



Short Communication

Diuretic activity of different extracts of *Biophytum sensitivum* (Linn.) DCSachin K. Chandavarkar, S.N. Mamle Desai¹Department of Pharmacy, Bhagwant University, Ajmer, Rajasthan, ¹Department of Pharmaceutical Chemistry, P.E.S's Rajaram and Tarabai Bandekar College of Pharmacy, Ponda, Goa, India

Abstract

Introduction: Drugs that induce diuresis are known as diuretics. Diuretic drugs act either by increasing the glomerular filtration rate (or) by decreasing the rate of reabsorption of fluid from the tubules. In recent years, interest in herbal agents as therapeutic treatment option has increased due to their limited side effects. **Aim:** To evaluate the diuretic activity of various extracts of whole plant of *Biophytum sensitivum* (Linn.) DC. in Wistar strain albino rats. **Materials and Methods:** Randomly selected animals were divided into five groups ($n = 6$ in each). First group served as a control group. Group 2 served as standard control in which furosemide was administered at a dose of 10 mg/kg. Groups 3–5 as test drug groups, in which chloroform, methanol, and aqueous extracts of *B. sensitivum* were administered orally at a dose of 200 mg/kg. The diuretic activity was evaluated by determination of urine volume and urinary electrolyte concentrations of sodium, potassium, and chloride ions. **Results:** Methanol and aqueous extracts significantly increased the urinary output and excretion of electrolyte concentrations of sodium and potassium comparatively better than the standard control, and chloroform extract showed insignificant effect. **Conclusion:** The study concluded that *B. sensitivum* possess moderate to insignificant diuretic activity.

Key words: *Biophytum sensitivum*, diuretic activity, furosemide

Introduction

Diuretic drugs increase the urine output and thus remove additional extra- and intra-cellular water from the edematous tissue. They act either by increasing the glomerular filtration rate (GFR) (or) by decreasing the rate of reabsorption of fluid from the tubules. Drugs that induce diuresis are known as diuretics.^[1] Drug-induced diuresis is beneficial in many life-threatening disease conditions such as congestive heart failure, nephritic syndrome, cirrhosis, renal failure, and hypertension.^[2] Naturally occurring diuretics includes caffeine (in coffee, tea, and cola), which inhibit Na^+ reabsorption and alcohol (in beer, wine, and mixed drinks), which inhibit secretion of anti-diuretic hormones.^[3]

In recent years, interest in herbal agents as therapeutic treatment option has increased due to their limited side effects. Most of these products have been found to be nontoxic in animal studies. At present, there are few isolated reports where attempts have been made to

understand the mode of diuretic activity of some medicines in India. The present study was undertaken to evaluate the diuretic potential of different extracts of *Biophytum sensitivum* (Linn.) DC. (Family: Oxalidaceae), known as “*Viparitalajjalu*”^[4] that is a small herb with paripinnate leaves (leaflets 3–12 pairs), normally forming a rosette at the base, yellow flowers in terminal racemes and elliptic shining capsules containing many transversely tubercled seeds. The plant occurs as a weed throughout India.^[5] The flower of this plant is considered as one of the 10 sacred plants in tradition and culture of Kerala, India.^[6] *B. sensitivum* is reported for its chemoprotective,^[7] hypoglycaemic,^[8] immunomodulatory, antitumor,^[9] antifertility,^[10] anti-metastatic effects,^[11] and anti-inflammatory, antipyretic, and analgesic activities.^[12] Scientifically, there is no report on the diuretic studies of *B. sensitivum*^[13] so far, though it is used in folk medicine.^[4]

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Thus, the present investigation is an approach to explore the diuretic effects of extracts of *B. sensitivum* on experimental animals.

Materials and Methods

Plant collection and authentication

Whole plants of *B. sensitivum* was collected from local areas of Goa in August, the flowering season, washed with water to remove physical impurities such as soil and dirt, and dried at room temperature. The dried plant was subjected to size reduction with a crusher to get coarse powder and then passed through sieve no. 40 to get uniform powder. The plant was authenticated at Regional Medical Research Centre, ICMR, Belgaum, Karnataka, India (Accession number RMRC-587).

Plant extraction

Around 200 g of powdered plant material was subjected to extraction with petroleum ether (for the purpose of defatting), chloroform, and methanol by successive soxhlet method. The aqueous extract was subjected for maceration process. Each extract was then distilled to dryness under reduced pressure using Buchi rota evaporator to yield the respective dried extracts.

Animals

Wistar albino rats of either sex weighing between 150 and 200 g were obtained from P.E.S's Rajaram and Tarabai Bandekar College of Pharmacy, Ponda, Goa, India. Animals were housed into groups of 6–8 per cage at a temperature of $25 \pm 1^\circ\text{C}$ and relative humidity of 45–55%. Animals had free access to food and water, however, food and water were withdrawn 18 h before the experiment. The Institutional Animal Ethics Committee approved the protocol of this study (PESRTBCOP/IAEC; clear/2013-14/R-10).

Grouping and posology

Animals were divided into a total of five groups ($n = 6$ in each group). Group 1 served as control received equivalent amount of normal saline. Group 2 received furosemide 10 mg/kg body weight as standard control. Groups 3, 4, and 5 (test drug groups) received chloroform, methanol, and aqueous extracts of *B. sensitivum* at a dose of 200 mg/kg body weight orally. Literature survey found that the plant extracts were administered in the dose of 200 mg/kg body weight in animals.^[12]

Suspension of chloroform and methanol extracts were prepared by triturating accurately weighed quantity of the extract with 1% Tween 80 in a glass mortar, with gradual addition of distilled water, to make up the required volume. Furosemide tablets I.P. 40 mg (Lasix 40 mg, Aventis Pharma Ltd., B. no. 0211063,

Mfg. October 2011, Exp. September 2015) and aqueous extract of *B. sensitivum* were diluted with distilled water.

Evaluation of diuretic activity

The diuretic study was carried out as per the modified method of Lipschitz.^[14] All animals were deprived of food and water 18 h prior to the experiment. Normally, urine output in rats is very low (1–2 ml/rat/day). Hence, to get the measurable quantity of urine, rats of all the groups were administered with distilled water (2 ml/100 g) after 30 min of test drug administration. Then, the animals were placed individually in metabolic cages with netted floor, and urine was collected in conical flasks placed below the polythene funnel of the metabolic cages. Extreme care was taken to avoid the contamination of urine with fecal matter.^[15] Urine was collected up to 5 h after dosing. Room temperature was maintained up to $25 \pm 0.5^\circ\text{C}$. During this period, no water or food was made available to the animals. Diuretic activity was assessed by measuring total urine volume and urine electrolyte concentration of Na^+ , K^+ , and Cl^- .^[16,17]

Statistical analysis

Results were presented as mean \pm standard error of mean (SEM). All data were analyzed by one-way analysis of variance test (ANOVA), followed by Dunnett's test with the level of significance set at $P < 0.05$, $P < 0.01$, and $P < 0.001$ versus control.

Results and Discussion

The methanol and aqueous extracts of *B. sensitivum* (Linn.) DC. significantly increased the urinary output and excretion of electrolyte concentrations of sodium and potassium comparatively better than the control. The chloroform extract of *B. sensitivum* had insignificant effect on urine output and electrolyte concentrations of sodium, potassium, and chloride ions [Table 1]. Urine volume, concentration of electrolytes in the urine such as sodium, chloride, and potassium were the parameters measured while assessing the diuretic potential of all the groups. There are two factors on which urine volume depends. One is the GFR and other is the degree of tubular re-absorption. The observed effect may be attributed to mechanisms such as increasing the renal blood flow and the attendant increase in GFR.^[18] The present study demonstrates that methanol and aqueous extracts of *B. sensitivum* significantly increased the urinary output. Methanol extract increased sodium and potassium ions significantly, and aqueous extract moderately increased only potassium ions. Chloroform extract was the least potent compared to other extracts that showed absence of diuretic activity. Preliminary phytochemical screening of the extracts revealed the presence of alkaloids, carbohydrates, flavonoids, tannins, and phenolic compounds.

Table 1: Diuretic activity of different extracts of *Biophytum sensitivum* (n=6 in each group)

Parameters	Control	Standard	Chloroform extract	Methanol extract	Aqueous extract
Urine volume (mL)	1.308 \pm 0.02626	3.917 \pm 0.09458***	1.150 \pm 0.05627	2.850 \pm 0.1232***	1.900 \pm 0.0730***
Na^+ (Meq/L)	11.30 \pm 0.4539	22.30 \pm 1.435***	10.87 \pm 0.2400	18.96 \pm 1.022***	12.97 \pm 0.8823
K^+ (Meq/L)	59.63 \pm 2.742	87.30 \pm 3.336***	67.40 \pm 2.184	103.5 \pm 2.042***	73.94 \pm 4.181**
Cl^- (Meq/L)	12.03 \pm 0.4745	21.87 \pm 1.721***	9.697 \pm 0.4168	9.175 \pm 0.7111 ^{NS}	11.36 \pm 0.5906

All values are mean \pm SD; ** $P < 0.01$, *** $P < 0.001$ Vs control.

Therefore, some of these components may have played role in the observed diuretic activity profile.

Conclusion

The present study provides first scientific evidence in support of diuretic activity of *B. sensitivum* (Linn.) DC. The findings support the traditional claims of the plant as diuretic. The observed diuretic activity may be due to the individual or combined activity of chemical constituents present in the plant. However, further studies are required to explore its exact mechanism of action, as well as, to isolate the active principle responsible for the diuretic activity.

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Conflicts of interest

There are no conflicts of interest.

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हिन्दी सारांश

बायोफायटम सेन्सिटीवम (लिन) वनस्पती के मूत्रल प्रभाव का मूल्यांकन

सचिन के. चांदवरकर, एस.एन. मामले देसाई

प्रस्तुत अध्ययन बायोफायटम सेन्सिटीवम (लिन) संपूर्ण पौधे के विभिन्न अर्क से विस्तार स्ट्रेन अल्लिबिनो चूहों में मूत्रल क्रिया का प्रभाव के अध्ययन हेतु किया गया। यादृच्छिक चुने हुए चूहों को, ६ चूहे एक समूह में ऐसे ५ समूहों में बाँटा गया। परीक्षण हेतु चिकित्स्य औषधी अर्क २०० मि.ग्रा./कि.ग्रा. मात्रा आंतरपर्युदर्या (इंट्रापेरीटोनिअल) मार्ग से दिया। मूत्रल क्रिया के प्रभाव का अध्ययन मूत्र की मात्रा और मूत्र में इलैक्ट्रोलाइट्स की सांद्रता के आधार पर तुलनात्मक तरीके से अध्ययन किया गया। अंततः बायोफायटम सेन्सिटीवम (लिन) का संपूर्ण पौधे के अर्क से मूत्रल क्रिया पर उत्साहजनक परिणाम पाया गया।