Assessment of the diuretic and urinary electrolyte effects of ethanolic extract of flowers of *Capparis Decidua*

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A B S T R A C T

Diuretics are the agents which increase the amount of urine flow and sodium excretion and are used to adjust
the volume and/or composition of body fluids in a variety
of clinical situations, including hypertension, cardiac
failure, kidney failure, nephrotic syndrome, and cirrhosis.
These agents were widely explored in Indian ancient
system of medicine. The numerous diuretic plants with
their active phytoconstituents have been explored. The
present study was carried out to investigate the diuretic
activity of ethanolic extract of flowers of *Capparis
decidua*. Lipschitz test in Wistar rats was used to evaluate
the diuretic effect of ethanolic extract of *Capparis
decidua*. with furosemide as a standard and normal saline
as control. The urine volume (in mL) measured at 5 h.

The urine volume and urinary electrolyte excretion (Na+
and K+) were found to be significantly higher in rats
treated with *Capparis decidua*, as compared to normal
rats. This present study indicates that Ethanolic extract of
flowers of *Capparis decidua*, has potential diuretic and
natriuretic property.

KEYWORDS:

*Capparis decidua*, Lipschitz test, diuretic activity, urine
volume.

1. INTRODUCTION

*Capparis decidua* commonly known as Bare Caper is a
climbing shrub belonging to the family of Capparaceae
which is widely distributed throughout India. In the Unani
system of medicine the plant has been used as a
carminative, tonic, emmenagogue, aphrodisiac, alexipharmic;
improves the appetite; good for rheumatism, lumbago, hiccough, cough and asthma[1].
Several phytoconstituents have been identified and
isolated from different parts of *Capparis decidua* which
includes alkaloids, glycosides, terpenoids, sterols, flavonoids, phenols and fatty acids[2]. The hydrocarbon
fraction of flowers contains nonacosan, triacontane,
Ascorbic acid, phytic acid, oxalic acid, and phthalic acid.
Two new saturated aliphatic ketones (C28 and C32), n-
nonacosanol, b-sitosterol, b- D-glucoside of b-sitosterol, a
new isomer of b-sitosterol, a new glycoside, pelargonidin-
3-galactoside,

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glucocappasilin, glucocapparin, and two free sugars, D glucose, and D- galactose are additional phytochemicals
present in flowers[3]. The different parts of the plant has
been screened for pharmacological activities and reported
to possess antiatherosclerotic [4], antihelmintic[5],
antiepileptic and sedative [6], anti-inflammatory and
analgesic [7], antimicrobial (antibacterial and antifungal)[8],
cardiac depressant[9], hypoglycaemic[10], hypolipidaemic[11],
purgative [12], hepatoprotective[13], and antiplatelet activity[14]. The present study has been carried
out to explore the diuretic activity of ethanolic extract of
flowers of *Capparis decidua*.

2. MATERIAL AND METHODS

Collection of Material:
The fresh flowers of trees *Capparis decidua* belonging to
the family *Capparaceae* were collected in bulk from the
local area of Warangal, Telangana, India in the month of
April 2017. The identification and the authentication of
*Capparis decidua* tree were done in the Department of
Botany, Kakatiya University. The standard furosemide
was obtained from Viraj Pharmaceutical Private Limited,
Mumbai, India.

Preparation of plant extract:
After collection, flowers were washed very carefully and
clearly with water and dried under shade. The dried
flowers were then powdered in an electrical processor. 50
gram of dried powder
flower was extracted in a Soxhlet apparatus with 200 ml of ethanol. The ethanolic extract was then distilled, evaporated and dried in vacuum to get the semisolid resinous extract. All the extracts were kept in a desiccator and stored in a refrigerator for the further pharmacological experiment.

**Animals:**

Wistar rats of either sex, weighing about 180-200 grams were used in experiments. Animals were housed in polypropylene cages with not more than three animals per cage and maintained under standard condition (12 hours light / dark cycle; temperature 25 ± 3 °C; relative humidity 55 ± 5%) and had free access to standard pellet feed (Hindustan Lever Ltd., India) and water ad libitum. All the animals were acclimatized to laboratory condition for a week before the commencement of the experiment. The experiments on animals were conducted in accordance with CPCSEA and our protocols were duly approved by the Institutional Ethical Committee (02/JCP/IAEC/2017; Dt: 29-08-2017)

**Acute Toxicity Studies:**

The acute toxicity study to carry out the gross behavioral effects and safety effects of the ethanolic extract of *Capparis decidua* was carried on mice weighing about 20-25gm as per as per ICH Topic S7A guidelines and OECD 423 guidelines. Overnight fasted mice received the test extract at a dose of 5 mg/kg bodyweight orally and mortality was observed for first 24 hours, with special attention for the first 4 hours and daily then, for a total of 14 days. If no mortality was observed for any mice, then the procedure was repeated again with doses of 50, 300 and 2000 mg/kg body weight orally. The extract was well tolerated by the mice without any explicit signs of toxicity even at the dose of 2000 mg/kg body weight orally. [15]

**EVALUATION OF DIURETIC ACTIVITY BY LIPSCHITZ METHOD:** [16] [17]

The Lipschitz test has been demonstrated to be a standard method and a very valuable tool for screening of possible diuretics. Wistar rats were randomly divided into three groups containing six animals each. Group 1 was served as the normal control group and treated with Normal Saline alone; Groups 2 served as the positive control and treated with furosemide (10 mg/kg, p.o.); Group 3 was treated with ethanolic extract of flowers of *Capparis decidua* (500 mg/kg, p.o.). Animals were fasted and deprived of water for 18h prior to the experiments. On the day of the experiment before treatment, all animals received 0.15 ml/10 gram body weight of 0.9% NaCl by oral gavage to impose a uniform water and salt load. Before the administration of the extract/control, the bladder of the rat was emptied by gentle compression of the pelvic area and pulling of tails. Immediately after dosing, the rats were placed in the metabolic cages (Three rats are placed in one metabolic cage) specially designed to separate urine and fecal matter. Animals were kept at room temperature of temperature 25± 3 °C and the relative humidity 55 ± 5% throughout the experimental period. The urine was collected in measuring cylinder up to 5hrs after dosing with extract. During this period, food or water was not provided to the rats. The total volume of urine collected was measured for both the control and treated groups. Urine volume excreted per 100 g body weight is calculated for each group.

\[
\text{Diuretic index} = \frac{\text{Mean urine volume of the test group}}{\text{Mean urine volume of the control group}}
\]

\[
\text{Lipschitz value} = \frac{\text{Mean urine volume of the test group}}{\text{Mean urine volume of the reference group (Furosemide Group)}}
\]

Results are expressed as the “Lipschitz-value” and indices of <0.72, 0.72–1.00, 1.00–1.5, and >1.5, will be regarded as will be considered “nil”, “little”, “moderate”, and “good”, diuretic activity. [18]

Urine electrolytes (sodium, potassium concentrations were measured using flame photometry.

**STATISTICAL ANALYSIS:**

Values were expressed as Mean ± Standard Deviation. The Significance of differences among the group was assessed using one-way analysis of variance (ANOVA). The test followed by Dunnett’s multiple comparisons test of significance. p values less than 0.05 were considered as statistically significant.

**3.RESULTS AND DISCUSSION**

This study has been carried out to establish the diuretic properties of ethanolic extract of flowers of *Capparis decidua*. For the screening of diuretic effect Lipschitz method was used which is based on water and sodium excretion in test animals and compared to rats treated with a standard diuretic. Ethanolic extract of *Capparis decidua* (2.67±0.89) as well as furosemide (3.62±1.07) significantly increased the urine volume when compared with control 1.92±0.71 (Table 1) and showed significant diuretic effect. The diuretic activity of a drug is considered nil if it is less than 0.72, little if it is between 0.72 and 1.00, moderate if it is within 1.00–1.50 and good if it is above 1.50. In this respect, *Capparis decidua* flower extract has little significant diuretic activity when compared to that of control.

<table>
<thead>
<tr>
<th>S. No</th>
<th>Treatment</th>
<th>Urine volume (ml/100g/Sh)</th>
<th>Diuretic index</th>
<th>Lipschitz value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Control (Saline)</td>
<td>1.92±0.71</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Standard (Furosemide)</td>
<td>3.62±1.07**</td>
<td>1.84</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td><em>Capparis decidua</em> Extract</td>
<td>2.67±0.89*</td>
<td>1.39</td>
<td>0.735</td>
</tr>
</tbody>
</table>

Values are mean ± SD (n=6) One way ANOVA followed by Dunnet’s test. *P < 0.05 and **P < 0.01 when compared to control

Table 1. Effect of oral administration of *Capparis decidua* extract on urine volume
Further, the present results suggest that ethanolic extract flowers of *Capparis decidua* increases the urinary electrolyte excretion of sodium and potassium ions and exhibit potent natriuretic activity when compared to normal control. (Table 2)

<table>
<thead>
<tr>
<th>S. No</th>
<th>Treatment</th>
<th>Urinary Na(^+)(mmol/L)</th>
<th>Urinary K(^+)(mmol/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Control (Saline)</td>
<td>111.42±4.12</td>
<td>53.52±1.34</td>
</tr>
<tr>
<td>2</td>
<td>Standard (Furosemide)</td>
<td>176.63±3.76**</td>
<td>98.21±2.93**</td>
</tr>
<tr>
<td>3</td>
<td><em>Capparis decidua</em> Extract</td>
<td>123.96±2.97*</td>
<td>70.64±1.64*</td>
</tr>
</tbody>
</table>

Values are mean ± SD (n=6) One way ANOVA followed by Dunnet’s test. *P < 0.05 and **P < 0.01 when compared to control

Table 2. Effect of oral administration of *Capparis decidua* extract on the electrolyte excretion

Figure 1: Effect of oral administration of *Capparis decidua* extract on the electrolyte excretion

4. DISCUSSION

Diuretics are the agent that increases the production of urine and are used to treat heart failure, liver cirrhosis, moderate hypertension, influenza, water poisoning, and certain kidney diseases. The medicinal plants constitute an everlasting source of active substances; those of diuretic action stand out due to its employment in the treatment of important diseases. The present study was undertaken to appraise the diuretic activity of ethanolic extract of flowers of *Capparis decidua*. This study revealed that *Capparis decidua* extract significantly increased the urinary output which indicates that the tree has a significant diuretic effect. Increase in the urinary volume was also accompanied by an increase in the excretion of sodium and potassium ions hence; *Capparis decidua* extract has been shown to possess significant saluretic and natriuretic effects. The diuretic effect of the *Capparis decidua* extract may be by Inhibiting vasopressin secretion or Inhibiting the Na–K–2Cl symporter, Na+/K+ exchanger or Na+/Cl− symporter thereby displaying the diuretic property. Diuretics are tools of considerable therapeutic importance. In the light of the above-mentioned study, we can report that the ethanolic extract of flowers of *Capparis decidua* is an effective diuretic and also resulted in increased sodium, potassium and chloride ions in urine; it can be used as tools of considerable therapeutic importance for the management of Hypertension and congestive cardiac failure.

5. CONCLUSION

The present observations provide evidence that ethanolic extract of flowers of *Capparis decidua* showed the significant diuretic property as it increased urine and electrolyte excretion. However, further studies are suggested for explaining the mechanism of diuretic activity.

CONFLICTS OF INTEREST

The authors do not have any conflict of interest.

REFERENCE