



Original Research Paper

EVALUATION OF DIURETIC ACTIVITY OF CINNAMALDEHYDE IN WISTAR ALBINO RATS

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ABSTRACT

Objective: Cinnamomum is claimed in traditional medicine as a diuretic. Diuretics that are in current use possess serious adverse effects. Thus, there is a need for discovering efficacious and safe diuretics possibly from natural sources. Hence, the study was carried out to scientifically evaluate the diuretic potential of Cinnamaldehyde obtained from *Cinnamomum zeylanicum*.

Methods: Wistar albino rats weighing 180-270 g of either sex were divided into four groups containing six subjects in each. All were starved for 18 h and hydrated subsequently with oral sodium chloride solution (0.9%). Group, I (control) received normal saline (15 ml per animal orally). Group III, and IV received different doses (250, 500 mg/kg) of Cinnamaldehyde. Rats were placed individually in metabolic cages. Cumulative urine outputs at hourly intervals for six hours, urinary Na⁺, K⁺, Cl⁻, HCO₃⁻, specific gravity, pH and total dissolved solids were determined. **Results:** A strong dose-dependent diuretic activity with a rapid onset of action, rapid peak diuresis and short duration of action was observed compared to furosemide. The diuretic action was accompanied with a significant ($p < 0.05$) increase in urinary Na⁺, HCO₃⁻ and pH and decrease in urinary H⁺. **Conclusion:** The results indicated that Cinnamaldehyde possesses marked diuretic action compared to furosemide.

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1. INTRODUCTION

The kidneys are a pair of vital organs that perform many functions to keep the blood clean and chemically balanced. Reduced kidney function may lead to kidney diseases that are characterized as hereditary, congenital or acquired. In India, approximately sixteen percent of the population have some form of kidney damage present and are therefore at a risk of renal disease. Due to cost constraints for treatment of renal diseases with western medicine, majority of people (80%) in developing countries rely on traditional medicine (TM). Traditional Indian medicine has been used for thousands of years to improve the kidney function. Over the years, hundreds of herbal formula were created and refined for specific types of diseases. These herbal formula involve various combinations of herbs that are used to treat a particular disease.^[1]

Principles of traditional Indian medicine Traditional Indian medicine is one of the oldest healing systems. Clinical diagnosis and Indian herbology are very important components of Traditional Indian medicine. According to Traditional Indian medicine, everything in the universe consisted of five basic elements: wood, fire, earth, metal, and water, and the universe is constantly changing to achieve dynamic balance or harmony in all things, which is called five elements theory. Disease occurs due to falling out of balance and such knowledge was applied to understand, prevent, and cure disease. Hence, this study is intended to evaluate the diuretic activity of Cinnamaldehyde in rats.^[2]

2.MATERIAL AND METHODS

The analytical HPLC graded Cinnamaldehyde was collected from Sigma adrich. Ltd, India.

Phytochemicals are synthetic exacerbates that happen normally in plants. The term is commonly used to allude to those synthetics that may influence well being, yet are not built up as fundamental supplements.^[3] The nearness of tannins, alkaloids, flavonoids, general test for glycosides (decreasing sugars), anthraquinones, sterols and saponins were tried by basic subjective strategies.

3. EXPERIMENTAL SETUP

Animals

Albino wistar rodents of either sex having a weight scope of 90 – 120 g obtained from CPCSEA affirmed creature house, Sri sainath office, Hyderabad. The creatures were housed in polypropylene confines (6 rodents for every pen) under standard natural conditions and 12 h/12 h light/dim cycle. The creatures were enabled free access to faucet water and research center pellet. Each rodent was set in an individual metabolic pen 24 h preceding beginning of the examination for adjustment. The consideration and treatment of creatures were as per universally acknowledged OECD rules for utilization of creatures and the strategy was endorsed by the Institutional creature Ethics Committee.^[4]

Experimental Design

Albino wistar rats were randomly assigned into four groups each consisting of six rats for diuretic test. The controls were treated with the vehicles. The standard group was treated with Furosemide 10 mg/kg. The test- I & test- II group was treated with plant extract 250 mg/kg & 500 mg/kg respectively. Dose selections were made based on the acute oral toxicity test performed prior to the beginning of the actual experiment. All the animals received priming dose of a 0.9% sodium chloride solution (10 ml/kg b.w.).

Group- I (Control) served as normal saline (10 ml/kg, i.p.)

Group- II (Standard) Received the standard drug furosemide (10 mg/kg b.w.) suspended in CMC.

Group- III (Test- I) Received the Cinnamaldehyde (250 mg/kg b.w.) suspended in a CMC .

Group- IV (Test- II) Received the Cinnamaldehyde(500 mg/kg b.w.) suspended in a CMC.^[4]

The technique for was utilized in the assurance of diuretic action. The rodents were fasted for 18 h with free access to water. Prior to treatment, all creatures got typical saline at an oral portion of 15 mL/1000 g body weight, to force a uniform water and salt burden. Every gathering was then managed the concentrates and vehicles orally by gavages. Following organization, the rodents were separately set in a metabolic confine. During this period no sustenance and water was made accessible to the creatures. The pee was gathered and estimated at 1, 2, 3, 4, 5 and 24 h in the wake of dosing and put away at –20°C for electrolyte examination.

The accompanying parameters were resolved so as to contrast the impacts of the concentrates and vehicle and standard on pee discharge. The urinary discharge autonomous of the creature weight was determined as absolute urinary yield isolated by all out fluid managed. The proportion of urinary discharge in test gathering to urinary discharge in the control

gathering was utilized as a proportion of diuretic activity of a given portion of a specialist. A parameter (factor) known as diuretic movement was additionally determined. To get diuretic action, the diuretic activity of the concentrate was contrasted with the diuretic activity of the standard medication in the test gathering.^[4]

Statistical Analysis

Each result is presented as mean $\pm$ SEM (standard error of mean). Statistical analysis of the data were performed with one-way analysis of variance (ANOVA) followed by the Tukey post hoc comparison test. Dose dependent effects were evaluated using correlation coefficient. Significant differences were set at p- values lower than 0.05.^[4]

4.RESULTS AND DISCUSSION

Effect on Urine Volume

The fluid concentrate delivered diuresis, which appeared to be an element of portion and time. Test-I expanded diuresis beginning from the first h of pee gathering (60%, $p < 0.01$) and greatest diuresis was seen toward the finish of 24 h (65%, $p < 0.001$) when contrasted with control. Test-II created diuresis which was noteworthy beginning from the first h and most extreme increment of diuresis was recorded toward the finish of 24 h (102%, $p < 0.001$) contrasted with the control. Furosemide would be wise to diuresis than Test-I ($p < 0.001$), and tantamount impact with Test-I toward the finish of the 24 h perception time frame.^[6]

Effect on Electrolyte Content of the Urine

The fluid concentrate portions expanded urinary chloride discharge which was critical (half and 68% separately for Test-I and Test-II) contrasted with control. As demonstrated in Table 3, the saluretic files of Na⁺ and Cl⁻ of the fluid concentrates at the most elevated portion and Furosemide were tantamount (1.60, 1.67 versus 1.68, 1.69). Also, the Na⁺/K⁺ proportion of Test-II was higher than the proportion for Furosemide (1.78 versus 1.73). From the determined Cl⁻/Na⁺+K⁺ proportions, A100 had the most minimal worth (0.59).

Looking at the changed dosages of the fluid concentrate, Test-II and Test-I had delivered a critical natriuresis when contrasted with ($p < 0.001$) for the two portions. Test-II had the most noteworthy kaliuresis impact when contrasted with, yet no critical distinction when contrasted and Test-I. The discharge profile of chloride, in any case, demonstrated a critical contrast in the middle of the portions.^[7]

Urinary pH

Urinary pH measurement revealed that the different treatment groups of aqueous extracts had produced relatively alkaline urine. The control had produced the lowest pH and the standard gave rise to alkaline urine like the aqueous extract. But there was not any significant difference between the extracts and the controls.

Diuretics are drugs that expansion the rate of pee stream, sodium discharge and are utilized to alter the volume and structure of body liquids in an assortment of clinical circumstances. Expanding the portion affected the diuretic impact created by the plant removes. For example, the diuretic impacts of Test-II were higher than the diuretic impacts of Test-I after 5 h. Also, the diuretic movement (0.83) of Test-I was lower than that

of Test-II (1.02). Conversely, M400 created a diuretic impact of (3.86±0.09) which was at this point lower than the diuretic impact of Test-II after 5 h. Thus, it is conceivable to recommend that the ingredient(s) of the plant in charge of diuretic impact most likely polar and preferable separated by water over.^[3]

The beginning of diuretic activity was speedy, the impact was dependable and the pee was especially hyperkalemic and basic as demonstrated by K⁺ level in the pee and pH of pee, separately. These perceptions recommended that the two concentrates of Cinnamaldehyde are not going about as potassium saving diuretics: potassium-saving diuretics are

TABLE 1: Effect of Cinnamaldehyde on 24 h urine volume in rats

Group	Volume of Urine (mL)					
	1 h	2 h	3 h	4 h	5 h	24 h
Control	1.00 ± 0.05	1.21 ± 0.07	1.46 ± 0.04	1.80 ± 0.05	2.01 ± 0.05	4.25 ± 0.04
Std	1.97 ± 0.04 ³	2.40 ± 0.00 ³	2.88 ± 0.23 ³	3.55 ± 0.07 ³	3.98 ± 0.07 ³	8.45 ± 0.14 ³
Test- I	1.66 ± 0.05	1.90 ± 0.05 ²	2.13 ± 0.09 ¹	2.65 ± 0.13 ³	3.26 ± 0.06 ³	7.03 ± 0.18 ³
Test- I	1.80 ± 0.09	2.18 ± 0.25 ²	2.58 ± 0.18 ¹	2.90 ± 0.12 ^{a3}	3.46 ± 0.1 ³	8.00 ± 0.01 ³

Each value represents mean ± S.E.M (n=6) and was analyzed by ANOVA followed by Tukey post hoc multiple comparison test. p < 0.05, ²: p < 0.01, ³: p < 0.001

TABLE 2: Effect of Cinnamaldehyde on urinary electrolyte excretion in rats

Group	Urinary Electrolyte Concentration (mmol/L)			Saluretic Index			Na ⁺ /K ⁺	Cl ⁻ /Na ⁺ +K ⁺
	Na ⁺	K ⁺	Cl ⁻	Na ⁺	K ⁺	Cl ⁻		
Control	70.50 ± 1.87	46.83 ± 1.87	65.67 ± 1.67 111.17				1.50	0.50
Std	118.17 ± 1.13 ^{a3}	68.17 ± 2.32 ³	±8.08 ³	1.67	1.97	1.69	1.73	0.60
Test- I	102.16 ± 1.67	60.83 ± 1.13 ³	98.50 ± 2.04 ³	1.43	1.76	1.37	1.67	0.60
Test- II	112.83 ± 2.08	63.33 ± 3.01 ¹	104.33 ± 2.94 ³	1.60	1.83	1.68	1.78	0.62

Each value represents mean ± S.E.M (n=6) and was analyzed by ANOVA followed by Tukey post hoc multiple comparison test. p < 0.05, ²: p < 0.01, ³: p < 0.001

generally have moderate beginning of activity and increment the urinary Na⁺/K⁺ proportion.

The bigger dosages of fluid and concentrates of Cinnamaldehyde utilized in this examination delivered comparative Na⁺ and Cl⁻ discharge profile to that of hydrochlorothiazide. This could propose that the instrument by which the concentrate produces diuresis is like that of thiazide diuretics.^[4]

In assurance of urinary pH, the watery concentrates demonstrated a relative increment in pH esteems when contrasted with controls, strengthening the idea that carbonic anhydrase restraint as one of the conceivable instruments of activity of the plant. What's more, sodium and chloride discharge profile of the two concentrates was similar to the standard hydrochlorothiazide which expanded Na⁺/Cl⁻ proportion which is called thiazide secretory file. This perception proposes a thiazide like method of activity as a conceivable component of activity of the plant. Thiazide sort of diuretics lift thiazide secretory list, at the same time by expanding urinary degrees of sodium and potassium by

repressing Na⁺/Cl⁻-co-transporter in the distal tangled tubule of the nephron.^[6]

To entirety up, this examination underpins the conventional utilization of Cinnamaldehyde for its diuretic impact. In view of the example of pee discharge, sodium and potassium, it creates the impression that the plant may conceivably have more than one component of activity which adds to the watched Sal uretic impact. Various method of activity had been accounted for with some home grown medications. Henceforth, signifying the foreseen carbonic anhydrase inhibitory impact, there must be another method of activity that adds to the most astounding diuretic impact of the plant.^[7]

5. CONCLUSION

This examination offers help for the conventional utilization of Cinnamaldehyde as a diuretic operator through upgrade of salt and water discharge. Despite the fact that the dynamic segments (s) which is in charge of the watched impact remain(s) to be seen, polar constituents

separately or in collaboration act by numerous systems to deliver the watched impact. Taking a gander at the information, the bigger portions, of the fluid concentrate created an exceptionally intriguing diuresis profile, which was tantamount to hydrochlorothiazide. From the electrolyte's investigation and urinary pH, it is conceivable to accept that the plant could have various method of activity. In the present examination, no lethality was seen in any event for the portion and length utilized, which could demonstrate that security profile of the concentrate as an additional favourable position. At long last, it is obvious from the analysis that the

watery concentrates of Cinnamaldehyde stem bark have demonstrated an expansion in pee and electrolyte discharge which supports its customary use as a diuretic specialist.

6.CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest.

7. REFERENCES

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