IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 2, September 2023

Evaluation of Diuretic Activity of Ethanolic Extract of Semecarpus Anacardium

Dhirendra Prakash[1] and Dr. Alok Sharma[2]
Research Scholar, Department of Pharmacy[1]
Research Guide, Department of Pharmacy[2]
OPJS University, Churu, Rajasthan, India

Abstract: *Ethnopharmacological relevance: India is home to a large population of Semicarpusanacardium, sometimes known as "Marketing Nut," a tropical flowering plant. Medicine often uses Semicarpus anacardium because of its immunomodulatory qualities. The plant's component has also been used in traditional medicine to treat diuretics.*
Aim of study: The aim of this work was to assess the diuretic capacity of ethanolic extracts of Semicarpus anacardium seed in normal rats following acute and sub-chronic oral administration, since the diuretic activity of these plant materials has not been explored in well controlled scientific investigations.
Materials and methods: For eight days, oral dosages of 150 and 300 mg/kg of ethanolic extracts from Semicarpus anacardium seeds were administered to male Wistar rats. Furosemide was used as a reference drug at a dose of 10 mg/kg. Urine output in the rats was tested many times after therapy. Numerous other parameters were evaluated as well, such as creatinine clearance, plasma electrolyte concentration, and urine electrolyte concentration, using flame spectrophotometry and the Jaffe alkaline picrate method.
Results: Following the administration of a single dosage of Semicarpus anacardium seed extracts, urine output increased significantly at all time periods. The biggest total volume of urine voided 24 hours after the dose was furosemide-treated urine, followed by plant extracts and the control group. Furosemide only increased Na+ levels while lowering K+ levels; yet, the increases in urine Na+ and K+ levels from both extracts were almost similar. Even though the compounds varied in the electrolyte excretion via urine, none of them altered the plasma Na+ and K+ levels.
Conclusion: The present study supports the traditional medicine's use of Semicarpus anacardium seeds for their diuretic qualities

Keywords: Semicarpus anacardium seed, Ethanolic extracts, Furosemide, Diuretic activity, Urine output, Plasma Na^+ and K^+ levels

I. INTRODUCTION

Diuretics are drugs that increase the excretion of urine. Oedema, hypertension, nephritis, toxemia, congestive heart failure (CHF), and different UTIs are among the conditions that these drugs are often used to treat. Diuretics are used to relieve lung congestion and are crucial during pregnancy and premenstrual stress.1. Although synthetic diuretics are already available, they have significant side effects. These synthetic diuretics significantly lower K+ secretion, which results in K+ retention. 2. Plant medicine has a long history of being used to treat a variety of kidney issues, and many plants are known to have potent diuretic effects. Animal tests have shown the diuretic qualities of several herbs utilized in ethnomedicine. 3. For our present study, we used Semecarpusanacardium (Linn.), a plant belonging to the Anacardiaceae family. It is in the sub-Himalayan tract, which stretches from the Bias eastward and rises to 3,500 feet in the Western Peninsula, Assam, Khasia hills, Chittagong, and Central India's outer highlands. The fruit and seed have a hot, sharp, and somewhat sweet flavor. In traditional medicine, it serves as an aphrodisiac, digestible, and anthelmintic laxative. Furthermore, skin disorders, piles, diarrhea, tumors, fevers, anorexia, urine discharges, ulcer healing, tooth strengthening, insanity, and asthma are treated with it. Leucoderma, coryza, epilepsy, and other nerve diseases may all benefit from the oil. Moreover, it makes hair black. It eases moderate pain, aids with paralysis, and lowers inflammation. 4. Studies have previously looked into the plant's analgesic, anti-inflammatory, anti-arthritic, antimicrobial, antibacterial, anthelmintic,

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 2, September 2023

antimutagenic, antitumor, antioxident, fungistatic, hepatocellular carcinoma,15–17, hypocholesterolemic, hypolipidemic, immunomodulatory,20, and mammary carcinoma, 21 traits.

II. MATERIAL AND METHODS

2.1. Plant Material Collection

Dr. A.K.S. Rahat of the National Botanical Research Institute (NBRI), Lucknow Campus, verified that the plant, Semicarpusanacardiumby, was identified from plant seeds gathered from nearby areas of Uttar Pradesh. The NBRI in Lucknow is home to a voucher specimen (Specimen No.: NBRI/CIF/328/2012).

2.2. Preparation of ethanolic extract[22]

To make a coarse powder, the seeds of Semecarpus anacardium were chopped, dried in the shade, and then sieved through sieve number sixty. 200g of dried and powdered Semecarpusanacardium seeds were extracted using petroleum ether for 4 hours and 95% v/v ethanol for 20 hours in a soxhlet extractor. After that, the extract was concentrated to leave behind a dark brown residue. The final extract was stored in an airtight container at 4˚C.

2.3. Experimental Animals

Male Wistar rats weighing 150–200 g were utilized in the study. Six animals per group were housed in plastic cages with a regular feed pellet, unrestricted access to water, a 12:12 light/dark cycle, a temperature of 22±2°C, and a humidity of 50±10%. The level of cleanliness was maintained. Both our institutional animal ethics committee and the government's animal regulatory body gave their approval to the methods used in the animal experiments. After the animals were acclimated for two weeks, they were used in the next studies.

2.4. Standard drug

Furosemide (Lasix, Aventis Pharma Limited, India), a high-ceiling loop diuretic, served as the reference medication (positive control).It was dissolved in water for injection prior to administration.

2.5. Biochemical methods

Blood was obtained by retro-orbital puncture while under a light diethyl ether anesthetic. Plasma was created by centrifuging urine for 7–10 minutes at 6000 rpm after it had been centrifuged for 10 minutes at 3000 rpm. Urine and plasma samples were tested for sodium and potassium concentrations using flame spectrophotometry..

2.6. Evaluation of diuretic activity: experimental design

The following methodology was used to assess the diuretic action: 24 animals were placed in separate metabolic cages to adapt them one day before to the start of the experiment. These rats were divided into four groups of six for the purposes of the study. Rats were allowed to starve for the whole night while having unlimited access to water, and they were treated as described below.

2.6.1. Diuretic activity

Before the experiment began, each animal was administered physiological saline (0.9% NaCl) orally at a dose of 5 mL/100 g body weight in order to impose a consistent water and salt load. The first group (the vehicle control) received 10 mL/kg of body weight of distilled water orally. The second group (Standard) received intraperitoneal furosemide at a dose of 10 mg/kg body weight. The third and fourth groups received oral administration of 150 and 300 mg/kg body weight of extract from Semecarpusanacardium seeds, respectively. Urine samples were collected 1, 2, 4, 6, and 24 hours after the dose. The sodium and potassium contents were assessed using 24-hour urine samples and rat plasma.[25, 26, 24, 25]

2.7. Statistical analysis

The findings are shown as Mean ±S.E.M. The data were examined statistically using the Student's t-test or one-way analysis of variance (ANOVA) (Graph pad Prism 5.0). Statistical significance was indicated by a P-value less than 0.05.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 2, September 2023

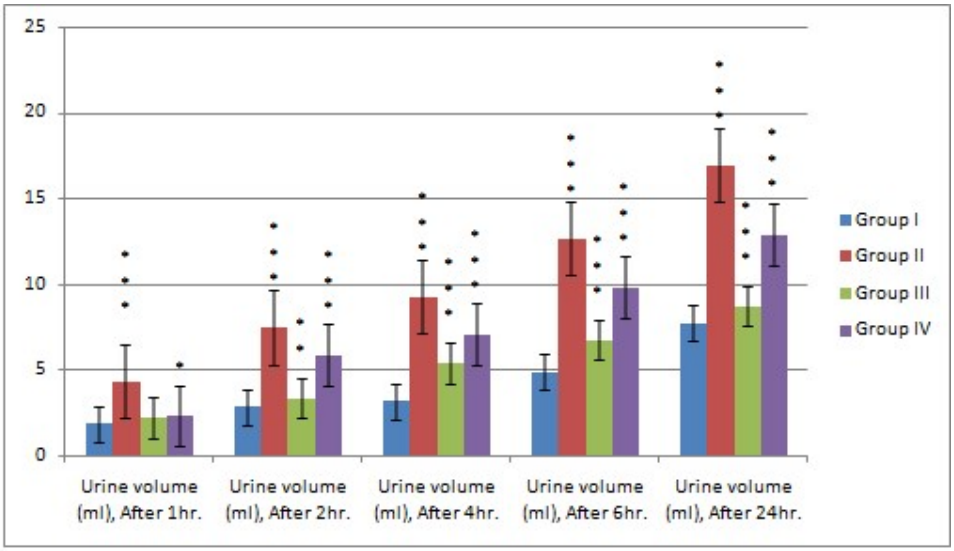
III. RESULTS

3.1. Effect on urine volume

At first, the study with single dose of ethanolic extract (150 and 300 mg) showed increased diuresis (Fig.1), which subsequently showed rise in urine output on comparison with control group rats at an interval of 4h after dose (Ethanolic 150 mg (5.37±0.18mL) 300 mg (7.09±0.15 mL) v/s control group 3.17±0.07 mL).Urine output showed simultaneous increase over the period of experimental study, such that the cumulative urinary excretion was significantly higher at 6 h (Ethanolic 150 mg (6.76±0.2 mL) 300 mg(9.8±0.2 mL) v/s control group 4.89±0.8 mL) and 24 h(Ethanolic 150 mg (8.7±0.13 mL) 300 mg(12.9±0.2 mL) v/s control group 7.7±0.09 mL) (Fig. 1).The effect of a single dose of the reference diuretic, furosemide, was also rapid and higher than that of the plant extracts (Fig. 1), Reference drug showed the highest value in terms of urine output measurement(furosemide 16.9±0.3 mL).

Groups	Urine volume (ml), After 1hr.	Urine volume (ml), After 2hr.	Urine volume (ml), After 4hr.	Urine volume (ml), After 6hr.	Urine volume (ml), After 24hr.
Group I	1.82±0.029	2.82±0.068	3.17±0.075	4.89±0.082	7.71±0.096
Group II	4.35±0.136***	7.44±0.131***	9.28±0.170***	12.67±0.25***	16.96±0.317***
Group III	2.18±0.07^{ns}	3.33±0.069**	5.37±0.183***	6.767±0.29***	8.70±0.137***
Group IV	2.30±0.131*	5.89±0.098***	7.09±0.151***	9.8±0.21***	12.92±0.223***

Fig. 1: Effect of single dose of the root extract (150 mg and 300 mg) of Semecarpusanacardiumand furosemide on 24 h urinary excretionUrine volume measurements were taken of six rats in each group at 1, 2, 4, 6, and 24 hours after treatment; the total data are shown as mean±SEM. *P < 0.05; **P < 0.01; ***P < 0.001 when comparing with controls using the Student's t-test



3.2. Effect on urinary electrolyte excretion

Table 1 displays the effects of furosemide and ethanolic extracts from Semicarpus anacardium on the excretion of electrolytes (Na+ and K+) in the urine during a 24-hour period. The enhanced excretion of electrolytes [K+ ($P < 0.05$) and Na+ ($P < 0.001$)] brought on by plant ethanolic extract may account for higher outcomes than furosemide. In comparison to the controls, furosemide actually reduced K+ excretion; as a result, the Na+/K+ excretion ratio (1.98) was greater than that of the aqueous extracts (150 mg 1.86, 300 mg 1.91) (Table 2).

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 2, September 2023

3.1.3. Effect on plasma electrolyte levels

On contrary to urinary electrolyte levels, plasma electrolyte levels showed minimal effect on the furosemide and aqueous extract levels of Na^+ and K^+ (Table 2).

Table 2: Effect of the ethanolic extract of plant, and furosemide on 24 h urinary electrolyte excretion and plasma Na+ and K+ levels in normal rats

Treatment	Dose(mg/kg BW)	Urinary Electrolyte Conc.		Plasma Electrolyte Conc.	
		Na^+ (mmol/L)	K^+ (mmol/L)	Na^+ (mmol/L)	K^+ (mmol/L)
Water	10	73.6±1.5	60±103	143.56±2.8	4.9±0.3
Furosemide	10	103.4±2.8***	52.1±1.3**	137±1.6	5±0.4
Extract 1	150	117.4±2.3*	63.1±2.4**	135.3±1.0	4.8±0.3
Extract 2	300	140±5.3***	73.2±0.84***	133.9±0.5	5.2±0.2

The mean±S.E.M. of six rats in each group is used to represent the values. *P < 0.05; **P < 0.01; ***P < 0.001 using Student's t-test in comparison to controls. anBefore the test chemicals were given to the rats, an oral dosage of 5 mL/100 g BW of normal saline was given to all of them as a pre-treatment.

IV. DISCUSSIONS

This study aims to elucidate Semicarpus anacardium's potent diuretic qualities, which have been documented in a range of customary folk applications. Oral administration of the ethanolic extract was used. The diuretic furosemide, which is widely used in clinical practice, was used to compare the pharmacological responses. Alongside the investigation, useful evaluations of urine production, urinary electrolyte excretion, and plasma electrolyte excretion were conducted.

The word "diuresis" refers to the kidneys' increased production of urine, which often matches an increase in the volume of pee the body expels. If diuresis is felt without a corresponding rise in the amount of urine produced, major health problems might occur.Furosemide inhibits the luminal Na-K-2Cl symporter in the thick ascending limb of the loop of Henle, or NKCC2. Without inhibiting aldosterone or carbonic anhydrase, the action on the distal tubules removes the corticomedullary osmotic gradient and stops both positive and negative free water clearance. By inhibiting the transporter, the loop diuretics reduce the lumen-positive potential caused by both the reabsorption of NaCl and K+ recycling. Diuretics work by lowering the electrical potential that results in the normal divalent cation reabsorption of the loop, which increases the excretion of Mg2+ and Ca2+. Prolonged use may cause severe hypomagnesemia in certain individuals. As a consequence of the distal convoluted tubule's active Ca2+ absorption, loop diuretics often do not cause hypocalcemia.27.

The ethanolic extract of Semecarpusanacardium seeds (at 150 and 300 mg/kg B.W.) increased diuresis in comparison to the control. The extracts of 150 mg (5.37, 6.76, and 7.7 mL) and 300 mg (7.09, 9.8, and 12.9), respectively, were substantially larger than the urine output of the control group at 4h, 6h, and 24h (3.17, 4.89, and 7.71 mL). On the first day, furosemide, however, generated the largest quantitative collection of pee at 4 hours, 6 hours, and 24 hours. Urine and plasma electrolyte were measured by flame spectrometry, and the results were reported in mmol/L. By comparing the values of plasma (Control 143.5, Furosemide 137, ethanolic extract 150 mg 135.3 and ethanolic extract 300 mg 133.9) with the values of urine (Control 60, Furosemide 52.1, ethanolic extract 150 mg 63.1 and ethanolic extract 300 mg 73.2), the analysis's findings show that the values of Na+ were higher in plasma than the values of K+.

V. CONCLUSIONS

In conclusion, Semicarpus anacardium's traditional medical usage is supported by the present study because of its diuretic qualities. Salt concentrations, as a metabolite in the plant process, seemed to be mainly associated with the diuretic effect of the plant. This usually rules out the osmotic phenomenon since there was an increase in sodium levels and a comparable decrease in the other salt. Plant extracts don't appear to be harmful to the kidneys when used in experiments. The pattern of water, sodium, and potassium excretion suggests that these extracts contain at least one active component with a

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 2, September 2023

furosemide-like effect. Our findings suggest, for the first time, the mechanism or processes by which the diuretic Semicarpus anacardium functions in traditional medicine.

VI. ACKNOWLEDGMENTS

The facilities required to carry out the study were supplied by the Department of Pharmacy at A. P. S. Agra, for which the authors are appreciative..

REFERENCES

[1]. Butler J, Forman DE, Abraham WT, et al (2004). Relationship between heart failure treatment and development of worsening renal function among hospitalized patients. Am Heart J 2004;47:331-8.

[2]. Ellison DH. The physiological basis of diuretic synergism: its role in treating diuretic resistance. Ann Intern Med 1991;114:886-894.

[3]. LahlouS ,Tahraoui A, Israili Z, Lyoussi BA. Diuretic activity of the aqueous extracts of Carumcarviand Tanacetumvulgarein normal rats. J Ethnopharmacology 2007;110:458–63.

[4]. Basavaraj P, Shivakumar B, Shivakumar H, Giresh HN, Jali1 MV. Anxiolytic activity of Semecarpusanacardium (linn.) nut extract in mice.Pharmacologyonline2011; 660-74

[5]. Jabbar S, Khan MTH, Choudhri MSK, Chowdhary NMH and Gafur MA, Analgesic and anti-inflammatory activity of activity of Semecarpusanacardium (Linn.) HamdardMedicus, 1998; 41 (4): 73-80.

[6]. Vijayalakshmi T, Muthulakshmi V, Sachdanandam P, Effect of the milk extract of Semecarpusanacardium nut on adjuvant arthritis a dose-dependent study in Wistar albino rats. Gen Pharmacol, 1996; 27 (7): 1223-1226.

[7]. Nair A, Bhide SV, Antimicrobial properties of different parts of Semecarpusanacardium. Indian drugs, 1996; 33: 323-328.

[8]. Patwardhan BK, Francis RP, Kapre SV, Sharma KD. Antibacterial activity of Semecarpusanacardium extracts, Bulletin of the Haffkin Institute, 1982; 10 (2): 27- 30.

[9]. Sharma PV, Chaturvedi C. In-vitro anthelmintic effects of Semecarpus anacardium (Linn.). J Med Sci, 1964; 5 (1): 58-68.

[10]. Kothari AB, Lahiri M, Ghaisas SD, Bhide SV. In-vitro studies on antimutagenecity of water, alcoholic and oil extract of Semecarpusanacardium. Ind J Pharmacol, 1997; 29: 301-305.

[11]. Arul B, Kothai R, Christina AJ. Hypoglycemic and antihyperglycemic effect of Semecarpusanacardium (Linn.) in normal and streptozotocin-induced diabetic rats. ExpClinPharmacol, 2004; 26 (10): 759-62.

[12]. Indap MA, Ambaye RY, Gokhale SV. Anti-tumour and pharmacological effect of the oil from Semecarpusanacardium (Linn.). Ind J PhysiolPharmacol, 1983; 27: 2.

[13]. Premalatha B, Sachdanandam P. SemecarpusanacardiumL. nut extract administration induces the in vivo antioxidant defense system in aflatoxin B1 mediated hepatocellular carcinoma. J Ethnopharmacol, 1999; 66 (2): 131-9.

[14]. Sharma K, Shukla SD, Mehta P, Bhatnagar M. Fungistatic activity of nut extracts of Semecarpusanacardium (Linn.). Ind J ExpBiol, 2002; 40: 314-318.

[15]. Premalatha B, Sachdanandam P. Effect of Semecarpusanacardiumnut extract agaistaflatoxin B1-induced hepatocellular carcinoma. Fitoterapia 1999; 70: 484- 492.

[16]. Premalatha B, Sachdanandam P. Semecarpusanacardium L. nut extract administration induces the in vivo antioxidant defence system in aflatoxin B1 mediated hepatocellular carcinoma. J Ethnopharmacol, 1999; 66 (2): 131-9.

[17]. Premalatha B, Muthulakshmi V, Sachdanandam P. Anticancer potency of the milk extract of Semecarpusanacardium (Linn.) nuts against aflatoxin B1 mediated hepatocellular carcinoma bearing Wistar rats with reference to tumour marker enzymes. Phytother Res, 1999; 13 (3): 183-187.

[18]. Sharma A, Mathur R, Dixit V P. Hypocholesterolemic activity of nut shell extracts of Semecarpusanacardium (Bhilawa) in cholesterol fed rabbits. Indian J. Exp. Biol 1995; 33: 444-448.

[19]. Tripathi YB, Pandey RS. Semecarpusanacardium L. nuts inhibit lipopolysaccharide induced NO production in rat macrophages along with its hypolopidemic property. Ind J ExpBiol, 2004; 42: 432-436.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 2, September 2023

[20]. anu Ram Kumar Ramprasath, PalaviveluShanthi, PanchanathamSachdanandam, Immunomodulatory and Anti-inflammatory effects of Semecarpusanacardium (Linn.) nut milk extract in experimental inflammatory conditions. BiolPharma Bull, 2006; 29 (4): 693-700.

[21]. Arathi G, Sachdanandam P. Therapeutic effect of Semecarpusanacardium (Linn.) nut milk extract on carbohydrate metabolizing and mitochondrial TCA cycle and respiratory chain enzymes in mammary carcinoma in rats. J Pharm Pharmacol, 2003; 55 (9): 1283-90.

[22]. Devmurari VP. Antibacterial Evaluation and Phytochemical Screening of SymplocosracemosaRoxb. Int J Pharm Tech Res 2010;2(2):1359-63.

[23]. Benjumea, D, Abdala, S., Hernandez-Luis, F., P´erez-Paz, P., Martin-Herrera, D., 2005. Diuretic activity of Artemisia thuscula, an endemic canary species.Journal of Ethnopharmacology. 100, 205–209.

[24]. Lipschitz WL, Hadidian Z, Kerpchar A. Bioassay of Diuretics. J PharmacolExpTher 1943;79:97–110.

[25]. Mukherjee PK, Das J, Saha K, Pal M, Saha BP: Diuretic activity of Rhizome of NelumbonuciferaGaertn. (Fam. Nymphacaceae). Phytotherapy Research 1996:424-5.

[26]. Murugesan T, Manikandan L, Suresh KB, Pal M, Saha BP: Evaluation of Diuretic potential of J. suffruticosa Linn. extract in Rats. Indian J Pharm Sci 2006:2(2):150.

[27]. Jackson E.K., 1996. Drugs affecting renal and cardiovascular function, in: Hardman J.C., Gilman, A.G., Limbird, L.E. (Eds.), Goodman and Gilman's the Pharmacological Basis of Therapeutics, 9th ed. Pergamon Press, New York, pp. 685–713.