



Anti-urolithiatic and natriuretic activity of steroidal constituents of *Solanum xanthocarpum*

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Abstract

The isolated compounds from methanolic extracts from *Solanum xanthocarpum* berries was evaluated for antiurolithiatic activity on rodent. First isolated compound was solasonine, a glycoalkaloid of *Solanum xanthocarpum* was given in a dose of 80 mg/kg of body weight in vehicle water. The second compound isolated was solasodine, a steroidal aglycone of *Solanum xanthocarpum* was given in a dose of 80 mg/kg of body weight in vehicle 1% CMC. Na⁺ and K⁺ ion concentration in urine were evaluated using Flame Photometer. For isolated compound solasonine ratio(Vt/Vc) obtained 1.6 and for second compound, solasodine 1.5, which was one of the criteria for antiurolithiatic activity and also significant difference in Na⁺ and K⁺ ion concentration was observed in both isolated compounds, that was indicated that solasonine showed good activity as natriuretic activity compared to solasodine.

Keywords: antiurolithiatic, glycoalkaloid, steroidal aglycone, natriuretic, Flame Photometer

Introduction

Solasodine is the main alkaloid of *Solanum xanthocarpum* [1, 2, 5]. It was mainly used as a precursor for the production of steroidal drugs like glucocorticoids and contraceptive hormones. All pharmacological activities are reported either on fruit/ seed/ herbs extracts. It was reported that aqueous extract of *Solanum xanthocarpum* gave antiurolithiatic activity, but no specific pharmacological reports on biological activities are available for isolated chemical constituents of *Solanum xanthocarpum*. Therefore it was thought of interest to carry out antiurolithiatic and natriuretic activity of solasodine and solasonine.

Another reason to carry out antiurolithiatic and natriuretic activity was the structure similarity of solasodine with potassium sparing diuretic spironolactone. Spironolactone is significantly metabolized to its active metabolite canrenone which has a lactone ring at C-17 position, was

antagonist to aldosterone for binding to the aldosterone receptor protein. It was assumed that two oxygen of lactone in which one oxygen at C-3 position of canrenone may be essential for diuretic activity[4]. Similarly a spironolactone steroidal alkaloid solasodine which has got N instead of O and structurally similar to canrenone, can bind to the aldosterone receptor protein and prevent activity produced by aldosterone.

Results and Discussion

No adverse effect or mortality was detected in albino rats up to 300 mg/kg, *orally* of isolated compounds of berries of *Solanum xanthocarpum* during 24 h observation period. In antiurolithiatic activity, the screening of compounds was summarized in Table 1.

Table 1 Antiurolithiatic and Natriuretic effect of isolated compounds

Compound	Group	Volume of urine (ml)	Vt/Vc*	Concentration of ion		Na ⁺ / K ⁺	Na ⁺ t/Na ⁺ c
				Na ⁺	K ⁺		
Test 1 (solasonine)	Control	7.2	1.6	0.1956	0.1513	1.293	1.689
	Test	11.5		0.3304	0.138	2.394	
Test 2 (solasodine)	Control	8	1.5	0.2086	0.1589	1.104	1.250
	Test	12		0.2608	0.1513	1.724	

* Volume of urine collected in test sample/ control

Antiurolithiatic activity depend on possible differences in absorption, plasma binding, distribution, biotransformation, excretion and secondary effect on kidney such as alteration in blood flow and glomerular filtration rate.

The isolated compounds Test 1 and Test 2 were found to have good antiurolithiatic and natriuretic activity having a negligible kaliuretic activity. This type of activity is of particular interest since among the currently prescribed agents, both the loop diuretic and thiazide diuretic cause kaliuresis and often associated with clinically significant hypokalemia. The both isolated test sample with useful antiurolithiatic and natriuretic activity did not cause excess potassium excretion would thus be desirable and could have place in treatment in hypertension and CCF.

Materials and Methods

Chemical

Water, CMC, isolated compounds

Plant material Treatment

The ripe berries of *Solanum xanthocarpum* were collected during month of March-May from the region of North Gujarat. The Plant materials were dried in Hot air oven at a constant temperature at 60°C. The two compounds were isolated by extraction and hydrolysis method. [3, 6]

Animals

Albino rats of Wistar strain (250-300 g) were procured from the central animal house of the institute. They were housed in standard polypropylene cages and kept under controlled room temperature ($24 \pm 20^\circ\text{C}$; relative humidity 60-70%) in a 12 h light-dark cycle. The rats were given a standard laboratory diet and water *ad libitum*. Food was withdrawn 12 h before and during the experimental hours. All experimental protocols were approved by institutional animal ethical committee.

Acute Toxicity Study

In albino rats, the isolated compounds were given orally by suspending in water and 1% CMC. The dose was given from 40 to 300 mg/kg of body weight and animals were observed for 24 hr period.

Antiuro lithiatic activity

The animals were divided into four groups as control and test for each of isolated compounds. All animals deprived of food and water for 24 h period prior to and during the experiment, were dosed by gavages with vehicle (test compound 1 80 mg/kg of body weight, dissolve in water and test compound 2 80 mg/kg of body weight, dissolve in 1% CMC).

Each group was immediately hydrated with water 25 ml per kg of body weight. The rats were placed in metabolic cages and urine collected for 12 h after dosing. The cumulative urine volumes were measured. For each isolated compound mean diuresis, the ratio between the effects observed in treated animal and those of control rats were calculated. Ratio equal or greater than 1.5 and 2 for urine volume were taken as criteria for activity. [7].

Natriuretic activity

Urinary electrolyte outputs were determined by Flame Photometer. The concentration of Na^+ and K^+ ion were measured and the ratio of Na^+ and K^+ ion was evaluated.

Conclusion

The isolated solasonine have a greater antiuro lithiatic and natriuretic activity compared to solasodine.

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References

- [1] K.R.Kirtikar, B.D.Basu; Indian Medicinal Plants, Lalit Mohan Basu, Allahabad, **1968**, 2nd ed, 896.
- [2] Anonymous, The Wealth of India: A Dictionary Of Indian Raw Materials & Industrial Products, Publications & Information Directorate, CSIR: New Delhi; **1989**, Vol. IX: Rh, 299-305.

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- [3] A.Kar; Pharmacognosy and Pharmacobiotechnology, New Age International Publishers, New Delhi, **2003**, 482-487.
- [4] T.L.Lemke, D.A.Williams, V.F.Roche, S.W.Zito; Foye's Principles of Medicinal Chemistry, Wolters kluwer, New Delhi, **2008**, 6th ed, 732-734.
- [5] S.S.Gupta, S.C.L.Verma, C.Singh, P.Khandelwal, N.K.Gupta, *Ind. J. Med. Res.* **1967**, 55, 723-732.
- [6] P.Singh, M.Srivastava, L.Khemani, *Archives of Applied Science Research*, **2009**, 1, 67-73.
- [7] M.B.E.Fayez, A.A.Saleh, *Planta Medica*, **1967**, 15, 430-433.
- [8] K Darko, M.E.David, Q.David, J.William, *J. Med. Chem.* **1996**, 39, 1196-1200.