CODEN [USA]: IAJPBB ISSN: 2349-7750

INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES

http://doi.org/10.5281/zenodo.1168492

Available online at: http://www.iajps.com Research Article

POVONIA ODARATA (*LINN*) CONFERS DIURETIC EFFECTS ON ALBINO RATS.

N. R. Livingston Raja and R. Ramprasad

Department of Pharmacology and Pharmaceutics, Arulmigu Kalasalingam College of Pharmacy, Krishnankoil – 626 126 Tamilnadu.

Abstract:

Diuretics induce negative fluid balance and are useful in the treatment of diseases like edema and hypertension. In the present study ethanolic and aqueous extracts of Pavonia odorata was evaluated for diuretic activity of in male albino rats. Preliminary phytochemical studies carried out indicated the presence of flavonoids, saponins, glycosides, tannins, phenols and carbohydrates in the extracts of Pavonia odorata. Acute toxicity studies of the ethanolic and aqueous extract of the Pavonia odorata did not exhibit any signs of toxicity up to 2 g/kg body weight. Since there was no mortality observed at a higher dose, 100 and 200 mg/kg doses were selected for evaluation of diuretic activity. The diuretic activity of the extract was screened by quantification of urine volume and electrolyte concentration. Different doses of Pavonia odorata (100 mg/kg and 200 mg/kg) were administered orally to hydrated rats and the urine output was measured every hour, up to 3 hours. Frusemide (20 mg/kg) was used as standard drug, while normal saline (10ml/kg) was used as control. The treatment of Pavonia odorata at varying doses (100 mg/kg and 200 mg/kg) aqueous and alcoholic extract significantly (P>0.001) increases the urine output (68%, 81%) and (73%, 88%) the excretion of Na^+ (90%, 93%) and (92%, 95%). Furthermore, a potassium-sparing effect at (36%,39%) and (40%,43%) was observed. Based on the observations it can be concluded that Pavonia odorata extracts exhibits diuretic property in a dose-dependent manner.

Key Words: *Diuretic, Pavonia odorata, Frusemide.*

Corresponding author:

R. Ramprasad

Department of Pharmacology and Pharmaceutics,
Arulmigu Kalasalingam College of Pharmacy,
Krishnankoil – 626 126
Tamilnadu.
E-Mail:rramprasad75@gmail.com

QR code

*Please cite this article in press as N. R. Livingston Raja and R. Ramprasad., **Povonia Odarata (Linn) Confers Diuretic Effects on Albino Rats**, Indo Am. J. P. Sci, 2018; 05(01).*

INTRODUCTION:

Diuretic agents are most widely prescribed categories of drugs in the world [1]. But synthetic diuretics have serious side effects such as diabetonic effect, electrolyte imbalance, impotence and hyperuricemia [2,3]. Hence the searches for herbal drugs to act as diuretics are inevitable and can alter therapeutic efficacy without any adverse effects [4-6]. Diuretic plants induce the obstinate increase of the blood pressure thanks to the alkaloids [7,8]. An increase of blood pressure is a beneficial factor for the sportsman because a big number of molecules of oxygen and nutriments will be transported quickly toward the organs and the muscles requested by the movements [9]. Diuretics play an important role in the management of oedema and hypertension. This function is mainly an increase in net negative siddha are predominantly based on the use of plant materials[10]. Herbal drugs have gained importance and popularity in recent years because of their safety, efficacy and cost effectiveness [11]. Huge number of medicinal plants mentioned in ayurvedic system of medicine are known to possess diuretic properties such as Achyranthus aspera, Boerhavia diffusa, Anisochilus carnosus, Bixa orellana, Costus speciosus, Xanthium strumarium, Kigella pinnata, Bacopa monnieri, Barbara vulgaris, Abelmoschus esculentus, Steganotaemia araliacea, Benincasa hispida, Morinda citrifolia[12,13,14]. Phytochemical screening of this plant revealed the presence of flavonoids, saponins, carbohydrates, tannins, and triterpenes [15]. The present work aims at measuring the diuretic extract of *Povonia odarata* in acute treatment.

DRUGS AND CHEMICALS:

Frusemide (Laxis), ethanol were used in this study. All substances were prepared immediately before use and the reagents were used as analytical grade.

Plant materials

Povonia odarata is mainly used to folk medicine for various treatments like Anti-Inflammatory Infectiveness diseases, and Skin disorders. Diuretics are commonly used for management of hypertension and electrolytic balance. The present study was to investigate the preliminary phytochemical screening of the various extracts of *Povonia odarata* aerial part were studied for diuretic activity. Plant material and extraction Dried aerial parts were collected in the month of May (2017) from cultivated areas of district virdhunagar, Tamil nadu. Taxonomic distinguishing proof was produced using BSMPUS, Government of India, Tirunelveli District, Tamil Nadu. After removing the extraneous material, the aerial parts were crushed into a coarse powder with an electric grinder.

Extract preparation

Povonia odarata leaves powdered materials were extracted with aqueous and ethanol. In each experiment, the extract was diluted with water to desired concentration. Approximately, 500 g of the crushed material was soaked in one liter of hot water at room temperature (23–25 °C) for 3 days\ with occasional shaking (aqueous extract) and Approximately, 500 g of the crushed material was soaked in one liter of alcohol at room temperature (23–25 °C) for 3 days\ with occasional shaking (alcohol extract). The material was then filtered and the residue was again soaked in hot water alcohol for 3 days and this procedure was repeated thrice (total 9 days) and finally, the filtrate was evaporated in a rotary evaporator (under reduced pressure (−760 mmHg) to a thick, semi-solid pasty mass of dark brown color. Crude extract of *povonia odarata* (PO) was dissolved in distilled water and normal saline for use in in-vitro and in-vivo experimentation, respectively.

Animals

Adult male albino rat weighing about 200-250g were used in this study. Assessment of diuretic activity Adult albino rats of either sex having weights in the range of 200-220 g were divided into six groups of six animals each. Animals were screened for any visible signs of disease and only the healthy animals were selected for the study. The whole experiment was carried out in same environmental conditions. Temperature of the room was also kept constant to 25±5 ºC.

Group divided

Groups	Treatment
Group I	Control (Normal saline 10ml/kg) for 7 days.
Group II	Frusemide (20 mg/kg, p.o.) for 7 days.
Group III	Received aqueous extract of *Povonia odarata* at the dose of 100mg/kg orally for 7 days.
Group IV	Received aqueous extract of *Povonia odarata* at the dose of 200mg/kg orally for 7 days.
Group V	Received alcoholic extract of *Povonia odarata* at the dose of 100mg/kg orally for 7 days.
Group VI	Received alcoholic extract of *Povonia odarata* at the dose of 200mg/kg orally for 7 days.

All the doses were made in same volume of normal saline in order to administer same volume in each group. Reference and control drugs Furosemide, a high-ceiling loop diuretic, were used as the reference drug (positive control). Normal saline was used as control drug. Animals were also given pelleted food and drinking water ad libitum. Group I (control group) was given normal saline 10 ml/kg, Group II (refernce group) was given 20 mg/kg of furosemide and test groups (III and IV) were given 100, 200 mg/kg of *povonia odarata* alcohol extract and (V and VI) were given 100, 200 mg/kg of *povonia odarata* aqueous extract respectively.

Diuretic activity

Male albino rats weighing about 200-250gm were divided in to four groups of six animals each. The dosages of drugs were administered to the different groups.

Evaluation of diuretic activity

Oral rout was used for the administration of drugs because of its benefits over other routes i.e. ease of administration and freedom to administer large volume of fluids compared with other routes. Specially designed to separated urine and feces. The urine collected in graduated vials was measured at the end of 6 hr and expressed as ml/100g of body weight per 6 hr [16]. Determination of electrolyte levels of sodium and potassium in fresh urine samples were estimated using calibrated Flame Photometer Before estimating urinary sodium and potassium levels, samples were filtered to remove debris and shedding. Concentration of electrolytes was expressed in mEq/L [17,18,19]. Determination of urine pH of the fresh urine samples from all the six groups was measured with the help of a calibrated pH meter (Model: WTW-Series pH720) [20,21,22]. Assessment of acute toxicity Acute toxicity test of Tp.Cr. was performed on albino mice of 200-250 g body weight. Animals were divided in different groups of five mice each. The control group of mice was given normal saline (10 ml/kg), while other groups received increasing doses of extracts up to 100 mg/kg and 200 mg/kg [23]. All the treatments were administered by oral gavage. Animals were observed closely for 2 hr, then at 30 minute intervals for 6 hr for any visible sign of toxicity (salivation, lacrimation, ptosis, squinted eyes, writhing, convulsions, tremors, yellowing of fur, loss of hair), stress (erection of fur and exopthalmia), behavioural abnormalities (such as impairment of spontaneous movement, climbing, cleaning of face and ataxia, and other postural changes) and aggresive behaviour (biting and scratching behaviour, licking of tail, paw and penis, intense grooming behaviour and vocalization) and diarrhea and then mortality was noted at end of 24 hr [24]. According to this method, the animals were deprived of food and water for 18 hours prior to the experiment and each animal is placed in an individual metabolic cage 24h prior to commencement of the study for adaptation [25]. In this study animals were divided into four groups of five animals each. Group I animals were received normal saline (10 ml/kg, p.o.) for 7 days ,Group II animals were received the standard diuretic, Frusemide (20 mg/kg, p.o.) for 7 days and group 3&4 animals were received alcoholic extracts of *Povonia odarata,100,*200 mg/kg and group 4&5 animals were received aqueous extracts of *Povonia odarata,100,*200 mg/kg body weight for 7 days respectively. On seventh day, immediately after administration of the extracts, Frusemide the rats were paired and placed in metabolic cages. Urine was recollected in a graduated cylindrical tube and its volume was recorded at 1-h intervals for 3h. Finally the Electrolytes (Na+, K+) concentrations and pH were estimated from pooled urine sample of each pair of rat at the end of the experiment, 3h after administration[26,27]

Analytical method.

Na+ and K+ concentrations were measured by flame photometer. The instrument was calibrated with standard solution containing different concentrations of Na+ and K+. pH was directly determined on fresh urine samples using a pH meter, urine volume measured with a micropipette.

Table 1: Effects of Oral administration of *povonia odarata* on urinary volume excretion.

Groups	Dose	Volume of urine(ml/3h) Mean ± SEM	Diuretic index
Normal saline	10ml/kg	01.53 ± 0.12	-
Frusemide	20 mg/kg	10.1 ± 0.53	8.121
Aqueous extract Povonia odarata	100 mg/kg	4.29±0.32	3.411
Aqueous extract Povonia odarata	200mg/kg	6.66±0.38	4.352
Alcoholic extract Povonia odarata	100 mg/kg	6.98±0.72	4.562
Alcoholic extract Povonia odarata	200mg/kg	9.31±0.11	6.084

Table 2: Effects of oral administration of *povonia odarata* on urinary electrolytic excretion

Groups	Dose	Electrolyte Concentration in PPM		pH	Saluretic index	
		Total sodium (mEq/l)	Total potassium (mEq/l)		Na+	K+
Normal saline	10ml/kg	15.71±0.53	2.17 ± 0.06	6.13	-	-
Frusemide	20 mg/kg	47.41±0.74***	4.23±0.02***	8.54	3.017	1.953
Aqueous extract *Povonia odarata*	100 mg/kg	19.47±0.47**	2.75±0.32**	6.12	1.175	1.267
Aqueous extract *Povonia odarata*	200mg/kg	34.85±0.94***	3.36±0.23**	7.64	2.218	1.548
Alcoholic extract *Povonia odarata*	100mg/kg	19.47±0.47**	3.75±0.41***	7.12	1.201	1.728
Alcoholic extract *Povonia odarata*	200mg/kg	34.85±0.94***	4.06±0.13***	8.21	2.113	1.870

RESULTS:

The result of diuretic activity of the alcoholic extract of *Povonia odarata* at 100, 200 mg/kg showed that a dose dependent significantly increase of urinary water excretion and electrolytes concentration then compared with aqueous extract of *Povonia odarata* at 100, 200 mg/kg in normal rats. The results of 200mg/kg both extract treated group showed significant change in electrolytes concentration and urine volume ($P \leq 0.001$) compared with control group. In the present study, alcoholic extract treated groups at different doses (100mg/kg and 200mg/kg) showed significant effect on urinary potassium and sodium ion concentration. On the above results, it can be concluded that the extract produces diuretic effect with increase in Electrolyte concentration in urine.

CONCLUSION:

Further studies are necessary to identify and isolate the active constituents responsible for the diuretic activity. These findings may provide a lead for further investigations of the overall pharmacological actions of *Povonia odarata* in more appropriate model.

REFERENCES:

1.Gurwitz JH, Field TS, Harrold LR, Rothschild J, Debellis K, Seger AC, Cadoret C, Fish LS, Garber L,

Kelleher M, Bates DW. Incidence and preventability of adverse drug events among older persons in the ambulatory setting. Jama. 2003 Mar 5;289(9):1107-16.
2.Goldberg LI, McDonald Jr RH, Zimmerman AM. Sodium diuresis produced by dopamine in patients with congestive heart failure. New England Journal of Medicine. 1963 Nov 14;269(20):1060-4.
3.Sica DA. Diuretic-Related Side Effects: Development and Treatment. The Journal of Clinical Hypertension. 2004 Sep 1;6(9):532-40.
4.Weinberger MH. Diuretics and their side effects. Dilemma in the treatment of hypertension. Hypertension. 1988 Mar 1;11(3 Pt 2):II16.
5.Berglund G, Andersson O, Larsson O, Wilhelmsen L. Antihypertensive Effect and Side-effects of Bendroflumethiazide and Propranolol. Journal of Internal Medicine. 1976 Jan 12;199(1-6):499-506.
6.Andersson O. The use of diuretics in modern antihypertensive therapy. Basic & Clinical Pharmacology & Toxicology. 1984 Apr 1;54(s1):79-87.
7.Khare CP. Indian medicinal plants: an illustrated dictionary. Springer Science & Business Media; 2008 Apr 22.
8.Agbodjogbe WK, Aïkpe AJ, Ayedoun MA, Assogba FM, Dansou PH, Gbenou JD. Diuretic and natriuretic activities from ten medicinal plants used in south Benin. Journal of Chemical and Pharmaceutical Research. 2015;7(12):1145-52.
9.Kapoor LD. Handbook of Ayurvedic medicinal plants: Herbal reference library. CRC press; 2000 Nov 10.
10.Joshi SG. Medicinal plants. Oxford and IBH publishing; 2000.
11.Sharma A, Shanker C, Tyagi LK, Singh M, Rao CV. Herbal medicine for market potential in India: an overview. Acad J Plant Sci. 2008;1(2):26-36.
12.Srivastav S, Singh P, Jha KK, Mishra G, Srivastava S, Karchuli MS, Khosa RL. Diuretic activity of whole plant extract of Achyranthes aspera Linn. European journal of experimental Biology. 2011;1(2):97-102.
13.Sharma UK, Sharma UM, Singh AB, Agarwal V. Diuretic activity of Kigelia pinnata bark extract. Journal of Pharmacology Research. 2010;1(2):17-20.
14.Dar A, Channa S. Relaxant effect of ethanol extract of Bacopa monniera on trachea, pulmonary artery and aorta from rabbit and guinea-pig. Phytotherapy Research. 1997 Jun 1;11(4):323-5.
15.Kashima Y, Nakaya S, Miyazawa M. Volatile composition and sensory properties of Indian Herbal Medicine-Pavonia odorata-used in Ayurveda. Journal of oleo science. 2014;63(2):149-58.
16.Dawson WR, Shoemaker VH, Licht P. Evaporative water losses of some small Australian lizards. Ecology. 1966 Jun 1;47(4):589-94.
17.Benjumea D, Abdala S, Hernandez-Luis F, Pérez-Paz P, Martin-Herrera D. Diuretic activity of Artemisia thuscula, an endemic canary species. Journal of Ethnopharmacology. 2005 Aug 22;100(1-2):205-9.
18.Patel U, Kulkarni M, Undale V, Bhosale A. Evaluation of diuretic activity of aqueous and methanol extracts of Lepidium sativum garden cress (Cruciferae) in rats. Tropical Journal of Pharmaceutical Research. 2009;8(3).
19.Calder III WA, Hiebert SM. Nectar feeding, diuresis, and electrolyte replacement of hummingbirds. Physiological Zoology. 1983 Jul 1;56(3):325-34.
20.Osberg I, Chase HP, Garg SK, DeAndrea A, Harris S, Hamilton R, Marshall G. Effects of storage time and temperature on measurement of small concentrations of albumin in urine. Clinical chemistry. 1990 Aug 1;36(8):1428-30.
21.Omaye ST, Turnbull JD, Sauberlich HE. [1] Selected methods for the determination of ascorbic acid in animal cells, tissues, and fluids. InMethods in enzymology 1979 Jan 1 (Vol. 62, pp. 3-11). Academic Press.
22.Miller WG, Bruns DE, Hortin GL, Sandberg S, Aakre KM, McQueen MJ, Itoh Y, Lieske JC, Seccombe DW, Jones G, Bunk DM. Current issues in measurement and reporting of urinary albumin excretion. Clinical chemistry. 2009 Jan 1;55(1):24-38.
23.Ganapaty S, Dash GK, Subburaju T, Suresh P. Diuretic, laxative and toxicity studies of Cocculus hirsutus aerial parts. Fitoterapia. 2002 Feb 1;73(1):28-31.
24.Lorke D. A new approach to practical acute toxicity testing. Archives of toxicology. 1983 Dec 1;54(4):275-87.
25.Botham PA. Acute systemic toxicity—prospects for tiered testing strategies. Toxicology in vitro. 2004 Apr 1;18(2):227-30.
26.Benjumea D, Martín-Herrera D, Abdala S, Gutiérrez-Luis J, Quiñones W, Cardona D, Torres F, Echeverri F. Withanolides from Whitania aristata and their diuretic activity. Journal of ethnopharmacology. 2009 Jun 22;123(2):351-5.
27.Kau ST, Keddie JR, Andrews D. A method for screening diuretic agents in the rat. Journal of pharmacological methods. 1984 Mar 1;11(1):67-75.