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Evaluation of diuretic activity of Lagenaria Siceraria in Albino rats

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Abstract

Lagenaria siceraria belongs to Cucurbitaceae family. It is commonly known as lauki (Hindi) and bottle gourd (English) is a medicinal plant. It is used as medicine for its cardio tonic, general tonic and diuretic properties.

The present study was aimed to evaluate the diuretic activity of *Lagenaria siceraria* in comparison to Hydrochlorothiazide. 5 groups of rats with 6 rats in each group were taken.1st group of 6 rats was kept as control. 2nd group of 6 rats were fed with standard hydrochlorothiazide. The Third, fourth and fifth groups of 6 rats each were taken as test groups and administered with the crude extract of *LAGENARIA SICERARIA* in doses of 100, 200 and 400mg/kg body weight. The urine was collected for a period of 5 hours and 24 hours. Urinary volume, urinary electrolytes namely sodium, potassium and chloride are estimated.

The results obtained in the study indicate that Aqueous Extract of *Lagenaria siceraria*(AELS) increases the excretion of 3 parameters i.e. urinary volume, urinary Na^+, urinary Cl^- which is statistically significant and comparable to that of the standard diuretic agent hydrochlorothiazide and decrease K^+excreation.

Keywords: *Lagenaria siceraria*, Hydrochlorothiazide, Diuretic activity, Urinary volume, Urinary Na^+, k^+, Cl^- excretion

Introduction

Plants are the rich sources of medicine for thousands of years. Natural plants are the sources of potent medicinal compounds like and atropine, physostigmine, digitalis, morphine.(1)

The crude drugs being always available easily in abundance, comparatively cheaper, with negligible side effects and have frequently been prescribed to patients of all age groups.(2,3) The derivatives of medicinal plants are non-narcotic with little or no side effects.(4) In recent years, there has been growing interest in alternative therapies and the therapeutic use of natural products, especially those derived from plants.(5) So this study evaluates the diuretic activity of a medicinal plant known as *Lagenaria Siceraria, which* belongs to Cucurbitaceae family. *Lagenaria Siceraria* is commonly known as lauki (Hindi) and bottle gourd (English). It is used as medicine for its cardio tonic, general tonic, diuretic, anti hepatotoxic, analgesic, anti-inflammatory, hypolipidemic, anti-hyperglycemic, immuno modulatory and antioxidant activities. Diuretics are the substances which increase the urine formation and enhance the output of urine. These substances increase excretion of water, sodium and chloride through urine.

The available information published on these activities is insufficient to draw conclusions. So this study tries to evaluate the diuretic activity of alcoholic extract of *Lagenaria siceraria fruits* which is safer, cost effective, lesser damaging, lesser side effects and lesser toxicity, can be prescribed to patients of all age groups and suitable for chronic treatments.

Materials and Method

The Laboratory bred swiss albino rats of either sex, weighing 175-225gm were used for the study, under standard laboratory conditions. The approval of Institutional Animal Ethics Committee for experimental protocol was taken. Animals were maintained under standard conditions in an animal house approved by Committee for the Purpose of Control and Supervision on Experiments on Animals (CPCSEA). The fruits of *Lagenaria siceraria* are air dried and finely powdered. The aqueous extract of *Lagenaria Siceraria* (**AELS**) fruits was extracted with distilled water by a process of Soxhlet extraction.(6) Swiss albino rats were placed in metabolism cages. The urine is collected at the bottom exit of the funnel of metabolism cage and Urinary Volume is measured.

The urine samples are taken in "cuvettes" of Spectrophotometer.(7) The light passed through the cuvette is then made into electric pulse by the photocell, and amplified by photo multipliers, and finally passed into the display unit.

The sodium Potassium, Chloride(8) in the urinary samples were estimated on spectrophotometer by using sodium, Potassium, Chloride kits. The kit used for the study is manufactured by M/S Excel Diagnostics Pvt. Ltd, Hyderabad. The readings are then converted to meq/kg.

Experimental Design: This study contains 5 groups of rats with 6 rats in each group. The experimental animals were placed in metabolic cages, three rats in one metabolic cage. A Hartmann's Eustachian catheter was used as orogastric tube for feeding. 1st group of 6 rats was kept as control, with 3 rats in each cage, which were given only 0.9% normal saline 25ml/kg body weight orally. Second group of 6 rats were fed with normal saline 25ml/kg along with standard hydrochlorothiazide 25mg/kg. The Third, fourth and fifth groups of 6 rats each were taken as test group and the crude extract of *LAGENARIA SICERARIA* which

was obtained in liquid form along with normal saline was given, in doses of 100, 200 and 400mg/kg bodyweight. Animals were subsequently transferred to metabolism cages. The urine was collected in beakers for a period of 5 hours. The rats were not given food or water during the experiment. Urinary volume was noted and samples were taken for estimation of urinary electrolytes namely sodium, potassium and chloride. The statistical analysis of data was done using one way analysis of variance (ANOVA) followed by Dunnett's test. P value less than 0.05 was considered to be significant.

Results and Discussion

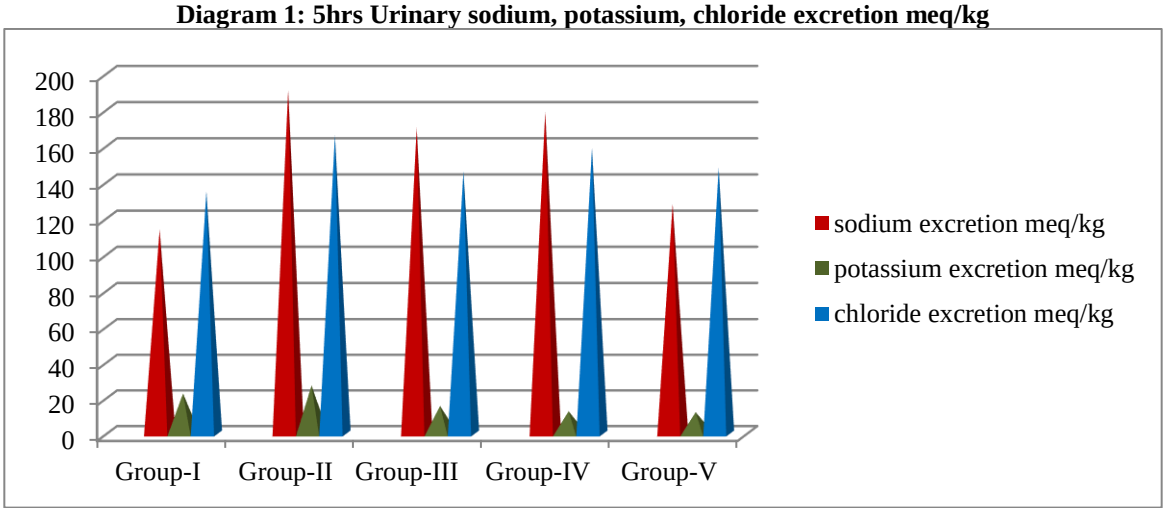
Results of 5hrs urine analysis: In 5hrs urine sample, the total urinary volume of the control group was 2.25±0.25ml. The urinary excretion of Na^+, K^+ and $C l^-$ are 114± 14, 22.5± 2.5 and 135.30±1.75 *meq/kg* respectively. The urinary volume of the Standard group was 13.5± 0.5ml, and the urinary excretion of Na^+, K^+ and Cl^- are 191 ± 1, 27 ± 1 and166.5 ± 1.5 *meq/kg*. The urinary volumes of the 100,200 and 400mg/kg of test drugs were 2.65± 0.15, 3.95±0.15, and 3.5± 0.3ml*/kg* respectively. There was increase in urinary volume excretion with 100,200 and 400mg/kg of test drug, as shown in Table 1 and diagram 1 which was significant with 200mg, when compared to control group. The urinary excretion of Na+, K+ and Cl- of *100mg/kg of test drug* were 170.2±1.21, 15.5± 0.5, 146± 4.5*meq/kg* respectively. The urinary excretion of Na+, K+ and Cl- of *200mg/kg of Test drug* were 179± 1, 12.5± 0.5, 159± 7, *meq/kg* respectively. The urinary excretion of Na+, K+ and Cl- of *400mg/kg of Test drug* were 128± 2, 12± 1, 148.65 ±5.48 *meq/kg* respectively. There was significant increase in sodium excretion with 200mg and there was significant increase in chloride excretion with 200and 400mg of test drug. There was dose dependent decrease in potassium excretion with 100, 200 and 400mg/kg. The above results shows that, the dose 200mg/kg of test drug was highly significant in increasing the urine volume, and excretion of sodium, and chloride.

Table 1: Effect of Aqueous Extract of *Lagenaria Siceraria* in 5hrs urine sample

Groups (n=6)-5hrs	Ph	Urinary volume ml/kg	Urinary sodium excretion meq/kg	Urinary potassium excretion meq/kg	Urinary chloride excretion meq/kg
Group-I Control NS 25ml/kg	8	2.25±0.25	114± 14	22.5± 2.5	135.30±1.75
Group-II Standard HCTZ 2.5mg/kg	8	13.5± 0.5*	191 ± 1*	27 ± 1*	166.5± 1.5**
Group-III Test-I(AELS) 100mg/kg	8	2.65± 0.15	170.2±1.21	15.5± 0.5	146.5± 4.5
Group-IV Test-II(AELS) 200mg/kg	6	3.95±0.15*	179± 1*	12.5± 0.5	159 ±7*
Group-V Test-III(AELS) 400mg/kg	7	3.5± 0.3	128± 2	12± 1	148.65±5.4*

All the results were represented as Mean ± SEM.
AELS=Aqueous Extract of *Lagenaria Siceraria*, HCTZ= Hydrochlorothiazide
*=p<0.05= significant, **=p<0.001= highly significant

Diagram 1: 5hrs Urinary sodium, potassium, chloride excretion meq/kg



Results of 24 hr urine analysis: There was slight decrease in urinary volume excretion with 100 mg, which is1.15±0.35ml and increase in urinary volume excretion with 200 and 400mg of test drug which is 3±0.2 ml, and 2.5± 0.3 ml which are significant respectively, There was significant increase in sodium excretion with 100, 200 and 400mg of test drug as shown in Table 2 and diagram 2. There was significant increase in the excretion of chloride with 100, 200 and 400mg of test drug. There was decrease in potassium excretion with 100,200,400mg/kg which was significant with 400mg when compared to control group.

Diagram 2: 24hrs Urinary sodium, potassium, chloride excretion (meq/kg)

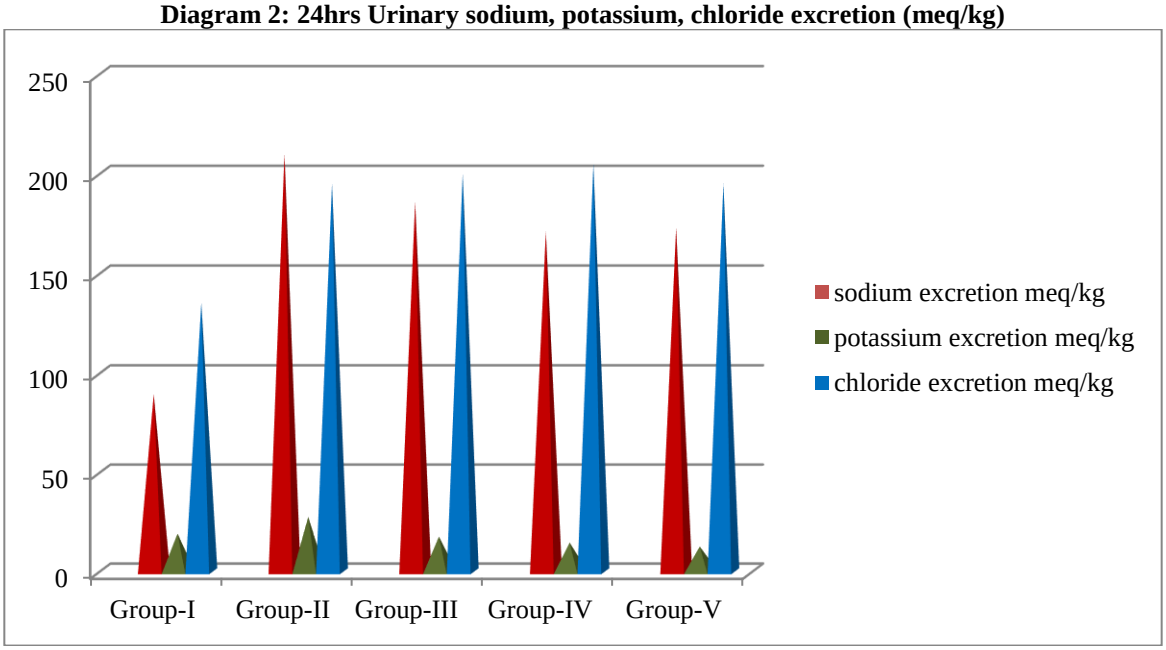


Table 2: Effect of Aqueous Extract of *Lagenaria Siceraria* in 24hrs urine sample

Groups (n=6)-24hrs	***Ph***	***Urinary volume ml/kg***	***Urinary sodium excretion meq/kg***	***Urinary potassium excretion meq/kg***	***Urinary chloride excretion meq/kg***
Group-I Control NS 25ml/kg,	9	1.7± 0.3	89.5±5.5	19±1	135.30±1.75
Group-II Standard HCTZ 2.5mg/kg	8	4.2±0.3*	210± 2*	27.5± 1.5*	195± 3*
Group-III Test-I(AELS) 100mg/kg	7	1.15±0.35	186.5±5.5*	17.5±0.5	200±2 *
Group-IV Test-II(AELS) 200mg/kg	9	3±0.2	171.5±2.5*	14.5± 0.5	205±5 *
Group-V Test-III(AELS) 400mg/kg	7	2.5± 0.3	173.5±4.5*	12.5±0.5*	195.5±2.5*

All the results were represented as Mean ± SEM. *AELS=Aqueous Extract of Lagenaria Siceraria HCTZ= Hydrochlorothiazide*, *=P<0.05= significant,

It shows high doses of test drug shows low potassium loss. *Lagenaria siceraria* is an excellent fruit in the nature which contains all the essential constituents that are necessary for normal and good health of human beings. Traditionally, *Lagenaria siceraria* fruits have been used as a general tonic, and cardio tonic drug. It has also been used as aphrodisiac, diuretic, purgative and antidote to certain poisons, scorpion stings. *Lagenaria siceraria* is also used to relieve pain, fever, and to heal ulcers. Scientific researchers have shown that *Lagenaria siceraria* possesses anthelmintic, antibacterial, antifungal, anti-allergic, analgesic, anti-inflammatory, antioxidant, free radical scavenging, cytotoxic, Immuno modulatory, antihyperlipidemic anti diabetic, hepatoprotective, anxiolytic and memory enhancing properties.[9,10]

Diuretics increase the excretion of Na^+ and water. They decrease the reabsorption of Na^+ and (usually) Cl^- from the filtrate, increased water loss being secondary to the increased excretion of NaCl (*natriuresis*). The results were compared with those of hydrochlorothiazide treated group which is a medium

efficacy diuretic drug, with primary site of action in the cortical diluting segment or the early Distal tubule.[11,12] Thiazides (Hydrochlorothiazide) diuretics are used in *hypertension*, Mild *heart failure* (loop diuretics are usually preferred), Severe resistant oedema (metolazone, especially, is used, together with loop diuretics), Potassium-sparing diuretics (e.g. amiloride, spironolactone) are used With K^+-losing (i.e. loop or thiazides) diuretics to prevent K^+ loss, where hypokalaemia is especially hazardous (e.g. patients requiring digoxin or amiodarone).

The Vacuum dried extract and methanol extract of *L. siceraria* fruit was evaluated for its diuretic activity in a study.[9] Both the extracts (100-200 mg kg^{-1}, p.o.) showed higher urine volume and exhibited dose dependent increased in excretion of electrolytes when compared with respective control and showed the maximal activity at 200 mg/kg, *p.o.* The present study also exhibited same result .as above showing increased volume of urine excretion with all three doses, more so with 200mg/kg dose and increased excretion of sodium and chloride electrolytes with all the three doses of 100,200,400 mg/kg, but for the dose dependent decrease in potassium excretion as which are significant. The results were compared with those of hydrochlorothiazide treated group which is a medium efficacy diuretic drug, with primary site of action in the cortical diluting segment or the early Distal tubule.[9,13,14,15,16] This may be due to presence of different phyto chemicals present in the pulp of bottle gourd. The seeds in the pulp contain steroidal moieties like avenasterol, codisterol, elesterol, isofucasterol, stigmasterol, sitosterol, compesterol, spinasterol;[13] *Their steroidal structure may be similar to* Spironolactone.Spironolactone (Aldosterone antagonist) is a steroid, chemically related to the mineralo corticoid aldosterone.[17,18,19,20]

Conclusion

The results of this study indicate potent diuretic activity of AELS and there was significant increase in excretion of 3 parameters i.e. urinary volume, urinary $Na^+$and Cl^-. All three doses of *Lagenaria siceraria* fruit extract increased urinary volume, maximum being with 200mg/kg dose. There was moderate decrease in urinary K^+ excretion at 100,200 and 400 mg/kg dose of *Lagenaria siceraria* fruit extract. It shows high doses of test drug (400mg/kg) shows low potassium loss. It indicates potassium sparing effect. The diuretic effect produced by the test drug in above said doses was less in comparison with that of hydrochlorothiazide. Still it is only a preliminary study that requires the molecular level study to find out the responsible chemical constituent precisely, for its diuretic activity.

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