 ± 0.5° C throughout the experiment. The total volume of urine was collected at the end of 5hrs after dosing. During this period no water and food was made available to animals.

with silver nitrate (N/50) using three drops of 5% potassium chromate solution as indicator [9].

multiple comparison test. The values are statistically significant at three levels, ***p<0.001. **p<0.01. *p<0.05.

methanol extract, the increase in urine volume at the doses of 200 mg/kg body weight and 400 mg/kg body weight was 5.46±0.21 and 6.52±0.90 (P<0.05), respectively, compared to the control group which was 2.82±0.55. It shows that the methanol extract of *Samanea saman* (Jacq) Merr, at high doses, may have equipotent diuretic activity as that of the Standard drug (Furosemide).

Table 3 shows the urinary electrolyte content following the administration of the extracts. The dose of 200 mg/kg and

400mg/kg methanol extract *Samanea saman* (Jacq) Merr produced a significant increase in Na⁺, K⁺ and Cl⁻ excretion, in a dose dependant manner when compared with the control group. The excretion of Na⁺ and K⁺ was very much significant at

the dose of 400mg/kg of methanol extract when compared to control. However urinary electrolyte excretion of 200mg/kg and 400mg/kg methanol extract *Samanea saman* (Jacq) Merr were less when compared with standard drug. Furosemide.

Table-1: Phytochemical screening of *Samanea saman* (Jacq) Merr

S.NO	PHYTOCHEMICAL CONSTITUNTS	METHANOLIC EXTRACT
1	Alkaloids	++
2	Saponins	++
3	Tannins	++
4	Terpenoids	++
5	Flavonoids	++
6	Carbohydrates	--
7	Cardiac glycosides	++
8	Phytosteroids	++
9	Amino acids	--
10	Gums	++

Table 2: Effect of *Samanea saman* (Jacq) Merr on Urine Volume

S.no	Treatment	Dose	Number of animals	Urine volume (ml/kg/5hr)	pH of urine
1	Normal Saline	25ml/kg	6	2.82±0.55	7.4±0.26

2	MESS	200mg/kg	6	5.46±0.21	7.2±0.39
3	MESS	400mg/kg	6	6.52±0.90*	7.1±0.14
4	Furosemide	20mg/kg	6	7.95±1.40**	7.2±0.21

Each value represents mean ± S.E (n=6) and was analysed by ANOVA Tukey-Kramer multiple comparison test. * $P < 0.05$, ** $P < 0.01$ compared with control group.

Table 3: Effect of *Samanea saman* (Jacq) Merr on Electrolyte excretion

GROUP	TOTAL Na+ ($\mu\text{mol/kg}$)	TOTAL K+ ($\mu\text{mol/kg}$)	TOTAL Cl- ($\mu\text{mol/kg}$)	Na+/K+ RATIO
I	98.94±3.08	21.30±5.18	41.65±6.64	4.64
II	132.07±14.91	45.43±2.99*	42.22±9.02	2.91
III	183.39±8.82**	63.62±4.35**	72.97±3.19*	2.88
IV	249.12±11.65**	87.92±9.17**	99.03±7.56**	2.83

Each value represents mean ± S.E (n=6) and was analysed by ANOVA Tukey-Kramer multiple comparison test. ** $P < 0.001$, * $P < 0.05$ compared with control group.

DISCUSSION:

The effect of methanolic extract of *Samanea saman* (Jacq) Merr on diuresis was accompanied by marked increase in urine volume and urinary Na⁺, K⁺ and Cl⁻. Higher doses of the extract of the plant may produce electrolyte and water excretion profile qualitatively similar to that of furosemide, albeit at a lower potency, due to the crude nature of the extract. Previous studies have demonstrated also that there are several compounds which could be responsible for the plants

diuretic effects such as flavonoids, saponins or organic acids [10].

The effect may be produced by stimulation of regional blood flow or initial vasodilation [11], or by producing inhibition of tubular reabsorption of water and anions [12], the result in both cases being diuresis. Preliminary phytochemical investigation of *Samanea saman* (Jacq) Merr has suggested the presence of flavonoids and steroidal compounds. It

may be suggested that these substances might be responsible, at least in part, for the observed diuretic activity and that they may act individually or synergistically.

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