**Summary**

Urinary tract and kidney stone ailments have affected human beings since antiquity. The occurrence of these stones has been increasing in rural and urban societies. A large population of India suffers from urinary tract and kidney stones, formed due to deposition of calcium, phosphates and oxalates. Antiurolithiatic studies were done with two assays, namely nucleation assay and aggregation assay. CaOx crystals were grown in the *in vitro* technique. The effect of root and shoot extracts of *Scoparia dulcis* L. was studied on the growth and inhibition of CaOx crystals. By comparing the activities of the two extracts shoot and root, the greater antiurolithiatic activity was shown by root sample with a concentration of 500 μl.

**Key Words** : Urinary tract and kidney stone, Antiurolithiatic, *In vitro* technique, *Scoparia dulcis* L.


**Article chronicle** : Received : 02.10.2012; Revised : 20.11.2012; Accepted : 27.11.2012

**Materials and Methods**

Aqueous root and shoot extracts of the plant *Scoparia dulcis* L. were used for the study.

**Nucleation assay** (Atmani and Khan 2000) :

Solution of calcium chloride and sodium oxalate were prepared at the final concentrations of 5 mmol/L and 7.5 mmol/L, respectively in a buffer containing Tris 0.05 mol/L and NaCl 0.15 mol/L at pH 6.5. To 100 μL of herb extracts (at different concentrations 100 to 500 μg/ml), 950 μL of calcium chloride solution was mixed. Crystallization was started by adding 950 μL of sodium oxalate solution. The temperature was maintained at 37°C. The optical density of the solution was monitored at 620 nm. The rate of nucleation was estimated by comparing the induction time in the presence of extract with that of control. The growth of crystals was expected due to the following reaction.

\[ \text{CaCl}_2 + \text{Na}_2\text{C}_2\text{O}_4 \rightarrow \text{CaC}_2\text{O}_4^+ \]

**Aggregation assay** (Atmani and Khan, 2000) :

The method was described by Atmani and Khan (2000) with some minor modifications. ‘Seed’ CaOx monohydrate (COM) crystals were prepared by mixing calcium chloride and sodium oxalate at 50 mmol/L. Both solutions were equilibrated to 60°C in a water bath for 1 hr and then cooled to 37°C.
Table 1: Antirolithic assays of root and shootsamples of *Scoparia dulcis* L.

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Assay</th>
<th>Sample</th>
<th>Control</th>
<th>100</th>
<th>200</th>
<th>300</th>
<th>400</th>
<th>500</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Nucleation</td>
<td>Root</td>
<td>84.73</td>
<td>87.33</td>
<td>35.59</td>
<td>84.25</td>
<td>83.37</td>
<td>82.77</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shoot</td>
<td>85.62</td>
<td>32.81</td>
<td>83.10</td>
<td>81.05</td>
<td>78.24</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shoot</td>
<td>-5.84</td>
<td>-10.34</td>
<td>-13.22</td>
<td>-15.61</td>
<td>-15.33</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Aggregation</td>
<td>Root</td>
<td>-125.93</td>
<td>-82.21</td>
<td>-189.67</td>
<td>-229.23</td>
<td>-238.33</td>
<td>-251.73</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shoot</td>
<td>-28.43</td>
<td>-147.99</td>
<td>-157.93</td>
<td>-158.94</td>
<td>-161.27</td>
<td></td>
</tr>
</tbody>
</table>

S.E. = 8.25
C.D. (0.05) = 16.53

Table 2: Effect of *Scoparia dulcis* L. root and shoot aqueous extracts on different stages of crystallization

<table>
<thead>
<tr>
<th>Concentration (µl/ml)</th>
<th>Control</th>
<th>100</th>
<th>200</th>
<th>300</th>
<th>400</th>
<th>500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Root (Aqueous extract)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Shoot (Aqueous extract)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

- + → Action on the stage N – Nucleation
- - → More / less action on the stage G – Growth
- - → No action on the stage A – Aggregation
overnight. The crystals were harvested by centrifugation and then evaporated at 37°C. CaOx crystals were used at a final concentration of 0.8 mg/ml, buffered with Tris 0.05 mol/L and NaCl 0.15 mol/L at pH 6.5. Experiments were conducted at 37°C in the absence or presence of the plant extract after stopping the stirring. The percentage aggregation inhibition rate was then calculated by comparing the turbidity in the presence of the extract with that obtained in the control using the following formula:

\[
Ir = \left(1 - \frac{\text{Turbidity}_{\text{Sample}}}{\text{Turbidity}_{\text{Control}}} \right) \times 100
\]

RESULTS AND DISCUSSION

By comparing the activities of the two extracts shoot and root, the greater capacity to reduce all the crystallization process is shown in root sample with a concentration of 500 μl (-258.73 μl/ml). The higher concentrations of herb extracts were associated with fewer crystals, and the size decreased proportionally (Table 1).

Similar result was obtained in fruit extracts of Solanum xanthocarpum Schrad and Wendl. and Pedalium murex Linn. by Patel et al. (2010). The present finding is in accordance with the findings of Patel et al. (2011) who evaluated the potency of different extracts of seeds of Elettaria cardamomum.

From the present findings it is indicated that root extract had more potency to inhibit crystallization (Table 2). Chauhan et al. (2011) inferred that magnesium acetate (1.0 M) prepared with 0.0 per cent, 0.5 per cent and 1 per cent concentrations of the extract showed high dissolution rate and fragmentation of struvite crystals.

REFERENCES


