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Diuretic activity of *Nyctanthes arbortristis* Linn.

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Abstract

Nyctanthes arbortristis Linn. is a well documented plant. The present study is done to establish the diuretic activity of the water-soluble portions of the ethanolic extracts of its flowers, barks, seeds and leaves. In toxicity study, the extracts were seen to be safe up to the dose of 2.0 gm/kg. For the estimation of diuretic activity, the parameters studied were total urine volume and urine concentration of Na^+, K^+ and Cl^-. The ethanolic extracts of different plant parts of *Nyctanthes arbortristis* L. possess significant diuretic activity as reflected by rise in urine volume with cation excretion. The ethanolic extracts of the seeds and leaves at their higher doses exhibited higher electrolyte excretion.

Key words : *Nyctanthes arbortristis* L., diuretic activity.

Introduction

Nyctanthes arbortristis Linn. (Fam.Oleaceae), commonly known as Harsingar or Night Jasmine, is a common wild hardy large shrub or small tree. It is a native of India, distributed wild in sub-Himalayan regions and southwards to Godavari. It is an ornamental plant in Indian gardens[1-3]. The rural people of Orissa use *Nyctanthes arbortristis* L. to cure various ailments. Its claimed traditional uses have been proved on scientific basis using in-vitro and in-vivo experiments [4-10]. Keeping in view of the medicinal importance of this plant an effort has been taken to establish the diuretic activity of the water-soluble portions of the ethanolic extracts of its flowers, barks, seeds and leaves.

MATERIALS AND METHODS

Plant materials :

The flowers, barks, seeds and leaves of *Nyctanthes arbortristis* L. were collected from the gardens and forests of Orissa. The herbarium of the plant (CNH/I-I (20)/2005-Tech-II/254)was authenticated as *Nyctanthes arbortristis* L. (Fam.Oleaceae) from Botanical Survey of India, Kolkata.

Preparation of extracts :

After drying properly, the leaves, barks and seeds were powdered coarsely and then were extracted successively with petroleum ether, chloroform and ethanol (90%) [8-10]. Its fresh flowers were extracted with ethanol (50%) [9-10]. The ethanolic extracts of leaves, barks, seeds and flowers were evaporated to dryness till these got concentrated to get dark gummy masses, having yield values 14%, 12.5%, 26.5% and 13% w/w respectively. The extracts were then subjected to preliminary chemical identification tests. The water-soluble portions of the extracts were subjected to the pharmacological screening.

Animals :

Wistar strains of albino rats weighing 150-180 g and Swiss albino mice weighing 18-22 g were obtained from the animal house of B.I.T., Mesra, Ranchi. They were kept under controlled environmental conditions allowing free access to food and water and acclimatized for at least a week before the commencement of the experiment. The animals were randomly distributed in control and test groups of six animals in each group. The Institutional Animals Ethics Committee (Registration No. 62/02/ac/CPCSEA) approved the experiments.

Toxicity study :

'Up and down' or 'staircase' method was followed for the estimation of acute toxicity of the ethanolic extracts of different plant parts of *Nyctanthes arbortristis* L.. The dose was increased from 400 mg/kg to 2.0 g/kg, body weight through intraperitoneal route of administration. The animals were observed continuously for the behavioral changes for the first 4 hours and then observed for mortality in any 24 hours after the drug administration [11,14].

Diuretic activity :

The diuretic activity of different plant parts of *Nyctanthes arbortristis* L. was estimated by the method of Lipschitz *et al* [12-14]. The animals were fasted and deprived of water for 18 hours. prior to the experiment. On the day of experiment, immediately after dosing, the rats were placed in the metabolic cages (2 in each cage), specially designed to separate urine and faeces. The urine was collected in measuring cylinder up to 5hrs after dosing during which no food and water was made available to the animals. Total urine volume, urine concentration of sodium, potassium and chlorine in urine were measured. The Na^+, K^+ levels were measured by flame photometry and Cl^-

level was estimated following Volhard-Arnold method by titration with silver nitrate solution (N/10) using ferric ammonium sulfate as indicator [15].

Statistical analysis :

Results were subjected to statistical analysis and expressed as Mean±S.E. ANOVA was used to establish significance of difference between the mean of the tests and control and $p<0.01$ and $p<0.001$ were considered to be significant.

Results

The ethanolic extracts were found to have carbohydrates, flavonoids, terpinoids, glycosides, sugars and tannins, whereas the seeds showed the presence of fats and leaves contain phytosterols. The ethanolic extracts were found to depress locomotor activity in mice, which may be due to CNS depression. The extracts were showed to be safe up to the dose of 2.0 gm/kg. From these, doses of 200, 400 and 600 mg/kg body weight were selected for the evaluation of diuretic activity.

Furesamide treated rats showed a significant increase in volume of urine and excretion of sodium, potassium and chloride ($p<0.001$) as compared to control, while the extracts were found to increase urine volume significantly ($p<0.01$) in a dose dependent manner. Higher electrolyte excretion ($p<0.001$) was observed in the ethanolic extracts of seeds and leaves at higher doses. The ethanolic extracts of the seeds and leaves were showed significant ($p<0.01$) increase in the chloride ion excretion. The ethanolic extract of the barks did not show remarkable increase in urinary sodium, potassium and chloride. The results are summarized in the Table 1.

Discussion

Diuretics relieve pulmonary congestion and peripheral edema. Application of diuretics to the management of hypertension has out stripped their use in edema by decreasing cardiac workload (preload), O_2 demand and plasma volume. These are also indicated in drug poisoning to promote its excretion. The extracts may be useful in these cases for their observed diuretic activity.

Increase loss of K^+ causes hypokalemia. The ethanolic extracts of flowers (600mg/kg), seeds and leaves of *Nyctanthes arbortristis* L. showed elevated levels of K^+ in urine, which may increase the risk of hypokalemia. The change in Na^+/K^+ balance is intimately related to renal control of acid-base balance.

Active principles such as flavonoids and terpinoids are known to be responsible for diuretic activity [16-17]. These active principles found to be present in the extracts may be responsible for its diuretic activity. Isolation of these active principles and study of their exact mechanism of action needs further investigation.

TABLE 1.
Diuretic activity of the ethanolic extracts of different plant parts of *Nyctanthes arbortristis* L.

Treatment	Dose (mg/kg)	Urine volume (ml)	Electrolyte Excretion			Percentage of Chlorine
			Na^+ µmoles/Kg	K^+ Mmoles/kg	Na^+/K^+	
Control (Saline water)	25 ml/kg	1.2±0.2	1877.67±2.52	878.33±3.512	1.796	0.651±0.009
Furesamide	100	8.23±0.309**	3815.67±9.44**	2545.0±8.35**	1.499	1.267±0.05**
NAF	200 400 600	1.725±0.005* 2.2±0.014* 2.5±0.004*	1598.75±36.46 1767.5±13.84 1851.75±19.46	897.5±20.83 904.5±22.12 928.75±8.46*	1.778 1.954 1.99	0.649±0.0003 0.648±0.0002 0.67±0.0011
NAB	200 400 600	1.325±0.011 1.925±0.011* 2.3±0.01*	1578.75±19.11 1586.25±21.84 1609.5±21.84	880.25±7.46 897.5±13.83 913.75±6.13	1.794 1.767 1.761	0.647±0.003 6.648±0.0002 0.670±0.0011
NAS	200 400 600	1.675±0.011* 2.6±0.01* 3.1±0.034*	1598.5±19.11 2029.25±10.46* 2193.25±24.46*	920.25±7.46 1223.25±24.46** 1353.023±3.89**	1.737 1.659 1.62	0.666±0.0003 0.757±0.0032* 0.905±0.0017*
NAL	200 400 600	1.425±0.005 2.433±0.104* 2.925±0.211*	1587.0±44.39 2018.0±15.63* 2193.25±14.46*	892.75±10.46 1257.67±6.25** 1288.75±36.46**	1.778 1.604 1.702	0.669±0.009 0.76±0.004* 0.876±0.012*

Values are represented in the form of mean±SEM; *p<0.01, **p<0.001.
NAF, NAB, NAS and NAL: Ethanolic extracts of the flowers, barks, seeds and leaves of *Nyctanthes arbortristis* L. respectively

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