LIST OF TABLES

Table 1.1. Risk factors for the development of urinary stone disease 15

Table 1.2. Relationship of stone location to common symptoms. 17

Table 1.3. Common causes of calcium oxalate stones. 23

Table 1.4. Method used for Anion exchange chromatography 28

Table 1.5. Currently consumed phytotherapeutic agents and their mechanisms of action. 41

Table 2.1. List of all plants and their effective antilithaite parts used 48

Table 2.2. Method used for anion exchange chromatography 60

Table 2.3. The gradient program designed on HPLC and used for amino acid analysis 64

Table 2.4. The order and volume of reagents to be added in a cuvette for estimation of LDH 74

Table 2.5. The order and volume of reagents to be added for estimation of AP 75

Table 3.1. Qualitative estimation of phytochemicals in the more than and less than 10 kDa fraction of Trachyspermum ammi aqueous extract. 95

Table 3.2. Inhibitory potential of precipitates obtained after ammonium sulfate precipitation of Trachyspermum ammi crude extract. 97
Table 3.3. Inhibitory potential of fractions obtained after anion exchange chromatography

Table 3.4. Inhibitory potential of fractions obtained after molecular sieve chromatography

Table 3.5. Outline of purification of inhibitory protein from the seeds of Trachyspermum ammi

Table 3.6. Percentage of amino acids in TAP

Table 3.7. The docking score and estimated free energy of binding ($\Delta G_{\text{bind}}$) on interaction of EF hand domain with the unit cell of COM

Table 3.8. Ionic bonds and hydrophobic interaction between the EF hand domains and COM crystal
<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 1.1</td>
<td>Plant of <em>Trachyspermum ammi</em></td>
<td>8</td>
</tr>
<tr>
<td>Figure 1.2</td>
<td>Seeds of <em>Trachyspermum ammi</em></td>
<td>9</td>
</tr>
<tr>
<td>Figure 1.3</td>
<td>Presence of stones in kidneys, ureter and urinary bladder</td>
<td>12</td>
</tr>
<tr>
<td>Figure 1.4</td>
<td>Diagnosis of suspected urinary stone (CT: computed tomography)</td>
<td>18</td>
</tr>
<tr>
<td>Figure 1.5</td>
<td>Algorithm for medicinal management of recurrent kidney stones</td>
<td>31</td>
</tr>
<tr>
<td>Figure 1.6</td>
<td>Photomicrograph of three main type of crystals present in plants.</td>
<td>37</td>
</tr>
<tr>
<td>Figure 1.7</td>
<td>CaOx crystals having a non-mineral matrix with an affinity for calcium and oxalate.</td>
<td>39</td>
</tr>
<tr>
<td>Figure 2.1</td>
<td>Bio-Rad Mini PROTEAN III</td>
<td>62</td>
</tr>
<tr>
<td>Figure 2.2</td>
<td>Flowchart representation of major group P and its sub-groups</td>
<td>70</td>
</tr>
<tr>
<td>Figure 2.3</td>
<td>Flowchart representation of major group Q and its sub-groups</td>
<td>71</td>
</tr>
<tr>
<td>Figure 3.1</td>
<td>Comparative analysis of three plants towards initiation of CaP mineral phase formation.</td>
<td>84</td>
</tr>
<tr>
<td>Figure 3.2</td>
<td>Comparative analysis of three plants towards growth of CaP mineral phase formation</td>
<td>86</td>
</tr>
<tr>
<td>Figure 3.3</td>
<td>Comparative analysis of three plants towards demineralization of CaP preformed mineral phase</td>
<td>87</td>
</tr>
<tr>
<td>Figure 3.4</td>
<td>Percentage inhibition of calcium oxalate crystal growth by Trachyspermum ammi aqueous extract</td>
<td>89</td>
</tr>
</tbody>
</table>
Figure 3.5. Evaluation of more than 10 kDa fraction of 10% (w/v) *Trachyspermum ammi* aqueous extract on CaP initial mineral phase formation

Figure 3.6. Evaluation of less than 10 kDa fraction of 10% (w/v) *Trachyspermum ammi* aqueous extract on CaP initial mineral phase formation

Figure 3.7. Evaluation of more than 10 kDa fraction of 10% (w/v) *Trachyspermum ammi* aqueous extract on CaOx crystal growth

Figure 3.8. Evaluation of less than 10 kDa fraction of 10% (w/v) *Trachyspermum ammi* aqueous extract on CaOx crystal growth

Figure 3.9. Graphical representation of purification process adopted

Figure 3.10. Elution profile generated by LP data view after anion exchange chromatography

Figure 3.11. Composition of peak 5 (36-42 mins) by SDS-PAGE (10%) analysis. Lane (1) is peak 5, Lane (2) is molecular weight markers.

Figure 3.12. Elution profile generated by LP data view after molecular sieve chromatography

Figure 3.13. Composition of peak 4 (980-1072 mins) by SDS-PAGE (10%) analysis. Lane (1) is peak 4, Lane (2) is molecular weight markers

Figure 3.14. Homogeneity ascertained by a single peak on RP-HPLC
**Figure 3.15.** Molecular weight determination of TAP by size exclusion HPLC

**Figure 3.16.** Dose dependant effect of TAP on calcium oxalate crystal growth

**Figure 3.17.** Dose dependant effect of TAP on calcium phosphate mineralization

**Figure 3.18.** Determination of Isoelectric point of TAP and found to be 6.2

**Figure 3.19.** Spectroscopic analysis of TAP between wavelength (λ) range of 220-400nm. The λ\textsubscript{max} was found to be 280nm

**Figure 3.20.** The peptide mass fingerprinting by MALDI-TOF MS obtained from trypsinized TAP

**Figure 3.21.** Results of MASCOT search engine after loading peptide m/z ratio from TAP

**Figure 3.22.** BLAST of unnamed protein product of *Vitis vinifera* (CAO23876) with non redundant database

**Figure 3.23.** Domains identified in unnamed protein of *Vitis vinifera* (CAO23876) by SMART normal module

**Figure 3.24.** The structure of Calcium oxalate monohydrate (COM) unit cell showing coordination polyhedra of atoms Calcium 1 [Ca (1)] and Calcium 2 [Ca (2)].
Figure 3.25. Two dimensional representations of the interactions observed between COM unit cell and EF hand a domain

Figure 3.26. Two dimensional representations of the interactions observed between COM unit cell and EF hand b domain.

Figure 3.27. Influence of both treatment periods on body weight of rats after both 9 and 15 days

Figure 3.28. Urine volume excreted in 24 hrs under treatment period of 9 and 15 days

Figure 3.29. Influence on the activity of urinary alkaline phosphatase after both 9 and 15 days treatment

Figure 3.30. Influence on the activity of urinary lactate dehydrogenase after 9 and 15 days treatment

Figure 3.31. Polarization micrographs of rat’s urine after 9 days treatment

Figure 3.32. Polarization micrographs of rat’s urine after 15 days treatment

Figure 3.33. Influence on the content of serum urea after 9 and 15 days treatment

Figure 3.34. Influence on the content of serum creatinine after 9 and 15 days of treatment

Figure 3.35. Influence on level of creatinine clearance after 9 and 15 days treatment
**Figure 3.36.** Kidney tissue observed under light microscope in 9 days treatment

**Figure 3.37.** Kidney tissue observed under light microscope in 15 days treatment

**Figure 3.38.** Polarization micrographs of renal tissue