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Diuretic Activity of *Lagenaria siceraria* Fruit Extracts in Rats

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Ghule, *et al.*: Diuretic activity of *Lagenaria siceraria*

Vacuum dried juice extract and methanol extract of the fruits of *Lagenaria siceraria* Mol. have been evaluated for its diuretic activity in albino rats. Different parameters viz. total urine volume (corrected for water intake during the test period), urine concentration of electrolytes such as sodium, potassium and chloride have been evaluated. The rats treated with vacuum dried *Lagenaria siceraria* juice extract (LSJE) and *Lagenaria siceraria* methanol extract (LSME) (100-200 mg/kg; *p.o.*) showed higher urine volume when compared to the respective control. Both LSJE and LSME have exhibited dose-dependent increase in the excretion of electrolytes when compared to control group. The elevated diuretic potential of LSJE and LSME was statistically significant ($P < 0.05$) and comparable to that of the standard diuretic agent furosemide (20 mg/kg; *i.p.*).

Key words: *Lagenaria siceraria*, fruit juice and methanol extracts, Electrolytes concentration, diuretic activity

The plant, *Lagenaria siceraria* (Mol.) Standl. (Family: Cucurbitaceae), known as bottle gourd, is a common fruit vegetable used throughout the India. Since time immemorial the fruit is used as diuretic, cardio-tonic, cardio-protective and nutritive agent. The fruit is also reported to have good source of vitamin B complex and choline along with fair source of vitamin C and β -carotene. It is also reported to contain cucurbitacins, fibers and polyphenols¹⁻⁴. Two sterols namely campesterol and sitosterol have been identified and isolated from the petroleum ether fraction of methanol extract of *L. siceraria* fruits, which is reported to possess antihepatotoxic activity⁵. LS fruit has been reported to possess antioxidant activity⁶, hypolipidemic and antihyperlipidemic effects in normocholesterolemic and triton-induced hyperlipidemic rats⁷. HPLC analysis of methanolic extract from plant shows the presence of flavone-C glycosides⁸. Lagenin, a novel protein has been isolated from lyophilized extract of seeds⁹.

Literature survey revealed that the plant extract has yet not been screened for its traditional diuretic activity in experimental animals. Therefore the present study was carried out to provide pharmacological evidence for the folklore medicinal consideration of fruit plant as diuretic.

L. siceraria fruits were collected from the local farms of Wardha District, Maharashtra in the month of October-November, the botanical authentication was done by the authority of Department of Botany, Nagpur University, Nagpur and voucher specimen is lodged in our research laboratory for the future reference.

The fresh and semi-ripened fruits were cut into small pieces and fed to a juicer to collect the juice and the collected juice was filtered and vacuum dried to obtain the *L. siceraria* fruit juice extract (LSJE, yield: 18 % w/w). Also the fruits were sliced using a home slicer and the slices obtained were shade-dried, pulverized and passed through a 20 mesh sieve. The dried, coarsely powdered plant material was extracted with 90% methanol using a Soxhlet apparatus. The solvent was evaporated under vacuum which gave semisolid mass (23% w/w) with respect to the dried powder. The preliminary phytochemical screening was carried out to detect the chemical constituents of both fresh fruit juice extract as well as methanol extracts (LSME) which revealed the presence of steroids, saponins and polyphenols, carbohydrates, proteins. Both the extracts were stored in tight containers in dessicator.

Adult Wistar rats of either sex weighing 170-200 g were used for experiment. The animals were housed in standard metal cages provided with food and water

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TABLE 1: EFFECTS OF LSJE AND LSME ON EXCRETORY PARAMETERS

| Treatment (mg/kg, p.o.) | Measured parameters of experimental groups | | | | |
|-------------------------|--|------------------------------------|---|------------------------------------|---|
| | Total urine volume (ml/24 h) | Total Na ⁺ (μ moles/kg) | Total K Potassium ⁺ (μ moles/kg) | Total Cl ⁻ (μ moles/kg) | Na ⁺ to K ⁺ ratio |
| Control (Saline) | 18.70±0.34 | 89.30±2.24 | 83.00±2.36 | 689.27±0.82 | 1.070 |
| Furosemide-20 | 42.40±0.21* | 180.20±3.67* | 160.20±3.34* | 3103.17±0.68* | 1.124 |
| LSJE-100 | 20.20±0.36* | 113.50±4.89* | 120.67±4.19* | 1368.20±0.17* | 0.940 |
| LSJE-200 | 25.30±0.92* | 144.30±5.37* | 140.18±6.45* | 2384.33±0.41* | 1.029 |
| LSME-100 | 22.50±0.78* | 107.12±2.43* | 127.53±6.16* | 1473.58±0.27* | 0.839 |
| LSME-200 | 27.10±0.58* | 160.67±3.20* | 152.00±5.21* | 2569.00±0.47* | 1.057 |

Each value is mean±SEM (n=6); *Denotes significant difference when compared to control values at P<0.05 (ANOVA followed by Dunnett's t-test); LSJE: *Lagenaria siceraria* fruit juice extract; LSME: *Lagenaria siceraria* methanol extract.

ad libitum. The Institutional Animal Ethical Committee approved the experimental protocol. The method described by Lipschitz *et al*¹⁰ and Kavimani *et al*,¹¹ was employed for the evaluation of diuretic activity. The animals were divided into 6 groups (6 in each), were deprived and fasted of water for 18 h prior to experiment. On the day of experimentation, first two groups were administered with LSJE (100 mg/kg and 200 mg/kg, *p.o.*). The 3rd and 4th groups were treated with LSME (100 mg/kg and 200 mg/kg, *p.o.*), while 5th and 6th groups were treated with normal saline (control) and furosemide (20 mg/kg, *i.p.*), respectively. Immediately after administration, animals were placed in metabolic cages (2 per cage) specially designed to separate urine and fecal matter and kept at room temperature (25±0.5°). During the period of study no food, water was made available to the animals. The total volume of urine was collected and measured from control, standard and extract treated groups up to 5 h of administration. The parameters monitored for the each individual rat were total urine volume (corrected for water intake during the test period and measured after 24 h of treatment) and urine concentration of Na⁺, K⁺ and Cl⁻. Na⁺ and K⁺ concentration were measured by flame photometry and Cl⁻ concentration was estimated as NaCl by titration with silver nitrate solution (2.096 g/l) using one drop of 5% potassium chromate solution as indicator.

Diuretics relieve pulmonary congestion and peripheral edema. These agents are useful in reducing the syndrome of volume overload, including orthopnea and paroxysmal nocturnal dyspnoea. They decrease plasma volume and subsequently venous return to the heart (preload). This decreases cardiac workload, oxygen demand and plasma volume, thus decreasing blood pressure¹². Thus, diuretics play an important role in hypertensive patients.

The LSJE and LSME were found to be active in

renal system of rats. Dose-response studies showed the maximal activity at 200 mg/kg, *p.o.* by LSJE and LSME. The excretion of sodium, potassium and chloride has also been significantly increased. The results were compared with those of furosemide (20 mg/kg; *i.p.*) treated group. All the data are expressed as mean±SEM and analyzed by ANOVA followed by Dunnett's *t*-test (n=6).

The results obtained in the study indicate that LSJE and LSME act as effective hypernatremic, hyperchloremic and hyperkalemic diuretics (increased Na⁺, K⁺ and Cl⁻ excretion volume). Data indicate that both extracts in tested doses produced significant and dose-dependent diuretic activity and this observation supports the folklore consideration of this fruit as diuretic (Table 1).

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