

## Diuretic activity of *Alternanthera sessilis* R.Br. Ex D.C. An ethnomedicine of Chhattisgarh (India)

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### ABSTRACT

*Alternanthera sessilis* has been used to treat a wide assortment of diseases including diarrhea and dysentery (intestinal disorder), as a diuretic, as a cooling agent to treat fever, hepatitis, tight chest, bronchitis, asthma and lung troubles among others. We evaluated the diuretic activity of the chloroform insoluble fraction of defatted ethanolic extract of whole plant of *A. sessilis* (CIAE). Diuretic activity was determined in rats, by administering a single dose and thereafter determining the cumulative urine output. CIAE profoundly increased the cumulative urine out put (159.92%) compared to 142.09% increase by furosemide (13mg/kg). The extract altered the urinary pH. It also provoked a significant ( $p < 0.001$ ) increase in urinary excretion of Na<sup>+</sup> but lowered very slightly the excretion of K<sup>+</sup>, thus altering the Na<sup>+</sup>/K<sup>+</sup> ratio, suggesting a potassium-sparing effect. The results justify the use of *A. sessilis* as diuretic agent in the traditional medicine

**Key words:** Chhattisgarh, ethnopharmacology, *Alternanthera sessilis*, diuretic.

### INTRODUCTION

*Alternanthera sessilis* R.Br. ex D.C. (Amaranthaceae) is a very common weed found throughout India<sup>1</sup>. It has been used in Indian traditional system of medicine since a long time, for promoting memory and intelligence and externally for complexion; Bhavapraakasha attributed blood-purifying properties to this herb. During the 16<sup>th</sup> century, it was used in diseases due to vitiated blood, skin diseases, ulcers and wounds<sup>2,3</sup>. The plant is a good adjuvant with sex tonics and for females a natural galactagogue<sup>1</sup>, entire plant and its parts, alone or in combination with other plants are used traditionally throughout the world and in India for intestinal cramps, diarrhea and dysentery (intestinal disorder), as a diuretic, as a cooling agent to treat fever, hepatitis, tight chest, bronchitis, asthma and lung troubles, to stop bleeding, as a hair tonic, for itch, common skin problems such as cuts, burns,

eczema, boils, and leucoderma; poultice of pounded fresh material is used in sprains, carbuncle, erysipelas and acute conjunctivitis; the plant is also used for hazy vision and night blindness<sup>1-10</sup>.

A review of the literature revealed that diuretic activity of this plant has not been subjected to scientific evaluation, therefore this study was undertaken to investigate the diuretic potential of chloroform insoluble fraction of alcoholic extract (CIAE) using rats.

### MATERIAL AND METHODS

#### Plant material

Whole plants were collected from the fields around the campus of Indira Gandhi Krishi Vishvavidyalaya (Agriculture University), Raipur (Chhattisgarh), India, during the months of December and January 2004-05, authentication was

made by Prof. P. Jayaraman, Director Plant Anatomy Research Centre; Chennai- India. The specimen was vouchered, and deposited at Institute of Pharmacy, Pt. Ravishankar Shukla Vishvdyalaya, Raipur; Chhattisgarh, India.

#### Extraction

1 kilogram of powdered drug was packed in soxhlet apparatus and successively extracted with petroleum ether (60-80°C) and ethanol (95%). The alcoholic extract was fractionated with chloroform. The chloroform insoluble fraction of alcoholic extract (CIAE), 5.9 % w/w of powdered drug, was used for further experimental work.

#### Experimental animal

Inbred, male, Wister Albino rats (150 – 180 grams) were selected for these studies. Six rats were taken for each group. The rats were used after an acclimatization period of 7 days to the laboratory environment. They were provided with food and water ad libitum. All animal experiments were carried out at Periyar College of Pharmaceutical Sciences for Girls, Trichy, Tamilnadu- India, according to the guidelines and approval of the Animal Ethics Committee (Registration Number 265/CPCSEA).

#### Evaluation of diuretic activity

The diuretic activity was evaluated as illustrated in a previous study<sup>11</sup>. Briefly, rats were deprived of water but not food for 18 h. Their urinary bladders were emptied by gentle compression of the pelvic area and by pull of their tails. Each of these rats was then orally administered with 15 ml of isotonic saline (NaCl, 0.9% w/v) to impose a uniform water load. Forty-five minutes later, these rats were randomly assigned into three groups (n=6) and treated orally as shown in Table 1. All treatment was given after the rats were fasted overnight. Each of these rats was individually placed in metabolic cages and cumulative urine outputs were determined at hourly intervals for 5 hours. pH of urine collected was recorded, thereafter urine was subjected to estimation of sodium, potassium and chloride ions.

#### Statistical analysis

All the data were subjected to statistical analysis using SPSS 14.0 for Windows. The results of the experiments are expressed as mean  $\pm$  SEM. After confirming the variances homogeneity of results by Bartlett's test, the differences were estimated by one-way ANOVA followed by Tukey's

**Table 1: Cumulative urine output over a 5-hour period following oral treatment**

Treatment (dose/kg body wt.)	Urine volume (ml)	pH
Control (normal saline) 25 ml	2.52 $\pm$ 0.09	6.43 $\pm$ 0.50
<i>A.sessilis</i> 200 mg	6.55 $\pm$ 0.09*	7.71 $\pm$ 0.51
Furosemide 13 mg	6.1 $\pm$ 0.28	7.26 $\pm$ 0.25**

Values are mean  $\pm$  S.E, n=6; \*p< 0.01 and \*\*p< 0.001 vs control.

**Table 2: Concentration of Ions (mEq/l)**

Treatment (dose/kg body wt.)	Na <sup>+</sup>	K <sup>+</sup>	Cl <sup>+</sup>	Na <sup>+</sup> / K <sup>+</sup>
Control (normal saline) 25 ml	96.2 $\pm$ 0.94	98.7 $\pm$ 0.94	86.2 $\pm$ 2.3	0.97
<i>A.sessilis</i> 200 mg	136.8 $\pm$ 0.49**	93.1 $\pm$ 1.79**	95.4 $\pm$ 1.55**	1.47
Furosemide 13 mg	121.3 $\pm$ 7.3	90.5 $\pm$ 3.9	82.4 $\pm$ 5.8	1.34

Values are mean  $\pm$  S.E, n=6; \*p< 0.01 and \*\*p< 0.001 vs control.

test for the single dose studies, or by means of Dunnet's test for individual comparison of groups with control. When the probability ( $p$ ) was  $<0.05$ , the results were considered to be significant.

## RESULTS

A pharmacological evaluation for diuretic activity of CIAE was carried out at a dose of 200 mg/kg along with Furosemide (13 mg/kg). The control animals received 25 ml normal saline. Urinary excretion of water, pH, and  $\text{Na}^+$ ,  $\text{K}^+$  and  $\text{Cl}^-$  content were investigated in rats. The extract as well as standard drug possesses strong diuretic activity when given orally in a single dose, with substantial increase in urinary and sodium excretion that were appreciably higher than the control group (Table 1 and 2).

## 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 antihypertensive agent. A number of diuretics like mannitol, thiazides, frusemide, ethacrinic acid are used in practice. Still there is a need for more effective and less toxic diuretic<sup>12</sup>. Plant derived medicines are traditionally used in the

treatment of some renal diseases, and many plants are reported to possess significant diuretic activity in experimental animals<sup>13</sup>. Many indigenous drugs are claimed to have diuretic effect in Ayurvedic system of medicine but they were not properly investigated. Among the several plants, *Dolichos biflorus*, *Tribulus terrestris*, *Dendrophthoe falcata*, *Boerhaavia diffusa*, *Saccharum officinarum*, *Butea frondosa*, *Boerhaavia repens*, and *Homonia riparia* among several other plants have shown excellent diuretic activity<sup>12,13</sup>.

In the present study, CIAE profoundly increased the cumulative urine out put (159.92%) compared to 142.09% increase by furosemide (13mg/kg). Electrolytes and pH were measured in order to know the mechanism by which the extract shows its diuretic effect. The extract altered the urinary pH. It also provoked a significant ( $p < 0.001$ ) increase in urinary excretion of  $\text{Na}^+$  but lowered very slightly the excretion of  $\text{K}^+$ , thus altering the  $\text{Na}^+/\text{K}^+$  ratio, suggesting a potassium-sparing effect (Table 2). The results justify the use of *A. sessilis* as diuretic agent in the traditional medicine and if the results are applicable to humans, then this is an important and clinically useful finding both locally and globally as it provides scientific evidence in favor of its claimed diuretic potential by controlled experimentation.

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